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INTRODUCTION

Recent projections of potential energy recovery from biomass in the United States vary widely. The Office of Technology Assessment (OTA) predicts that by the turn of the century between 12 and 17 quads per year (1 quad equals 10^{15} BTUs) could be derived from biomass and selected wastes depending upon cropland availability, development of efficient conversion processes and level of policy support (OTA, 1980).[1] Biomass derived energy in these quantities would at that time constitute about 15 percent of projected energy consumption (100 quads) (Hayes, 1977; CEQ, 1978; Hall, 1981, p. 99). Estimates from the Department of Energy (DOE, 1982) are much more pessimistic and envision that the conversion of biomass would result in only 3 to 5 quads of energy equivalent fuels. The lower end of this range is less than twice the current commercial contribution of wood (1.8 quads or 850,000 barrels of oil equivalent per day).

Biomass may be broadly defined as all forms of plant and animal material, grown on land, in or on the water, and substances derived from biological growth, such as animal, plant and human. Biomass wastes, containing carbohydrates and hydrocarbons, provide a feedstock for direct energy conversion or the production of several carbon-based fuels. Some of the more obvious biomass sources include agricultural wastes such as residues, crop silviculture (forest cultivation), mariculture (marine plant cultivation), domestic animal wastes and municipal solid waste. Carbohydrate wastes and residues contain sugar, starch, cellulose, and lignin. Sugar and starch are primary products of grain crops while wastes from logging operations and the straw, stover, stalks and hull residues of agricultural production have a high cellulose and lignin content (Tillman, 1978). The source of biomass, as well as the amount and type of fuel used in the conversion process, largely determine the actual process and fuel that can be produced. For example, wood can be used to make either methanol or ethanol, but methanol is the more common liquid fuel product. In contrast, biomass which is higher in sugar and starch is used in digestion and fermentation processes to produce ethanol. Animal, municipal, and human solid waste are usually anaerobically digested to produce synthetic natural gas with a high methane content.

Because of the importance of the type of biomass in energy conversion, a first step in understanding its potential role in energy production is to estimate availability. The primary purpose of this report is to contribute to this inventory of readily available feedstocks for energy production from

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[1]The OTA forecast of energy from biomass includes 10 quads from wood, 0 to 5 quads from grasses and legume herbage, 1 quad from crop residues, and 0.3 quads from manure. Anderson and Tillman (1977) estimate that the amount of biomass readily available for energy in the United States is 230 million tons (dry matter equivalent). Larson (1977) estimates that annual residues from food crops total 330 million tons of which perhaps 20 percent is harvestable. Estimates of manure tonnage generated yearly range from 210 (Loehr, 1968) to 250 million tons of which 46 million tons (Smith *et al.*, 1979) to 135 million tons (Van Dyne and Gilbertson, 1978) can be collected and anaerobically digested to produce 0.3 to 1.0 quads.

biomass. The scope for such an inventory could be quite extensive. However, our attention is limited in three important respects. First, the biomass inventory considers only those sources pertinent to the United States Department of Agriculture (USDA) program for energy from agricultural crops and residues. These sources include crop residue, animal manure, and industrial waste remaining from food processing operations but exclude biomass from forests and timber products. Second, because the Department of Energy is responsible for projects of all sizes where the principal feedstock is municipal wastes, aquatic harvests, and silviculture, these sources of biomass are excluded as well.

Finally, this particular report is limited to a consideration of the northeast United States.[2] Consequently, we assume that the scope for conversion of grain to ethanol is limited because of the limited cropland suitable for feed grain production and competing feed demand from the dairy and other livestock industries in the Northeast. Similarly, any potential farm or industrial biomass sources that come from practices or processes that are not yet well established in the Northeast are considered beyond the scope of this analysis. Thus, the likelihood of commercial development of hydrocarbon biomass sources such as hevea, guaycile, or Jerusalem artichoke is considered too small to warrant consideration.

Biomass availabilities are considered from two different viewpoints. The first is the technical availability of collectible residues and wastes irrespective of collection and conversion costs or other economic considerations. This approach does not ignore, however, the costs implicit in erosion and nutrient loss in the case of crop residue collection, the impracticality of manure collection for range fed beef, or by-product production and energy generation currently utilizing industrial wastes.

A second approach is to determine residue availabilities in the context of conversion viability. Here, attention is directed to optimally sized conversion facilities, and availability of requisite feedstocks within some critical distance of the plant, defined in part by the cost of transportation. For example, the optimal size of a biomass fueled electric power plant or synthetic fuels plant is determined by a trade-off between economies of size typically encountered among utilities and the cost of transporting feedstock to the conversion plant. Economies of size enjoyed by large conversion plants may be matched by the cost savings associated with mass producing a large number of smaller conversion units. Further, in industrial applications, size is determined by the needs of the industrial plant rather than on the basis of the size of the boiler alone. Because the number of sites where large quantities of biomass are available to a single plant on a continuing basis are limited, fullest utilization of biomass resources for thermo chemical conversion may require the development of small-scale, mass-produced units (OTA, 1980, p. 129). In general crop residues in counties with insufficient residue densities to support a 5 million gallon/year methanol plant are excluded from the second inventory approach. Likewise, animal wastes generated on farms with fewer than 50 confined beef animals, 50 dairy animals,

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[2]Inventories for other regions are being prepared elsewhere. To the extent possible, these studies are based on a consistent methodology and when all of them are completed, it will be possible to obtain a national inventory of potentially available biomass for energy conversion.

10,000 layers, 30,000 broilers or 100 swine are insufficient to warrant investment in a digester and are ignored for inventory purposes.

The remainder of the report is organized into four sections. The following two sections describe the procedures used to estimate inventories and collection costs for crop residues and animal wastes, respectively. The third section briefly discusses the potential for food processing wastes. A final section summarizes the results and draws policy conclusions. To assist the reader in placing the inventory estimates in proper perspective, a brief description of the various biomass-to-energy conversion processes and on appraisal of their economic feasibility is given in Appendix A.

Section 2

AVAILABILITY OF CROP RESIDUES

Crop residues are the stalks, stems, and leaves of a crop which are normally left on the field after harvest. In actual quantity, they may often equal or exceed the weight of harvested grain and fruit. As they are only sporadically collected for use as animal bedding or feed, they have been widely evaluated in recent years as possible biomass feedstocks for energy production (Flaim and Hertzmark, 1981). The most promising conversion processes using crop residues as feedstocks include: direct combustion, gas production (either producer gas or methane), and liquid fuel production (either methanol or ethanol).

Intelligent choices on the use of crop residues in energy production require a careful evaluation of actual quantities available and their cost of acquisition. Available residues are those quantities over and above what is needed for essential erosion control, are collectable mechanically and storable. Costs of acquiring harvestable residues include foregone agronomic nutrient value, and harvest, storage, and transportation costs. The long-run residue price will also depend on local markets for residue which conceivably could vary widely from region to region.

This section outlines the methodology for estimating available crop residues. Briefly, the methodology makes use of topographical soils and farm management data from the National Resource Inventory (NRI) and crop data from the Census of Agriculture to estimate county level residue availabilities. Harvestable residue estimates for 1978 are based on data from the Census of Agriculture and residue projections for the years 1985 and 1990 make use of national (NIRAP) crop acreage and yield forecasts for the Northeastern states.

The quantities of residues available for energy conversion are expected to vary with farm management practices and so a sensitivity analysis simulating three levels of farm management is included for 1978 and the two forecast periods.

METHODOLOGY FOR MAXIMUM RESIDUE HARVEST

Although crop residues are popularly viewed as waste products from crop production, they do have significant agronomic value in United States agriculture. Larson *et al.* (1978, pp. 12-14) note that crop residues provide plant nutrients, improve soil structure, regulate soil moisture, air, and temperature relations, reduce runoff and erosion, and make tillage easier. Perhaps their most important role, in terms of this discussion on availability, is that of erosion control. While some of these factors can be easily evaluated in an economic analysis because there are purchased inputs to serve as a substitute, the long-term destruction of cropland via excessive erosion is difficult to value.

Removal of residue, under any cultivation system, will lead to increased topsoil loss. The loss of minor quantities of topsoil may be evaluated on economic grounds to determine whether residue harvest is justified, but an excessive rate of erosion may be held *a priori* as unjustifiable. Residue removal should only be undertaken where expected soil erosion after collection is still below a critical erosion rate. If residue collection does not permit long-term maintenance of soil characteristics, then for purposes of this study it is considered infeasible.

Larson, *et al*. (1978) were among the first researchers to address crop residue collection from the standpoint of its impact on soil erosion. Their methodology is largely based on procedures developed over the last 30 years by the National Runoff and Soil Loss Data Center of the Agricultural Research Service (now Science and Education Administration) in cooperation with Purdue University. These procedures are designed to estimate actual and safe erosion levels for cropland (USDA, 1980).

Two principal methods, based on general climatic conditions, may be used to calculate soil erosion. The Universal Soil Loss Equation (USLE) applies to humid areas of the United States where water is the dominant erosive force. The Wind Erosion Equation applies chiefly to the Great Plains states where wind is the dominant erosive force. Larson *et al*. performed their study for Iowa and Southern Minnesota using the USLE.

This equation enables one to estimate the sheet and rill erosion based on known agronomic, topographic and climatic conditions. The equation for expected soil loss is a multiplicative function:

$$E = R * K * LS * C * P, \tag{1}$$

where

R = rainfall and runoff factor;
K = soil erodibility factor;
LS = topographic factor;
C = vegetative cover and management factors, and
P = support practice factor.

The larger the value of any factor in the equation, the greater the potential soil loss. Factors R and K are generally beyond the control of the land manager. R is a function of climate, reflecting quantities and intensity of rainfall. K is determined by soil particle size, structure, permeability, and organic matter content. The LS factor is derived from land slope length (L) and steepness (S). Longer and steeper slopes are more susceptible to erosion. LS is to some extent alterable by land managers through the use of terracing and other land management practices, although this is generally expensive.

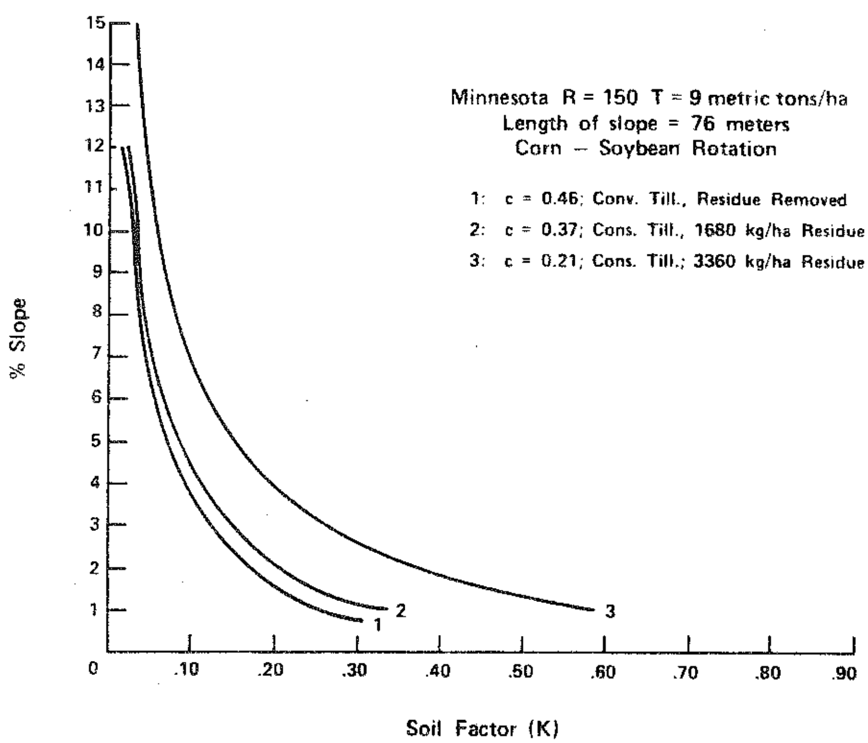
The C and P factors are the ones most subject to management. C is the ratio of soil loss from land with a specific crop management system to the soil loss from the same land were it continuously cultivated in fallow. Crop rotation, residue management, winter cover, and cultivation practices are used in its derivation. The P factor reflects the use of conservation practices such as contouring and strip cropping. It is the ratio of soil loss under a given conservation practice to one of straight up and down slope cultivation.

Since C and P are both ratios with the worst case in the denominator, their maximum values are unity.

Once calculated, estimates of soil loss from the USLE may be compared to an empirically estimated tolerable soil loss (T, in tons/ha) factor.[1] The T factor reflects the level of soil loss that can be undergone and still not materially change the land's long-term economic productivity. An effective soil erosion control system occurs when the USLE value is less than or equal to the empirically determined T-value.

Larson et al. (1978) determine values for R, L, and P and then study the interaction of specified C factors with land slope (S) and erodibility (K) factors. The C factor is selected for various rotations and management practices and then is varied to allow for different residue removal rates. Figure 1 illustrates for Southern Minnesota the combination of K and S that will produce an average annual soil loss of 9 metric tons/hectare for a corn-soybean rotation with different tillage and residue management practices. Under a reasonable erodibility factor of 0.28, their findings reveal that

Figure 1. Relationship between percent slope and soil K factor on soil erosion in southern Minnesota. Lines show a computed soil loss of 9 metric tons/ha.



Source: Larson et al., 1978.

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[1]NRI T-factor estimates are included in the individual inventory data records and come from USDA soil interpretation forms, Soil Form #5.

under conventional tillage, a 1 percent slope is the maximum from which all residues could be removed. Under conservation tillage, 1.3 percent is the maximum slope from which all but 1500 pounds of residue could be removed, and 2.8 percent is the maximum slope from which all but 3,000 pounds of residue could be taken. Given a scenario where all residues were to be removed, Larson et al. (1978, p. 8) estimate that for the region of Iowa and Southern Minnesota, anywhere from 1 to 57 percent of the land area could be harvested, depending on specific subregions, without contributing to excessive soil loss.

Larson et al. used data from the 1967 Conservation Needs Inventory, various other published and unpublished sources, including personal communications, and judgment. Reasonably accurate estimates of crop rotations and management factors were crucial to the studies. Although management factors appear to have been assumed, rotations were derived from USDA data for 1974 by soil type. This approach is necessarily broad and may not capture actual management levels in practice. That is, the assumption that conventional tillage (management level unspecified) is practiced with a P factor reflecting worst contour practices does not allow for superior management practices that might permit residue harvest and which are undoubtedly practiced by many farmers.

Thus, expansion of the Larson et al. methodology beyond southern Minnesota and Iowa would require a significant expenditure of time and effort and would necessitate broad assumptions concerning crucial management factors.

DATA ASSUMPTIONS AND AGGREGATION

Since the Larson study was completed in 1978, the 1977 National Resource Inventory (NRI) data collected by the Soil Conservation Service (SCS) have been released and provide the necessary USLE component data for sampled cropland within each of the 50 states. Each of the nearly 170 thousand observations and its associated level of management, topography and other USLE factors can be categorized by state, resource area,[2] and crop specific land use. Where appropriate, computations in this analyses employ the NRI data in their raw, disaggregate form. Harvestable acreage percentages and USLE components are calculated from these data and are aggregated by crop, state, and resource area. This cross-sectional partition and its methodological usefulness is most readily discussed in the context of a three dimensional matrix, with crops and resource areas occupying the rows and columns of a series of tables, one for each state. A particular cell of this three-dimensional matrix might contain eight observations for New York corn acreage in Resource Area 144B. When aggregating point estimates to the crop, state, and resource area cross-section totals, NRI expansion factors provided for each sample point are used to weight observations by the total area they represent. The expansion factors are approximations of total nearby acreage with characteristics similar to the sample point. Although the NRI sample is drawn to be random at the state level, it is argued that any bias introduced by aggregation to state-resource area partitions is more than offset by the resource area variation captured at the more disaggregate level. In short, the NRI data allow estimates of harvestable crop residues to be calculated in the

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[2]Resource area boundaries are determined by the Soil Conservation Service (USDA-SCS, 1978).

spirit of Larson with fewer general assumptions about erosion factors, land management characteristics and other important factors.

Basically, the procedure is to take the USLE data for each point estimate, substitute them into equation (1) and test the result against the critical erosion factor T. The acreage represented by every point estimate for which E is less than T is added to the state-resource area harvestable residue acreage of the crop which the point estimate represents. Total acreages for all crops grown within a state-resource area are also summed and from these figures harvestable acreage percentages can be calculated.

As straightforward as this approach appears there are caveats in the use of these data, in particular with regard to the C value component. Perhaps the most serious drawback of the NRI C-factors is that the effects of rotation, level of management, and amount of residue cover assumed in their derivation are inseparable. Thus, it is impossible to determine exactly what impact residue removal would have on a specific C-value. This is an important consideration since residue removal may need to be curtailed on lands where pre-residue harvest erosion rates were only marginally below the critical T-factor. Table 1 illustrates this problem in detail. It shows several corn cropping scenarios, including continuous corn and various rotations, for grain and silage operations. Silage may be considered a reasonable approximation of grain with residue harvest under a given management practice. In the case of continuous corn, the variation between grain and silage for the first four management practices ranges from 3 percent for high management fall plowing to 34 percent for high management spring plowing. Perhaps more importantly, compensation for a change in residue management could be made through a change from fall to spring plowing or in rotation management. For instance, referring again to continuous corn, by moving from low management spring plowing of grain to high management spring plowing of silage, the C value actually falls by 13 percent. Similar examples can be found throughout the various rotations.

The NRI C-value data is also specific to corn observations. The data for corn acreages do not differentiate between corn grown for silage and that for grain. Since very little residue remains from corn grown for silage, C-values for this acreage will be higher than that for grain corn acreage. Since there is no way of distinguishing a grain corn from a silage corn point estimate in the NRI data (prior to harvest), C-values for acreage devoted to silage corn cannot be separated, and the resultant C-values used for grain corn are biased upward. Some algebra reveals that this bias is approximately offset by residue removal of all but 2,000 pounds/acre, an amount which is considered to be uncollectable.[3] However, in determining the degree of bias in the C-values, data limited a comparison to fall chisel practices with varying amounts of

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[3]Ideally, one would want to estimate a C value, $\overline{C}$, which is a weighted average of the C values for corn grain, C_g, and corn silage, C_s,

$$\overline{C} = \frac{C_g W_g + C_s W_s}{W_g + W_s}$$

where W_g and W_s are averages of corn grain and silage, respectively. The ratio of grain C-values to silage C-values varies from 0.57 to 0.82, depending

Table 1. Typical C Factors for Corn Rotations

Rotation[a]	Low Management		High Management		Fall Chisel[b]		No-Till in Silage Cover or Residue
	Fall Plow	Spring Plow	Fall Plow	Spring Plow	2000#	4000#	
Continuous							
grain	0.51	0.45	0.39	0.29	0.16	0.11	0.04
silage	0.59	0.58	0.40	0.39	–	–	0.07
C_3OH_3							
silage	0.25	0.24	0.16	0.15	–	–	0.03
grain	0.20	0.19	0.13	0.12	0.06	0.05	0.02
C_3OH							
silage	0.34	0.33	0.22	0.20	–	–	0.04
grain	0.28	0.26	0.18	0.17	0.08	0.07	0.03
C_2OH_4							
silage	0.17	0.16	0.10	0.09	–	–	0.03
grain	0.13	0.12	0.07	0.06	0.05	0.04	0.02
COH_4							
silage	0.11	0.10	0.06	0.05	–	–	0.02
grain	0.09	0.07	0.04	0.04	–	–	0.01
C_2H_4							
silage	0.24	0.23	0.15	0.13	–	–	0.04
grain	0.19	0.17	0.13	0.12	0.07	0.04	0.03
C_3H_3							
silage	0.34	0.32	0.21	0.19	–	–	0.04
grain	0.27	0.25	0.19	0.17	0.07	0.05	0.03
C_3WH_3							
silage	0.24	0.23	0.15	0.14	–	–	0.03
grain	0.19	0.18	0.12	0.11	0.06	0.05	0.02
C_2WH_4							
silage	0.16	0.15	0.09	0.08	–	–	0.03
grain	0.12	0.11	0.07	0.06	0.05	0.04	0.02

Source: U.S.D.A. Soil Conservation Service, New York Technical Guide (1980).

[a]C_3OH_3 refers to a rotation of three years corn, one year oats, and three years hay.

[b]The headings refer to uncollected residue quantities in pounds.

residue removal and across various rotations. C-factor differences are likely to be greater for low and high management practices, and less for no-till.

On the basis of the analysis in footnote 3 and in order not to complicate excessively the data processing, the assumption that the C-value's bias for corn grain is offset by residue removal was made. To the extent that minimum and no till practices are not yet widely adopted and spring and fall plowing are predominant practices, the baseline scenario (as embodied in the 1977 NRI data) slightly overestimates harvestable residues. On the other hand, it seems reasonable to assume that minimum and no-till practices will be more widespread in the forecast period. If this is in fact the case, the baseline scenario demarcates a lower bound for available corn residues.

While this solves the problem of residue removal on C-values for grain corn, what about other crops? Unfortunately, there are no data available upon which to base an adjustment. Whenever oats and wheat are grown as part of a corn rotation, the preceding analysis applies and the effects of residue removal can be ignored. In order to test the sensitivity of changing C-values for crops other than corn when they are not part of a corn rotation, the C-value was increased 25 percent for these crops and harvestable acreage percentages were determined again. Under this assumption, harvestable acreage percentages for wheat in the Northeast declined 7 percentage points, from 54 percent to 47 percent and oats declined from 48 percent to 40 percent. Given

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3 (cont.)

on rotation and management practices. The differences decrease as practices improve. If one assumes that on average

$$C_g = 0.7 * C_s, \text{ then}$$

$$\overline{C} = W_s * \frac{C_g}{0.7} + W_g * C_g.$$

In New York, $W_s = 0.52$ and $W_g = 0.48$. Thus,

$$\overline{C} = 0.52 * \frac{C_g}{0.7} + 0.48 * C_g$$

$$C_g = \overline{C}/1.22.$$

Under these assumptions, C_g is biased upward (C_g is about 22 percent lower than the reported $\overline{C}$) by 21.4 percent in New York. In Pennsylvania, $W_s = 0.26$ and $W_g = 0.74$ and C_g is biased upward by 11.1 percent.

Another important factor affecting the C values is the proportion of residue actually removed. When fall chiselling is practiced and residue removal is increased so that residue cover is reduced from 4,000 pounds/acre to 2,000 pounds/acre, the increases in the C values by rotation are: 45 percent increase continuous corn; 20 percent increase C_3OH_3; 14 percent C_3OH; 25 percent C_2OH_4; 40 percent C_3H_3; and 20 percent C_3WH_3 (USDA, 1980). Thus, to the extent that rotations such as C_3H_3 and continuous corn are not predominant, the effects of C-value bias on grain corn and C value increases due to residue removal largely offset one another and can be ignored for purposes of this study.

the uncertainty surrounding the impact of residue harvest on C-values for acreage devoted to these other crops, the analysis proceeds on the basis that current C factors can be sustained even with residue harvest. Since residues from crops other than corn are important in only a few of the areas included in this study, this assumption has relatively little bearing on the outcome.

The preceding discussion of the NRI C-values focused on the effects of residue removal on the C-value at a point in time. Important also is consideration of the dynamic effects of changing farm practices on those USLE components which are farmer controlled. As previously mentioned, these are the C-values and P-values. It is possible that, over time, improved management practices may allow for the harvesting of acreage currently unsuitable for residue removal. This is especially true if demand for the residues increases the economic motivation for undertaking such practices.

NRI data for P-factors for the Northeastern states suggest that most of the cropland is not contoured. For no crop is the P-value less than 0.941 (up and down hill farming = 1.00). Since the P-value is so uniformily high, the general concensus must be that it is impractical or uneconomic to contour fields. There is little basis on which to forecast changes away from current practices and as such this study makes the assumptions that P-values will not deviate significantly in the forecast period from their 1977 values.

Analysis of the data also indicates wide variation for crop specific C-values even within a state and resource area. The wide range of values for a fairly homogenous region suggests that better practices have been adopted by some farmers and assuming profit maximizing behavior, that these practices make economic sense. To simulate adaptation of better rotation and tillage practices, two scenarios (in addition to the baseline scenario where no adjustment was made to the C values) are included. Both these scenarios adjust C-values by crop, state and resource area downward. These three simulations serve as a sensitivity test and the baseline scenario can be viewed as the most conservative of the three estimates.

Considerable attention has been directed toward the C and P values since these depend on farm management practices. Determination of harvestable acreage in this study assumes all other components of the USLE are fixed at 1977 levels. The fact that they are held constant does not mean that they are unimportant. Although generally all of the USLE factors are lower for land meeting erosion standards, in most cases it is the LS factor that varies the most. For the most important residue crops (corn, wheat, and oats), the LS factors are 4.8, 3.5, and 2.9 times larger, respectively, for acreage with excessive erosion than for acreage at safe levels. The slope percentage is the dominant cause of the LS factor differential. Of the remaining factors, none appears to outweigh the C-value in importance. The C factor for excessive erosion acreage is on average 57 percent higher than for those lands meeting the T standard.

This closes the discussion of the NRI data, its problems, and the critical assumptions necessary for its use (along with the USLE) in the context of residue availability. The next section describes in more detail the specific methodology used at Cornell to compute harvestable acreage percentages and crop residue availability in the Northeast and it is followed by an analysis of collection costs.

HARVESTABLE RESIDUES AND COUNTY RESIDUE DENSITIES

Harvestable crop residues at county and state levels and county harvestable residue densities can be estimated by determining harvestable acreage percentages from the NRI data, multiplying the percentages by grain production data from the Census of Agriculture, converting the grain data to residue equivalents, and adjusting for storage losses. After a brief discussion of partitioning and preparation of the data for three residue scenarios, these elements are discussed in detail.

The National Resource Inventory data tape is first stripped of those records pertaining to the Northeast states and to row crops, close grown crops, and vegetables. After discarding records with incomplete USLE figures, the data are partitioned across the nine states, thirteen resource areas, and sixteen crops included in the Northeast residue matrix.

As discussed above, the C-value component is the principal variant in the residue availability analysis. The three residue scenarios included in this study are ultimately based on varying degrees of farmer adaptability to better management practices. Implicit in the USLE data is a range of farm practices quantified in the C-value measure. Where these values have a large variance, there is probably potential for further adoption of the better practices. So in preparation for the different scenarios, standard deviations in C-values are first calculated for all crops grown within a particular state's resource areas.

C-values given in the 1978 NRI data serve as the basis for the residue availability baseline scenario. For two other simulations, C-values are allowed to vary by an amount dependent on 1978 C-value variance for a particular cell. In the second scenario, C-values or a specific point estimate are adjusted downward by one standard deviation of C-values within the cell and can be expressed as follows:

(2) $$C_{PE} = CNRI_{PE} - \sigma_{CSRA}$$

where:

C_{PE} is C-value for the second scenario for a particular sample point (single observation) within the crop-state resource area cell.

$CNRI_{PE}$ is the 1978 NRI C-value for a particular sample point within the crop-state resource area cell.

σ_{CSRA} is the standard deviation of C-values across all sample point within the state resource area cell.[4]

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[4]When there were too few observations within a particular state's portion of a resource area to have confidence in the estimate of the standard deviation, the crop specific standard deviation for the entire resource area is used instead.

In the third scenario, C-values are also adjusted downward, but the standard deviations are weighted by the ratio of C-value at the sample point to mean crop C-value for that particular state, and resource area. The logic behind this adjustment is that the potential for realizing further reductions in C-values due to improved management practices varies inversely with the existing C-value. This adjustment procedure can be expressed as

(3) $$C_{PE} = CNRI_{PE} - \frac{CNRI_{PE}}{\overline{C}_{CSRA}} * \sigma_{CSRA}$$

where:

$\overline{C}_{CSRA}$ is the mean C-value of all point estimates within a crop-state-resource area cell.

A lower limit for the resultant C value in both the second and third scenarios is placed at 0.02 to prevent them from going negative or attaining unrealistically low values (see Table 1).

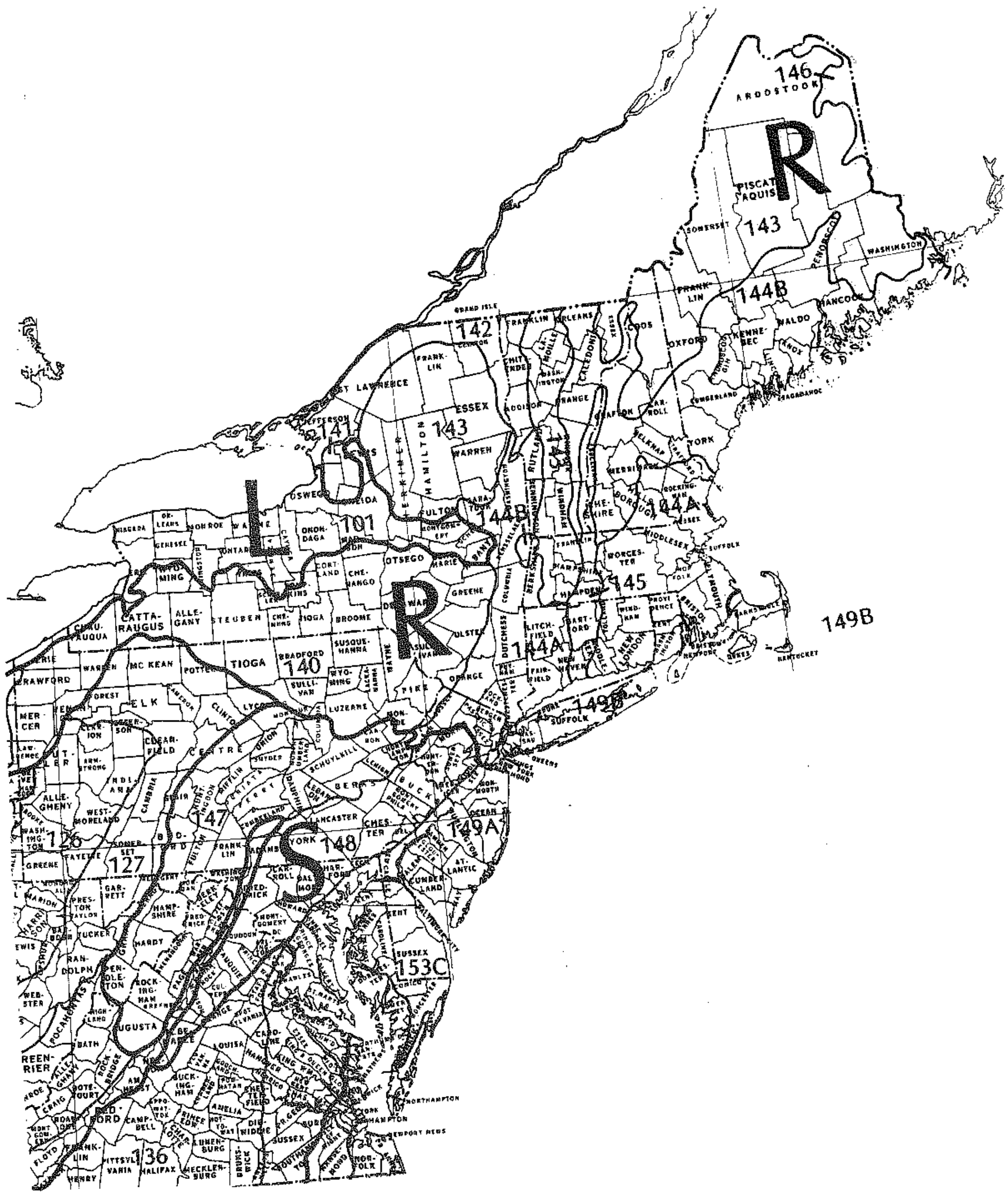
Harvestable Acreage Percentages

For each of the three scenarios, harvestable acreage percentages (e.g. the percent of cropland in a given crop for which the residue can be harvested) are calculated by summing the expansion factors for a particular crop-state-resource area cell that represent observations meeting the critical T value erosion standard of the USLE and dividing by the sum of all expansion factors for the cell. Harvestable acreage percentages are also calculated for crop-resource area partitions in the matrix and include observations from all states covered by the resource area.[5]

In some cases, the C-value adjustments of simulation 2 and simulation 3 are quite substantial. For example, New York State is comprised of five resource areas; they are 101, 140, 142, 143, and 144a. Resource area 140 covers all New York counties bordering Pennsylvania from Sullivan County to Chautauqua County (see Figure 2). The average C-value for corn land in this resource area is 0.25, but the standard deviation is 0.15. The C-value adjustments result in an increase of harvestable acreage from 41 percent in

[5]For the less important crops specific to a state-resource area partition, there are often fewer than three observations. In these cases the harvestable acreage percentages by crop for the entire resource area are substituted. Occasionally, there are no observations for a crop-resource area partition even though data from the Census of Agriculture indicate that some of the crop is raised for counties within the resource area. Without exception this problem pertains to the row crops barley, rye, oats, and sometimes wheat. Thus, harvestable acreage percentages for all other row crops are substituted. In cases where this alternative is not viable, acreages reported by the Census of Agriculture are trivial and do not warrant further consideration.

Figure 2. Resource Areas



Source: U.S. Department of Agriculture, SCS, 1978.

the base simulation to 71 percent for simulation 2. Harvestable acreage in simulation 3 is greater still; residues may be gathered on 74 percent of all corn land. Conversely, the C-value adjustments can have little or no effect. Barley acreage in resource area 147 in Pennsylvania has an average C-value of 0.18 and a standard deviation of 0.04. In all three scenarios, however, 65 percent of barley lands may be harvested for residues and improved farm practices of a scope allowed by simulations 2 and 3 have no bearing on this outcome.

Although calculation of harvestable acreage percentages was possible using NRI data, they do not include yield information for the sample points, and their use in the determination of residue availability would require some general assumptions about yields by soil class. Furthermore, use of these sample data to estimate actual acreages by crop is probably less reliable than data on acreage and crop production reported in the 1978 Census of Agriculture. The NRI data also cannot be disaggregated to the county level and were not collected to be representative at the county level. Therefore, by combining data from the Census of Agriculture on acreages and yields with the NRI-based estimates of harvestable acreage percentages, it was possible to construct county-level residue estimates.

The fact that yields vary considerably by county, even within resource areas, makes it desirable to accommodate this level of detail. Furthermore, from the standpoint of residue usage, transportation costs will undoubtly prohibit overly centralized processing plants. Residue collection will probably be limited to an area within an average 25 mile transport distance of the processing facility but may vary somewhat with plant size and local harvesting costs. Thus, county level residue totals and density figures are more useful than aggregate state residue totals and densities.

Production and acreage data were gathered from the Census of Agriculture and land areas by county (needed for residue density estimates) were derived by dividing total land in farms by the proportion of the county estimated to be in the farms. Using resource area maps containing county boundary demarcations, counties were subjectively partitioned to resource area. For the most part, counties exhibit unique resource area characteristics, but in some cases are dissected by as many as four resource areas. In these cases, weights are assigned by inspection to the resource areas comprising each county depending on the subjective estimate of the proportion of the county included in each of the resource areas. These weights sum to one.[6] For lack of a better alternative, it was necessary to assume that acreage devoted to specific crops in a county was distributed proportionally to the resource areas using these same weights.

Ratios of Residue to Grain

Once the crop acreages and production levels for corn, grain, wheat, oats, rye and barley are distributed by states and resource areas, one can

[6]For instance, Franklin county in Massachusetts can be divided among resource areas 143, 144A, 144B, and 145 (see Figure 2) which were assigned weights 0.5, 0.15, 0.10, and 0.25, respectively.

proceed to determine total available and harvestable residues. This requires two additional pieces of information. The first are the biological ratios of residue to grain, while the second is the efficiency limitation of residue harvesting machinery.

Technically, biological residue/grain ratios are the amount of plant material above the soil surface (excluding the panicle) relative to grain weight at a specified moisture level. The residue may be measured at a comparable moisture level or on a dry weight basis. Since dry weight basis is a more appropriate measure of residue energy potential, it is the dry weight ratios that are adopted for this analysis.

Larson et al. (1978) provide a series of ratios for crops most commonly grown in the United States. Their ratios were subsequently reviewed by Pierce in an unpublished study, leading to significant downward revisions for oats and soybeans. The ratios, including the revisions, are given in Table 2.

The residue ratios for a given crop would be expected to vary by hybrid type, yield, and degree of die-down prior to harvest. Higher yielding hybrids probably have lower residue ratios than less prolific varieties. However, greater plant density may temper the extent to which this is true. Consideration must also be given to the post-harvest condition of the residue. For example, soybean plants at full growth have 1.5 pounds of dry matter residue per pound of beans, but the plant's leaves generally die and fall to the ground prior to harvest. A similar problem exists for potatoes. For these reasons, corn, wheat, rye, oats, and barley are the only crops considered to have residue potential.

Table 2. Ratios of Residue to Grain

Crop	Dry Weight Ratio (straw/grain)
Barley	1.5
Corn	1.0
Cotton	1.0
Oats	1.4[a]
Rice	1.5
Rye	1.5
Sorghum	1.0
Soybeans	<1.0[a]
Wheat	
Winter	1.7
Spring	1.3

Source: Larson, et al., 1978, p. 3.

[a]Revised downward from the figures of Larson et al. by Francis Pierce, University of Minnesota.

To obtain an initial estimate of the weight of available residue by crop on a per acre basis, the ratios in Table 2 are multiplied by the weight of grain associated with the per acre yields reported in the Census of Agriculture. These preliminary estimates were then adjusted to reflect harvesting difficulties.[7] After accounting for these losses, corn and wheat generally yield the highest quantity of total residue per acre, and oats yield the lowest. For example, for New York State, average residue yields per acre for corn, wheat, barley, rye, and oats are 1.36, 1.45, 1.23, 1.08, and 1.05, respectively.

Storage Loss

Energy production from residues is likely to be a year-round activity to make the maximum use of conversion equipment. However, harvesting of residues will occur over a brief period of time following grain harvest. Consequently, residues must be stored. In the case of on-farm energy producers using their own residues, storage will occur on the farm. Centralized energy producers may store residues at plant site or on the farms where the residues were collected. Centralized storage is probably too expensive, as residues are bulky and the rental on industrial land needed for storage is expensive. Scientists at Purdue University estimate a 1000 ton/day conversion facility would require 300 acres of storage for a one year supply. Thus, they recommend on-farm storage of residues, preferably next to all weather roads (Tyner et al. 1979). These inventories would be drawn on as needed by the centralized facility. Throughout the remainder of the analysis, it is assumed that storage is on the farm and harvestable residue is measured net of storage losses. This amount is what must be transported to the facility.

Storage losses vary by storage methods. Flaim and Young (1981) estimated six month storage losses for corn stover under various storage conditions; these are shown in Table 3. It is clear that indoor storage causes the least spoilage, but is also costly. Outdoor storage under humid conditions leads to dry matter losses ranging from 15 to 20 percent. If stored under plastic, outside storage losses may be reduced by half.

Regardless of the storage method, some losses will occur and residue availability will be reduced. If outdoor storage without plastic is assumed, availability after harvest must be reduced by as much as 20 percent, although for this analysis a 15 percent overall loss is assumed. If one were concerned about this assumption and had more accurate information about storage procedures in certain regions of the Northeast, the results could be modified accordingly.

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[7]Because these ratios reflect the total non-grain plant matter above ground, they also reflect residue that cannot be harvested. Scientists at Purdue University estimate that, for corn and sorghum, one ton per acre or 37.5 percent of residue is uncollectable, whichever is greater. For wheat and other close grown crops, Purdue estimates that 500 pounds of residue per acre will be uncollectable. These amounts are subtracted from county per acre residue estimates (Tyner et al. 1979).

Table 3. Estimated Six-Month Storage Losses For Corn Stover

Climate	Package Technique	Outside	Losses Outside with Plastic	In Pole Barn
		- - - - - - - - -	percent - - - - - - - -	
Humid	Round Bale	15	7	5
Humid	Stack	20	NR[a]	5
Semi-arid	Round Bale	10	6	5
Semi-arid	Stack	15	NR[a]	5

Source: Flaim and Young, 1981.
[a]NR = not reported.

Harvestable Residues

Combining the county level grain production data, the residue conversion ratios, the resource area composition of a county, harvestable acreage percentages from the appropriate state-resource area cell, and allowing for 15 percent storage losses, county level residue availability can be computed as:

$$(4) \quad HR^S_{Cj} = PROD_{Cj} * W_j * (RESI/GRAIN)_j * (\sum_{i \varepsilon c} F_i \; HACRPC^S_{cji}) * (1 - .15);$$

where

HR^S_{cj} is the total tons of harvestable residue (in tons) (adjusted for storage losses) by county, C, and crop, j, for each of three scenarios, S;

$PROD_{Cj}$ is county level crop production for each county, C, and crop j (in bushels);

W_j is the weight in tons of per bushel of crop j;

$(RESI/GRAIN)_j$ is the residue to grain ratio for crop, j;

F_i is the fraction of the land area assigned to resource area i within a county, c;

$HACRPC^S$ is the harvestable acreage percentage for county C, crop j, and resource area i, which may vary by scenario S;

S are scenarios that assume different C-value for the USLE in calculating HACRPC; S=1 is the base; C-values for S=2 and S=3 are given by equations (2) and (3) respectively.

Harvestable residues and residue densities in tons per square mile are calculated at the county level; these harvestable residues in turn are aggregated at the state level. Residue densities are an important determinant of collection and conversion feasibility. If, for example, collection is limited to a 37 mile radius, (25 mile average traveling distance), a relatively small methanol conversion plant requiring 50 tons of residue daily cannot be supported with a harvestable residue density of less than 4.6 tons/square mile. Densities at the state level are meaningless owing to the fact that a significant portion of land in the Northeast is not devoted to crop production and the prohibitive transportation costs involved in overcentralized location of processing plants. Transportation costs are discussed in detail below.

County harvestable residue yields by crop in tons/acre are calculated on the basis of county wide crop yields on all acreage, since there is no way of differentiating yields on acreage which meets erosion standards from yields on acreages which do not. If crop yields are higher where farms are better managed and hence residue harvest is possible, this assumption implies a conservative bias to the estimates of residue yields/acre. Residue yield estimates by county and crop are used below to determine residue collection costs; overall collection costs are extremely sensitive over the range of yields up to about 1 ton/acre.

Forecasts

Up to this point, the discussion has focused on the residue estimates for 1978. In addition, forecasts of residue availabilities are made for the years 1985 and 1990. The forecasts are based on NIRAP projections of agricultural production by state and crop. These projected acreages are allocated to counties on the same basis as the 1978 Census of Agriculture crop acreage distribution among counties within a state. State level percentage changes in yields during the forecast periods are assumed to affect all counties uniformly. Then, the entire process of enumerating county level harvestable residue totals, densities, yields and state level residue totals by scenario is repeated for the two forecast periods. Three sets of county residue availabilities by crop are thus generated for each scenario, one for the 1978 base year and one each for the forecast periods. The three sets of county crop residue availabilities become inputs to the calculation of collection costs.

RESULTS

Tables 4, 5, and 6 contain state harvestable residue estimates for the three simulations for 1978 and the two forecast periods. In 1978, under the base simulation conditions, it is estimated that the nine Northeastern states could harvest 1.27 million tons of crop residue. These estimates rise by 75 and 69 percent under the changes in management practices implied in the new USLE parameters for simulations 2 and 3, respectively. As the Tables suggest, Pennsylvania, New York, and New Jersey generate the largest residue tonnages. These three states account for 96 percent of the residue for the base simulation, with corn and oats being by far the two most important contributors. The situation is the same for the remaining two simulations.

Table 4. 1978 Harvestable Crop Residues

State	Corn	Wheat	Barley	Rye	Oats	Total
	tons					
Connecticut						
Simulation 1	1,000	0	0	0	0	1,000
Simulation 2	2,700	0	0	0	0	2,700
Simulation 3	2,400	0	0	0	0	2,400
Maine						
Simulation 1	1,700	1,600	200	100	39,000	42,600
Simulation 2	2,300	1,600	200	100	39,000	43,100
Simulation 3	2,300	1,600	200	100	39,000	43,100
Massachusetts						
Simulation 1	1,100	0	0	100	100	1,200
Simulation 2	3,400	0	0	100	100	3,500
Simulation 3	3,800	0	0	100	100	4,000
New Hampshire						
Simulation 1	1,100	0	0	0	0	1,100
Simulation 2	1,300	0	0	0	0	1,300
Simulation 3	1,300	0	0	0	0	1,300
New Jersey						
Simulation 1	36,900	15,400	12,300	1,000	500	66,100
Simulation 2	88,000	20,400	13,500	1,100	2,500	125,500
Simulation 3	78,700	24,800	15,800	1,300	3,400	123,900
New York						
Simulation 1	253,200	9,400	3,600	1,000	99,700	366,800
Simulation 2	495,900	37,100	3,800	1,000	149,400	687,300
Simulation 3	465,700	37,100	6,000	1,700	142,900	653,300
Pennsylvania						
Simulation 1	595,600	46,000	27,800	200	118,900	788,500
Simulation 2	1,117,300	60,800	27,800	2,000	150,700	1,358,600
Simulation 3	1,067,100	60,800	27,800	2,100	150,000	1,307,800
Rhode Island						
Simulation 1	0	0	0	0	0	0
Simulation 2	0	0	0	0	0	0
Simulation 3	0	0	0	0	0	0
Vermont						
Simulation 1	1,000	100	100	0	700	1,900
Simulation 2	3,700	100	100	0	700	4,500
Simulation 3	3,200	100	100	0	700	4,100

Note: Simulation 1 reflects unadjusted USLE C-value component. Simulation 2 reflects USLE C-value adjustment described in equation (2). Simulation 3 reflects USLE C-value adjustment described in equation (3).

Table 5. 1985 Harvestable Crop Residues

State	Corn	Wheat	Barley	Rye	Oats	Total
	tons					
Connecticut						
Simulation 1	0	0	0	0	0	0
Simulation 2	0	0	0	0	0	0
Simulation 3	0	0	0	0	0	0
Maine						
Simulation 1	0	0	0	0	26,300	26,300
Simulation 2	0	0	0	0	26,300	26,300
Simulation 3	0	0	0	0	26,300	26,300
Massachusetts						
Simulation 1	0	0	0	0	0	0
Simulation 2	0	0	0	0	0	0
Simulation 3	0	0	0	0	0	0
New Hampshire						
Simulation 1	0	0	0	0	0	0
Simulation 2	0	0	0	0	0	0
Simulation 3	0	0	0	0	0	0
New Jersey						
Simulation 1	20,800	34,600	17,700	4,300	800	78,200
Simulation 2	49,600	46,000	19,400	4,600	3,900	123,500
Simulation 3	44,300	55,700	22,700	5,300	5,300	133,400
New York						
Simulation 1	433,900	33,800	6,600	2,000	141,700	618,000
Simulation 2	850,500	133,200	7,100	2,100	212,400	1,205,300
Simulation 3	798,400	133,200	11,000	3,700	203,200	1,149,500
Pennsylvania						
Simulation 1	717,000	102,100	58,900	600	217,200	1,095,700
Simulation 2	1,345,000	135,100	58,900	5,800	275,300	1,820,000
Simulation 3	1,284,700	135,100	58,900	6,200	274,000	1,758,900
Rhode Island						
Simulation 1	0	0	0	0	0	0
Simulation 2	0	0	0	0	0	0
Simulation 3	0	0	0	0	0	0
Vermont						
Simulation 1	0	0	0	0	1,200	1,200
Simulation 2	0	0	0	0	1,200	1,200
Simulation 3	0	0	0	0	1,200	1,200

Note: Simulation 1 reflects unadjusted USLE C-value component. Simulation 2 reflects USLE C-value adjustment described in equation (2). Simulation 3 reflects USLE C-value adjustment described in equation (3).

Table 6. 1990 Harvestable Crop Residues

State	Corn	Wheat	Barley	Rye	Oats	Total
	tons					
Connecticut						
Simulation 1	0	0	0	0	0	0
Simulation 2	0	0	0	0	0	0
Simulation 3	0	0	0	0	0	0
Maine						
Simulation 1	0	0	0	0	31,200	31,200
Simulation 2	0	0	0	0	31,200	31,200
Simulation 3	0	0	0	0	31,200	31,200
Massachusetts						
Simulation 1	0	0	0	0	0	0
Simulation 2	0	0	0	0	0	0
Simulation 3	0	0	0	0	0	0
New Hampshire						
Simulation 1	0	0	0	0	0	0
Simulation 2	0	0	0	0	0	0
Simulation 3	0	0	0	0	0	0
New Jersey						
Simulation 1	18,500	33,400	16,900	4,100	800	73,700
Simulation 2	44,100	44,500	18,500	4,400	3,700	115,200
Simulation 3	39,500	53,900	21,600	5,100	5,000	125,100
New York						
Simulation 1	486,400	42,300	6,200	2,100	154,000	690,900
Simulation 2	953,700	167,100	6,600	2,200	230,900	1,360,400
Simulation 3	895,100	167,100	10,300	3,700	220,800	1,297,100
Pennsylvania						
Simulation 1	782,800	111,500	60,700	600	232,300	1,187,900
Simulation 2	1,468,200	147,500	60,700	6,000	294,400	1,976,900
Simulation 3	1,402,600	147,500	60,700	6,400	293,000	1,910,300
Rhode Island						
Simulation 1	0	0	0	0	0	0
Simulation 2	0	0	0	0	0	0
Simulation 3	0	0	0	0	0	0
Vermont						
Simulation 1	0	0	0	0	1,100	1,100
Simulation 2	0	0	0	0	1,100	1,100
Simulation 3	0	0	0	0	1,100	1,100

Note: Simulation 1 reflects unadjusted USLE C-value component. Simulation 2 reflects USLE C-value adjustment described in equation (2). Simulation 3 reflects USLE C-value adjustment described in equation (3).

Because of the way in which the parameters in the USLE were adjusted, the relative availabilities of residue are approximately the same across scenarios for the 1985 and 1990 forecasts. However, NIRAP does forecast important changes in crop production that affect the volume of collectable residue by state. In 1985, for example, total available residues are estimated at 1.82 million tons for the nine states. This is a 43 percent increase over 1978 levels in the base simulation and by 1990 there is an additional 13 percent available. These increases are by and large due to the additional residue forthcoming from Pennsylvania and New York. By 1985, availability of residue is projected to increase by 68 percent over 1978 levels for simulation 1 in New York and by 39 percent in Pennsylvania. New Jersey experiences a modest increase of 18 percent, while three states, Connecticut, Massachusetts and New Hampshire, with minimal availabilities in 1978, are projected to have no harvestable residues by mid-1980.

The differences in projected 1985 and 1990 residue availabilities result entirely from NIRAP projections of crop acreage and yields. For 1990, the largest acreage increases in percentage terms over 1978 levels are predicted for wheat and rye in New Jersey (72 and 240 percent, respectively), wheat and oats in Pennsylvania (87 and 128 percent, respectively) and for corn and wheat in New York (52 and 209 percent, respectively).

The most significant increase in actual acreage devoted to a particular crop is forecast for New York where corn acreages are expected to increase by 300 thousand acres. NIRAP is also forecasting yield increases through 1990: over 20 percent for wheat and rye in New Jersey; 18 and 39 percent for corn and wheat, respectively in New York; and 25 percent for wheat and oats in Pennsylvania.

County residue estimates and resultant densities by simulation are reported in Appendix B. The highest densities and tonnages are found in counties throughout Pennsylvania, New York, and New Jersey. Cayuga, Orleans, and Seneca counties in New York, for example, all exhibit residue concentrations in excess of 50 tons/square mile and in Pennsylvania, Lancaster, Lebanon, and Montour generate more than 60 tons of residue/square mile. Figures 3 through 5 summarize the density information from the first simulation and display these areas of the Northeast where the potential for biomass conversion is the greatest. Before discussing these points, however, one must understand the costs involved in collection, storage and transportation.

CROP RESIDUE ACQUISITION COSTS

Although the crop residues reported in Tables 4, 5 and 6 are potentially available for conversion to fuel without long term consequences for soil productivity, they have traditionally played an important role in erosion control and soil fertility management. Traditionally, they have been used sparingly as fodder and bedding for animals, and until recently their value as a fuel source was limited by cheap and plentiful hydrocarbon fuels. As a result, a market delivery price for residues has never been established.

In the absence of market prices for residues, the costs of residue delivery are estimated by engineering methods. These costs may be compared to the costs of other potential energy feedstocks to determine the viability of

Figure 3. Residue Densities by State and County, 1978

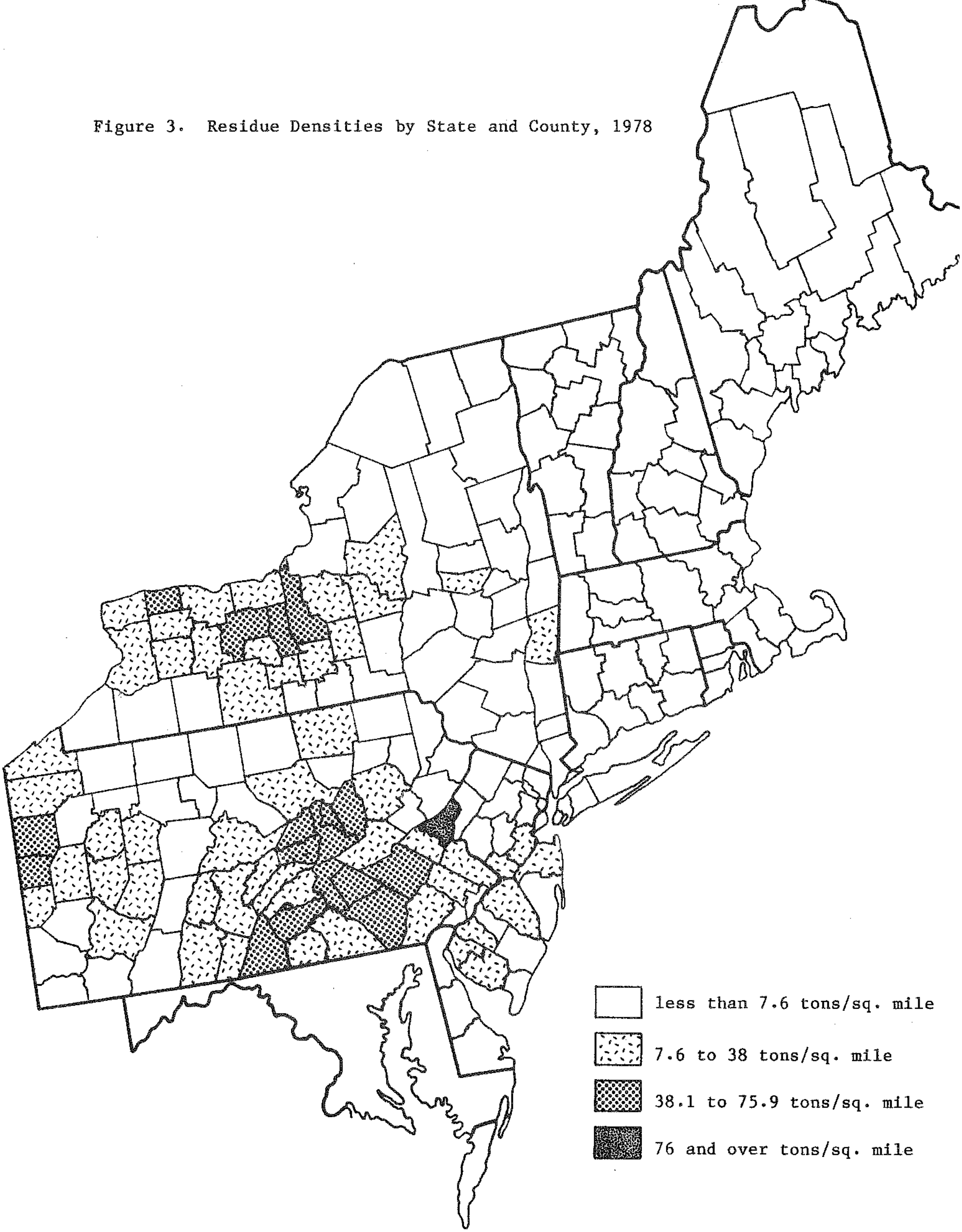


Figure 4. Residue Densities by State and County, 1985

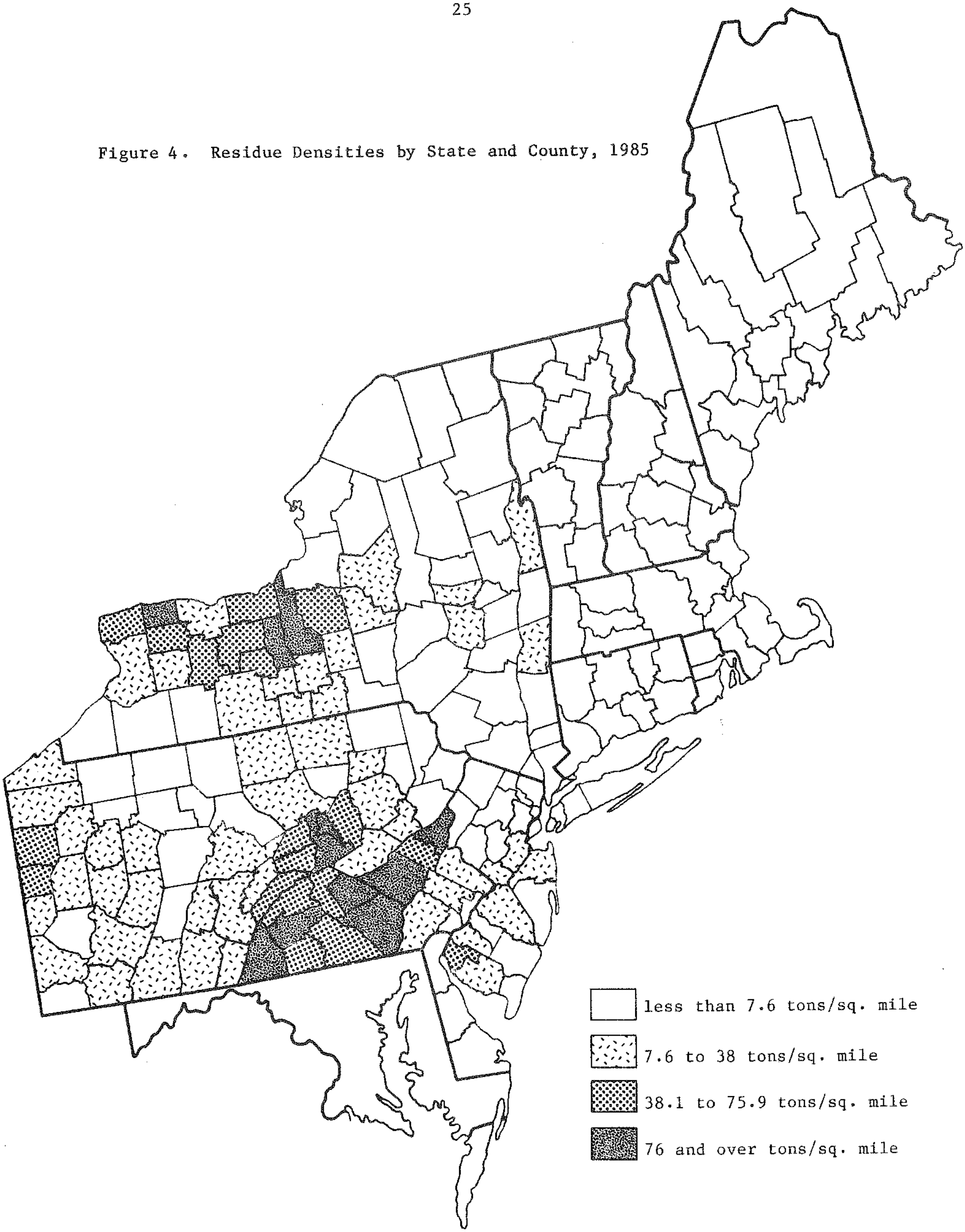
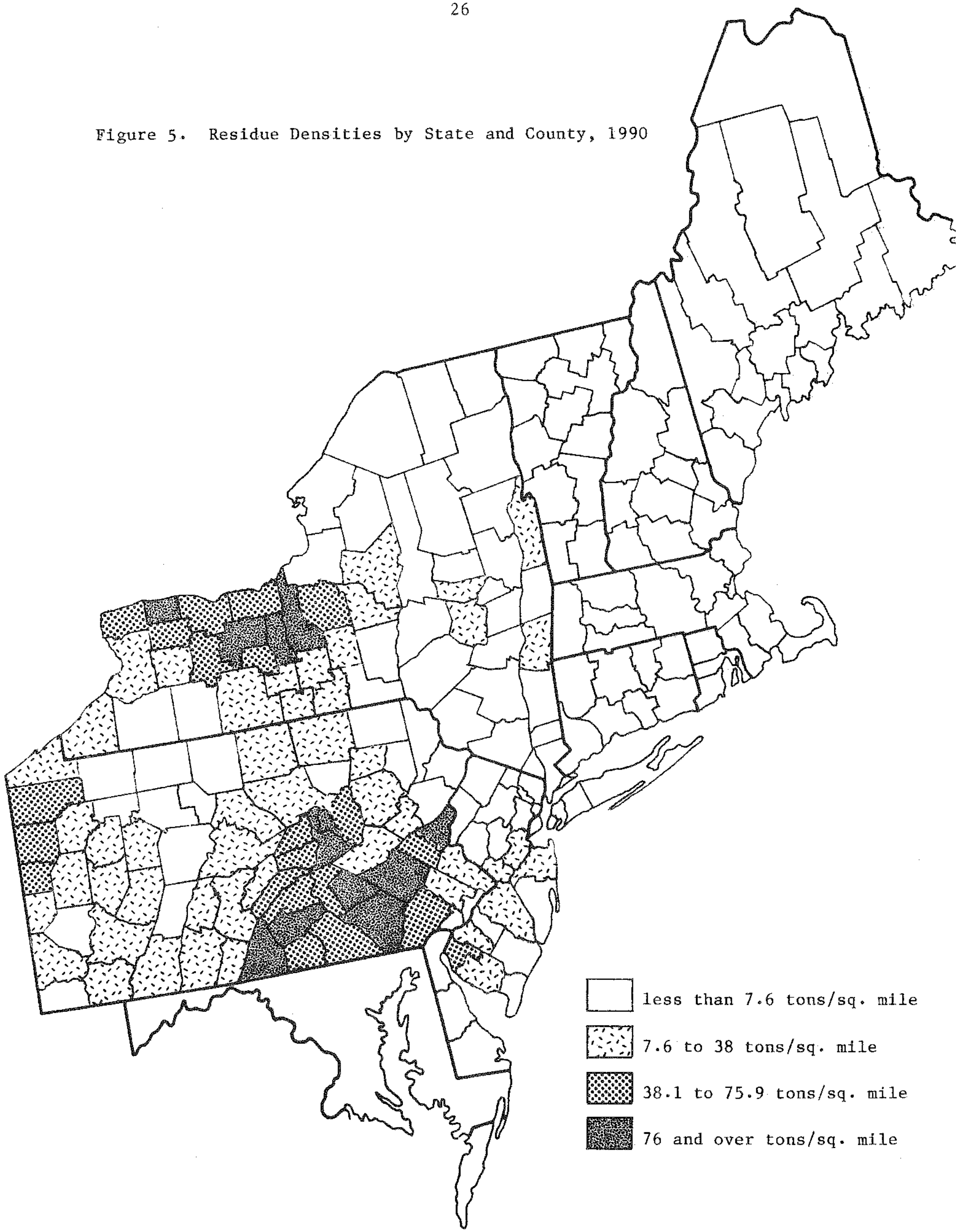


Figure 5. Residue Densities by State and County, 1990



an energy from residue program. The procedure to estimate residue collection costs was adopted from Lockeretz (1981, p. 73) and Barber (1979). Barber's work stresses the operational costs of residue collection based on labor and capital costs, yields, and transportation distances. He has developed four equations that provide on-farm collection cost estimates for residues gathered in large round bales and in stacks for both corn and small grain crops. Barber's original equations allowed collection costs to vary only with yield; however, they were later modified to permit variable labor and fuel costs and to take into account on-farm storage costs. Costs of transporting the residues from a farm to a central facility are determined separately. Barber has provided another four equations for the transportation component of residue collection costs (Table 7).

Although Barber's methodology accommodates the estimation of direct costs involved in residue harvest and collection, it does not consider such indirect costs as foregone nutrient value of the marketed residue and nutrient loss through increased erosion of topsoil. These indirect costs pertinent to crop production in the Northeast are included in this analysis, but for reasons discussed below, other indirect costs incurred as a result of planting and land preparation delays, and increased irrigation and reservoir maintenance outlays resulting from increased soil runoff are not considered.

The mechanics of estimating residue collection costs require county crop yield data, and labor and fuel costs, and some assumptions about storage and transportation. Price and crop yield data are obtained in a relatively straightforward fashion. (The specifics of storage and transportation are discussed in more detail below and are followed by Lockeretz's considerations.) The county yield data can be derived from 1978 Census of Agriculture county production and acreage figures; the data set is a by-product of the harvestable residue estimation process. Labor costs are the imputed opportunity costs of farm-operator labor in New York for 1980 (Snyder, 1981, p. 43) and fuel costs input are New York wholesale diesel prices for the first six months of 1980 (Crop Reporting Board, 1981). Then price and yield data are input to the modified Barber equations to determine residue collection costs by county, crop, and baling method.

For purposes of this study, it is assumed that residue will be gathered either in large round bales or in stacks. It is also assumed that New York labor and diesel prices apply to the entire Northeast. The owner-operator labor cost of $7.96/hour is perhaps too high for general use and it is possible that a good portion of residues can be collected by cheaper labor. A conservative bias is thus built into collection costs reported in this study.

Harvesting of residues must generally occur within a one month period of grain harvest, while residue demand by an energy plant may be continuous over the year. Thus, storage of residues is essential. Given that land is generally cheaper at rural sites, on-farm storage is believed to be less expensive than centralized storage (Barber, 1979). Storage costs are incurred at either site. The most significant of these costs is due to the opportunity cost of capital and storage losses.

The costs associated with storage losses are taken into account since the harvestable residues used as input into Barber's equations are net of storage losses. The capital costs of storage are determined for on-farm residue stor-

Table 7. Modified Purdue Residue Cost Equations ($/Ton Dry Residue, Delivered)

	Harvest and Storage	Transportation
Corn Stover (Large Round Bales)	(1.07) (4.189 + .223L + .772F + 7.588/HR + .457L/HR + 2.284F/HR)	.425 + .043L + .067F + .0870 + .0132L(D) + .0595F(D)
Corn Stover (Stacks)	(1.07) (1.387 + .057L + .283F + 7.522/HR + .307L/HR + 1.537F/HR)	.485 + .056L + .11F + .133D + .020L(D) + .089F(D)
Small Grain Residue (Bales)	(1.07) (6.942 + .059L + .295F + 7.226/HR + .154L/HR + .77F/HR)	.478 + .048L + .075F + .098D + .0148L(D) + .067F(D)
Small Grain Residue (Stacks)	(1.07) (1.36 + .056L + .305F + 3.78/HR + .154L/HR + .847F/HR)	.571 + .0625L + .125F + .149D + .0223L(D) + .1F(D)

Source: Derived from Tyner et al. 1979.

Notes: L = Labor cost in dollars per hour.
F = Fuel cost in dollars per gallon.
HR = Harvestable residue in tons/acre (dry).
D = One-way distance to plant in miles.

age and are based on collection costs alone. It is assumed in this report that the cost of capital to the farmer is 14 percent, and that the average storage time is 6 months. Thus, Barber's residue collection cost equations are multiplied by a value of 1.07 to reflect capital charges.

The cost of collecting corn residue in bales using Barber's equations is summarized in Table 8. The costs per ton of collecting residue are of course highly dependent on numerous assumptions. For instance, a wage rate increase of $1/hour increases the cost of a ton of corn residue gathered in bales by $0.68, and every $0.10 increase in wholesale diesel fuel prices increases collection costs of corn stover about $0.30/ton. The data in Table 7 demonstrate sensitivity of collection cost to changes in residue yields per acre. Sensitivity to yield changes is quite pronounced in the lower range of corn residue yields.

The transportation component of residue delivery prices may also be estimated using equations developed by Barber. The equations for transport costs of corn stover and closely grown crops gathered in bales and stacks appear in Table 7 next to the collection cost equations. If small scale, on-farm energy conversion systems are envisioned then residue delivery prices need not include this transportation component. Scenarios that favor large-scale, centralized plants producing low BTU gas, methanol, and ethanol or facilities that burn residues directly call for residues on the order of 5 million tons annually and more. Residue delivery prices to such facilities must include this transportation component.

As the transportation cost equations in Table 7 indicate, hauling costs are assumed to be linear functions of the distances residues are trucked. The cost of hauling residue varies according to crop and baling method. Assuming imputed farm labor costs of $7.96/hour and diesel fuel costs of $0.98/gallon, the costs of transporting a ton of corn stover bales, corn stover stacks, straw bales and straw stacks an additional mile are $0.25, $0.38 $0.28 and $0.42, respectively.

All costs determined to this point are attributable to actual harvesting, storage and transportation of residues. Larson <u>et al</u>. (1978) notes that crop residue contains significant quantities of nutrients which are, of course,

Table 8. Collection Costs for Corn Residue

Labor Cost	Fuel Cost	Corn Residue Yield (dry ton/acre)	Collection Cost /Ton Baled Corn Residue
$7.96	$0.98	0.8	$25.21
7.96	0.98	1.0	21.61
7.96	0.98	1.2	19.21
7.96	0.98	1.4	17.49
7.96	0.98	1.6	16.20
7.96	0.98	1.8	15.19
7.96	0.98	2.0	14.40

Source: Calculated from data described in the text and the equations in Table 7.

lost from the soil with the residue's removal. Corn residue contains 1.1 percent nitrogen, 0.18 percent phosphorus, and 0.33 percent potassium by weight (Larson et al., 1978, p. 6). Using 1981 nutrient values provided by Lockeretz, this is equivalent to an average of $8.95 per ton of residue in nutrient value. The nutrient value of a ton of residue would be worth $8.50 if from sorghum, $5.40 if from wheat, $8.30 if from oats, $6.90 if from barley, and $4.80 if from rye (Lockeretz, 1981, p. 78). In addition, Lockertz notes that soil lost through increased erosion will contain nutrients. Although the methodology followed in this analysis has been oriented toward preventing excessive soil loss, some loss will unavoidably occur due to residue removal. Lockeretz estimates this soil loss will lead to $3 to $6 worth of lost nutrients for every ton of residues removed (Lockeretz, p. 79).

Lockeretz notes that some decrease in grain yields may be expected as a consequence of residue harvesting, even when nutrients are replaced. However, as estimates of harvestable residues in this study have sought to assure that there is no net depletion of topsoil, this effect can probably be ignored.

Scientists at Purdue note that harvesting of residues may also interfere with soil preparation operations in the fall. Should this lead to a delay in spring planting, yield losses of 1 bushel per day per acre of corn may result. Actual experience in Indiana showed that in 4 years out of 7, residue harvest delayed planting and an average reduction of 1.6 bushels per acre was experienced. At corn prices of $2.70/bushel, this would amount to $4.30 per acre, and given a harvestable residue of 1.26 tons per acre for Indiana, as estimated at Purdue, this is equivalent to $3.40 per ton of residue removed (Tyner et al. 1979). No comparable values for wheat or small grains are available in the literature, nor are any values specific to crops in the Northeast. In general, however, small grains such as wheat are harvested well before fall, and fall land preparation is not as common in the Northeast as it is in the Midwest. Thus, no major impact on yield would be expected in our study region.

Finally, Lockertz notes that soil runoff problems caused by greater residue harvesting may add to the costs of waterway and reservoir maintenance. Although these costs may be severe in some local areas, Lockertz concludes their general impact will be minor.

In sum, to obtain estimates of residue collection costs, it appears reasonable to augment direct harvesting, storage and transportation costs only by the value of nutrients lost due to residue harvest. Given a nutrient values ranging from $8 per ton for rye straw to $12 per ton for corn stover, opportunity costs of lost nutrients are presented in Table 9.

These costs of residue collection were estimated by crop and county in the study region with the help of a small computer program written expressly for that purpose. The results for 1978 and the two forecast periods are summarized in Tables 10 through 12.[8] Group collection costs presented in these Tables are average costs of collection across all counties, weighted by county crop residue tonnages. Counties are assigned to a group based on their overall average residue yields per acre. The critical cutoff points for Groups 1 through 5 are 1.3, 1.2, 1.1, 1.0, and 0.8 tons/acre, respectively.

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[8]Note that residue collection costs include only costs of collection, storage, and hauling and are net of lost nutrient value.

Table 9. Nutrient Costs Per Ton for Crop Residue

Crop	Direct Nutrient Loss	Indirect Soil Nutrient Loss
Corn	$8.95	$3.00
Sorghum	8.47	3.00
Wheat	5.40	3.00
Oats	8.31	3.00
Barley	6.90	3.00
Rye	4.79	3.00

Source: Lockeretz, 1981.

Notice that, in the forecast period, many of the counties move up one or two groups. This accounts for the stability of the constant dollar (1978) collection costs for a particular group through time. Appendix C contains county residue collection costs by crop and baling method for all counties with crop residue densities in excess of 5.0 tons/square mile (simulation 1). In these Tables, a much greater county-to-county variation in collection costs may be found. Also, county collection costs generally fall through time in constant dollars as yields increase. The range in collection costs can be appreciated by reviewing the differences in estimated 1978 stacked corn residue delivery prices (25 mile haul) for Adams and Lancaster counties in Pennsylvania. Lancaster prices are nearly $4.00/ton cheaper at $18.47/stacked ton than Adams county prices. By 1990, the estimated constant dollar cost of Lancaster county stacked corn residue falls $0.34 to $18.13. A more dramatic drop in residue delivery prices occurs in Livingston, New York, where stacked wheat residue delivery prices fall $1.36 from $19.05 to $17.69/stacked ton between 1978 and 1990. This results from sharply higher NIRAP wheat yield estimates for New York State in the coming decade.

Collection and conversion feasibility is dependent on a critical residue density level below which transportation costs become considerable and a critical yield per acre below which collection costs are prohibitive. To some extent, a relatively high density can offset low residue yields per acre by reducing transportation costs. Counties such as Livingston, Schuyler, and Wyoming in New York, however, can probably not support a viable conversion facility in spite of significant residue resources, simply because corn residue yields are too low.

Delivery costs (25 mile distance) of group 1 residues gathered in stacks average $19.30/ton. This average is heavily weighted by the collection cost of corn residue since their availability predominates. If a cost equal to the direct and indirect nutrient loss of a ton of corn residue ($11.95) is added to this figure, residue delivery prices (all things considered) are about $31.00/ton. Remember that $30/ton residue is not competitive with $30/ton wood chips because residue contains only 80 percent of the carbon embodied in wood. Since the marginal cost of transporting corn stover stacks is $0.38/ton-mile, the cost of delivering residue beyond the 25 mile average limit, even in counties enjoying good crop yields, is likely to be prohibitive.

Table 10: 1978 Residue Collection Costs Per Dry Ton (1978 Dollars)

County Groups	Average Cost - All Residues		Specific Residue Costs - Stacks					Specific Residue Costs - Bales				
	Stacks	Bales	Corn	Wheat	Barley	Rye	Oats	Corn	Wheat	Barley	Rye	Oats
Group 1	$19.30	$23.84	$19.26	$18.71	$18.82	$21.42	$21.65	$23.61	$23.55	$23.73	$27.83	$28.19
Group 2	20.33	25.17	20.42	19.04	19.40	20.93	21.56	24.97	24.07	24.65	27.06	28.04
Group 3	20.85	25.90	20.87	19.65	19.58	21.08	21.49	25.50	25.03	24.92	27.29	27.94
Group 4	21.65	26.93	22.22	19.70	20.25	20.01	21.14	27.08	25.12	25.98	25.61	27.38
Group 5	22.49	28.03	23.48	19.13	20.43	21.04	21.59	28.56	24.21	26.27	27.23	28.10

Note: Counties are grouped by overall average residue yields per acre. The numbers in parenthesis give the appropriate ranges in tons per acre.

Group 1 Counties
(>1.3)
New Jersey:
- Mercer
- Middlesex
- Salem
- Warren

New York:
- Columbia
- Orleans
- Schoharie
- Washington

Pennsylvania:
- Beaver
- Berks
- Blair
- Chester
- Clinton
- Lancaster
- Lebanon
- Lehigh
- Mifflin

Group 2 Counties
(1.2-1.29)
New Jersey:
- Burlington
- Cumberland

New York:
- Cayuga
- Oneida

Pennsylvania:
- Bradford
- Centre
- Clarion
- Crawford
- Cumberland
- Dauphin
- Fayette
- Franklin
- Huntingdon
- Mercer
- Montgomery
- Northampton
- Union
- York

Group 3 Counties
(1.1-1.19)
New Jersey:
- Hunterdon
- Monmouth

New York:
- Cortland
- Madison
- Montgomery
- Niagara
- Onondaga
- Tioga
- Tompkins
- Yates

Pennsylvania:
- Armstrong
- Bucks
- Butler
- Erie
- Indiana
- Juniata
- Lawrence
- Lycoming
- Northumberland
- Perry
- Somerset
- Venango
- Washington
- Westmoreland
- Wyoming

Group 4 Counties
(1.0-1.09)
Maine:
- Aroostook

New Jersey:
- Gloucester

New York:
- Erie
- Genesee
- Monroe
- Ontario
- Seneca
- Steuben
- Wayne

Pennsylvania:
- Adams
- Bradford
- Columbia
- Fulton
- Jefferson
- Luzerne
- Monroe
- Montour
- Schuylkill
- Snyder

Group 5 Counties
(0.8-0.99)
New York:
- Chemung
- Livingston
- Schuyler
- Wyoming

Pennsylvania:
- Tioga

Table 11: 1985 Residue Collection Costs Per Dry Ton (1978 Dollars)

County Groups	Average Cost - All Residues		Specific Residue Costs - Stacks					Specific Residue Costs - Bales				
	Stacks	Bales	Corn	Wheat	Barley	Rye	Oats	Corn	Wheat	Barley	Rye	Oats
Group 1	$19.25	$23.80	$19.59	$17.97	$17.88	$19.93	$19.92	$24.00	$22.38	$22.24	$25.48	$25.46
Group 2	20.15	25.02	20.60	18.51	18.40	19.41	20.38	25.18	23.24	23.06	24.65	26.18
Group 3	20.50	25.56	20.77	19.23	18.60	21.43	20.95	25.38	24.38	23.37	27.85	27.08
Group 4	21.20	26.53	21.37	17.43	19.59	0.00	21.24	26.09	21.53	24.93	0.00	27.55
Group 5	23.03	28.82	25.22	19.72	19.30	21.16	22.49	30.60	25.15	24.47	27.42	29.51

Note: Counties are grouped by overall average residue yields per acre. The numbers in parenthesis give the appropriate ranges in tons per acre.

Group 1 Counties (>1.3)
New Jersey:
Burlington
Cumberland
Mercer
Middlesex
Monmouth
Salem
New York:
Cayuga
Chautauqua
Chenango
Columbia
Cortland
Dutchess
Erie
Genesee
Madison
Monroe
Montgomery
Niagara
Oneida
Onondaga
Orleans
Otsego
Schoharie
Seneca
Steuben
Tioga
Tompkins
Washington
Wayne
Yates

Group 1 Counties (1.2-1.29)
Pennsylvania:
Beaver
Bedford
Berks
Blair
Bucks
Butler
Centre
Chester
Clinton
Crawford
Cumberland
Dauphin
Erie
Fayette
Franklin
Huntingdon
Lancaster
Lebanon
Lehigh
Mercer
Mifflin
Montgomery
Northampton
Northumberland
Union
York

Group 2 Counties (1.1-1.19)
New York:
Livingston
Ontario
Schuyler
Wyoming
Pennsylvania:
Adams
Armstrong
Clarion
Fulton
Indiana
Juniata
Lawrence
Lycoming
Perry
Somerset
Venango
Washington
Westmoreland
Wyoming

Group 3 Counties (1.0-1.09)
New Jersey:
Gloucester
New York:
Alleghany
Chemung
Pennsylvania:
Cambria
Columbia
Jefferson
Luzerne
Monroe
Montour
Schuylkill
Snyder

Group 4 Counties (0.8-0.99)
New York:
Jefferson
Pennsylvania:
Bradford
Tioga

Group 5 Counties
Pennsylvania:
Carbon

Table 12: 1990 Residue Collection Costs Per Dry Ton (1978 Dollars)

County Groups	Average Cost - All Residues		Specific Residue Costs - Stacks					Specific Residue Costs - Bales				
	Stacks	Bales	Corn	Wheat	Barley	Rye	Oats	Corn	Wheat	Barley	Rye	Oats
Group 1	$18.91	$23.38	$19.16	$17.80	$17.75	$19.55	$19.63	$23.49	$22.11	$22.04	$24.88	$25.01
Group 2	19.85	24.73	19.88	18.89	18.39	20.95	20.49	24.34	23.83	23.04	27.08	26.37
Group 3	20.54	25.70	20.79	16.83	19.28	0.00	20.63	25.41	20.59	24.45	0.00	26.58
Group 4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Group 5	22.03	27.52	23.60	19.35	19.03	20.67	21.81	28.71	24.56	24.05	26.65	28.44

Note: Counties are grouped by overall average residue yields per acre. The numbers in parenthesis give the appropriate ranges in tons per acre.

Group 1 Counties
(>1.3)
New Jersey:
- Burlington
- Cumberland
- Mercer
- Middlesex
- Monmouth
- Salem

New York:
- Cayuga
- Chautauqua
- Chenango
- Columbia
- Cortland
- Dutchess
- Erie
- Genesee
- Livingston
- Madison
- Monroe
- Montgomery
- Niagara
- Oneida
- Onondaga
- Orleans
- Otsego
- Schoharie
- Schuyler
- Seneca
- Steuben
- Tioga
- Tompkins
- Washington

Group 1 Counties
(1.2-1.29)
New York Cont.:
- Wayne
- Wyoming
- Yates

Pennsylvania:
- Adams
- Armstrong
- Beaver
- Bedford
- Berks
- Blair
- Bucks
- Butler
- Centre
- Chester
- Clarion
- Clinton
- Crawford
- Cumberland
- Dauphin
- Erie
- Fayette
- Franklin
- Fulton
- Huntingdon
- Indiana
- Juniata
- Lackawanna
- Lancaster
- Lawrence
- Lebanon
- Lehigh

Group 1 Counties
(1.1-1.19)
Pennsylvania Cont.:
- Lycoming
- Mercer
- Mifflin
- Montgomery
- Northampton
- Northumberland
- Perry
- Somerset
- Union
- Washington
- Westmoreland
- Wyoming
- York

Group 2 Counties
(1.0-1.09)
New Jersey:
- Gloucester

New York:
- Alleghany
- Chemung

Pennsylvania:
- Bradford
- Cambria
- Columbia
- Jefferson
- Luzerne
- Monroe
- Montour
- Schuylkill
- Snyder
- Susquehanna
- Venango

Group 3 Counties
(0.8-0.99)
New York:
- Jefferson

Pennsylvania:
- Tioga

Group 4 Counties
- None

Group 5 Counties
Pennsylvania:
- Carbon

A methanol plant producing 3 million gallons annually requires 30,000 dry tons of residue. An area within 35 miles distance (average hauling distance of 25 miles) of such a methanol plant would require a residue density of at least 7.6 tons/square mile in order to provide enough feedstock. This assumes that all farmers sell what residues may be harvested.

Figures 3 through 5 depict the geographical distribution of counties in the Northeast with residue densities sufficient to support at least one small liquid fuels plant (3 million gallon).[9] Residues in counties capable of supporting a large liquid fuels conversion plant (50 million gallon) might also be considered for direct combustion, co-combustion, or gasification. Regions that appear to have the most potential are the southern tier and western region of New York State, most of Pennsylvania, but especially the southwest counties, and in New Jersey the chain of counties bordering the Delaware River. The information in Figures 3 and 4 suggests that a similar pattern would obtain throughout the forecast period.

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[9]Figures 3, 4, and 5 are all based on densities obtained in the most conservative simulation, simulation 1.

Section 3

AVAILABILITY AND COLLECTION COSTS OF ANIMAL MANURES

Animal manures are probably the most obvious and widely identified wastes produced in agriculture. Yet, as is often the case with "wastes", manures do contain valuable materials. Livestock and poultry manures have traditionally been spread on cropland and pasture. If properly applied, manures provide soil organic matter, nitrogen, phosphorus, potassium, and other minerals. However, manures are often spread for no other reason than disposal, and with little or no consideration of agronomic needs or environmental factors. Pollution and poor crop yields caused by nutrient imbalances may result.

Technology to produce methane from manure via anaeorobic digestion has been widely studied in recent years (Jewell et al., 1974, Morris et al., 1975, Ashare et al., 1981), and full-scale digesters are being built and tested at Cornell University and elsewhere. The attraction of producing energy from animal manures has arisen in recent years due to higher prices for farm fuels. Simultaneously, manure has become more attractive as a soil nutrient source due to higher chemical fertilizer prices - particularly for nitrogen - induced by higher natural gas feedstock costs. Fortunately, these two uses are not necessarily competing. Although anaerobic digestion converts the nitrogen in manure effluent to a more volatile form, under certain conditions this does not result in a net loss of nutrients. Thus, the process generates products that have value as both energy and fertilizer.

The purpose of this section is to determine the availability, distribution, and costs of collecting manures in the Northeast. The estimation of manure inventories is undertaken under two different assumptions about manure transportability and digester scale economies. The first approach assumes central processing, digesters located within hauling distance of all available manure, and the actual transport of all "economically" recoverable manure to central facilities. The second approach views the costs of transporting manure as prohibitive and inventories effluent which can be economically processed on-farm.

ESTIMATION PROCEDURES

The Northeast region is potentially well-suited to a methane production industry. This stems from the predominant strength of dairy in Northeast agriculture. Of $5.7 billion in agricultural product value produced in 1978, $2.3 billion, or 40 percent, came from dairy products. This compares to a national value (excluding the Northeast) of $102.4 billion in agricultural products, of which dairy constitutes less than nine percent at $9.0 billion. Dairy animals produce the largest amounts of collectable manures of all livestock classes (Van Dyne and Gilbertson, 1978).

To derive estimates of manure availabilities, both methodologies used here rely heavily on estimates of animal numbers on farms and attempt to directly relate manure production. One approach, using data from the 1978 Census of Agriculture was developed by the Solar Energy Research Institute (Max et al., 1981). This methodology uses standardized values for manure production by animal type and weight, as derived by Jewell et al., 1974; Matulich et al., 1977; and the Agricultural Engineers Yearbook, 1979. The focus is on confined livestock, which are dairy animals, feeder cattle and swine. Estimated levels of manure production by animal are multiplied by animal numbers on farms reported in the 1978 Census of Agriculture. These values are subsequently converted to the BTU equivalents of the biogas produced or electricity generated from the manure and are presented by county and state totals.

The second methodology was developed by the USDA in the late 1970s, chiefly by Van Dyne of the Economics, Statistics and Cooperatives Service (ESCS), and Gilbertson, of the Science and Education Administration (1978). This approach predates that of SERI, although it follows a broadly similar approach. The USDA methodology is, however, better documented particularly with regard to regional manure management systems.

The USDA's methodology distinguishes among three levels of manure availability. The first level is total production by animal, in terms of dry weight of all solid and liquid wastes. The second level reflects losses and gains to manure weights due to manure management systems. Manure is often lost in management systems due to volatilization, runoff, and seepage, with more loss in liquid handling systems than in solid handling systems. Bulk may be added to manure quantities due to incorporation of litter, bedding, spilled feed, or soil. In general, management systems incur a net loss of material, and particularly of manure nutrients. The third level of manure availability defines collectable manures after management system losses. These manure quantities are directly related to confinement. Animals such as swine that are completely confined have a collectable manure total equivalent to the amount surviving the management system. Range cattle, which are almost never confined, have only 4 percent of total manure defined as collectable. Dairy animals have 90 percent of level two manure collectable. Available manure at this level is also called "economically recoverable" manure in the USDA methodology.

Table 13 summarizes these values by animal type. Manure quantities for beef cattle, dairy cattle, sheep, laying hens and turkeys are based on adult animal units with an allowance for manure produced by replacement stock and offspring. Thus, dairy cows would include an adjustment for the manure of one bull per 25 production cows, a 95 percent calf crop, and an allowance for 10 percent of the heifer calves being retained for replacement (Van Dyne and Gilbertson, 1978). Fat hog manure quantities are similarly adjusted for manure of breeding stock. Regions of the country are defined for various animal types by prevailing management system. Regional values pertinent to the Northeast are: region 1 for beef range cattle, region 3 for feeder cattle, region 5 for dairy cattle, region 10 for swine, and region 11 for turkeys. Sheep, hen, and broiler manure management systems are not differentiated regionally.

Van Dyne and Gilbertson multiply the values in Table 13 by animal numbers in the 1974 Census of Agriculture to estimate total manure production by county, state, and nation for that year. Actual inventory numbers are used for animals usually on the farm the entire year. These animals are beef and dairy cattle, sheep, and laying hens. Sales numbers are used for animals which are usually not kept for a full year, such as swine, feeder cattle,

Table 13. Quantities of Manure Voided, Surviving Management Systems, and Collectable by Animal Type and Geographic Region

Commodity	Production area[1]	Production Period (days)	Manure/Animal		
			Total Voided	Net of Storage and Manure Handling Losses	Economically Recoverable
			- - - - - - - - - - - - dry weight pounds - - - - - - - - - - -		
Beef cattle (range)	1	365	2,159	1,971	164
Feeder cattle	3	180	800	1,222	1,222
Dairy cattle	5	365	4,750	4,357	3,922
Fat hogs	10	120	203	134	66
Sheep	2/	365	236	213	106
Laying hens	2/	365	24	23	23
Turkeys	11	140	23	29	22
Broilers	2/	56	2	2	2

Source: Van Dyne and Gilbertson, 1978

[1]Production areas are organized according to similar manure and nutrient production characteristics and are not mutually exclusive. Area 1 -- Northern States, including Nevada to Virginia, all States in between, and those northward; area 2 -- Southern States; area 3 -- North Dakota, South Dakota, Nebraska, Kansas, Arkansas, Louisiana, and all States eastward; area 4 -- Western States; area 5 -- the Northeast, Appalachia, Corn Belt, Lake States, Northern Plains, and northern Mountain States; area 6 -- the Southeast, northern California, Oregon, and Washington; area 7 -- the southern Plains; area 8 -- southern California, Arizona, and New Mexico; area 9 -- the Corn Belt, Lake States, South Dakota, Nebraska, Kansas, Texas, Kentucky, Tennessee, North Carolina, and Georgia; area 10 -- all areas of the United States not included in area 9; area 11 -- the Northeast; area 12 -- the Middle Atlantic and Pacific States; area 13 -- East North Central, West South Central, and Mountain States; area 14 -- West North Central, South Atlantic, and East South Central States.

[2]Little noticeable difference among different regions of the United States.

turkeys, and broilers. As manure quantities for beef and dairy cattle, sheep, laying hens, and turkeys are defined to include manure produced by offspring and replacement stock, adult animal populations should be used for these animals. For similar reasons, hog populations should be exclusive of breeding stock (Van Dyne and Gilbertson, 1978).

Updating the 1974 estimates by using animal numbers from the 1978 Census of Agriculture data is relatively straightforward. Some difficulty is encountered with heavily capitalized industries such as poultry enterprises at the county level, however. Often one or two large producers account for most of the broiler and egg output of a county. If production figures of such producers are considered proprietary, they are not released and so county level output is indeterminate. Disclosure problems occur most frequently with layers and, to a lesser degree, broilers and turkeys but dairy cow feeder cattle, and hog figures are also affected occasionally.[1]

Table 14 provides a summary of manure production in the Northeast for the three production categories defined above. The general production levels and distribution agree closely with those calculated for 1974 by Van Dyne and Gilbertson (1978). It is estimated that 6.4 million tons of manure was voided in 1978 by animals on farms in the nine states. For the region as a whole, 72 percent of all manure produced originated from dairy animals, 14 percent from beef cows, 6 percent from hens and the remaining 8 percent from the other 5 animal types. The total volume of recoverable manure net of handling losses and collection constraints was 4.7 million tons, 74 percent of total manure production. The percentage distribution of recoverable manure generated by animal type is 81 percent from dairy animals, 7 percent from layers, 5 percent from feeder cows and 7 percent from other animals.

Table 15 gives data on collectable manure quantities by animal type for each of the nine states of the Northeast Region. Data for recoverable manure at the county level are included in Appendix E. Here, density per square mile figures indicate areas probably best-suited for a manure-to-methane industry. Figure 6 gives a geographical presentation of the density information in Appendix E. The highest concentrations of manure in the Northeast are found in southeastern Pennsylvania, although New York State shows a large belt of contiguous counties with manure in excess of 50 tons per square mile.

MANURE ACQUISITION FOR CENTRAL PROCESSING

The economics of collecting manure for conversion to energy are highly dependent on the site at which the energy production process takes place. If energy production occurs where manure is produced, collection costs are relatively low. Costs include additional handling expenses and potential manure nutrient losses. However, if energy production occurs away from the

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[1]In the case of broilers and turkeys, it is possible to estimate sales figures by inflating inventory data on the basis of statewide sales to inventory ratios. Since a simple adjustment procedure did not present itself for layers, no estimates were obtained. Dairy cow figures for Bedford, Pennsylvania and Queens and Rockland, New York, hog figures for Westchester, New York, Bristol, and Kent, Rhode Island, and feeder cattle figures for Cape May, New Jersey are zero for the same reason.

Table 14. Estimated Manure Production in the Northeastern United States, 1978

Animal Type	Number of Animals	Total Voided	Net of Losses from Management Systems	Recoverable
		- - - - - - - - - - - -	dry tons	- - - - - - - - - -
Dairy cows	1,925,400	4,572,900	4,194,600	3,775,800
Beef cows, steers	807,300	871,500	795,600	66,200
Feeder Cattle	393,000	135,500	240,100	240,100
Hogs, Pigs	1,498,900	152,000	98,100	65,200
Sheep	128,300	15,100	13,600	6,800
Hens	30,400,000	364,800	349,600	349,600
Broilers	152,600,000	152,600	152,600	152,600
Turkeys	2,454,500	28,200	35,600	27,000
Total	190,207,400	6,350,100	5,929,900	4,683,300

Source: Derived from data on animal numbers in the state volumes of 1978 Census of Agriculture and procedures described by VanDyne and Gilbertson (1978).

Table 15. State Inventories of Total and Economically Recoverable Manure, 1978

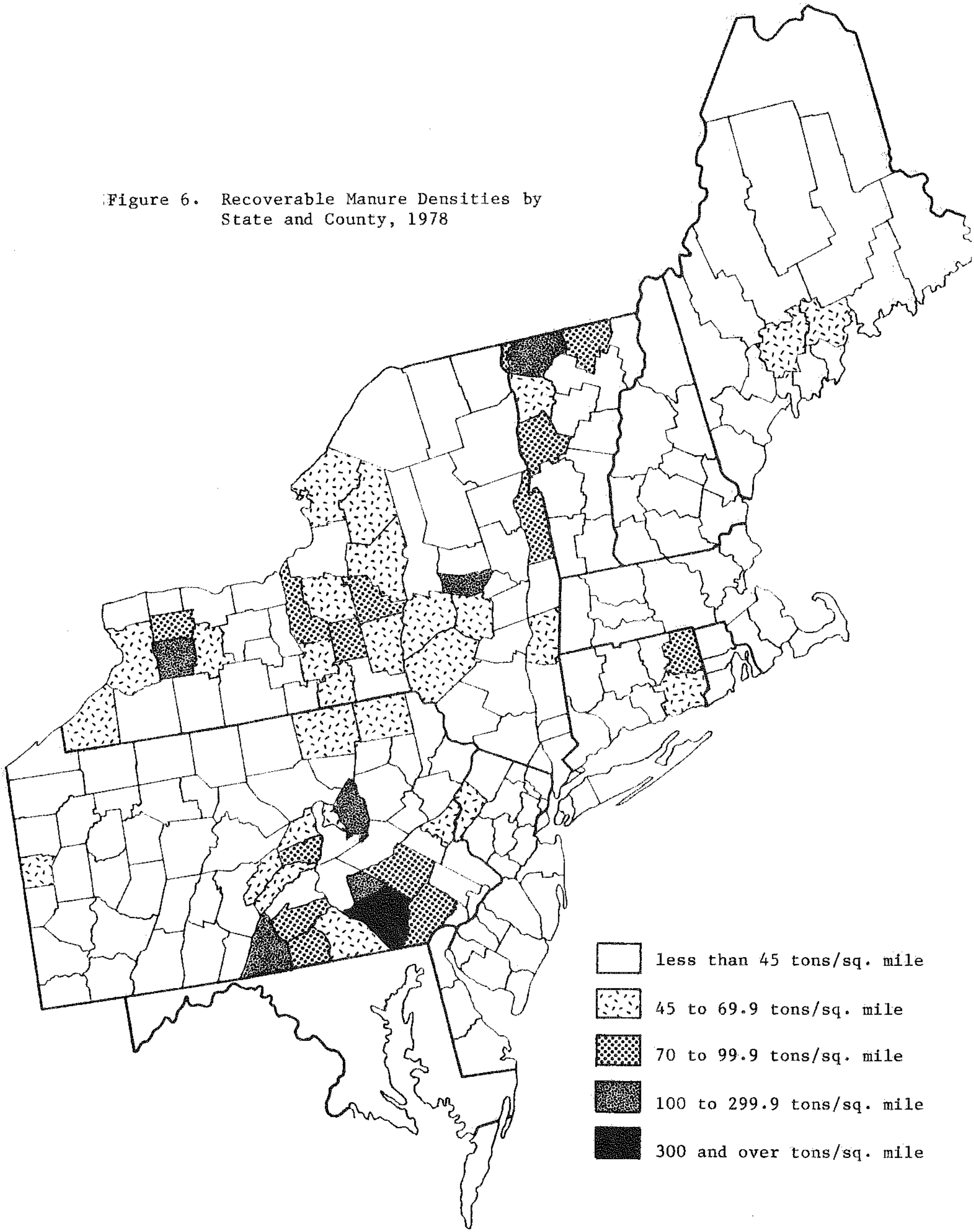
State	Total Manure Production	Economically Recoverable Manure										
		Total	% of Total Production	Density/ square mile	Dairy	Beef	Feeder	Hogs	Sheep	Turkeys	Hens	Broilers
	- - - - Dry Tons[a]	- - -		- - - - - -	- - - - - -	- - - -	- - - -	Dry Tons[a]	- - - -	- - - -	- - - -	- - - -
Connecticut	170,700	153,700	90	299	98,000	500	1,600	500	100	0	52,500	500
Maine	248,600	226,100	91	226	111,100	900	2,100	400	400	0	44,000	67,300
Massachusetts	136,900	117,600	86	78	97,500	600	1,600	2,700	200	600	14,400	0
New Hampshire	80,600	69,600	86	129	60,000	400	1,100	500	200	0	7,300	0
New Jersey	125,500	103,500	82	286	83,900	900	3,100	4,900	300	0	10,200	200
New York	2,553,600	1,830,100	72	5,332	1,666,700	48,600	63,200	1,700	1,700	2,300	45,500	500
Pennsylvania	2,135,100	1,804,100	84	1,984	1,286,900	13,600	165,300	54,400	3,500	24,000	172,400	84,000
Rhode Island	13,800	11,600	84	b/	9,100	100	200	300	0	0	1,800	0
Vermont	415,700	367,300	88	381	362,500	700	2,000	300	200	0	1,500	0

Source: Derived from data on animal numbers in the state volumes of 1978 Census of Agriculture and procedures described by VanDyne and Gilbertson (1978).

[a]All estimates, except densities, are rounded to the nearest 100 tons.

[b]Rounds to zero.

Figure 6. Recoverable Manure Densities by State and County, 1978



manure production site, then the economics become somewhat complicated. Transportation costs must be considered, as well as appropriate compensation to livestock producers for the foregone value of the manure as a nutrient source.

The major component of acquisition cost for a centralized energy producer is transportation. Manure has a relatively high moisture content even in solid form (in excess of 80 percent water) and is thus expensive to ship. Hauling costs per ton of solid manure were calculated by Matulick (1977), and are presented in 1981 dollars in Table 16. If manure is assumed to be 15 percent solids, then the cost of hauling one ton of dry manure a roundtrip distance of 16 miles would exceed $8, even using a 24-ton truck.

These costs are based on the assumption that manure is acquired by a central facility but not returned after digestion. Then, the livestock producer must be compensated for lost nutrients less the costs saved by not having to spread the manure. Given the manure nutrient percentages in Table 17, and nutrient values of $0.14 per pound of nitrogen, $0.61 per pound of phosphorus, and $0.14 per pound of potassium, the nutrient values of a ton of dry manure range from $14.48 for feeder cattle manure to $57.77 for hog manure. Dairy manure has a nutrient value of $24.30/ton. Spreading costs of manure are highly variable but Cornell farm records indicate that manure application costs of as little as $20/dry ton and less can be realized for daily spreading operations (Snyder, 1981). If a nutrient value of $23.30 per dry ton of digested cow manure is inputed (reflecting the loss of $1.00 of volatile nitrogen), the on-farm disposal operation pays for itself.

Table 16: Manure Hauling Costs (per ton dry matter)

Roundtrip Distance	10-ton truck	24-ton truck
16 miles	$16.46	$ 8.20
30 miles	30.80	15.40
40 miles	37.20	18.60
50 miles	44.07	22.07
60 miles	50.27	25.27

Note: Converted from 1977 dollars to 1980 dollars using the transportation portion of the Consumer Price Index. All costs are for dry tons of manure, adjusted from Matulick's costs given in terms of wet manure. A 15 percent solids content was assumed.

Sources: Matulick, 1977.

Table 17. Nutrient Percentages of Animal Manures

Animal	Nutrient (percents)			1980 Nutrient Value (per ton)
	Nitrogen	Phosphorus	Potassium	
	- - - - - - - - percent[a] - - - - - - - - -			
Beef cattle	2.20	0.91	2.01	$22.89
Feeder cattle	1.64	0.60	0.92	14.48
Dairy cattle	2.65	0.63	3.29	24.30
Fat Hogs	5.15	2.58	4.24	57.77
Sheep	2.83	1.04	4.43	33.02
Laying Hen	3.04	2.17	2.17	41.06
Turkeys	3.64	1.36	2.27	33.14
Broilers	5.00	1.50	2.00	37.90

Source: Van Dyne and Gilbertson, 1978.

[a]All percentages are on a dry weight basis and apply to collectable manure tonnages.

Table 17 indicates that for beef and feeder cattle and dairy cows the nutrient value of manure is either less or only slightly more than estimated spreading costs. It is possible that manure from dairy and feeder cattle operations would be available to a central processor at moderate or no charge. In such cases, the viability of central anaerobic digestion of farm manures depends on the costs of transporting manures to the central facility and digester scale economies. Up to a point, hauling costs over longer distances may be offset by the efficiency of larger digesters. Biogas production costs can be expected to decrease in larger digesters but anaerobic digestion processes are not well enough established to pinpoint an optimally sized digester suitable for central processing. Nonetheless, the marginal biogas production costs pertaining only to the manure transportation component can be derived based on estimated round trip hauling costs. These estimated costs are given for various hauling distances in Tables 18. Smaller facilities may be able to take advantage of shorter hauling distances and can be situated in counties with lower manure concentrations.

The transportation component of biogas production costs is high relative to the current costs of electricity and natural gas ($0.04-$0.10/KWh and $3.80-$5.40/10^6 BTU natural gas). Effluent disposal costs further the case against centralized processing. Unless producers can turn this disposal

Table 18. Cost of Manure Transportation Per KWh Produced

County Manure Density/sq. mi.	Average Hauling Distance	Change in Production Cost/KWh
31.6	60	$0.066
45.5	50	$0.058
71.1	40	$0.050
126.4	30	$0.042
444.5	16	$0.022

Source: Based on Table 16.

problem into a byproduct credit by marketing dewatered effluent as bedding or a soil conditioner, centralized manure processing looks uneconomic.

A 1 MWe power plant (capable of servicing 15,000 residential customers) fueled by anaerobic digesters producing 5.3 ft^3 biogas/pound of dry dairy cow solids would require 715,000 dry tons of dairy manure yearly or 1960 dry tons daily. Total capacity of the fermentation tanks of such a system would be on the order of 55 million gallons. Table 18 gives estimates of the marginal production costs per KWh for the manure transportation component alone. It is assumed that the biogas has a BTU content of 600 BTU/ft^3 and that biogas can be converted to electricity with 20 percent efficiency. In counties where manure densities are higher, average hauling distances are shorter and the transportation component of production costs is lower.

Thus, a centralized facility will incur transporation costs that are not a factor at the farm level, but may also be able to benefit from economies of scale in manure disposal. Whether or not the net cost of acquisition (including digested manure disposal) will be negative or positive will be dependent on specific circumstances facing energy producers.

AVAILABILITY FOR ON-FARM PROCESSING

Table 15 lists economically collectible manures by state assuming transportation to a centrally located digester is economically feasible. However, given the high costs of transporting wet manure, which most analysts consider prohibitive, it is probably more sensible to survey on-farm possibilities for anaerobic digestion.

Animal operations chosen for this analysis were selected on the basis of total economically recoverable manure generated on farms where animals are close quartered. As cited above, manure from dairy, feedlot, swine, layer, and broiler operations constitute about 98 percent of economically collectible manure voided in the Northeast. Although OTA data suggests that methane digesters are most suited to turkey operations, turkey data are not presented for the Northeast because of the paucity of farms engaged in turkey production.

There is disagreement in the literature concerning the farm size (in animal units) required for breakeven operation of an on-farm digester.

Jewell's findings are that dairy farms with over 380 head, feedlots with more than 570 head, poultry operations with sales over 57,000 birds, and hog producers with more than 2,800 animals are sufficiently large to warrant investment in an anaerobic digester (1974). Unfortunately, the Census of Agriculture does not publish data on farm size by animal type in such a way that the number of farms meeting Jewell's criteria can be identified. Manure availability by farm size group is therefore based on the groupings reported in the Census of Agriculture (see Table 19).

There is sufficient overlap on the low side of Jewell's estimates to avoid undercounting. For example, the first three hog farm size categories present data on manure that is probably uneconomic to digest. Likewise, the first two dairy cow groups, the first three feeder cattle groups, the first two layer groups, and the first broiler groups include farms which are generally considered too small to support a digester. If by-product credit can be assigned to the digested effluent, it is possible that the smaller farms reported here can also produce methane economically from manure. The marginal categories also serve to indicate the relative quantities of manure available on farms of different sizes and may help focus digester research and design priorities in order to take full advantage of this resource.

In order to employ the Van Dyne-Gilbertson methodology for estimating manure production by farm size, 1978 Census of Agriculture county inventory data of dairy cows and laying hens by farm size and county sales data of broiler, feeder cattle, and swine by farm size were collected. Unfortunately, the Census data is not in a directly usable form. Generally available for each county are data on total farms and total number of animals for a particular enterprise, say dairy. Following the total figures, each county has listed the number of farms falling within each of the farm size ranges. For instance, in the case of dairy animals, the total farm and total animal figures are presented for each county followed by the number of farms operating within each of seven disaggregate size ranges, 1-9 head, 10-19 head, 20-49 head, 50-99 head, 100-199 head, 200-499 head, and over 500 head.

The animal totals given for the county can be distributed over the disaggregate size ranges by assuming a uniform distribution of animals over all ranges. This is accomplished by summing the products of disaggregate farm

Table 19. U.S.D.A. Farm Size Groupings

Animal Type	Group			
	I	II	III	IV
Dairy Cows	50- 99	100- 199	200- 499	500+
Feeder Cattle	50- 99	100- 199	200- 499	500+
Hogs	100- 199	200- 499	500- 999	1,000+
Layers	10,000-19,999	20,000-49,999	50,000- 99,999	100,000+
Broilers	30,000-59,999	60,000-99,999	100,000-499,999	500,000+

numbers and median range size and arriving at an estimated total number of animals for all farms in a county. A ratio is then formed by the actual total and the estimated total number of animals. Each of the median range sizes is multiplied by the ratio in order to satisfy the county aggregate. In this manner, the resultant mean number of animals for each farm size range is skewed from the median of each range by a similar percentage. There are two cases for which this generalization is violated. If, in adjusting the mean for one of the ranges, the upper or lower limit of the range is exceeded, the mean is set to the limit. In this event, the program continues to search for mean values of the other farm size ranges that will satisfy the county aggregate. The other, more trivial, case concerns those counties for which number of animals on farms of the largest size are disclosed. For these counties, the arbitrary mean of the largest farm size range is overwritten with the actual mean and its value thereafter remains unaffected by the iterative search for means that satisfy the county aggregates.

In counties where a small number of large farmers are responsible for a predominant portion of any one type of animal production, data disclosure problems disallow determination of mean farm sizes for the various farm ranges at the county level. Where disclosure problems exist, they typically affect publication of total animal figures at the county level but not number of farms within each of the ranges. By summing the number of farms within each of the ranges for all counties with disclosure problems, the state residual number of animals (the total of unprocessed counties) can be distributed among farms in counties with disclosure problems in a manner similar to the above. Data on number of farms is pooled only to determine mean farm size for the various ranges. Once the mean farm size for all farm size ranges is determined for the unprocessed counties, manure available in each of the unprocessed counties is based on the mean size of the various ranges for all unprocessed counties and the number of farms within the various ranges for a particular county. Thus data on the number of farms by size for all counties with disclosure problems is retained until all other counties in the state with complete data sets have been processed and a residual animal total can be computed.

Estimates of manure feedstocks available for on-farm processing are presented in Tables 20-24. State level dry manure tonnages for each of the four largest Census of Agriculture farm size partitions are reported for dairy cows, feeder cattle, swine, layers, and broilers. From the Tables, it is apparent that the bulk of manure available for on-farm digestion in the Northeast are generated on dairy farms with a herd size of 50-200 animals. To a lesser extent, manure produced in layer operations with over 20,000 birds also warrants attention.

States in the Northeast with greatest potential for on-farm methane generation are New York and Pennsylvania, although the Maine broiler industry might also be a candidate for on-farm digesters. The within state distribution of manures by farm size can be obtained from Appendix D.

Table 20. Dry Tons of Dairy Manure Available for Methane Conversion on Farms with Over 50, 100, 200, and 500 Head by State

STATE	Dairy Farms by Size							
	50-99 Head		100-199 Head		200-499 Head		Over 500 Head	
	Number of Farms	Collectible Manure	Number of Farms	Collectible Manure	Number of Farms	Collectible Manure	Number of Farms	Collectible Manure
Connecticut	240	31,300	114	29,700	29	17,600	1	1,300
Maine	318	40,200	84	21,400	11	6,500	0	0
Massachusetts	267	34,000	88	22,400	22	13,100	1	1,300
New Hampshire	176	22,600	50	12,800	10	5,800	0	0
New Jersey	304	38,900	79	20,100	16	9,400	1	1,200
New York	5,613	726,400	1,192	312,000	168	101,600	8	10,400
Pennsylvania	3,612	466,200	619	161,100	80	48,300	4	5,300
Rhode Island	30	3,100	7	1,300	0	0	0	0
Vermont	1,248	161,200	304	77,500	45	27,100	3	3,900
Total	11,808	1,523,900	2,537	658,300	381	229,400	18	23,400

Source: Estimated from 1978 Census of Agriculture data.

Table 21. Dry Tons of Feedlot Manure Available for Methane Conversion on Farms with Over 50, 100, 200, and 500 Head by State

STATE	Dairy Farms by Size							
	50-99 Head		100-199 Head		200-499 Head		Over 500 Head	
	Number of Farms	Collectible Manure	Number of Farms	Collectible Manure	Number of Farms	Collectible Manure	Number of Farms	Collectible Manure
Connecticut	1	0	1	100	2	400	0	0
Maine	4	100	0	0	3	400	0	0
Massachusetts	4	200	1	100	0	0	1	400
New Hampshire	2	100	1	100	0	0	1	400
New Jersey	12	500	3	200	1	200	0	0
New York	64	2,500	26	2,100	12	2,000	4	1,700
Pennsylvania	699	28,000	376	26,400	161	29,700	38	17,100
Rhode Island	0	0	0	0	0	0	0	0
Vermont	3	100	4	300	1	200	0	0
Total	789	31,500	412	29,300	180	32,900	44	19,600

Source: Estimated from 1978 Census of Agriculture data.

Table 22. Dry Tons of Hog Manure Available for Methane Conversion on Farms with Over 100, 200, 500, and 1,000 Head by State

STATE	Dairy Farms by Size							
	100-199 Head		200-499 Head		500-999 Head		Over 1,000 Head	
	Number of Farms	Collectible Manure	Number of Farms	Collectible Manure	Number of Farms	Collectible Manure	Number of Farms	Collectible Manure
Connecticut	22	100	17	200	1	0	1	0
Maine	17	100	4	100	1	0	0	0
Massachusetts	65	200	45	700	22	600	10	800
New Hampshire	17	100	15	200	1	0	0	0
New Jersey	46	300	41	700	12	400	23	2,900
New York	200	1,100	118	1,600	45	1,300	22	1,300
Pennsylvania	1,007	6,000	923	13,200	451	12,300	210	13,700
Rhode Island	12	100	8	100	2	100	0	0
Vermont	13	100	6	100	1	0	0	0
Total	1,399	8,100	1,177	16,900	536	14,700	266	18,700

Source: Estimated from 1978 Census of Agriculture data.

Table 23. Dry Tons of Layer Manure Available for Methane Conversion on Farms with Over 10, 20, 50, and 100 Thousand Birds by State

STATE	Dairy Farms by Size							
	10,000-19,999 Hens		20,000-49,999 Hens		50,000-99,999 Hens		Over 100,000 Hens	
	Number of Farms	Collectible Manure	Number of Farms	Collectible Manure	Number of Farms	Collectible Manure	Number of Farms	Collectible Manure
Connecticut	25	3,100	33	11,700	10	7,800	9	29,600
Maine	48	5,900	73	25,200	11	9,000	6	44,300
Massachusetts	16	2,000	10	3,400	3	2,100	2	4,200
New Hampshire	7	1,300	13	4,500	1	800	1	1,300
New Jersey	13	1,500	4	1,300	5	3,700	2	3,700
New York	48	6,200	49	17,700	16	12,400	17	39,100
Pennsylvania	197	29,500	145	51,400	55	42,500	13	25,500
Rhode Island	5	700	3	1,000	1	600	0	0
Vermont	4	600	5	2,000	0	0	1	2,300
Total	363	50,800	335	118,200	102	78,900	51	150,000

Source: Estimated from 1978 Census of Agriculture data.

Table 24. Dry Tons of Broiler Manure Available for Methane Conversion on Farms with Over 30, 60, 100, and 500 Thousand Birds by State

STATE	Dairy Farms by Size							
	30,000-59,999 Birds		60,000-99,999 Birds		100,000-499,999 Birds		Over 500,000 Birds	
	Number of Farms	Collectible Manure	Number of Farms	Collectible Manure	Number of Farms	Collectible Manure	Number of Farms	Collectible Manure
Connecticut	4	100	3	200	1	200	0	0
Maine	18	600	40	2,600	225	53,000	13	12,700
Massachusetts	3	100	0	0	0	0	0	0
New Hampshire	1	0	1	100	0	0	0	0
New Jersey	4	200	0	0	1	300	0	0
New York	2	100	1	100	1	200	0	0
Pennsylvania	62	2,300	48	3,100	220	53,000	35	26,600
Rhode Island	0	0	0	0	0	0	0	0
Vermont	0	0	0	0	0	0	0	0
Total	94	3,400	93	6,100	448	106,700	48	39,300

Source: Estimated from 1978 Census of Agriculture data.

Cost of Manure Acquisition - On-Farm Processing

The need for modifying manure management systems is highly dependent on the energy conversion method adopted. In some cases, such as a plug flow anaerobic digester working on a gravity system, almost no modifications in collection methods are required. In others, where the digester requires higher solid contents than current manure collection practices allow, a more expensive system would be required, the cost of which must, at least in part, be attributed to the energy production operation.

If manure is digested on farm, the value of nutrients lost or destroyed during the digestion process will be the cost of acquisition. Thus, it is necessary to determine the impact of digestion on manure nutrients.

Anaerobic digestion of manures does not significantly affect the level of available nitrogen, phosphorus or potassium in the manure. It does, however, change the form of the nitrogen from urea to ammonia, the latter material being very volatile. If the digested manure is applied to a legume crop where nitrogen is not a requirement, then essentially the value of the manure remains unchanged. If, however, it is applied to corn or other non-nitrogen-fixing crops, the increased volatibility of nitrogen may be a factor. Daily spreading techniques may result in the loss of some of the nitrogen in the digested manure to the atmosphere, lessening the value of the manure by approximately 1 pound of nitrogen per wet ton, or 7 pounds per dry ton. As one pound of nitrogen in chemical fertilizer is worth approximately $0.14, acquisition cost, in an opportunity sense, would be about $0.98 per dry ton.

Daily spreading as a management practice will represent the maximum cost of lost manure nutrients to on-farm methane producers. Given a more efficient manure system, including storage and large-scale spreaders, the nitrogen loss relative to raw manure becomes negligible.

Section 4

FOOD PROCESSING RESIDUES

The Northeast is a significant producer of fruits and vegetables. For example, New York State ranks second nationally in the production of apples, grapes, and tart cherries, fourth in pears and fresh vegetables, sixth in sweet cherries, and seventh in processing vegetables. Food grade fruits and vegetables would, however, not be economically attractive feedstocks for conversion to other energy forms in light of their current market prices. Apples for fresh consumption, for instance, sold for more than $16.00 per hundred weight in 1983. It would require approximately 139 pounds of apples to produce a gallon of ethanol. However, processing of fruits and vegetables may yield waste byproducts that are suitable for energy conversion, either by direct combustion, fermentation to ethanol or conversion to methanol.

Within the region, major fruit byproducts are apple and grape pomaces. Major vegetable byproducts result from the processing of beets, beans, cabbage, carrots, and peas. The forms in which processed byproducts occur range from a press cake of roughly 25 to 40 percent solids, and approximately 12 to 13 percent sugar, to slurries of 14 percent solids or less, and approximately 5 percent sugar.[1]

In general, accurate and site specific data on the production of processing byproducts is either unavailable from a consistent source or would reveal proprietary information if released. Pursuit of additional inventory information, therefore, depends upon the perceived importance of these byproducts for energy use. A careful review of the literature and conversations with industry representatives indicated a number of general considerations applicable to this issue. First, the acquisition of food processing byproducts is a problem due to the generally high shipping costs and difficulties encountered in handling and storage. For example, pomace in 30 percent solids form is extremely bulky, and costs in the neighborhood of 10 to 20 dollars per ton to transport even over relatively short distances. Transportation costs alone, assuming the pomace is shipped to a central energy conversion site, could approach $1.00 per gallon of ethanol produced from the sugar content. Thus, acquisition costs become prohibitive.

Moreover, the relatively low sugar to solids ratio in most food processing byproducts often precludes their use as an energy feedstock given conventional technologies. Low sugar to solids complicates acquisition of pomace, and creates inefficiencies in processes requiring fermentation and distillation. The generally high water content not only makes transporation difficult and expensive, but complicates long term storage possibilities.

As a rule, the production of food processing byproducts is highly seasonal throughout most of the region. Seasonality problems for energy

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[1]Sugar concentrations vary considerably thoughout the region due to the widespread practice of secondary sugar recovery from pomace in many modern food processing operations. This practice lowers pomace sugar concentrations to 6 or 7 percent for 30 percent solids pomace.

feedstocks can be overcome if the substance in question can be stored, allowing for year round conversion plant operation. However, the water content of most food processing byproducts permits only several days storage without spoilage and makes the concentration of usable sugars economically prohibitive.

The relatively high fiber content of most food processing waste byproducts complicates conversion processes dependent upon fermentation by necessitating a four to five part dilution of the feedstock for submerged fermentation to occur. Given the initial low sugar concentration of most waste products, this will yield a sugar concentration of less than three percent and an ethanol yield (for example) of less than 1.5 percent. Ethanol concentrations of less than 2 percent are normally uneconomic to recover, given conventional distillation techniques. In addition, the fiber component of the beer may result in clogging of the distillation tower. Centrifuging prior to distillation would prevent such clogging but would cause substantial losses in ethanol yield. Direct fermentation of leachate from byproducts such as fruit pomaces also does not look attractive economically. Fruit drinks or juice concentrates often utilize such leachates as a base at a substantially greater economic yield than if conversion to an energy product took place. For example, the quantity of leachate used to produce a gallon of ethanol from apple pomace -- approximately 28 gallons -- could yield 2.5 gallons of 72 percent sugar concentrate with a total market value of $18.00. A gallon of ethanol currently brings less than $.95 wholesale at East Coast terminals.

In summary, food processing waste byproducts are not strong candidates for conversion to useful energy products. Their seasonality, bulk, water content, low sugar yields, and other more economic uses argue against major investments in facilities to utilize such products as energy conversion feedstocks. Moreover, the availability of specific types of food processing waste products can vary greatly over time as a result of fluctuations in both market and growing conditions. Such instability of supply further argues against widespread application of energy conversion technology to this area of agricultural biomass. As a consequence, we will not attempt a further detailed inventory of potential residue byproducts available in the Northeastern states.

Section 5

SUMMARY AND CONCLUSIONS

Table 25 displays 1980 power usage by energy source for the Northeastern states. Energy requirements for the commercial, industrial, residential and transportation sectors in the Northeast totaled 12,623.8 x 10^{12} BTUs. Under optimal soil management practices and 100 percent utilization of available crop residues and manures, about 38 x 10^{12} BTUs of energy could be generated from agricultural sources. Of this amount, 33 x 10^{12} BTUs could be generated from the direct combustion of crop residues and the methane equivalent to 5 x 10^{12} BTUs could be derived from the anaerobic digestion of manures. More realistically, however, crop residues will probably be converted to liquid fuels rather than be combusted directly. If this is the case, 2.23 million tons of crop residues could be converted to methanol with a net energy content of 11.5 x 10^{12} BTUs. The combination of methanol from crop residues and methane from manures represents only 0.13 percent of 1980 total energy consumption in the Northeast.

Although the energy potential of agricultural wastes appears minor in comparison to the overall energy needs of the Northeast, waste derived energy could play a significant role in fulfilling the energy requirements of the agricultural sector. Table 26 lists the 1974 state agricultural energy requirements for crop and livestock sectors. The estimated values are disaggregated into direct and indirect energy usage; the indirect figure pertaining to energy inputs into fertilizer, pesticide, and other chemical production. Indirect energy usage applies only to crop production since data are not available for livestock production. Methanol from crop residue could account for 36 percent of the 31.6 x 10^{12} BTUs directly consumed in crop production or about 20 percent of the total energy involved in crop production. Methane from animal manures could provide 33 percent of the total energy consumed in livestock production. Achievement of this level of market penetration will, however, depend on technical, logistical and, most importantly, economic factors that are beyond the scope of this study.

Table 25. Northeastern States Energy Consumption, 1980 (10^{12} BTU's)

State	Petroleum	Coal	Gas	Nuclear	Hydro	Total
Connecticut	544.7	0.3	74.3	125.9	2.7	738.5
Massachusetts	930.2	22.5	187.0	34.4	1.6	1,223.3
Maine	223.1	3.1	2.3	46.9	63.9	312.1
New Hampshire	143.1	29.3	9.4	0.0	10.6	198.6
New Jersey	1,315.8	68.2	348.8	81.1	-2.9	2,069.7
New York	2,231.0	312.0	756.0	205.1	348.3	3,855.9
Pennsylvania	1,496.0	1,606.2	794.0	128.7	7.6	3,918.0
Rhode Island	111.1	.1	28.6	0.0	0.0	189.2
Vermont	67.5	.5	4.4	31.7	10.4	118.5
Total	7,062.50	2,042.20	2,204.80	653.80	442.20	12,623.8

Source: State Energy Data Report, 1982.

Table 26. 1974 Energy Usage by the Agriculture Sector in the Northeast

State	Crops			Livestock			Total Agriculture		
	Direct	Indirect	Total	Direct	Indirect	Total	Direct	Indirect	Total
	Energy Usage (10^{12} BTUs)								
Connecticut	.576	.522	1.098	.516	N/A	.516	1.092	.522	1.614
Maine	1.101	1.331	2.432	1.192	N/A	1.192	2.293	1.331	3.624
Massachusetts	.695	.582	1.277	.410	N/A	.410	1.105	.582	1.687
New Hampshire	.222	.329	.551	.216	N/A	.216	.438	.329	.767
New Jersey	2.751	1.945	4.696	.444	N/A	.444	3.195	1.945	5.140
New York	12.311	10.179	22.492	4.945	N/A	4.945	17.258	10.179	27.437
Pennsylvania	13.042	10.560	23.602	5.075	N/A	5.075	18.117	10.56	28.677
Rhode Island	.066	.090	.156	.46	N/A	.46	.112	.090	.202
Vermont	.874	1.386	2.260	.931	N/A	.931	1.805	1.386	3.191
N. E. Total	31.64	26.92	58.56	14.19	N/A	14.19	45.83	26.92	72.75

Source: Energy and U.S. Agriculture: 1974 Data Base, September 1976.

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Appendix A

CONVERSION PROCESSES

Biomass materials may be categorized as cellulosic or solid organic wastes. As an energy source, lignocellulosic materials may be processed in a variety of ways. These processes include:

1. Direct combustion;

2. Gasification to produce low BTU gas;

3. Destructive distillation to produce methanol or methanation of low BTU gas to produce methane;

4. Liquefaction to produce oil and hydrocarbon fuels;

5. Enzyme or acid hyrolysis to produce sugars which are in turn fermented to produce ethanol; and

6. Anaerobic fermentation to produce methane.

Thus, methanol, ethanol, methane, and synthetic gas can all be produced from lignocellulosic sources. One of the most attractive features of processes 3 through 7 is that they result in fuels that are easy to transport and distribute through existing fuel systems (Hall, p. 78). Because different kinds of biomass can be used as the feedstock in each process, a brief description of the procedures and the economic feasibility of each helps place the inventory estimates into proper perspective.

DIRECT COMBUSTION

Currently, biomass is most commonly converted to energy via direct combustion. The most widely used feedstocks -- wood, wood byproducts and bagasse (from sugar cane) -- are of little concern in this study because of its focus on agricultural biomass in the Northeast. Crop residues, however, can be mixed economically with coal and burned to produce process steam or electricity.[1] For example, the Logansport, Indiana Municipal Utility burns outdated seed corn in a mixture with coal to fire its generators (OTA, 1980, p. 131), and Abdullah (1978) has shown that corn stover available at from $13 to $24/ton can also be mixed economically with coal and burned directly. As with "co-combustion", feedstock costs (including transportation costs) are the principal determinants of the viability of direct combustion, and costs can vary considerably across regions.

One of the most positive aspects of direct combustion and "co-combustion" of cellulosic biomass is the resultant lower sulphur emissions. One major

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[1]The BTU content of cellulosic material is directly related to the percentage of combustible carbon present in the material. Straw and stalk residue from crops has about 80 percent of the carbon content of wood and 2 to 20 times as much ash (Tillman, 1978).

drawback to direct combustion is that heat produced must be used on site since it cannot be absorbed or transported by existing delivery systems. Another is related to the bulk and moisture content of residues. Retrofitted oil-fired burners often require dry, small particle feedstock. This latter problem may be overcome by drying and pellitizing the feedstock prior to transporting it. Wood contains sufficient lignin to bind the pellets in the densification process but crop residues and grasses may need adhesives to prevent pellet disintegration. The costs of this additional processing is not known but could be prohibitive.

GASIFICATION

Gasification is a process for converting solid biomass directly into gas suitable for use as a fuel or for chemical synthesis. Gasifiers employ blowers to force air through the feedstock to burn it partially. The heat generated then gasifies the remaining material. Air-blown gasifiers produce a gas with lower heat content than the resultant gas from oxygen or pyrolysis gasification, due to the nitrogen content of air and consequent dilution. Gas from air-blown gasifiers has a heat content of 120-250 BTU/cubic foot. Higher quality gas (300-500 BTU/cubic foot) can be obtained from partial combustion or pyrolysis processes but neither this medium BTU gas nor the low BTU gas from air-blown gasifiers is suitable for general pipeline distribution. Low and medium BTU gas can be used for process heat either together with or as a substitute for oil or natural gas in industrial boilers. Gasifier systems have the potential for higher efficiency than direct combustion when a variety of feedstocks with different moisture contents are used.

Oil and gas fired burners can be retrofitted with mass produced air-blown biomass gasifiers for between $4,000 and $9,000/million BTU/hour (1979 dollars) over a gasifier size range of 14-85 million BTU/hour. With residue available for $24/ton, the resultant estimate of gas costs range from $2.70-$2.90/million BTU (OTA, 1981, p. 138). Comparatively, a million BTU from crude oil costs $3.45 and $6.90 at $20/barrel and $40/barrel, respectively (Hall, 1981, p. 262).

METHANOL

A solution to the transportability problems posed by direct combustion, "co-combustion", and production of low and medium BTU gas is the transformation of residues into synthetic gasoline or other liquid petroleum products, synthetic natural gas, and synthetic liquid fuels such as methanol. The choice among these alternatives depends on market condition, compatability of the fuel with the existing network of supply and distribution, and overall costs, including those related to feedstock transportation, emissions, effluents, and disposal of unmarketable by-products.

Among major methanol markets, the largest end use is in formaldehyde production. Other chemicals derived from methanol include dimethyl terephthalate, methyl halides, ethylene glycol, and acetic acid. More recently, methanol has also been used as a fuel anticer and a fuel additive for rocket, jet, and combustion engines. It is useful in the purification of coal, coal tar, and gaseous and liquid hydrocarbons; in plastics for catalyst removal, separation, and telogenation; and as a leading agent for uranium ore (Anderson and Tillman, 1977, p. 172). Methanol for direct combustion would compete with gasoline, low sulfur fuel oil, or coal which is either refined with a solvent or burned with stack gas cleanup.

As a transportation fuel, methanol has a lower volatility, a slightly higher density, and about one-half the heating value of 100 octane gasoline reference fuel. In a 10 percent mixture with unleaded gasoline, it raises the octane rating from 2 to 4 points, depending on the initial rating of the gasoline. Methanol gives about one-half the mileage of gasoline. It is less corrosive than ethanol and does not require plastic tanks, carburetors, and fuel lines to protect against deterioration of more conventional auto part materials (Anderson and Tillman, 1977, p. 172).

Most methanol is produced from natural gas through a reaction with steam and CO_2 to produce carbon monoxide and hydrogen, the major components of methanol. The gas composition is then adjusted to correct methanol component proportions and pressurized in the presence of a catalyst to produce the liquid. Methanol can be produced from biomass through this same process by first using oxygen and pyrolytic gasification to produce the CO-hydrogen mixture (OTA, 1980, p. 139).

Methanol yields from wood are dependent on the type of feedstock but average about 120 gallons/dry ton if electricity is not generated as part of the production process and 100 gallons/dry ton when electricity is co-generated. These yields correspond to conversion efficiencies of 48 and 40 percent, respectively. Yields from crop residues are not documented but based on the above efficiencies and the relative carbon content of wood and raw residue, the yields are likely to be in the neighborhood of 80 to 100 gallons/ton depending on electricity source. In theory, all of these yields can be increased significantly (OTA, 1980, p. 141).

Cost estimates for methanol synthesized with an oxygen blown gasifier vary from $0.67 to $1.33/gallon when wood feedstock is available at $30/ton (1979 dollars). Capital costs run about $2.00/gallon of yearly capacity. This is somewhat more expensive than grain ethanol distilleries.

There is some optimism that fluidized bed pyrolysis gasifiers when fully developed will be capable of cutting production costs significantly by eliminating equipment needed to produce oxygen. Estimates range from $0.52 to 0.95/gallon of methanol. Since methanol has about half the energy of a similar volume of gasoline, methanol that costs $0.50/gallon would be competitive with gasoline at $1.00/gallon. However, there are many alternative industrial and chemical end uses of methanol and the ultimate economic viability of methanol synthesis from biomass is not strictly dependent on its competitiveness with automobile fuels.

Although a larger portion of available biomass could be utilized in small, mass-produced methanol plants, there are technical limitations to small plants that make them inefficient. Because small centrifugal compressors cannot achieve the pressures needed for methanol synthesis, plants smaller than 5 million gallons/year would require a reciprocal compressor. It is possible that this requirment would result in plant costs higher than those due to normal diseconomies of size (OTA, 1980, p. 141).

Even though the economics of methanol production from biomass in medium scale plants employing low and medium pressure (765 to 1,475 psig) processes with oxygen gasifiers are becoming increasingly attractive (costs per BTU are approaching those of grain ethanol), methanol from biomass is likely to be more expensive than methanol from coal, due primarily to scale economies that can be achieved with very large coal conversion facilities employing a high pressure (approximately 5,000 psig) process. Successful development of the fluidized bed pyrolysis gasifier or higher coal delivery prices could ultimately tilt production costs in favor of methanol from biomass (OTA, 1980, p. 141).

PYROLYTIC OIL

Cellulose can be converted to liquid fuel oils by high pressure hydrogenation and to a bitumen like material in the presence of a catalyst at elevated temperatures and pressures. A Pittsburgh Energy Research Center investigation of the Fischer-Schrader process of dissolving brown coal with carbon monoxide revealed that the chemistry of the process could be applied to carbohydrates. The oil obtainable from these processes is a viscous material and in some cases may be classified as a bitumen. The conversion process may be undertaken over a temperature range of from 250 to 400°C. Temperature has little effect on conversion efficiencies and yield although the character of the product can vary. Oil obtained at higher temperatures has a lower oxygen content and flows slowly while the low temperature oil is a soft solid which must be heated to enhance fluidity.

Experiments undertaken by the Pittsburgh Energy Research Center were confined to the laboratory; nonetheless, they have reported breakeven feedstock costs based on construction estimates for a full scale plant (Anderson and Tillman, 1977, p. 136). The envisioned plant is quite large and requires 3,000 tons of biomass waste daily, half of which are cellulosic and the rest urban solid wastes. Extrapolating from these figures, the breakeven prices of pyrolytic oil (valued at $20/barrel) is reached when residue wastes are available at $15/ton (1974 dollars). Pyrolytic oil has a BTU content about 70 to 80 percent of an equal volume of petroleum.

A small pilot plant sponsored by the U.S. Energy Research and Development Administration has been built in Albany, Oregon. This facility employs a slow heating process to convert about one ton of woodchips daily to oil. In spite of early technical difficulties, the plant is producing a low sulfur oil about 30 percent lower in heat content than petroleum fuel oil. It has not yet been determined how well the oil stores and what modifications may be necessary to bring the oil up to boiler fuel grade. At present, the production costs appear high when compared to air gasifiers ($7.00 to $12.00/million BTU vs. $5.50 to $9.00/million BTU's) (1979 dollars) (OTA, 1981, p. 153).

ETHANOL

There are two methods by which ethanol may be produced from agricultural surplus. The first involves fermentation of sugar and starch feedstocks such as sugarcane, sweet sorghum, sugar beets, corn, and other grains. The second process is capable of converting cellulosic feedstocks such as crop residues, grasses, wood, and municipal wastepaper into ethanol by first reducing or hydrolyzing the cellulose into sugars which can then be fermented.

All processes for the production of ethanol through fermentation consist of four basic steps:

a) the feedstock is treated to produce a sugar solution;

b) sugar is converted to ethanol and CO_2 by yeast or bacteria in a process called fermentation;

c) ethanol is removed from fermented solution by a distillation process, yielding a solution of ethanol and water which is at least 4.4 percent water; and

d) the water is removed to produce dry ethanol.

The fermentation process of converting starches and sugars to ethanol is well established; most ethanol distilleries in operation today were designed for beverage alcohol production. However, plants to produce ethanol for energy do exist. For example, Ralph Katzen Associates have designed a distillery suitable for a large scale ethanol program. The distillery reduces to a minimum the number of distillation columns, and uses vapor recompression to dry the distillers grain, a by-product sold as animal feed.

Ethanol production costs vary according to the substrate or feedstock, capital investment (which is also a function of substrate), financing arrangements, tax credits, other economic incentives, etc. A distillery designed solely for sugar crop feedstocks is significantly more expensive than one handling grain starches. Sugar-based feedstocks must be concentrated for storage since the feedstock is available only during the harvesting season. Pretreatment equipment must handle a larger volume than the distillery itself and remains idle most of the year. In addition storage tanks are needed for the syrup.

The Katzen distillery, designed to operate at a 50 million gallon/year capacity with coal handling facilities, pollution control equipment, and allowing the production of distillers grain costs an estimated $64 million. A 50 million gallon/year distillery for sugarcane or sweet sorghum costs an estimated $120 million assuming the feedstock is available half the year and a half year's syrup storage is required. If feedstock is available for only three months of the year, OTA estimates the distillery would cost $168 million. Katzen (1979) estimates that a distillery capable of handling both starch and sugar feedstocks would cost about $110 million (all figures are 1980 dollars).

OTA estimates of ethanol production costs in a 50 million gallon/year distillery range from $0.86/gallon (grain sorghum feedstock) to $2.20/gallon (sugarcane feedstock) (OTA, 1980, p. 165).[2] The price of fuel grade ethanol in 1980 was $1.85/gallon. If ethanol is to be substituted in large quantities

[2]Borghlum arrives at a cost of $1.53/gallon for ethanol produced in a 2 million gallon/year distillery from $3.20/bushel corn with distillers grain credits (Klass and Emert, 1981, p. 297).

for gasoline, the price of ethanol would have to fall to about $0.80/gallon based on $1.20/gallon cost of gasoline in 1980, given the relative BTU content of the two commodities. The major operating expense in ethanol production is the net feedstock cost. If grain corn, sorghum, and sugar cane are used increasingly as feedstock for ethanol production, it is reasonable to expect their prices to increase. A $0.50/bushel increase in corn grain prices increases production costs $0.12/gallon.

A major issue confronting ethanol production, but of less importance for processes such as direct combustion, relates to net energy production. For the Katzen plant, the entire process including feed drying consumes about 55 thousand BTU/gallon of ethanol, the heating value of which is 76 thousand BTU/gallon. Comparatively, the energy required by a distillery using sugar plant feedstocks is considerably more per gallon of ethanol produced. The average energy usage for a sugar feedstock would be about 85 thousand BTU's of coal per gallon of ethanol, slightly more than the energy content of the ethanol. If plant residue left from sugar extraction is used to fuel the boiler, then 110 thousand BTU of bagasse would be needed to produce 1 gallon of ethanol. In order to reduce reliance on fossil fuels, crop residues could be used to fuel distilleries using either sugar or grain feedstocks.

Feedstocks with the largest potential for ethanol production in both absolute quantity and yield per acre are cellulosic feedstocks. Both cellulose and hemicellulose found in wood, grasses, and crop residues can be reduced or hydrolyzed to sugars that can be fermented. Although the reduction of hemicellulose is straightforward, the lignin embedded in cellulose protects it from biological and, to lesser extent, from chemical attack.

Cellulosic hydrolysis can be undertaken with sulfuric acid treatments or enzymically with a mutant strain of fungus, Trichoderma viride. Enzymic hydrolysis has a number of advantages over acid conversion of cellulose (Ebon Research Systems, 1979, p. 190):

a) Expensive corrosion resistant equipment is unnecessary;

b) Process conditions such as temperature do not have to be so closely monitored;

c) The conversion efficiency can approach 90 percent (110 gallons/ton of biomass fermented) compared to the 50 percent level recorded for acid hydrolysis; and

d) The process <u>is not</u> energy intensive.

The disadvantage of enzymic hydrolysis is that it requires relatively pure cellulose and it has not been effective on lignin containing materials such as grasses, crop residues, and wood.

Acid hydrolysis of cellulosic material has been available as a technology since the 1880's. The advent of cheap petrochemicals eroded the economic viability of this process. When oil prices are rising, acid hydrolysis looks more attractive and breakthroughs in lignocellulose processing could make the process competitive both with fermentation ethanol and gasoline. The key to producing ethanol from lignocellulose at a competitive price without relying on by-product credits is reduced equipment costs, increased yields, and insuring a good recovery of process chemicals without producing toxic wastes.

New York University examined the technical and economic feasibilities of a continuous two-stage hydrolysis allowing for a more complete utilization of carbohydrate content than single stage acid hydrolysis technologies. The plant requires a hardwood sawdust feedstock and is capable of producing ethanol at $1.07/gallon from a 42 million gallon/year plant. Researchers at NYU concluded that the 10 percent extra yield from the two-stage process did not warrant investment in the extra equipment required for prehydrolysis processing or the increased operating expenses due to the increased energy requirement in the two stage hydrolysis. The single stage ethanol production cost determined at NYU is $0.95/gallon from a 38 million gallon/year plant (Klass and Emert, 1981, p. 318).

Perhaps the most promising procedure involving enzymic hydrolysis was developed by Emert. Research on this process was begun in 1971 under Gulf Oil Chemicals Corp. It was transferred to the University of Arkansas Foundation for scale- up and this process could possibly be commercially operable by the mid-1980s. The method requires grinding and pretreatment for the feedstock, then heating followed by hydrolysis with a mutant bacterium. A unique feature is that hydrolysis and fermentation occur simultaneously in the same vessel without acid agents. Time requirements of a separate hydrolysis step are eliminated, yields are increased, and equipment costs lowered.

Based on pilot plant experience, Emert estimates ethanol production costs of $1.49/gallon with private financing and $1.01/gallon with 80 percent municipal bond financing. The analysis assumes a feedstock of 50 percent municipal solid waste (MSW) at $14/ton, 25 percent sawmill waste at $21/ton and 25 percent pulp mill waste at $14/ton. OTA analysis of the process was based on a doubling of feedstock costs. Consequently, the ethanol production cost rises by an average of $0.15/gallon. The analysis original cost estimates were also suspect because of the large by-product credit for dried fermentation yeast ($0.40/gallon) and no allowance for cost increases generally encountered in scale-up. Nevertheless, the availability of municipal financing could make the Emert process competitive (OTA, 1981, p. 170).

While no cost estimates are available for the Emert process using woodchips, grasses, or crop residues, Emert reports that modifications in the thermal mechanical pretreatment enables ethanol yields of just over 70 gallons/ton of biomass. It appears that crop residue available at $25/ton would allow production costs similar to the above (OTA, 1981, p. 171).

ANAEROBIC DIGESTION

The preceding discussion of direct combustion, gasification, and liquid fuels conversion processes was directed primarily toward utilization of crop residues. Anaerobic digestion is a process technically capable of converting animal manure, aquatic plants, wet food processing wastes, wood, and crop residues into a "biogas" mixture of methane and carbon dioxide.

Anaerobic digestion is a three-step process involving:

a) enzymic hydrolysis of complex plant and animal matter into soluble organic compounds such as sugar;

b) conversion of decomposed or hydrolyzed matter to fatty acids by "acid forming" bacteria; and

c) conversion of acids to methane and carbon dioxide by a substrate specific, strictly anaerobic group of bacteria called "methane formers" (Anderson and Tillman, p. 93).

In this multi-step process, the "rate limiting" step is the last step, methane fermentation. The methane forming bacteria require a 4 to 10 day regeneration period. Optimal gas yields over time can be achieved only by providing the proper chemical and physical environment for the methane forming bacteria. Briefly, this environment must be oxygen free, temperature controlled within ± 2°F during a 24 hour period, and free from toxic elements such as heavy metals and ionic materials. The feedstock must be nutritionally balanced, containing sufficient organic carbon, nitrogen, phosphorus, and trace elements. Manure has enough of all the nutrients required and constitutes one of the best feedstocks for anaerobic digestion. Generally, materials that are higher in lignin, such as wood and crop residues, are poor feedstocks because the lignin protects the cellulose from bacterial attack. Pretreatment of crop residues can increase their susceptibility to digestion, but even then digestion energy efficiencies generally do not exceed 50 to 75 percent.

Digester processes have been classified into three types, depending on the operating temperatures. These are psychophilic, operating at temperatures below 68°F, mesophilic (68°F to 113°F), and thermophilic (113°F to 150°F). The cost, complexity, and energy requirements of the systems increase with temperature, as does the rate of gas production. Gas produced per pound of feedstock can either increase or decrease with temperature. Retention time is also an important consideration, and gas production per pound of feedstock is sometimes sacrificed for increased production over time and/or reduced digester size and cost. Although most on-farm systems have been mesophilic, optimal operating temperatures appear to be site and feedstock specific.

Digester design depends on the feedstock chosen, availability and cost of labor, and digester function. The common digesters include the single tank plug flow, multi-tank batch system, single tank complete mix, two- and three-stage digesters, packed bed, expanded bed, and variable feed digesters. On farm digesters are typically the plug flow variety; their popularity stemming from a simple, low-cost design and ease of operation.

Gas produced by digesters can be burned in internal combustion engines (after removing hydrogen sulfide) to generate electricity. The electricity generated can then be used on farm and excess sold to the electric utility. Waste heat from the generator can be used on farm (usually to control fermentation tank temperatures) and excess heat goes to waste. Typically, 15 percent of the energy produced is used to heat the manure entering the digester and for the other energy needs of the digester. There is sufficient gas storage to limit electricity generation to the peak load demand times of the utility or farmer. Feedstock storage would allow for seasonal variation in energy production.

OTA has published figures on the costs of various digesters with electricity generating capabilities. Digester size ranges from 10 thousand gallon to 300 thousand gallon capacity. Capital requirements range from $27 thousand to $220 thousand and annual operating estimates from $600 to $4,600. OTA does not present per million BTU generation costs but instead cites returns to the digesters assuming farmers can displace electricity costing $0.05/kWh, sell electricity at $0.025/kWh and displace heating oil used on-farm costing $6/million BTU.

According to OTA, most digester units surveyed are profitable, even on farms with as few as 337 dairy cows. Reasonable returns are achieved on farms with over 100 thousand layers and 200 thousand broilers. Farms with only 500 swine or feedlots with as few as 500 steers on feed are not profitable. Turkey farms tend to be the most economic because of their large average size and the relatively large thermal energy requirements (OTA, 1980, p. 195).[3]

Jewell has produced a table (see Table 1) listing farm size by animal type for breakeven operation of a digester. With the exception of the beef number, Jewell's figures are more or less in line with OTA's (Jewell, et al., 1974, p. 19).

Table 1 illustrates the importance of by product marketing to the economic viability of anaerobic digestion. As Jewell and other researchers point out, if the residues left after digestion are to be economically exploited as a soil conditioner (low-grade fertilizer), feed for ruminants, or bedding, the number of animals at break-even point becomes surprisingly small.[4]

Actual costs of gas generation from anaerobic digesters are difficult to find in the literature. A somewhat unsubstantiated finding (Morris, et al.,

Table 1: Number of Animals for Economic Methane Generation

Animal	Energy Only	Energy and Nitrogen
Beef	570	155
Dairy	380	80
Poultry	57,000	5,200
Swine	2,800	585

Source: Jewell et al., (1974).

[3]This results directly from assumptions about displaced electricity costs.

[4]The breakeven number of animals after by-product credit reported by Jewell should be viewed with suspicion. Our analysis indicates that the nutrient value of dairy and beef manure are roughly equivalent to spreading costs thus negating any net gain from the spreading operation.

1975, p. 14) suggests that the per million BTU costs of generating methane in a plug flow digester on a one hundred head dairy farm is $20. The same study claims that on a 1,000 cow farm the cost would be about $2. The type of digester is not specified.

Another study analyzes a plug flow digester on the Mason Dixon Farm, a 1,200 head dairy farm astride the Pennsylvania-Maryland border. The digester tank holds 24,000 cubic feet and provides a retention time of 13 days. It operates in a mesophilic temperature range at about 99°F (37°C). The digester was constructed on-farm by the owners with little contractor input at a total cost of $180,000. Without by-product credit and including costs of processing the effluent into clean bedding material, the digester produces gas at a cost of $2.70/million BTU, a very competitive price (Institute of Gas Technology, p. 455).

A much more sophisticated digester proposed for a 20,000 head feedlot in Bartow, Florida with variable retention time, temperature range, mixing, and feed rates is expected to produce gas at a cost of $4.38/million BTU without byproduct credit. Expenses include operating costs of $150,000 annually and 10 percent interest changes on capital costs of $1.25 million. The dewatered effluent, however, has been shown to have the same digestibility as cottonseed meal and is valued at over $400,000/year. The fuel gas and refeed product together make the digester an attractive investment (Institute of Gas Technology, 1981, p. 377).

Appendix B

Table B-1. Forecasted Harvestable Crop Residue Totals and Densities by County and Simulation for the Northeastern United States, 1978

STATE/SIMULATION	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
CONNECTICUT										
	FAIRFIELD		HARTFORD		LITCHFIELD		MIDDLESEX		NEW HAVEN	
SIMULATION 1	0.	0.0	347.	0.5	156.	0.2	50.	0.1	269.	0.4
SIMULATION 2	0.	0.0	483.	0.7	907.	1.0	114.	0.3	535.	0.9
SIMULATION 3	0.	0.0	474.	0.6	782.	0.8	105.	0.3	500.	0.8
	NEW LONDON		TOLLAND		WINDHAM					
SIMULATION 1	24.	0.0	25.	0.1	79.	0.2				
SIMULATION 2	137.	0.2	70.	0.2	458.	0.9				
SIMULATION 3	118.	0.2	63.	0.2	395.	0.8				

Table B-1. Continued

STATE/SIMULATION	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
MAINE										
	ANDROSCOGGIN		AROOSTOOK		CUMBERLAND		FRANKLIN		HANCOCK	
SIMULATION 1	33.	0.1	39894.	5.8	0.	0.0	64.	0.0	5.	0.0
SIMULATION 2	51.	0.1	39894.	5.8	0.	0.0	79.	0.0	5.	0.0
SIMULATION 3	51.	0.1	39894.	5.8	0.	0.0	79.	0.0	5.	0.0
	KENNEBEC		KNOX		LINCOLN		OXFORD		PENOBSCOT	
SIMULATION 1	149.	0.2	0.	0.0	0.	0.0	557.	0.3	886.	0.3
SIMULATION 2	234.	0.3	0.	0.0	0.	0.0	723.	0.3	993.	0.3
SIMULATION 3	234.	0.3	0.	0.0	0.	0.0	723.	0.3	993.	0.3
	PISCATAQUIS		SAGADAHOC		SOMERSET		WALDO		WASHINGTON	
SIMULATION 1	0.	0.0	0.	0.0	881.	0.2	59.	0.1	0.	0.0
SIMULATION 2	0.	0.0	0.	0.0	1010.	0.3	93.	0.1	0.	0.0
SIMULATION 3	0.	0.0	0.	0.0	1010.	0.3	93.	0.1	0.	0.0
	YORK									
SIMULATION 1	26.	0.0								
SIMULATION 2	42.	0.0								
SIMULATION 3	42.	0.0								

Table B-1. Continued

STATE/SIMULATION	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
MASSACHUSETTS										
	BARNSTABLE		BERKSHIRE		BRISTOL		DUKES		ESSEX	
SIMULATION 1	0.	0.0	300.	0.3	27.	0.0	0.	0.0	11.	0.0
SIMULATION 2	0.	0.0	628.	0.7	63.	0.1	0.	0.0	26.	0.1
SIMULATION 3	0.	0.0	601.	0.6	56.	0.1	0.	0.0	23.	0.0
	FRANKLIN		HAMPDEN		HAMPSHIRE		MIDDLESEX		NANTUCKET	
SIMULATION 1	129.	0.2	110.	0.2	443.	0.8	9.	0.0	0.	0.0
SIMULATION 2	456.	0.6	412.	0.7	1462.	2.8	20.	0.0	0.	0.0
SIMULATION 3	548.	0.8	524.	0.8	1763.	3.3	18.	0.0	0.	0.0
	NORFOLK		PLYMOUTH		SUFFOLK		WORCESTER			
SIMULATION 1	0.	0.0	0.	0.0	0.	0.0	202.	0.1		
SIMULATION 2	0.	0.0	0.	0.0	0.	0.0	471.	0.3		
SIMULATION 3	0.	0.0	0.	0.0	0.	0.0	420.	0.3		

Table B-1. Continued

STATE/SIMULATION	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
NEW HAMPSHIRE										
	BELKNAP		CARROLL		CHESHIRE		COOS		GRAFTON	
SIMULATION 1	0.	0.0	34.	0.0	194.	0.3	0.	0.0	296.	0.2
SIMULATION 2	0.	0.0	40.	0.0	233.	0.3	0.	0.0	355.	0.2
SIMULATION 3	0.	0.0	40.	0.0	233.	0.3	0.	0.0	355.	0.2
	HILLSBOROUGH		MERRIMACK		ROCKINGHAM		STRAFFORD		SULLIVAN	
SIMULATION 1	215.	0.2	283.	0.3	73.	0.1	0.	0.0	0.	0.0
SIMULATION 2	235.	0.3	320.	0.3	73.	0.1	0.	0.0	0.	0.0
SIMULATION 3	235.	0.3	320.	0.3	73.	0.1	0.	0.0	0.	0.0

Table B-1. Continued

STATE/SIMULATION	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
NEW JERSEY										
	ATLANTIC		BERGEN		BURLINGTON		CAMDEN		CAPE MAY	
SIMULATION 1	92.	0.2	0.	0.0	15022.	18.4	190.	0.9	434.	1.6
SIMULATION 2	106.	0.2	0.	0.0	17210.	21.1	223.	1.0	499.	1.9
SIMULATION 3	127.	0.2	0.	0.0	20583.	25.2	269.	1.2	597.	2.2
	CUMBERLAND		ESSEX		GLOUCESTER		HUDSON		HUNTERDON	
SIMULATION 1	7983.	16.0	0.	0.0	3136.	9.5	0.	0.0	2099.	5.0
SIMULATION 2	8677.	17.3	0.	0.0	3468.	10.5	0.	0.0	21961.	51.9
SIMULATION 3	10207.	20.4	0.	0.0	4102.	12.5	0.	0.0	16373.	38.7
	MERCER		MIDDLESEX		MONMOUTH		MORRIS		OCEAN	
SIMULATION 1	5229.	22.9	3328.	10.7	10654.	22.3	405.	0.9	694.	1.1
SIMULATION 2	8160.	35.7	5984.	19.2	11821.	24.8	1935.	4.1	846.	1.3
SIMULATION 3	9132.	40.0	6381.	20.5	13997.	29.4	1478.	3.2	1030.	1.6
	PASSAIC		SALEM		SOMERSET		SUSSEX		UNION	
SIMULATION 1	0.	0.0	13598.	37.2	560.	1.8	508.	1.0	0.	0.0
SIMULATION 2	0.	0.0	15113.	41.4	5660.	18.4	1099.	2.1	0.	0.0
SIMULATION 3	0.	0.0	17906.	49.0	4657.	15.2	961.	1.8	0.	0.0
	WARREN									
SIMULATION 1	2139.	5.9								
SIMULATION 2	22770.	62.9								
SIMULATION 3	16089.	44.4								

Table B-1. Continued

STATE/SIMULATION	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
NEW YORK										
	ALBANY		ALLEGHANY		BRONX		BROOME		CATTARAUGUS	
SIMULATION 1	865.	1.6	4405.	4.2	0.	0.0	1218.	1.7	3209.	2.4
SIMULATION 2	1661.	3.2	8171.	7.8	0.	0.0	2222.	3.1	5849.	4.4
SIMULATION 3	1581.	3.0	8367.	8.0	0.	0.0	2292.	3.2	5965.	4.5
	CAYUGA		CHAUTAUQUA		CHEMUNG		CHENANGO		CLINTON	
SIMULATION 1	37602.	53.9	4624.	4.3	2150.	5.2	3876.	4.3	1162.	1.1
SIMULATION 2	73056.	104.7	8528.	7.9	3984.	9.6	7072.	7.8	1789.	1.7
SIMULATION 3	68027.	97.5	8499.	7.9	4090.	9.8	7288.	8.1	1778.	1.7
	COLUMBIA		CORTLAND		DELAWARE		DUTCHESS		ERIE	
SIMULATION 1	5097.	7.9	3943.	7.8	1055.	0.7	3305.	4.1	9123.	8.6
SIMULATION 2	10102.	15.7	7294.	14.5	1872.	1.3	6504.	8.0	16858.	16.0
SIMULATION 3	8828.	13.7	7485.	14.9	1944.	1.3	5678.	7.0	16682.	15.8
	ESSEX		FRANKLIN		FULTON		GENESEE		GREENE	
SIMULATION 1	29.	0.0	754.	0.5	550.	1.1	17801.	35.5	519.	0.8
SIMULATION 2	36.	0.0	1269.	0.8	975.	2.0	34391.	68.6	958.	1.5
SIMULATION 3	36.	0.0	1249.	0.7	942.	1.9	31850.	63.5	991.	1.5
	HAMILTON		HERKIMER		JEFFERSON		KINGS		LEWIS	
SIMULATION 1	0.	0.0	3074.	2.1	3639.	2.8	0.	0.0	1675.	1.3
SIMULATION 2	0.	0.0	4914.	3.4	5461.	4.2	0.	0.0	2528.	2.0
SIMULATION 3	0.	0.0	4809.	3.4	5461.	4.2	0.	0.0	2450.	1.9

Table B-1. Continued

	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
	LIVINGSTON		MADISON		MONROE		MONTGOMERY		NASSAU	
SIMULATION 1	19914.	31.2	11226.	17.0	12900.	19.1	5498.	13.5	0.	0.0
SIMULATION 2	37393.	58.6	17685.	26.8	25150.	37.2	9866.	24.2	0.	0.0
SIMULATION 3	35058.	54.9	17534.	26.5	23328.	34.5	9216.	22.6	0.	0.0
	MANHATTAN		NIAGARA		ONEIDA		ONANDAGA		ONTARIO	
SIMULATION 1	0.	0.0	14921.	28.0	12003.	9.8	19035.	24.0	28009.	43.0
SIMULATION 2	0.	0.0	29447.	55.3	21814.	17.8	35896.	45.2	52597.	80.8
SIMULATION 3	0.	0.0	27044.	50.8	20240.	16.5	33005.	41.5	48775.	74.9
	ORANGE		ORLEANS		OSWEGO		OTSEGO		PUTNAM	
SIMULATION 1	141.	0.2	21105.	53.3	2495.	2.3	4305.	4.3	148.	0.6
SIMULATION 2	249.	0.3	42072.	106.2	4041.	4.2	7880.	7.8	282.	1.2
SIMULATION 3	244.	0.3	38492.	97.1	3690.	3.8	7889.	7.8	245.	1.1
	QUEENS		RENSSELAER		RICHMOND		ROCKLAND		ST LAWRENCE	
SIMULATION 1	0.	0.0	1341.	2.0	0.	0.0	0.	0.0	2163.	0.8
SIMULATION 2	0.	0.0	2617.	3.9	0.	0.0	0.	0.0	3467.	1.3
SIMULATION 3	0.	0.0	2282.	3.4	0.	0.0	0.	0.0	3430.	1.2
	SARATOGA		SCHENECTADY		SCHOHARIE		SCHUYLER		SENECA	
SIMULATION 1	1521.	1.9	284.	1.4	3444.	5.5	3527.	10.7	17380.	52.7
SIMULATION 2	2689.	3.3	553.	2.7	6355.	10.2	6544.	19.8	30953.	93.8
SIMULATION 3	2635.	3.2	502.	2.4	6247.	10.0	6532.	19.8	29053.	88.0

Table B-1. Continued

	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
	STEUBEN		SUFFOLK		SULLIVAN		TIOGA		TOMPKINS	
SIMULATION 1	17055.	12.1	0.	0.0	0.	0.0	3531.	6.7	9429.	19.6
SIMULATION 2	32582.	23.1	0.	0.0	0.	0.0	6464.	12.3	17827.	37.0
SIMULATION 3	33286.	23.6	0.	0.0	0.	0.0	6654.	12.7	17932.	37.2
	ULSTER		WARREN		WASHINGTON		WAYNE		WESTCHESTER	
SIMULATION 1	2179.	1.9	0.	0.0	4633.	5.5	19139.	31.6	0.	0.0
SIMULATION 2	3971.	3.5	0.	0.0	8191.	9.8	36999.	61.0	0.	0.0
SIMULATION 3	3932.	3.4	0.	0.0	8025.	9.6	34008.	56.1	0.	0.0
	WYOMING		YATES							
SIMULATION 1	9895.	16.6	10183.	29.7						
SIMULATION 2	18513.	31.0	19680.	57.3						
SIMULATION 3	18566.	31.1	19204.	55.9						

Table B-1. Continued

STATE/SIMULATION	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
PENNSYLVANIA										
	ADAMS		ALLEGHENY		ARMSTRONG		BEAVER		BEDFORD	
SIMULATION 1	15791.	30.0	1151.	1.6	7908.	12.1	3760.	8.5	14172.	13.9
SIMULATION 2	26739.	50.8	2435.	3.4	16678.	25.6	7939.	18.0	26697.	26.2
SIMULATION 3	25505.	48.5	2545.	3.5	17520.	26.9	8324.	18.9	23291.	22.9
	BERKS		BLAIR		BRADFORD		BUCKS		BUTLER	
SIMULATION 1	48823.	56.7	8686.	16.4	13826.	12.0	8390.	13.7	12763.	16.1
SIMULATION 2	81355.	94.4	16971.	32.0	19140.	16.7	14869.	24.2	25834.	32.5
SIMULATION 3	78794.	91.5	14732.	27.8	20162.	17.6	13714.	22.3	27046.	34.0
	CAMBRIA		CAMERON		CARBON		CENTRE		CHESTER	
SIMULATION 1	2780.	4.0	16.	0.0	2363.	5.8	16844.	15.1	23730.	31.2
SIMULATION 2	6999.	10.1	40.	0.1	3690.	9.1	32202.	28.9	41871.	55.0
SIMULATION 3	4602.	6.7	26.	0.1	3665.	9.0	27593.	24.8	38199.	50.2
	CLARION		CLEARFIELD		CLINTON		COLUMBIA		CRAWFORD	
SIMULATION 1	5579.	9.4	1644.	1.5	5187.	5.7	19976.	41.3	26253.	25.9
SIMULATION 2	12330.	20.7	3956.	3.5	11618.	12.9	32364.	66.9	38131.	37.6
SIMULATION 3	11588.	19.4	2975.	2.6	8736.	9.7	32549.	67.3	40217.	39.7
	CUMBERLAND		DAUPHIN		DELAWARE		ELK		ERIE	
SIMULATION 1	33058.	59.5	22021.	42.5	314.	1.7	532.	0.7	15217.	18.7
SIMULATION 2	53738.	96.8	35517.	68.6	552.	3.0	1340.	1.7	21154.	26.0
SIMULATION 3	53125.	95.7	34903.	67.4	501.	2.7	881.	1.1	22110.	27.2

Table B-1. Continued

	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
	FAYETTE		FOREST		FRANKLIN		FULTON		GREENE	
SIMULATION 1	5037.	6.3	200.	0.5	40918.	54.2	7837.	18.0	872.	1.5
SIMULATION 2	11423.	14.3	503.	1.2	67825.	89.9	12132.	27.9	1825.	3.2
SIMULATION 3	10060.	12.6	331.	0.8	67116.	89.0	11946.	27.5	1943.	3.4
	HUNTINGDON		INDIANA		JEFFERSON		JUNIATA		LACKAWANNA	
SIMULATION 1	10097.	11.3	10439.	12.7	3951.	6.1	11198.	29.0	1614.	3.6
SIMULATION 2	17212.	19.3	22699.	27.5	8659.	13.3	18199.	47.2	2493.	5.5
SIMULATION 3	16956.	19.0	22200.	26.9	8312.	12.8	17951.	46.5	2669.	5.9
	LANCASTER		LAURENCE		LEBANON		LEHIGH		LUZERNE	
SIMULATION 1	60480.	63.9	14461.	39.4	23910.	65.8	10460.	30.1	7021.	7.9
SIMULATION 2	106787.	112.9	23724.	64.6	40659.	112.0	18853.	54.2	11137.	12.5
SIMULATION 3	96894.	102.4	25019.	68.1	39629.	109.1	18658.	53.6	11699.	13.2
	LYCOMING		MCKEAN		MERCER		MIFFLIN		MONROE	
SIMULATION 1	17975.	14.8	138.	0.1	25962.	38.7	10741.	24.9	3101.	5.0
SIMULATION 2	33279.	27.4	346.	0.3	39624.	59.1	18247.	42.3	5214.	8.5
SIMULATION 3	29912.	24.6	228.	0.2	41767.	62.3	18001.	41.7	5417.	8.8
	MONTGOMERY		MONTOUR		NORTHAMPTON		NORTHUMBERLAND		PERRY	
SIMULATION 1	6453.	13.0	8075.	62.2	29517.	78.5	26476.	58.5	15552.	28.2
SIMULATION 2	11388.	22.9	12699.	97.7	49773.	132.3	43784.	96.7	24732.	44.9
SIMULATION 3	10532.	21.2	12495.	96.2	49185.	130.7	43175.	95.4	24395.	44.3

Table B-1. Continued

	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
	PHILADELPHIA		PIKE		POTTER		SCHUYLKILL		SNYDER	
SIMULATION 1	0.	0.0	184.	0.3	2206.	2.0	15749.	20.0	14214.	43.5
SIMULATION 2	0.	0.0	292.	0.5	3485.	3.2	25583.	32.6	22960.	70.3
SIMULATION 3	0.	0.0	313.	0.6	2985.	2.7	25193.	32.1	22606.	69.2
	SOMERSET		SULLIVAN		SUSQUEHANNA		TIOGA		UNION	
SIMULATION 1	8110.	7.5	1130.	2.4	2295.	2.8	7288.	6.4	14705.	46.2
SIMULATION 2	20414.	18.9	1320.	2.8	3134.	3.8	9967.	8.7	24922.	78.3
SIMULATION 3	13423.	12.4	1356.	2.8	3262.	3.9	10154.	8.9	24551.	77.2
	VENANGO		WARREN		WASHINGTON		WAYNE		WESTMORELAND	
SIMULATION 1	4127.	6.1	1338.	1.5	6336.	7.4	1103.	1.5	9174.	8.9
SIMULATION 2	7088.	10.4	1987.	2.2	13363.	15.6	1741.	2.3	20100.	19.6
SIMULATION 3	6854.	10.1	1800.	2.0	14038.	16.4	1869.	2.5	19309.	18.8
	WYOMING		YORK							
SIMULATION 1	3017.	7.6	34246.	37.7						
SIMULATION 2	4575.	11.5	60352.	66.4						
SIMULATION 3	4879.	12.2	55466.	61.0						

Table B-1. Continued

STATE/SIMULATION	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
RHODE ISLAND										
	BRISTOL		KENT		NEWPORT		PROVIDENCE		WASHINGTON	
SIMULATION 1	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 2	0.	0.0	0.	0.0	0.	0.0	29.	0.1	0.	0.0
SIMULATION 3	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0

Table B-1. Continued

STATE/SIMULATION	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
VERMONT										
	ADDISON		BENNINGTON		CALEDONIA		CHITTENDEN		ESSEX	
SIMULATION 1	625.	0.8	70.	0.1	0.	0.0	344.	0.6	25.	0.0
SIMULATION 2	1228.	1.6	143.	0.2	0.	0.0	851.	1.6	25.	0.0
SIMULATION 3	1097.	1.4	153.	0.2	0.	0.0	832.	1.6	25.	0.0
	FRANKLIN		GRAND ISLE		LAMOILLE		ORANGE		ORLEANS	
SIMULATION 1	211.	0.3	212.	2.6	40.	0.1	4.	0.0	57.	0.1
SIMULATION 2	553.	0.8	282.	3.4	109.	0.2	140.	0.2	446.	0.6
SIMULATION 3	508.	0.8	282.	3.4	119.	0.3	85.	0.1	322.	0.5
	RUTLAND		WASHINGTON		WINDHAM		WINDSOR			
SIMULATION 1	238.	0.3	0.	0.0	0.	0.0	30.	0.0		
SIMULATION 2	608.	0.7	0.	0.0	0.	0.0	155.	0.2		
SIMULATION 3	545.	0.6	0.	0.0	0.	0.0	132.	0.1		

Table B-2. Forecasted Harvestable Crop Residue Totals and Densities by County and Simulation for the Northeastern United States, 1985

STATE/SIMULATION	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
CONNECTICUT										
	FAIRFIELD		HARTFORD		LITCHFIELD		MIDDLESEX		NEW HAVEN	
SIMULATION 1	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 2	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 3	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
	NEW LONDON		TOLLAND		WINDHAM		MIDDLESEX		NEW HAVEN	
SIMULATION 1	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 2	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 3	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0

Table B-2. Continued

STATE/SIMULATION	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
MAINE										
	ANDROSCOGGIN		AROOSTOOK		CUMBERLAND		FRANKLIN		HANCOCK	
SIMULATION 1	0.	0.0	25711.	3.8	0.	0.0	10.	0.0	4.	0.0
SIMULATION 2	0.	0.0	25711.	3.8	0.	0.0	10.	0.0	4.	0.0
SIMULATION 3	0.	0.0	25711.	3.8	0.	0.0	10.	0.0	4.	0.0
	KENNEBEC		KNOX		LINCOLN		OXFORD		PENOBSCOT	
SIMULATION 1	0.	0.0	0.	0.0	0.	0.0	0.	0.0	373.	0.1
SIMULATION 2	0.	0.0	0.	0.0	0.	0.0	0.	0.0	373.	0.1
SIMULATION 3	0.	0.0	0.	0.0	0.	0.0	0.	0.0	373.	0.1
	PISCATAQUIS		SAGADAHOC		SOMERSET		WALDO		WASHINGTON	
SIMULATION 1	0.	0.0	0.	0.0	243.	0.1	0.	0.0	0.	0.0
SIMULATION 2	0.	0.0	0.	0.0	243.	0.1	0.	0.0	0.	0.0
SIMULATION 3	0.	0.0	0.	0.0	243.	0.1	0.	0.0	0.	0.0
	YORK									
SIMULATION 1	0.	0.0								
SIMULATION 2	0.	0.0								
SIMULATION 3	0.	0.0								

Table B-2. Continued

STATE/SIMULATION	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
MASSACHUSETTS										
	BARNSTABLE		BERKSHIRE		BRISTOL		DUKES		ESSEX	
SIMULATION 1	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 2	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 3	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
	FRANKLIN		HAMPDEN		HAMPSHIRE		MIDDLESEX		NANTUCKET	
SIMULATION 1	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 2	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 3	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
	NORFOLK		PLYMOUTH		SUFFOLK		WORCESTER			
SIMULATION 1	0.	0.0	0.	0.0	0.	0.0	0.	0.0		
SIMULATION 2	0.	0.0	0.	0.0	0.	0.0	0.	0.0		
SIMULATION 3	0.	0.0	0.	0.0	0.	0.0	0.	0.0		

Table B-2. Continued

STATE/SIMULATION	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
NEW HAMPSHIRE										
	BELKNAP		CARROLL		CHESHIRE		COOS		GRAFTON	
SIMULATION 1	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 2	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 3	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
	HILLSBOROUGH		MERRIMACK		ROCKINGHAM		STRAFFORD		SULLIVAN	
SIMULATION 1	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 2	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 3	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0

Table B-2. Continued

STATE/SIMULATION	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
NEW JERSEY										
	ATLANTIC		BERGEN		BURLINGTON		CAMDEN		CAPE MAY	
SIMULATION 1	154.	0.3	0.	0.0	15281.	18.7	244.	1.1	482.	1.8
SIMULATION 2	162.	0.3	0.	0.0	16522.	20.2	263.	1.2	519.	1.9
SIMULATION 3	189.	0.3	0.	0.0	19401.	23.7	309.	1.4	609.	2.3
	CUMBERLAND		ESSEX		GLOUCESTER		HUDSON		HUNTERDON	
SIMULATION 1	11646.	23.3	0.	0.0	3927.	11.9	0.	0.0	1714.	4.1
SIMULATION 2	12041.	24.1	0.	0.0	4116.	12.5	0.	0.0	16651.	39.4
SIMULATION 3	13926.	27.8	0.	0.0	4783.	14.5	0.	0.0	15304.	36.2
	MERCER		MIDDLESEX		MONMOUTH		MORRIS		OCEAN	
SIMULATION 1	7511.	32.9	4270.	13.7	14163.	29.7	254.	0.5	396.	0.6
SIMULATION 2	10805.	47.3	7447.	23.9	14826.	31.1	1512.	3.2	482.	0.7
SIMULATION 3	12800.	56.1	8452.	27.2	17222.	36.1	1336.	2.9	587.	0.9
	PASSAIC		SALEM		SOMERSET		SUSSEX		UNION	
SIMULATION 1	0.	0.0	15741.	43.1	564.	1.8	289.	0.5	0.	0.0
SIMULATION 2	0.	0.0	16584.	45.4	5185.	16.9	922.	1.7	0.	0.0
SIMULATION 3	0.	0.0	19306.	52.9	5477.	17.8	843.	1.6	0.	0.0
	WARREN									
SIMULATION 1	1532.	4.2								
SIMULATION 2	15413.	42.6								
SIMULATION 3	12887.	35.6								

Table B-2. Continued

STATE/SIMULATION	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
NEW YORK										
	ALBANY		ALLEGHANY		BRONX		BROOME		CATTARAUGUS	
SIMULATION 1	1505.	2.9	6945.	6.6	0.	0.0	2044.	2.9	5243.	4.0
SIMULATION 2	2997.	5.7	12945.	12.4	0.	0.0	3743.	5.3	9535.	7.2
SIMULATION 3	2859.	5.4	13270.	12.7	0.	0.0	3864.	5.4	9737.	7.4
	CAYUGA		CHAUTAUQUA		CHEMUNG		CHENANGO		CLINTON	
SIMULATION 1	64724.	92.7	7573.	7.0	3582.	8.6	6166.	6.8	1892.	1.8
SIMULATION 2	131484.	188.4	14201.	13.1	6743.	16.2	11279.	12.5	2913.	2.8
SIMULATION 3	123073.	176.3	14162.	13.1	6929.	16.7	11633.	12.9	2894.	2.7
	COLUMBIA		CORTLAND		DELAWARE		DUTCHESS		ERIE	
SIMULATION 1	8298.	12.9	6311.	12.6	1707.	1.2	5380.	6.6	15429.	14.6
SIMULATION 2	17251.	26.7	11690.	23.3	3026.	2.1	11027.	13.6	29496.	27.9
SIMULATION 3	15177.	23.5	12013.	23.9	3144.	2.2	9683.	11.9	29254.	27.7
	ESSEX		FRANKLIN		FULTON		GENESEE		GREENE	
SIMULATION 1	53.	0.0	1305.	0.8	896.	1.8	31142.	62.1	846.	1.3
SIMULATION 2	67.	0.0	2195.	1.3	1593.	3.2	63368.	126.4	1614.	2.5
SIMULATION 3	67.	0.0	2161.	1.3	1540.	3.1	59130.	118.0	1669.	2.6
	HAMILTON		HERKIMER		JEFFERSON		KINGS		LEWIS	
SIMULATION 1	0.	0.0	4997.	3.5	6441.	5.0	0.	0.0	2588.	2.0
SIMULATION 2	0.	0.0	7964.	5.6	9683.	7.5	0.	0.0	3946.	3.1
SIMULATION 3	0.	0.0	7821.	5.5	9683.	7.5	0.	0.0	3850.	3.0

Table B-2. Continued

	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
	LIVINGSTON		MADISON		MONROE		MONTGOMERY		NASSAU	
SIMULATION 1	34178.	53.5	19025.	28.8	23301.	34.5	8908.	21.8	0.	0.0
SIMULATION 2	68112.	106.7	29987.	45.4	49178.	72.8	16457.	40.3	0.	0.0
SIMULATION 3	64196.	100.6	29732.	45.0	46132.	68.3	15437.	37.8	0.	0.0
	MANHATTAN		NIAGARA		ONEIDA		ONANDAGA		ONTARIO	
SIMULATION 1	0.	0.0	26266.	49.4	19709.	16.1	32182.	40.5	48120.	73.9
SIMULATION 2	0.	0.0	54621.	102.6	36905.	30.2	63322.	79.7	94802.	145.6
SIMULATION 3	0.	0.0	50552.	95.0	34334.	28.1	58497.	73.6	88512.	136.0
	ORANGE		ORLEANS		OSWEGO		OTSEGO		PUTNAM	
SIMULATION 1	245.	0.3	34959.	88.2	3627.	3.8	6749.	6.7	257.	1.1
SIMULATION 2	434.	0.5	72004.	181.7	6871.	7.1	12497.	12.3	489.	2.1
SIMULATION 3	425.	0.5	66257.	167.2	6281.	6.5	12526.	12.4	424.	1.8
	QUEENS		RENSSELAER		RICHMOND		ROCKLAND		ST LAWRENCE	
SIMULATION 1	0.	0.0	2229.	3.3	0.	0.0	0.	0.0	3752.	1.4
SIMULATION 2	0.	0.0	4483.	6.7	0.	0.0	0.	0.0	6014.	2.2
SIMULATION 3	0.	0.0	3926.	5.9	0.	0.0	0.	0.0	5951.	2.1
	SARATOGA		SCHENECTADY		SCHOHARIE		SCHUYLER		SENECA	
SIMULATION 1	2568.	3.1	479.	2.3	5474.	8.8	5739.	17.4	29254.	88.6
SIMULATION 2	4540.	5.5	943.	4.5	10153.	16.3	11043.	33.5	55355.	167.7
SIMULATION 3	4449.	5.4	856.	4.1	9984.	16.0	11035.	33.4	52308.	158.5

Table B-2. Continued

	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
	STEUBEN		SUFFOLK		SULLIVAN		TIOGA		TOMPKINS	
SIMULATION 1	27404.	19.4	0.	0.0	0.	0.0	5695.	10.9	15662.	32.5
SIMULATION 2	54120.	38.4	0.	0.0	0.	0.0	10437.	19.9	34101.	64.5
SIMULATION 3	55339.	39.2	0.	0.0	0.	0.0	10756.	20.5	31306.	64.9
	ULSTER		WARREN		WASHINGTON		WAYNE		WESTCHESTER	
SIMULATION 1	3548.	3.1	0.	0.0	7543.	9.0	32773.	54.1	0.	0.0
SIMULATION 2	6556.	5.7	0.	0.0	13334.	15.9	65297.	107.7	0.	0.0
SIMULATION 3	6492.	5.7	0.	0.0	13065.	15.6	60286.	99.5	0.	0.0
	WYOMING		YATES							
SIMULATION 1	16065.	26.9	17252.	50.3						
SIMULATION 2	31436.	52.6	36056.	105.0						
SIMULATION 3	31567.	52.8	35298.	102.8						

Table B-2. Continued

STATE/SIMULATION	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
PENNSYLVANIA										
	ADAMS		ALLEGHENY		ARMSTRONG		BEAVER		BEDFORD	
SIMULATION 1	22038.	41.9	1641.	2.3	10768.	16.5	5134.	11.7	19259.	18.9
SIMULATION 2	35878.	68.2	3482.	4.8	22784.	35.0	10877.	24.7	34321.	33.7
SIMULATION 3	34432.	65.5	3616.	5.0	23794.	36.5	11333.	25.8	30199.	29.7
	BERKS		BLAIR		BRADFORD		BUCKS		BUTLER	
SIMULATION 1	68773.	79.8	11337.	21.4	20339.	17.7	10602.	17.3	17930.	22.6
SIMULATION 2	108427.	125.8	21267.	40.1	27058.	23.6	19002.	30.9	36414.	45.8
SIMULATION 3	105529.	122.5	18578.	35.0	28312.	24.7	17691.	28.8	37876.	47.7
	CAMBRIA		CAMERON		CARBON		CENTRE		CHESTER	
SIMULATION 1	3418.	4.9	20.	0.1	3757.	9.3	22971.	20.6	28593.	37.6
SIMULATION 2	8605.	12.4	50.	0.1	5613.	13.8	41600.	37.3	50856.	66.9
SIMULATICN 3	5658.	8.2	33.	0.1	5564.	13.7	35991.	32.3	46637.	61.3
	CLARION		CLEARFIELD		CLINTON		COLUMBIA		CRAWFORD	
SIMULATION 1	7304.	12.2	2134.	1.9	6425.	7.1	29869.	61.7	37149.	36.7
SIMULATION 2	16111.	27.0	5109.	4.5	14079.	15.6	47133.	97.4	52726.	52.0
SIMULATION 3	15231.	25.5	3898.	3.4	10650.	11.8	47253.	97.7	55200.	54.5
	CUMBERLAND		DAUPHIN		DELAWARE		ELK		ERIE	
SIMULATION 1	49537.	89.2	32836.	63.4	385.	2.1	652.	0.8	22962.	28.2
SIMULATION 2	74906.	134.9	49273.	95.1	676.	3.7	1641.	2.1	31265.	38.5
SIMULATION 3	74086.	133.4	48502.	93.6	615.	3.4	1079.	1.4	32409.	39.9

Table B-2. Continued

	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
	FAYETTE		FOREST		FRANKLIN		FULTON		GREENE	
SIMULATION 1	6439.	8.0	237.	0.6	59807.	79.3	12319.	28.3	1080.	1.9
SIMULATION 2	14557.	18.2	597.	1.4	92562.	122.7	17715.	40.7	2262.	3.9
SIMULATION 3	12939.	16.2	392.	0.9	91683.	121.5	17432.	40.1	2405.	4.2
	HUNTINGDON		INDIANA		JEFFERSON		JUNIATA		LACKAWANNA	
SIMULATION 1	13984.	15.7	14137.	17.1	5385.	8.3	16780.	43.5	2083.	4.6
SIMULATION 2	22575.	25.3	30729.	37.2	11786.	18.1	25428.	65.9	3152.	6.9
SIMULATION 3	22208.	24.9	30126.	36.5	11361.	17.4	25068.	65.0	3366.	7.4
	LANCASTER		LAURENCE		LEBANON		LEHIGH		LUZERNE	
SIMULATION 1	72169.	76.3	20153.	54.9	32988.	90.8	13396.	38.5	10118.	11.4
SIMULATION 2	128686.	136.1	33901.	92.3	53208.	146.5	25393.	73.0	16490.	18.5
SIMULATION 3	117078.	123.8	35487.	96.6	52002.	143.2	25293.	72.7	17179.	19.3
	LYCOMING		MCKEAN		MERCER		MIFFLIN		MONROE	
SIMULATION 1	24197.	19.9	169.	0.2	36329.	54.2	15028.	34.8	4371.	7.1
SIMULATION 2	43691.	35.9	426.	0.4	55590.	83.0	24054.	55.8	7531.	12.2
SIMULATION 3	39541.	32.5	280.	0.3	58133.	86.7	23710.	55.0	7776.	12.6
	MONTGOMERY		MONTOUR		NORTHAMPTON		NORTHUMBERLAND		PERRY	
SIMULATION 1	8488.	16.5	12514.	96.3	42696.	113.5	38866.	85.9	23693.	43.0
SIMULATION 2	14527.	29.2	18343.	141.2	67660.	179.9	60375.	133.4	34886.	63.3
SIMULATION 3	13572.	27.3	18028.	138.8	66859.	177.7	59495.	131.4	34396.	62.5

Table B-2. Continued

	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
	PHILADELPHIA		PIKE		POTTER		SCHUYLKILL		SNYDER	
SIMULATION 1	0.	0.0	242.	0.5	3328.	3.0	23596.	30.0	21409.	65.5
SIMULATION 2	0.	0.0	380.	0.7	4879.	4.5	36008.	45.8	32352.	99.0
SIMULATION 3	0.	0.0	408.	0.8	4273.	3.9	35436.	45.1	31817.	97.4
	SOMERSET		SULLIVAN		SUSQUEHANNA		TIOGA		UNION	
SIMULATION 1	9622.	8.9	1885.	3.9	3578.	4.3	11093.	9.7	20546.	64.6
SIMULATION 2	24221.	22.5	2128.	4.4	4809.	5.8	14465.	12.6	32889.	103.4
SIMULATION 3	15926.	14.8	2173.	4.5	4965.	6.0	14695.	12.8	32354.	101.7
	VENANGO		WARREN		WASHINGTON		WAYNE		WESTMORELAND	
SIMULATION 1	5780.	8.5	2055.	2.3	8727.	10.2	1376.	1.9	12500.	12.2
SIMULATION 2	9631.	14.2	2862.	3.2	18461.	21.6	2146.	2.9	27353.	26.7
SIMULATION 3	9348.	13.8	2632.	2.9	19288.	22.5	2300.	3.1	26391.	25.7
	WYOMING		YORK							
SIMULATION 1	4041.	10.1	43012.	47.3						
SIMULATION 2	5990.	15.0	76155.	83.8						
SIMULATION 3	6361.	16.0	70527.	77.6						

Table B-2. Continued

STATE/SIMULATION	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
RHODE ISLAND										
	BRISTOL		KENT		NEWPORT		PROVIDENCE		WASHINGTON	
SIMULATION 1	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 2	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 3	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0

Table B-2. Continued

STATE/SIMULATION	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
VERMONT										
	ADDISON		BENNINGTON		CALEDONIA		CHITTENDEN		ESSEX	
SIMULATION 1	513.	0.7	51.	0.1	0.	0.0	261.	0.5	45.	0.1
SIMULATION 2	513.	0.7	51.	0.1	0.	0.0	261.	0.5	45.	0.1
SIMULATION 3	513.	0.7	51.	0.1	0.	0.0	261.	0.5	45.	0.1
	FRANKLIN		GRAND ISLE		LAMOILLE		ORANGE		ORLEANS	
SIMULATION 1	193.	0.3	0.	0.0	0.	0.0	0.	0.0	27.	0.0
SIMULATION 2	193.	0.3	0.	0.0	0.	0.0	0.	0.0	27.	0.0
SIMULATION 3	193.	0.3	0.	0.0	0.	0.0	0.	0.0	27.	0.0
	RUTLAND		WASHINGTON		WINDHAM		WINDSOR			
SIMULATION 1	89.	0.1	0.	0.0	0.	0.0	0.	0.0		
SIMULATION 2	89.	0.1	0.	0.0	0.	0.0	0.	0.0		
SIMULATION 3	89.	0.1	0.	0.0	0.	0.0	0.	0.0		

Table B-3. Forecasted Harvestable Crop Residue Totals and Densities by County and Simulation for the Northeastern United States, 1990

STATE/SIMULATION	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
CONNECTICUT										
	FAIRFIELD		HARTFORD		LITCHFIELD		MIDDLESEX		NEW HAVEN	
SIMULATION 1	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 2	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 3	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
	NEW LONDON		TOLLAND		WINDHAM		MIDDLESEX		NEW HAVEN	
SIMULATION 1	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 2	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 3	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0

Table B-3. Continued

STATE/SIMULATION	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
MAINE										
	ANDROSCOGGIN		AROOSTOOK		CUMBERLAND		FRANKLIN		HANCOCK	
SIMULATION 1	0.	0.0	30451.	4.5	0.	0.0	12.	0.0	4.	0.0
SIMULATION 2	0.	0.0	30451.	4.5	0.	0.0	12.	0.0	4.	0.0
SIMULATION 3	0.	0.0	30451.	4.5	0.	0.0	12.	0.0	4.	0.0
	KENNEBEC		KNOX		LINCOLN		OXFORD		PENOBSCOT	
SIMULATION 1	0.	0.0	0.	0.0	0.	0.0	0.	0.0	443.	0.1
SIMULATION 2	0.	0.0	0.	0.0	0.	0.0	0.	0.0	443.	0.1
SIMULATION 3	0.	0.0	0.	0.0	0.	0.0	0.	0.0	443.	0.1
	PISCATAQUIS		SAGADAHOC		SOMERSET		WALDO		WASHINGTON	
SIMULATION 1	0.	0.0	0.	0.0	288.	0.1	0.	0.0	0.	0.0
SIMULATION 2	0.	0.0	0.	0.0	288.	0.1	0.	0.0	0.	0.0
SIMULATION 3	0.	0.0	0.	0.0	288.	0.1	0.	0.0	0.	0.0
	YORK		SAGADAHOC		SOMERSET		WALDO		WASHINGTON	
SIMULATION 1	0.	0.0	0.	0.0	288.	0.1	0.	0.0	0.	0.0
SIMULATION 2	0.	0.0	0.	0.0	288.	0.1	0.	0.0	0.	0.0
SIMULATION 3	0.	0.0	0.	0.0	288.	0.1	0.	0.0	0.	0.0

Table B-3. Continued

STATE/SIMULATION	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
MASSACHUSETTS										
	BARNSTABLE		BERKSHIRE		BRISTOL		DUKES		ESSEX	
SIMULATION 1	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 2	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 3	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
	FRANKLIN		HAMPDEN		HAMPSHIRE		MIDDLESEX		NANTUCKET	
SIMULATION 1	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 2	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 3	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
	NORFOLK		PLYMOUTH		SUFFOLK		WORCESTER		NANTUCKET	
SIMULATION 1	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 2	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 3	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0

Table B-3. Continued

STATE/SIMULATION	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
NEW HAMPSHIRE										
	BELKNAP		CARROLL		CHESHIRE		COOS		GRAFTON	
SIMULATION 1	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 2	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 3	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
	HILLSBOROUGH		MERRIMACK		ROCKINGHAM		STRAFFORD		SULLIVAN	
SIMULATION 1	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 2	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 3	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
	HILLSBOROUGH		MERRIMACK		ROCKINGHAM		STRAFFORD		SULLIVAN	
SIMULATION 1	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 2	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 3	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0

Table B-3. Continued

STATE/SIMULATION	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
NEW JERSEY										
	ATLANTIC		BERGEN		BURLINGTON		CAMDEN		CAPE MAY	
SIMULATION 1	147.	0.3	0.	0.0	14284.	17.5	232.	1.0	458.	1.7
SIMULATION 2	155.	0.3	0.	0.0	15395.	18.8	250.	1.1	492.	1.8
SIMULATION 3	180.	0.3	0.	0.0	18059.	22.1	293.	1.3	576.	2.2
	CUMBERLAND		ESSEX		GLOUCESTER		HUDSON		HUNTERDON	
SIMULATION 1	11120.	22.2	0.	0.0	3723.	11.3	0.	0.0	1588.	3.8
SIMULATION 2	11476.	22.9	0.	0.0	3894.	11.8	0.	0.0	15353.	36.3
SIMULATION 3	13264.	26.5	0.	0.0	4522.	13.8	0.	0.0	14286.	33.8
	MERCER		MIDDLESEX		MONMOUTH		MORRIS		OCEAN	
SIMULATION 1	7135.	31.3	4033.	13.0	13468.	28.2	231.	0.5	359.	0.6
SIMULATION 2	10220.	44.8	7020.	22.6	14067.	29.5	1399.	3.0	437.	0.7
SIMULATION 3	12145.	53.2	7996.	25.7	16326.	34.2	1246.	2.7	533.	0.8
	PASSAIC		SALEM		SOMERSET		SUSSEX		UNION	
SIMULATION 1	0.	0.0	14766.	40.4	529.	1.7	261.	0.5	0.	0.0
SIMULATION 2	0.	0.0	15503.	42.5	4843.	15.8	852.	1.6	0.	0.0
SIMULATION 3	0.	0.0	18025.	49.4	5178.	16.9	781.	1.5	0.	0.0
	WARREN		SALEM		SOMERSET		SUSSEX		UNION	
SIMULATION 1	1380.	3.8	14766.	40.4	529.	1.7	261.	0.5	0.	0.0
SIMULATION 2	13794.	38.1	15503.	42.5	4843.	15.8	852.	1.6	0.	0.0
SIMULATION 3	11729.	32.4	18025.	49.4	5178.	16.9	781.	1.5	0.	0.0

Table B-3. Continued

STATE/SIMULATION	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
NEW YORK										
	ALBANY		ALLEGHANY		BRONX		BROOME		CATTARAUGUS	
SIMULATION 1	1739.	3.3	7606.	7.3	0.	0.0	2316.	3.2	5749.	4.4
SIMULATION 2	3486.	6.6	14223.	13.6	0.	0.0	4243.	6.0	10471.	7.9
SIMULATION 3	3327.	6.3	14581.	13.9	0.	0.0	4382.	6.1	10695.	8.1
	CAYUGA		CHAUTAUQUA		CHEMUNG		CHENANGO		CLINTON	
SIMULATION 1	71738.	102.8	8320.	7.7	4066.	9.8	6776.	7.5	2084.	2.0
SIMULATION 2	147131.	210.8	15680.	14.5	7690.	18.5	12408.	13.7	3209.	3.0
SIMULATION 3	137790.	197.4	15634.	14.5	7906.	19.0	12799.	14.2	3189.	3.0
	COLUMBIA		CORTLAND		DELAWARE		DUTCHESS		ERIE	
SIMULATION 1	9142.	14.2	6925.	13.8	1880.	1.3	5927.	7.3	17085.	16.2
SIMULATION 2	19230.	29.8	12842.	25.6	3332.	2.3	12272.	15.1	33023.	31.3
SIMULATION 3	16945.	26.3	13198.	26.3	3462.	2.4	10790.	13.3	32731.	31.0
	ESSEX		FRANKLIN		FULTON		GENESEE		GREENE	
SIMULATION 1	50.	0.0	1437.	0.9	987.	2.0	35493.	70.8	931.	1.4
SIMULATION 2	62.	0.0	2419.	1.4	1755.	3.5	73048.	145.7	1791.	2.7
SIMULATION 3	62.	0.0	2381.	1.4	1696.	3.4	68141.	135.9	1852.	2.8
	HAMILTON		HERKIMER		JEFFERSON		KINGS		LEWIS	
SIMULATION 1	0.	0.0	5334.	3.7	7482.	5.8	0.	0.0	2790.	2.2
SIMULATION 2	0.	0.0	8602.	6.0	11173.	8.6	0.	0.0	4279.	3.3
SIMULATION 3	0.	0.0	8421.	5.9	11173.	8.6	0.	0.0	4156.	3.2

Table B-3. Continued

	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
	LIVINGSTON		MADISON		MONROE		MONTGOMERY		NASSAU	
SIMULATION 1	39114.	61.3	20946.	31.7	26871.	39.8	9770.	23.9	0.	0.0
SIMULATION 2	78915.	123.6	33003.	49.9	57554.	85.2	18178.	44.5	0.	0.0
SIMULATION 3	74399.	116.5	32722.	49.5	54056.	80.0	17003.	41.7	0.	0.0
	MANHATTAN		NIAGARA		ONEIDA		ONANDAGA		ONTARIO	
SIMULATION 1	0.	0.0	29600.	55.6	21697.	17.7	35671.	44.9	54894.	84.3
SIMULATION 2	0.	0.0	62183.	116.8	40858.	33.4	70753.	89.0	109385.	168.0
SIMULATION 3	0.	0.0	57638.	108.3	38005.	31.1	65397.	82.3	102035.	156.7
	ORANGE		ORLEANS		OSWEGO		OTSEGO		PUTNAM	
SIMULATION 1	280.	0.3	38777.	97.9	4081.	4.2	7390.	7.3	286.	1.2
SIMULATION 2	496.	0.6	80435.	203.0	7779.	8.1	13733.	13.6	544.	2.3
SIMULATION 3	486.	0.6	74080.	187.0	7113.	7.4	13765.	13.6	472.	2.0
	QUEENS		RENSSELAER		RICHMOND		ROCKLAND		ST LAWRENCE	
SIMULATION 1	0.	0.0	2455.	3.7	0.	0.0	0.	0.0	4160.	1.5
SIMULATION 2	0.	0.0	4977.	7.5	0.	0.0	0.	0.0	6667.	2.4
SIMULATION 3	0.	0.0	4363.	6.6	0.	0.0	0.	0.0	6597.	2.4
	SARATOGA		SCHENECTADY		SCHOHARIE		SCHUYLER		SENECA	
SIMULATION 1	2830.	3.5	539.	2.6	6018.	9.7	6382.	19.3	33104.	100.3
SIMULATION 2	5002.	6.1	1062.	5.1	11172.	17.9	12400.	37.6	63604.	192.7
SIMULATION 3	4901.	6.0	963.	4.6	10987.	17.6	12391.	37.5	59953.	181.6

Table B-3. Continued

	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
	STEUBEN		SUFFOLK		SULLIVAN		TIOGA		TOMPKINS	
SIMULATION 1	29982.	21.3	0.	0.0	0.	0.0	6256.	11.9	17452.	36.2
SIMULATION 2	59877.	42.4	0.	0.0	0.	0.0	11477.	21.9	35082.	72.8
SIMULATION 3	61223.	43.4	0.	0.0	0.	0.0	11828.	22.6	35310.	73.3
	ULSTER		WARREN		WASHINGTON		WAYNE		WESTCHESTER	
SIMULATION 1	3909.	3.4	0.	0.0	8310.	9.9	37226.	61.4	0.	0.0
SIMULATION 2	7249.	6.4	0.	0.0	14691.	17.6	74705.	123.2	0.	0.0
SIMULATION 3	7178.	6.3	0.	0.0	14394.	17.2	68936.	113.7	0.	0.0
	WYOMING		YATES		WASHINGTON		WAYNE		WESTCHESTER	
SIMULATION 1	18005.	30.1	19077.	55.6	8310.	9.9	37226.	61.4	0.	0.0
SIMULATION 2	35646.	59.6	40631.	118.4	14691.	17.6	74705.	123.2	0.	0.0
SIMULATION 3	35794.	59.9	39786.	115.9	14394.	17.2	68936.	113.7	0.	0.0

Table B-3. Continued

STATE/SIMULATION	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
PENNSYLVANIA										
	ADAMS		ALLEGHENY		ARMSTRONG		BEAVER		BEDFORD	
SIMULATION 1	24586.	46.7	1781.	2.5	11633.	17.9	5537.	12.6	20793.	20.4
SIMULATION 2	40200.	76.4	3779.	5.2	24611.	37.8	11729.	26.7	37134.	36.5
SIMULATION 3	38548.	73.3	3927.	5.4	25707.	39.4	12224.	27.8	32663.	32.1
	BERKS		BLAIR		BRADFORD		BUCKS		BUTLER	
SIMULATION 1	74235.	86.2	12268.	23.1	22339.	19.5	11641.	19.0	19331.	24.3
SIMULATION 2	117230.	136.1	23043.	43.5	29887.	26.0	20842.	33.9	39276.	49.4
SIMULATION 3	114077.	132.4	20125.	38.0	31299.	27.3	19390.	31.6	40863.	51.4
	CAMBRIA		CAMERON		CARBON		CENTRE		CHESTER	
SIMULATION 1	3873.	5.6	23.	0.1	4175.	10.3	24859.	22.3	31018.	40.8
SIMULATION 2	9748.	14.1	57.	0.1	6279.	15.5	45068.	40.4	55137.	72.5
SIMULATION 3	6410.	9.3	38.	0.1	6227.	15.3	38984.	35.0	50551.	66.5
	CLARION		CLEARFIELD		CLINTON		COLUMBIA		CRAWFORD	
SIMULATION 1	7897.	13.2	2410.	2.1	6967.	7.7	32968.	68.2	40037.	39.5
SIMULATION 2	17421.	29.2	5775.	5.1	15274.	16.9	52287.	108.1	56958.	56.2
SIMULATION 3	16466.	27.6	4395.	3.9	11552.	12.8	52444.	108.4	59644.	58.9
	CUMBERLAND		DAUPHIN		DELAWARE		ELK		ERIE	
SIMULATION 1	53334.	96.1	35328.	68.2	418.	2.3	719.	0.9	24664.	30.3
SIMULATION 2	80854.	145.6	53157.	102.6	733.	4.0	1810.	2.3	33683.	41.4
SIMULATION 3	79967.	144.0	52321.	101.0	667.	3.7	1190.	1.5	34924.	43.0

Table B-3. Continued

	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
	FAYETTE		FOREST		FRANKLIN		FULTON		GREENE	
SIMULATION 1	6968.	8.7	257.	0.6	64344.	85.3	13276.	30.5	1171.	2.0
SIMULATION 2	15754.	19.7	648.	1.6	99873.	132.4	19155.	44.1	2454.	4.2
SIMULATION 3	13998.	17.5	426.	1.0	98918.	131.1	18850.	43.4	2609.	4.5
	HUNTINGDON		INDIANA		JEFFERSON		JUNIATA		LACKAWANNA	
SIMULATION 1	15106.	16.9	15273.	18.5	5868.	9.0	18099.	46.9	2256.	5.0
SIMULATION 2	24426.	27.3	33199.	40.2	12846.	19.7	27483.	71.3	3417.	7.5
SIMULATION 3	24030.	26.9	32544.	39.4	12379.	19.0	27094.	70.3	3649.	8.0
	LANCASTER		LAURENCE		LEBANON		LEHIGH		LUZERNE	
SIMULATION 1	78323.	82.8	21876.	59.6	35586.	98.0	14492.	41.6	11158.	12.5
SIMULATION 2	139552.	147.5	36913.	100.5	57516.	158.4	27545.	79.1	18253.	20.5
SIMULATION 3	126944.	134.2	38650.	105.2	56206.	154.8	27399.	78.7	19033.	21.4
	LYCOMING		MCKEAN		MERCER		MIFFLIN		MONROE	
SIMULATION 1	26183.	21.5	192.	0.2	39179.	58.5	16261.	37.7	4860.	7.9
SIMULATION 2	47355.	39.0	483.	0.5	60131.	89.7	26053.	60.4	8384.	13.6
SIMULATION 3	42851.	35.3	318.	0.3	62891.	93.8	25683.	59.6	8662.	14.1
	MONTGOMERY		MONTOUR		NORTHAMPTON		NORTHUMBERLAND		PERRY	
SIMULATION 1	8908.	17.9	13780.	106.1	46221.	122.9	41910.	92.6	25601.	46.5
SIMULATION 2	15797.	31.8	20350.	156.6	73310.	194.9	65250.	144.1	37744.	68.5
SIMULATION 3	14751.	29.7	20006.	154.0	72445.	192.6	64302.	142.0	37214.	67.6

Table B-3. Continued

	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
	PHILADELPHIA		PIKE		POTTER		SCHUYLKILL		SNYDER	
SIMULATION 1	0.	0.0	286.	0.5	3577.	3.3	25996.	33.1	23251.	71.2
SIMULATION 2	0.	0.0	450.	0.8	5262.	4.8	39929.	50.8	35247.	107.9
SIMULATION 3	0.	0.0	483.	0.9	4603.	4.2	39301.	50.0	34668.	106.1
	SOMERSET		SULLIVAN		SUSQUEHANNA		TIOGA		UNION	
SIMULATION 1	10445.	9.7	2039.	4.3	3906.	4.7	12113.	10.6	22229.	69.9
SIMULATION 2	26293.	24.4	2314.	4.8	5281.	6.3	15882.	13.9	35617.	111.9
SIMULATION 3	17289.	16.0	2364.	4.9	5457.	6.6	16139.	14.1	35042.	110.1
	VENANGO		WARREN		WASHINGTON		WAYNE		WESTMORELAND	
SIMULATION 1	6239.	9.2	2240.	2.5	9452.	11.0	1491.	2.0	13504.	13.2
SIMULATION 2	10412.	15.3	3146.	3.5	19991.	23.3	2327.	3.1	29552.	28.8
SIMULATION 3	10105.	14.9	2888.	3.2	20892.	24.4	2494.	3.4	28508.	27.8
	WYOMING		YORK		WASHINGTON		WAYNE		WESTMORELAND	
SIMULATION 1	4403.	11.1	46797.	51.5	9452.	11.0	1491.	2.0	13504.	13.2
SIMULATION 2	6537.	16.4	82826.	91.1	19991.	23.3	2327.	3.1	29552.	28.8
SIMULATION 3	6944.	17.4	76672.	84.3	20892.	24.4	2494.	3.4	28508.	27.8

Table B-3. Continued

STATE/SIMULATION	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
RHODE ISLAND										
	BRISTOL		KENT		NEWPORT		PROVIDENCE		WASHINGTON	
SIMULATION 1	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 2	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 3	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
	BRISTOL		KENT		NEWPORT		PROVIDENCE		WASHINGTON	
SIMULATION 1	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 2	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0
SIMULATION 3	0.	0.0	0.	0.0	0.	0.0	0.	0.0	0.	0.0

Table B-3. Continued

STATE/SIMULATION	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI	TOTAL RES TONS	DENSITY TONS/SQMI
VERMONT										
	ADDISON		BENNINGTON		CALEDONIA		CHITTENDEN		ESSEX	
SIMULATION 1	466.	0.6	46.	0.1	0.	0.0	237.	0.4	41.	0.1
SIMULATION 2	466.	0.6	46.	0.1	0.	0.0	237.	0.4	41.	0.1
SIMULATION 3	466.	0.6	46.	0.1	0.	0.0	237.	0.4	41.	0.1
	FRANKLIN		GRAND ISLE		LAMOILLE		ORANGE		ORLEANS	
SIMULATION 1	175.	0.3	0.	0.0	0.	0.0	0.	0.0	25.	0.0
SIMULATION 2	175.	0.3	0.	0.0	0.	0.0	0.	0.0	25.	0.0
SIMULATION 3	175.	0.3	0.	0.0	0.	0.0	0.	0.0	25.	0.0
	RUTLAND		WASHINGTON		WINDHAM		WINDSOR		ORLEANS	
SIMULATION 1	80.	0.1	0.	0.0	0.	0.0	0.	0.0	25.	0.0
SIMULATION 2	80.	0.1	0.	0.0	0.	0.0	0.	0.0	25.	0.0
SIMULATION 3	80.	0.1	0.	0.0	0.	0.0	0.	0.0	25.	0.0

Appendix C

Table C-1. Residue Collection Costs by County, Crop, and Baling Method for the Northeastern United States, 1978.

MAINE

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
MAINE / AROOSTOOK																	
5.00	0.98	7.96	0.00	0.00	0.00	1.78	16.13	9.09	1.33	18.02	10.28	1.26	18.42	10.54	1.00	20.43	11.81
10.00	0.98	7.96	0.00	0.00	0.00	1.78	17.54	11.21	1.33	19.43	12.40	1.26	19.83	12.66	1.00	21.84	13.93
15.00	0.98	7.96	0.00	0.00	0.00	1.78	18.95	13.33	1.33	20.83	14.53	1.26	21.24	14.78	1.00	23.24	16.05
20.00	0.98	7.96	0.00	0.00	0.00	1.78	20.36	15.45	1.33	22.24	16.65	1.26	22.65	16.91	1.00	24.65	18.18
25.00	0.98	7.96	0.00	0.00	0.00	1.78	21.76	17.58	1.33	23.65	18.77	1.26	24.05	19.03	1.00	26.06	20.30

Table C-1. Continued

NEW JERSEY

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
NEW JERSEY / BURLINGTON																	
5.00	0.98	7.96	1.27	20.66	15.16	1.28	18.29	10.45	1.33	18.02	10.28	0.87	21.92	12.75	0.53	29.36	17.47
10.00	0.98	7.96	1.27	21.91	16.62	1.28	19.70	12.58	1.33	19.43	12.41	0.87	23.33	14.88	0.53	30.77	19.59
15.00	0.98	7.96	1.27	23.16	18.09	1.28	21.11	14.70	1.33	20.84	14.53	0.87	24.73	17.00	0.53	32.17	21.72
20.00	0.98	7.96	1.27	24.41	19.55	1.28	22.51	16.82	1.33	22.24	16.65	0.87	26.14	19.12	0.53	33.58	23.84
25.00	0.98	7.96	1.27	25.66	21.01	1.28	23.92	18.94	1.33	23.65	18.77	0.87	27.55	21.25	0.53	34.99	25.96
NEW JERSEY / CUMBERLAND																	
5.00	0.98	7.96	1.13	22.02	16.32	1.39	17.67	10.06	1.16	19.10	10.96	0.63	26.32	15.54	0.00	0.00	0.00
10.00	0.98	7.96	1.13	23.27	17.78	1.39	19.08	12.19	1.16	20.50	13.09	0.63	27.73	17.67	0.00	0.00	0.00
15.00	0.98	7.96	1.13	24.52	19.25	1.39	20.49	14.31	1.16	21.91	15.21	0.63	29.13	19.79	0.00	0.00	0.00
20.00	0.98	7.96	1.13	25.77	20.71	1.39	21.90	16.43	1.16	23.32	17.33	0.63	30.54	21.91	0.00	0.00	0.00
25.00	0.98	7.96	1.13	27.02	22.17	1.39	23.30	18.55	1.16	24.73	19.45	0.63	31.95	24.03	0.00	0.00	0.00
NEW JERSEY / GLOUCESTER																	
5.00	0.98	7.96	1.08	22.66	16.87	1.49	17.21	9.77	1.03	20.22	11.67	0.41	34.88	20.97	0.51	29.97	17.86
10.00	0.98	7.96	1.08	23.91	18.33	1.49	18.62	11.89	1.03	21.62	13.80	0.41	36.28	23.09	0.51	31.38	19.98
15.00	0.98	7.96	1.08	25.16	19.79	1.49	20.03	14.02	1.03	23.03	15.92	0.41	37.69	25.22	0.51	32.79	22.11
20.00	0.98	7.96	1.08	26.41	21.25	1.49	21.44	16.14	1.03	24.44	18.04	0.41	39.10	27.34	0.51	34.19	24.23
25.00	0.98	7.96	1.08	27.66	22.71	1.49	22.84	18.26	1.03	25.85	20.16	0.41	40.51	29.46	0.51	35.60	26.35
NEW JERSEY / HUNTERDON																	
5.00	0.98	7.96	1.16	21.66	16.01	1.18	18.93	10.86	0.93	21.27	12.35	0.93	21.17	12.28	0.65	25.86	15.25
10.00	0.98	7.96	1.16	22.91	17.47	1.18	20.34	12.98	0.93	22.68	14.47	0.93	22.58	14.40	0.65	27.27	17.38
15.00	0.98	7.96	1.16	24.16	18.93	1.18	21.75	15.11	0.93	24.09	16.59	0.93	23.99	16.53	0.65	28.68	19.50
20.00	0.98	7.96	1.16	25.41	20.40	1.18	23.15	17.23	0.93	25.50	18.71	0.93	25.39	18.65	0.65	30.08	21.62
25.00	0.98	7.96	1.16	26.66	21.86	1.18	24.56	19.35	0.93	26.90	20.84	0.93	26.80	20.77	0.65	31.49	23.74
NEW JERSEY / MERCER																	
5.00	0.98	7.96	1.47	19.05	13.79	1.42	17.52	9.97	1.81	16.05	9.03	0.00	0.00	0.00	0.46	32.17	19.25
10.00	0.98	7.96	1.47	20.30	15.25	1.42	18.93	12.09	1.81	17.46	11.15	0.00	0.00	0.00	0.46	33.58	21.37
15.00	0.98	7.96	1.47	21.55	16.71	1.42	20.34	14.21	1.81	18.86	13.28	0.00	0.00	0.00	0.46	34.98	23.50
20.00	0.98	7.96	1.47	22.80	18.18	1.42	21.75	16.34	1.81	20.27	15.40	0.00	0.00	0.00	0.46	36.39	25.62
25.00	0.98	7.96	1.47	24.05	19.64	1.42	23.15	18.46	1.81	21.68	17.52	0.00	0.00	0.00	0.46	37.80	27.74

Table C-1. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ACRE	OATS BALES $/TON	OATS STACKS $/TON
NEW JERSEY / MIDDLESEX																	
5.00	0.98	7.96	1.45	19.19	13.91	1.46	17.34	9.85	1.54	17.00	9.64	0.00	0.00	0.00	0.00	0.00	0.00
10.00	0.98	7.96	1.45	20.44	15.37	1.46	18.75	11.98	1.54	18.41	11.76	0.00	0.00	0.00	0.00	0.00	0.00
15.00	0.98	7.96	1.45	21.69	16.83	1.46	20.16	14.10	1.54	19.82	13.88	0.00	0.00	0.00	0.00	0.00	0.00
20.00	0.98	7.96	1.45	22.94	18.29	1.46	21.57	16.22	1.54	21.22	16.00	0.00	0.00	0.00	0.00	0.00	0.00
25.00	0.98	7.96	1.45	24.19	19.76	1.46	22.97	18.34	1.54	22.63	18.13	0.00	0.00	0.00	0.00	0.00	0.00
NEW JERSEY / MONMOUTH																	
5.00	0.98	7.96	1.14	21.89	16.21	1.33	18.03	10.29	1.30	18.19	10.39	0.75	23.70	13.89	0.00	0.00	0.00
10.00	0.98	7.96	1.14	23.14	17.67	1.33	19.44	12.41	1.30	19.59	12.51	0.75	25.11	16.01	0.00	0.00	0.00
15.00	0.98	7.96	1.14	24.39	19.13	1.33	20.85	14.54	1.30	21.00	14.63	0.75	26.52	18.13	0.00	0.00	0.00
20.00	0.98	7.96	1.14	25.64	20.59	1.33	22.26	16.66	1.30	22.41	16.76	0.75	27.93	20.25	0.00	0.00	0.00
25.00	0.98	7.96	1.14	26.89	22.05	1.33	23.66	18.78	1.30	23.82	18.88	0.75	29.33	22.38	0.00	0.00	0.00
NEW JERSEY / SALEM																	
5.00	0.98	7.96	1.49	18.96	13.71	1.47	17.29	9.82	1.27	18.37	10.50	0.80	23.03	13.46	0.60	27.16	16.08
10.00	0.98	7.96	1.49	20.20	15.17	1.47	18.70	11.94	1.27	19.77	12.62	0.80	24.43	15.58	0.60	28.57	18.20
15.00	0.98	7.96	1.49	21.45	16.63	1.47	20.10	14.06	1.27	21.18	14.75	0.80	25.84	17.70	0.60	29.98	20.32
20.00	0.98	7.96	1.49	22.70	18.09	1.47	21.51	16.19	1.27	22.59	16.87	0.80	27.25	19.82	0.60	31.38	22.45
25.00	0.98	7.96	1.49	23.95	19.55	1.47	22.92	18.31	1.27	24.00	18.99	0.80	28.65	21.95	0.60	32.79	24.57
NEW JERSEY / WARREN																	
5.00	0.98	7.96	1.41	19.48	14.16	1.46	17.35	9.86	1.05	20.02	11.55	0.00	0.00	0.00	0.70	24.72	14.53
10.00	0.98	7.96	1.41	20.73	15.62	1.46	18.76	11.98	1.05	21.43	13.67	0.00	0.00	0.00	0.70	26.13	16.66
15.00	0.98	7.96	1.41	21.98	17.08	1.46	20.17	14.11	1.05	22.83	15.79	0.00	0.00	0.00	0.70	27.54	18.78
20.00	0.98	7.96	1.41	23.23	18.54	1.46	21.58	16.23	1.05	24.24	17.92	0.00	0.00	0.00	0.70	28.95	20.90
25.00	0.98	7.96	1.41	24.48	20.00	1.46	22.98	18.35	1.05	25.65	20.04	0.00	0.00	0.00	0.70	30.35	23.02

Table C-1. Continued

NEW YORK

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ACRE	OATS BALES $/TON	OATS STACKS $/TON
NEW YORK / CAYUGA																	
5.00	0.98	7.96	1.22	21.11	15.55	1.54	17.01	9.64	1.14	19.29	11.09	1.00	20.46	11.83	1.04	20.09	11.59
10.00	0.98	7.96	1.22	22.36	17.01	1.54	18.42	11.76	1.14	20.70	13.21	1.00	21.87	13.95	1.04	21.50	13.72
15.00	0.98	7.96	1.22	23.61	18.47	1.54	19.82	13.89	1.14	22.10	15.33	1.00	23.28	16.08	1.04	22.90	15.84
20.00	0.98	7.96	1.22	24.86	19.93	1.54	21.23	16.01	1.14	23.51	17.45	1.00	24.68	18.20	1.04	24.31	17.96
25.00	0.98	7.96	1.22	26.11	21.39	1.54	22.64	18.13	1.14	24.92	19.58	1.00	26.09	20.32	1.04	25.72	20.08
NEW YORK / CHEMUNG																	
5.00	0.98	7.96	0.94	24.66	18.57	1.35	17.91	10.21	0.98	20.64	11.94	0.00	0.00	0.00	0.76	23.61	13.83
10.00	0.98	7.96	0.94	25.91	20.03	1.35	19.31	12.33	0.98	22.05	14.07	0.00	0.00	0.00	0.76	25.02	15.95
15.00	0.98	7.96	0.94	27.16	21.49	1.35	20.72	14.45	0.98	23.46	16.19	0.00	0.00	0.00	0.76	26.43	18.07
20.00	0.98	7.96	0.94	28.41	22.95	1.35	22.13	16.58	0.98	24.86	18.31	0.00	0.00	0.00	0.76	27.83	20.20
25.00	0.98	7.96	0.94	29.66	24.41	1.35	23.53	18.70	0.98	26.27	20.43	0.00	0.00	0.00	0.76	29.24	22.32
NEW YORK / COLUMBIA																	
5.00	0.98	7.96	1.43	19.37	14.06	1.60	16.77	9.49	0.00	0.00	0.00	0.00	0.00	0.00	0.77	23.48	13.74
10.00	0.98	7.96	1.43	20.62	15.52	1.60	18.18	11.61	0.00	0.00	0.00	0.00	0.00	0.00	0.77	24.89	15.87
15.00	0.98	7.96	1.43	21.87	16.98	1.60	19.59	13.74	0.00	0.00	0.00	0.00	0.00	0.00	0.77	26.29	17.99
20.00	0.98	7.96	1.43	23.12	18.44	1.60	20.99	15.86	0.00	0.00	0.00	0.00	0.00	0.00	0.77	27.70	20.11
25.00	0.98	7.96	1.43	24.37	19.90	1.60	22.40	17.98	0.00	0.00	0.00	0.00	0.00	0.00	0.77	29.11	22.23
NEW YORK / CORTLAND																	
5.00	0.98	7.96	1.29	20.48	15.01	1.15	19.16	11.00	0.00	0.00	0.00	0.00	0.00	0.00	0.96	20.89	12.10
10.00	0.98	7.96	1.29	21.73	16.47	1.15	20.57	13.13	0.00	0.00	0.00	0.00	0.00	0.00	0.96	22.29	14.22
15.00	0.98	7.96	1.29	22.98	17.93	1.15	21.97	15.25	0.00	0.00	0.00	0.00	0.00	0.00	0.96	23.70	16.34
20.00	0.98	7.96	1.29	24.23	19.39	1.15	23.38	17.37	0.00	0.00	0.00	0.00	0.00	0.00	0.96	25.11	18.47
25.00	0.98	7.96	1.29	25.48	20.85	1.15	24.79	19.49	0.00	0.00	0.00	0.00	0.00	0.00	0.96	26.52	20.59
NEW YORK / ERIE																	
5.00	0.98	7.96	1.17	21.63	15.99	1.30	18.18	10.39	1.10	19.58	11.27	1.10	19.60	11.28	0.84	22.31	13.00
10.00	0.98	7.96	1.17	22.88	17.45	1.30	19.59	12.51	1.10	20.98	13.39	1.10	21.00	13.40	0.84	23.71	15.12
15.00	0.98	7.96	1.17	24.13	18.91	1.30	21.00	14.63	1.10	22.39	15.51	1.10	22.41	15.53	0.84	25.12	17.24
20.00	0.98	7.96	1.17	25.38	20.37	1.30	22.41	16.75	1.10	23.80	17.64	1.10	23.82	17.65	0.84	26.53	19.37
25.00	0.98	7.96	1.17	26.62	21.83	1.30	23.81	18.88	1.10	25.21	19.76	1.10	25.23	19.77	0.84	27.94	21.49

Table C-1. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
NEW YORK / GENESEE																	
5.00	0.98	7.96	1.09	22.47	16.71	1.12	19.39	11.15	1.09	19.62	11.30	0.91	21.49	12.48	0.91	21.46	12.46
10.00	0.98	7.96	1.09	23.72	18.17	1.12	20.80	13.27	1.09	21.03	13.42	0.91	22.90	14.61	0.91	22.86	14.58
15.00	0.98	7.96	1.09	24.97	19.63	1.12	22.21	15.40	1.09	22.44	15.54	0.91	24.31	16.73	0.91	24.27	16.71
20.00	0.98	7.96	1.09	26.22	21.09	1.12	23.61	17.52	1.09	23.84	17.67	0.91	25.71	18.85	0.91	25.68	18.83
25.00	0.98	7.96	1.09	27.47	22.55	1.12	25.02	19.64	1.09	25.25	19.79	0.91	27.12	20.97	0.91	27.08	20.95
NEW YORK / LIVINGSTON																	
5.00	0.98	7.96	0.94	24.64	18.55	1.26	18.45	10.55	0.73	24.17	14.18	0.00	0.00	0.00	0.89	21.65	12.58
10.00	0.98	7.96	0.94	25.89	20.01	1.26	19.86	12.68	0.73	25.58	16.30	0.00	0.00	0.00	0.89	23.05	14.70
15.00	0.98	7.96	0.94	27.14	21.47	1.26	21.26	14.80	0.73	26.99	18.43	0.00	0.00	0.00	0.89	24.46	16.83
20.00	0.98	7.96	0.94	28.39	22.94	1.26	22.67	16.92	0.73	28.39	20.55	0.00	0.00	0.00	0.89	25.87	18.95
25.00	0.98	7.96	0.94	29.64	24.40	1.26	24.08	19.05	0.73	29.80	22.67	0.00	0.00	0.00	0.89	27.28	21.07
NEW YORK / MADISON																	
5.00	0.98	7.96	1.28	20.53	15.05	1.45	17.41	9.90	0.91	21.41	12.43	1.20	18.81	10.79	1.03	20.15	11.63
10.00	0.98	7.96	1.28	21.78	16.51	1.45	18.82	12.02	0.91	22.82	14.55	1.20	20.22	12.91	1.03	21.56	13.76
15.00	0.98	7.96	1.28	23.03	17.97	1.45	20.23	14.14	0.91	24.22	16.68	1.20	21.63	15.03	1.03	22.97	15.88
20.00	0.98	7.96	1.28	24.28	19.43	1.45	21.64	16.27	0.91	25.63	18.80	1.20	23.04	17.15	1.03	24.37	18.00
25.00	0.98	7.96	1.28	25.52	20.89	1.45	23.04	18.39	0.91	27.04	20.92	1.20	24.44	19.28	1.03	25.78	20.12
NEW YORK / MONROE																	
5.00	0.98	7.96	1.04	23.10	17.24	1.25	18.50	10.59	0.74	24.01	14.08	1.28	18.32	10.47	0.89	21.73	12.64
10.00	0.98	7.96	1.04	24.35	18.70	1.25	19.91	12.71	0.74	25.42	16.20	1.28	19.72	12.59	0.89	23.14	14.76
15.00	0.98	7.96	1.04	25.60	20.16	1.25	21.31	14.83	0.74	26.82	18.32	1.28	21.13	14.71	0.89	24.55	16.88
20.00	0.98	7.96	1.04	26.85	21.62	1.25	22.72	16.95	0.74	28.23	20.45	1.28	22.54	16.84	0.89	25.96	19.00
25.00	0.98	7.96	1.04	28.10	23.09	1.25	24.13	19.08	0.74	29.64	22.57	1.28	23.95	18.96	0.89	27.36	21.13
NEW YORK / MONTGOMERY																	
5.00	0.98	7.96	1.30	20.38	14.92	1.32	18.06	10.31	1.57	16.88	9.56	0.00	0.00	0.00	0.84	22.40	13.06
10.00	0.98	7.96	1.30	21.63	16.38	1.32	19.47	12.43	1.57	18.28	11.68	0.00	0.00	0.00	0.84	23.81	15.18
15.00	0.98	7.96	1.30	22.88	17.84	1.32	20.88	14.56	1.57	19.69	13.80	0.00	0.00	0.00	0.84	25.22	17.31
20.00	0.98	7.96	1.30	24.13	19.31	1.32	22.29	16.68	1.57	21.10	15.92	0.00	0.00	0.00	0.84	26.63	19.43
25.00	0.98	7.96	1.30	25.38	20.77	1.32	23.69	18.80	1.57	22.50	18.05	0.00	0.00	0.00	0.84	28.03	21.55

Table C-1. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
NEW YORK / NIAGARA																	
5.00	0.98	7.96	1.16	21.68	16.03	1.16	19.15	11.00	1.58	16.84	9.53	0.00	0.00	0.00	0.88	21.77	12.66
10.00	0.98	7.96	1.16	22.93	17.50	1.16	20.55	13.12	1.58	18.25	11.66	0.00	0.00	0.00	0.88	23.18	14.78
15.00	0.98	7.96	1.16	24.18	18.96	1.16	21.96	15.24	1.58	19.66	13.78	0.00	0.00	0.00	0.88	24.58	16.90
20.00	0.98	7.96	1.16	25.43	20.42	1.16	23.37	17.36	1.58	21.06	15.90	0.00	0.00	0.00	0.88	25.99	19.03
25.00	0.98	7.96	1.16	26.68	21.88	1.16	24.77	19.49	1.58	22.47	18.02	0.00	0.00	0.00	0.88	27.40	21.15
NEW YORK / ONEIDA																	
5.00	0.98	7.96	1.26	20.70	15.19	1.51	17.12	9.71	1.47	17.32	9.84	0.00	0.00	0.00	1.08	19.77	11.39
10.00	0.98	7.96	1.26	21.95	16.65	1.51	18.52	11.83	1.47	18.73	11.96	0.00	0.00	0.00	1.08	21.18	13.52
15.00	0.98	7.96	1.26	23.20	18.12	1.51	19.93	13.95	1.47	20.14	14.08	0.00	0.00	0.00	1.08	22.59	15.64
20.00	0.98	7.96	1.26	24.45	19.58	1.51	21.34	16.08	1.47	21.54	16.21	0.00	0.00	0.00	1.08	23.99	17.76
25.00	0.98	7.96	1.26	25.70	21.04	1.51	22.74	18.20	1.47	22.95	18.33	0.00	0.00	0.00	1.08	25.40	19.88
NEW YORK / ONANDAGA																	
5.00	0.98	7.96	1.20	21.26	15.68	1.44	17.44	9.91	0.96	20.87	12.09	0.00	0.00	0.00	1.01	20.37	11.77
10.00	0.98	7.96	1.20	22.51	17.14	1.44	18.84	12.03	0.96	22.28	14.21	0.00	0.00	0.00	1.01	21.78	13.89
15.00	0.98	7.96	1.20	23.76	18.60	1.44	20.25	14.16	0.96	23.68	16.33	0.00	0.00	0.00	1.01	23.18	16.02
20.00	0.98	7.96	1.20	25.01	20.06	1.44	21.66	16.28	0.96	25.09	18.46	0.00	0.00	0.00	1.01	24.59	18.14
25.00	0.98	7.96	1.20	26.26	21.52	1.44	23.07	18.40	0.96	26.50	20.58	0.00	0.00	0.00	1.01	26.00	20.26
NEW YORK / ONTARIO																	
5.00	0.98	7.96	1.03	23.26	17.37	1.21	18.72	10.73	0.99	20.57	11.90	1.24	18.56	10.63	0.95	21.04	12.19
10.00	0.98	7.96	1.03	24.51	18.84	1.21	20.13	12.85	0.99	21.97	14.02	1.24	19.97	12.75	0.95	22.44	14.32
15.00	0.98	7.96	1.03	25.76	20.30	1.21	21.54	14.97	0.99	23.38	16.14	1.24	21.38	14.87	0.95	23.85	16.44
20.00	0.98	7.96	1.03	27.00	21.76	1.21	22.95	17.10	0.99	24.79	18.26	1.24	22.78	16.99	0.95	25.26	18.56
25.00	0.98	7.96	1.03	28.25	23.22	1.21	24.35	19.22	0.99	26.20	20.39	1.24	24.19	19.12	0.95	26.67	20.68
NEW YORK / ORLEANS																	
5.00	0.98	7.96	1.41	19.50	14.17	1.09	19.65	11.32	1.13	19.32	11.11	0.00	0.00	0.00	1.00	20.43	11.81
10.00	0.98	7.96	1.41	20.75	15.63	1.09	21.06	13.44	1.13	20.73	13.23	0.00	0.00	0.00	1.00	21.84	13.93
15.00	0.98	7.96	1.41	22.00	17.10	1.09	22.47	15.56	1.13	22.14	15.35	0.00	0.00	0.00	1.00	23.24	16.05
20.00	0.98	7.96	1.41	23.25	18.56	1.09	23.87	17.68	1.13	23.55	17.48	0.00	0.00	0.00	1.00	24.65	18.18
25.00	0.98	7.96	1.41	24.50	20.02	1.09	25.28	19.81	1.13	24.95	19.60	0.00	0.00	0.00	1.00	26.06	20.30

Table C-1. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
NEW YORK / SCHOHARIE																	
5.00	0.98	7.96	1.59	18.35	13.19	1.18	18.93	10.86	0.00	0.00	0.00	0.00	0.00	0.00	0.92	21.35	12.39
10.00	0.98	7.96	1.59	19.60	14.65	1.18	20.34	12.98	0.00	0.00	0.00	0.00	0.00	0.00	0.92	22.76	14.52
15.00	0.98	7.96	1.59	20.85	16.11	1.18	21.75	15.11	0.00	0.00	0.00	0.00	0.00	0.00	0.92	24.16	16.64
20.00	0.98	7.96	1.59	22.10	17.58	1.18	23.16	17.23	0.00	0.00	0.00	0.00	0.00	0.00	0.92	25.57	18.76
25.00	0.98	7.96	1.59	23.35	19.04	1.18	24.56	19.35	0.00	0.00	0.00	0.00	0.00	0.00	0.92	26.98	20.88
NEW YORK / SCHUYLER																	
5.00	0.98	7.96	1.13	21.97	16.28	1.20	18.85	10.81	0.96	20.89	12.10	0.00	0.00	0.00	0.81	22.84	13.34
10.00	0.98	7.96	1.13	23.22	17.74	1.20	20.25	12.93	0.96	22.30	14.23	0.00	0.00	0.00	0.81	24.25	15.46
15.00	0.98	7.96	1.13	24.47	19.20	1.20	21.66	15.05	0.96	23.71	16.35	0.00	0.00	0.00	0.81	25.65	17.58
20.00	0.98	7.96	1.13	25.72	20.66	1.20	23.07	17.17	0.96	25.12	18.47	0.00	0.00	0.00	0.81	27.06	19.71
25.00	0.98	7.96	1.13	26.97	22.12	1.20	24.47	19.30	0.96	26.52	20.59	0.00	0.00	0.00	0.81	28.47	21.83
NEW YORK / SENECA																	
5.00	0.98	7.96	1.03	23.26	17.38	1.29	18.24	10.42	1.03	20.19	11.66	0.00	0.00	0.00	1.03	20.18	11.65
10.00	0.98	7.96	1.03	24.51	18.84	1.29	19.65	12.55	1.03	21.59	13.78	0.00	0.00	0.00	1.03	21.59	13.78
15.00	0.98	7.96	1.03	25.76	20.30	1.29	21.06	14.67	1.03	23.00	15.90	0.00	0.00	0.00	1.03	23.00	15.90
20.00	0.98	7.96	1.03	27.01	21.76	1.29	22.46	16.79	1.03	24.41	18.02	0.00	0.00	0.00	1.03	24.41	18.02
25.00	0.98	7.96	1.03	28.26	23.22	1.29	23.87	18.91	1.03	25.82	20.15	0.00	0.00	0.00	1.03	25.81	20.14
NEW YORK / STEUBEN																	
5.00	0.98	7.96	1.21	21.22	15.64	1.17	19.05	10.93	0.96	20.84	12.07	0.00	0.00	0.00	0.89	21.73	12.64
10.00	0.98	7.96	1.21	22.47	17.10	1.17	20.46	13.06	0.96	22.25	14.19	0.00	0.00	0.00	0.89	23.14	14.76
15.00	0.98	7.96	1.21	23.72	18.56	1.17	21.86	15.18	0.96	23.65	16.31	0.00	0.00	0.00	0.89	24.55	16.88
20.00	0.98	7.96	1.21	24.97	20.02	1.17	23.27	17.30	0.96	25.06	18.44	0.00	0.00	0.00	0.89	25.96	19.00
25.00	0.98	7.96	1.21	26.22	21.48	1.17	24.68	19.42	0.96	26.47	20.56	0.00	0.00	0.00	0.89	27.36	21.13
NEW YORK / TIOGA																	
5.00	0.98	7.96	1.31	20.26	14.82	0.95	21.00	12.17	0.00	0.00	0.00	0.00	0.00	0.00	0.84	22.36	13.03
10.00	0.98	7.96	1.31	21.51	16.29	0.95	22.41	14.30	0.00	0.00	0.00	0.00	0.00	0.00	0.84	23.77	15.16
15.00	0.98	7.96	1.31	22.76	17.75	0.95	23.82	16.42	0.00	0.00	0.00	0.00	0.00	0.00	0.84	25.17	17.28
20.00	0.98	7.96	1.31	24.01	19.21	0.95	25.22	18.54	0.00	0.00	0.00	0.00	0.00	0.00	0.84	26.58	19.40
25.00	0.98	7.96	1.31	25.26	20.67	0.95	26.63	20.66	0.00	0.00	0.00	0.00	0.00	0.00	0.84	27.99	21.52

Table C-1. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
NEW YORK / TOMPKINS																	
5.00	0.98	7.96	1.14	21.88	16.20	1.31	18.13	10.35	1.00	20.43	11.81	0.00	0.00	0.00	0.99	20.60	11.92
10.00	0.98	7.96	1.14	23.13	17.66	1.31	19.53	12.47	1.00	21.84	13.93	0.00	0.00	0.00	0.99	22.01	14.04
15.00	0.98	7.96	1.14	24.38	19.12	1.31	20.94	14.59	1.00	23.25	16.06	0.00	0.00	0.00	0.99	23.42	16.16
20.00	0.98	7.96	1.14	25.62	20.58	1.31	22.35	16.72	1.00	24.65	18.18	0.00	0.00	0.00	0.99	24.82	18.29
25.00	0.98	7.96	1.14	26.87	22.04	1.31	23.76	18.84	1.00	26.06	20.30	0.00	0.00	0.00	0.99	26.23	20.41
NEW YORK / WASHINGTON																	
5.00	0.98	7.96	1.42	19.43	14.12	1.67	16.52	9.33	0.00	0.00	0.00	0.00	0.00	0.00	0.80	22.97	13.42
10.00	0.98	7.96	1.42	20.68	15.58	1.67	17.92	11.45	0.00	0.00	0.00	0.00	0.00	0.00	0.80	24.38	15.54
15.00	0.98	7.96	1.42	21.93	17.04	1.67	19.33	13.57	0.00	0.00	0.00	0.00	0.00	0.00	0.80	25.79	17.67
20.00	0.98	7.96	1.42	23.18	18.50	1.67	20.74	15.70	0.00	0.00	0.00	0.00	0.00	0.00	0.80	27.19	19.79
25.00	0.98	7.96	1.42	24.43	19.96	1.67	22.14	17.82	0.00	0.00	0.00	0.00	0.00	0.00	0.80	28.60	21.91
NEW YORK / WAYNE																	
5.00	0.98	7.96	1.09	22.47	16.70	1.12	19.44	11.18	1.09	19.63	11.30	1.32	18.09	10.32	0.97	20.83	12.06
10.00	0.98	7.96	1.09	23.72	18.16	1.12	20.85	13.31	1.09	21.04	13.43	1.32	19.49	12.45	0.97	22.24	14.19
15.00	0.98	7.96	1.09	24.97	19.62	1.12	22.26	15.43	1.09	22.45	15.55	1.32	20.90	14.57	0.97	23.65	16.31
20.00	0.98	7.96	1.09	26.22	21.09	1.12	23.66	17.55	1.09	23.85	17.67	1.32	22.31	16.69	0.97	25.05	18.43
25.00	0.98	7.96	1.09	27.47	22.55	1.12	25.07	19.67	1.09	25.26	19.79	1.32	23.72	18.81	0.97	26.46	20.55
NEW YORK / WYOMING																	
5.00	0.98	7.96	1.08	22.58	16.80	1.17	19.05	10.93	1.70	16.39	9.25	0.90	21.60	12.55	0.87	21.93	12.76
10.00	0.98	7.96	1.08	23.83	18.26	1.17	20.45	13.06	1.70	17.80	11.37	0.90	23.01	14.67	0.87	23.33	14.88
15.00	0.98	7.96	1.08	25.08	19.72	1.17	21.86	15.18	1.70	19.21	13.50	0.90	24.41	16.80	0.87	24.74	17.00
20.00	0.98	7.96	1.08	26.33	21.18	1.17	23.27	17.30	1.70	20.62	15.62	0.90	25.82	18.92	0.87	26.15	19.13
25.00	0.98	7.96	1.08	27.58	22.64	1.17	24.68	19.42	1.70	22.02	17.74	0.90	27.23	21.04	0.87	27.55	21.25
NEW YORK / YATES																	
5.00	0.98	7.96	1.22	21.09	15.53	1.20	18.82	10.79	0.89	21.70	12.61	0.63	26.20	15.47	1.02	20.25	11.69
10.00	0.98	7.96	1.22	22.34	16.99	1.20	20.23	12.91	0.89	23.11	14.74	0.63	27.61	17.59	1.02	21.65	13.82
15.00	0.98	7.96	1.22	23.59	18.45	1.20	21.64	15.04	0.89	24.51	16.86	0.63	29.01	19.71	1.02	23.06	15.94
20.00	0.98	7.96	1.22	24.84	19.91	1.20	23.04	17.16	0.89	25.92	18.98	0.63	30.42	21.83	1.02	24.47	18.06
25.00	0.98	7.96	1.22	26.08	21.37	1.20	24.45	19.28	0.89	27.33	21.10	0.63	31.83	23.96	1.02	25.87	20.18

Table C-1. Continued

PENNSYLVANIA

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
PENNSYLVANIA / ADAMS																	
5.00	0.98	7.96	1.11	22.24	16.51	1.05	19.99	11.53	1.00	20.46	11.83	1.13	19.31	11.10	0.70	24.78	14.57
10.00	0.98	7.96	1.11	23.49	17.97	1.05	21.40	13.66	1.00	21.87	13.95	1.13	20.72	13.22	0.70	26.18	16.69
15.00	0.98	7.96	1.11	24.74	19.43	1.05	22.81	15.78	1.00	23.28	16.08	1.13	22.13	15.35	0.70	27.59	18.81
20.00	0.98	7.96	1.11	25.99	20.89	1.05	24.22	17.90	1.00	24.68	18.20	1.13	23.53	17.47	0.70	29.00	20.93
25.00	0.98	7.96	1.11	27.23	22.35	1.05	25.62	20.02	1.00	26.09	20.32	1.13	24.94	19.59	0.70	30.40	23.06
PENNSYLVANIA / ARMSTRONG																	
5.00	0.98	7.96	1.37	19.76	14.39	0.92	21.33	12.38	1.13	19.37	11.14	0.00	0.00	0.00	0.72	24.25	14.23
10.00	0.96	7.96	1.37	21.01	15.85	0.92	22.74	14.50	1.13	20.78	13.26	0.00	0.00	0.00	0.72	25.66	16.35
15.00	0.98	7.96	1.37	22.26	17.31	0.92	24.14	16.62	1.13	22.19	15.38	0.00	0.00	0.00	0.72	27.06	18.48
20.00	0.98	7.96	1.37	23.50	18.77	0.92	25.55	18.75	1.13	23.59	17.51	0.00	0.00	0.00	0.72	28.47	20.60
25.00	0.98	7.96	1.37	24.75	20.24	0.92	26.96	20.87	1.13	25.00	19.63	0.00	0.00	0.00	0.72	29.88	22.72
PENNSYLVANIA / BEAVER																	
5.00	0.98	7.96	1.47	19.08	13.82	1.43	17.52	9.96	1.56	16.93	9.59	0.00	0.00	0.00	0.93	24.23	12.32
10.00	0.98	7.96	1.47	20.33	15.28	1.43	18.93	12.09	1.56	18.33	11.71	0.00	0.00	0.00	0.93	22.64	14.44
15.00	0.98	7.96	1.47	21.58	16.74	1.43	20.33	14.21	1.56	19.74	13.83	0.00	0.00	0.00	0.93	24.05	16.56
20.00	0.98	7.96	1.47	22.83	18.20	1.43	21.74	16.33	1.56	21.15	15.96	0.00	0.00	0.00	0.93	25.45	18.69
25.00	0.98	7.96	1.47	24.08	19.66	1.43	23.15	18.46	1.56	22.56	18.08	0.00	0.00	0.00	0.93	26.86	20.81
PENNSYLVANIA / BEDFORD																	
5.00	0.98	7.96	1.51	18.81	13.58	1.09	19.62	11.29	1.18	18.93	10.86	0.82	22.72	13.26	0.77	23.48	13.74
10.00	0.98	7.96	1.51	20.06	15.04	1.09	21.02	13.42	1.18	20.34	12.98	0.82	24.12	15.38	0.77	24.88	15.86
15.00	0.98	7.96	1.51	21.31	16.51	1.09	22.43	15.54	1.18	21.75	15.11	0.82	25.53	17.51	0.77	26.29	17.99
20.00	0.98	7.96	1.51	22.56	17.97	1.09	23.84	17.66	1.18	23.16	17.23	0.82	26.94	19.63	0.77	27.70	20.11
25.00	0.98	7.96	1.51	23.81	19.43	1.09	25.25	19.78	1.18	24.56	19.35	0.82	28.35	21.75	0.77	29.11	22.23
PENNSYLVANIA / BERKS																	
5.00	0.98	7.96	1.45	19.19	13.91	1.30	18.20	10.39	1.29	18.25	10.43	0.78	23.27	13.61	0.75	23.78	13.94
10.00	0.98	7.96	1.45	20.44	15.37	1.30	19.60	12.52	1.29	19.66	12.55	0.78	24.68	15.74	0.75	25.19	16.06
15.00	0.98	7.96	1.45	21.69	16.83	1.30	21.01	14.64	1.29	21.06	14.67	0.78	26.09	17.86	0.75	26.60	18.18
20.00	0.98	7.96	1.45	22.94	18.29	1.30	22.42	16.76	1.29	22.47	16.80	0.78	27.50	19.98	0.75	28.01	20.30
25.00	0.98	7.96	1.45	24.18	19.75	1.30	23.83	18.88	1.29	23.88	18.92	0.78	28.90	22.10	0.75	29.41	22.43

Table C-1. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
PENNSYLVANIA / BLAIR																	
5.00	0.98	7.96	1.50	18.89	13.66	1.12	19.44	11.18	1.36	17.85	10.18	0.93	21.18	12.28	0.81	22.76	13.29
10.00	0.98	7.96	1.50	20.14	15.12	1.12	20.85	13.31	1.36	19.26	12.30	0.93	22.58	14.41	0.81	24.17	15.41
15.00	0.98	7.96	1.50	21.39	16.58	1.12	22.26	15.43	1.36	20.67	14.42	0.93	23.99	16.53	0.81	25.58	17.53
20.00	0.98	7.96	1.50	22.64	18.04	1.12	23.66	17.55	1.36	22.08	16.54	0.93	25.40	18.65	0.81	26.98	19.66
25.00	0.98	7.96	1.50	23.89	19.50	1.12	25.07	19.67	1.36	23.48	18.67	0.93	26.81	20.77	0.81	28.39	21.78
PENNSYLVANIA / BRADFORD																	
5.00	0.98	7.96	1.19	21.40	15.80	1.05	20.02	11.55	0.81	22.73	13.27	0.00	0.00	0.00	0.69	24.94	14.67
10.00	0.98	7.96	1.19	22.65	17.26	1.05	21.43	13.67	0.81	24.14	15.39	0.00	0.00	0.00	0.69	26.35	16.79
15.00	0.98	7.96	1.19	23.90	18.72	1.05	22.83	15.79	0.81	25.55	17.52	0.00	0.00	0.00	0.69	27.75	18.91
20.00	0.98	7.96	1.19	25.15	20.18	1.05	24.24	17.92	0.81	26.96	19.64	0.00	0.00	0.00	0.69	29.16	21.04
25.00	0.98	7.96	1.19	26.40	21.64	1.05	25.65	20.04	0.81	28.36	21.76	0.00	0.00	0.00	0.69	30.57	23.16
PENNSYLVANIA / BUCKS																	
5.00	0.98	7.96	1.26	20.71	15.20	1.14	19.22	11.05	1.12	19.42	11.17	0.98	20.71	11.98	0.70	24.66	14.49
10.00	0.98	7.96	1.26	21.96	16.67	1.14	20.63	13.17	1.12	20.83	13.29	0.98	22.11	14.11	0.70	26.06	16.61
15.00	0.98	7.96	1.26	23.21	18.13	1.14	22.04	15.29	1.12	22.24	15.42	0.98	23.52	16.23	0.70	27.47	18.73
20.00	0.98	7.96	1.26	24.46	19.59	1.14	23.45	17.41	1.12	23.64	17.54	0.98	24.93	18.35	0.70	28.88	20.86
25.00	0.98	7.96	1.26	25.71	21.05	1.14	24.85	19.54	1.12	25.05	19.66	0.98	26.33	20.47	0.70	30.29	22.98
PENNSYLVANIA / BUTLER																	
5.00	0.98	7.96	1.36	19.88	14.50	1.14	19.22	11.05	1.24	18.56	10.62	1.09	19.65	11.32	0.85	22.16	12.91
10.00	0.98	7.96	1.36	21.13	15.96	1.14	20.63	13.17	1.24	19.97	12.75	1.09	21.06	13.44	0.85	23.57	15.03
15.00	0.98	7.96	1.36	22.38	17.42	1.14	22.04	15.29	1.24	21.37	14.87	1.09	22.46	15.56	0.85	24.98	17.15
20.00	0.98	7.96	1.36	23.63	18.88	1.14	23.45	17.41	1.24	22.78	16.99	1.09	23.87	17.68	0.85	26.39	19.28
25.00	0.98	7.96	1.36	24.88	20.34	1.14	24.85	19.54	1.24	24.19	19.11	1.09	25.28	19.81	0.85	27.79	21.40
PENNSYLVANIA / CARBON																	
5.00	0.98	7.96	0.80	27.28	20.81	0.91	21.50	12.49	0.86	22.04	12.83	0.72	24.40	14.33	0.61	26.93	15.93
10.00	0.98	7.96	0.80	28.53	22.27	0.91	22.91	14.61	0.86	23.44	14.95	0.72	25.81	16.45	0.61	28.34	18.06
15.00	0.98	7.96	0.80	29.78	23.73	0.91	24.32	16.74	0.86	24.85	17.07	0.72	27.22	18.58	0.61	29.75	20.18
20.00	0.98	7.96	0.80	31.03	25.19	0.91	25.73	18.86	0.86	26.26	19.20	0.72	28.63	20.70	0.61	31.16	22.30
25.00	0.98	7.96	0.80	32.28	26.65	0.91	27.13	20.98	0.86	27.67	21.32	0.72	30.03	22.82	0.61	32.56	24.42

Table C-1. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
							PENNSYLVANIA / CENTRE										
5.00	0.98	7.96	1.39	19.67	14.32	1.16	19.11	10.97	1.11	19.51	14.23	1.58	16.86	9.54	0.82	22.64	13.21
10.00	0.98	7.96	1.39	20.92	15.78	1.16	20.52	13.09	1.11	20.91	13.35	1.58	18.26	11.67	0.82	24.04	15.33
15.00	0.98	7.96	1.39	22.17	17.24	1.16	21.92	15.22	1.11	22.32	15.47	1.58	19.67	13.79	0.82	25.45	17.45
20.00	0.98	7.96	1.39	23.42	18.70	1.16	23.33	17.34	1.11	23.73	17.59	1.58	21.08	15.91	0.82	26.86	19.58
25.00	0.98	7.96	1.39	24.67	20.16	1.16	24.74	19.46	1.11	25.14	19.72	1.58	22.49	18.03	0.82	28.27	21.70
							PENNSYLVANIA / CHESTER										
5.00	0.98	7.96	1.57	18.43	13.26	1.36	17.86	10.18	1.33	18.01	10.28	0.81	22.77	13.29	0.79	23.12	13.52
10.00	0.98	7.96	1.57	19.68	14.72	1.36	19.27	12.30	1.33	19.42	12.40	0.81	24.18	15.42	0.79	24.53	15.64
15.00	0.98	7.96	1.57	20.92	16.18	1.36	20.67	14.43	1.33	20.83	14.52	0.81	25.58	17.54	0.79	25.94	17.76
20.00	0.98	7.96	1.57	22.17	17.64	1.36	22.08	16.55	1.33	22.23	16.64	0.81	26.99	19.66	0.79	27.34	19.88
25.00	0.98	7.96	1.57	23.42	19.10	1.36	23.49	18.67	1.33	23.64	18.77	0.81	28.40	21.78	0.79	28.75	22.01
							PENNSYLVANIA / CLARION										
5.00	0.98	7.96	1.47	19.06	13.80	0.90	21.59	12.55	0.80	22.95	13.41	0.00	0.00	0.00	0.77	23.44	13.72
10.00	0.98	7.96	1.47	20.31	15.26	0.90	23.00	14.67	0.80	24.35	15.53	0.00	0.00	0.00	0.77	24.84	15.84
15.00	0.98	7.96	1.47	21.56	16.72	0.90	24.40	16.79	0.80	25.76	17.65	0.00	0.00	0.00	0.77	26.25	17.96
20.00	0.98	7.96	1.47	22.81	18.18	0.90	25.81	18.91	0.80	27.17	19.77	0.00	0.00	0.00	0.77	27.66	20.08
25.00	0.98	7.96	1.47	24.06	19.64	0.90	27.22	21.04	0.80	28.58	21.90	0.00	0.00	0.00	0.77	29.07	22.21
							PENNSYLVANIA / CLINTON										
5.00	0.98	7.96	1.48	18.98	13.73	0.96	20.89	12.10	1.36	17.87	10.19	0.00	0.00	0.00	0.73	24.20	14.20
10.00	0.98	7.96	1.48	20.23	15.19	0.96	22.30	14.22	1.36	19.28	12.31	0.00	0.00	0.00	0.73	25.61	16.32
15.00	0.98	7.96	1.48	21.48	16.65	0.96	23.71	16.35	1.36	20.68	14.43	0.00	0.00	0.00	0.73	27.01	18.44
20.00	0.98	7.96	1.48	22.73	18.11	0.96	25.11	18.47	1.36	22.09	16.55	0.00	0.00	0.00	0.73	28.42	20.57
25.00	0.98	7.96	1.48	23.98	19.57	0.96	26.52	20.59	1.36	23.50	18.68	0.00	0.00	0.00	0.73	29.83	22.69
							PENNSYLVANIA / COLUMBIA										
5.00	0.98	7.96	1.17	21.58	15.95	1.00	20.52	11.87	0.92	21.36	12.40	0.84	22.39	13.05	0.80	22.89	13.37
10.00	0.98	7.96	1.17	22.83	17.41	1.00	21.93	13.99	0.92	22.77	14.52	0.84	23.80	15.17	0.80	24.30	15.49
15.00	0.98	7.96	1.17	24.08	18.87	1.00	23.34	16.11	0.92	24.18	16.65	0.84	25.20	17.30	0.80	25.70	17.61
20.00	0.98	7.96	1.17	25.33	20.33	1.00	24.74	18.24	0.92	25.58	18.77	0.84	26.61	19.42	0.80	27.11	19.74
25.00	0.98	7.96	1.17	26.58	21.79	1.00	26.15	20.36	0.92	26.99	20.89	0.84	28.02	21.54	0.80	28.52	21.86

Table C-1. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
PENNSYLVANIA / CRAWFORD																	
5.00	0.98	7.96	1.47	19.10	13.83	1.47	17.32	9.84	0.89	21.71	12.62	1.14	19.27	11.07	0.81	22.85	13.34
10.00	0.98	7.96	1.47	20.35	15.29	1.47	18.72	11.96	0.89	23.12	14.74	1.14	20.67	13.20	0.81	24.25	15.46
15.00	0.98	7.96	1.47	21.59	16.75	1.47	20.13	14.08	0.89	24.52	16.87	1.14	22.08	15.32	0.81	25.66	17.59
20.00	0.98	7.96	1.47	22.84	18.21	1.47	21.54	16.20	0.89	25.93	18.99	1.14	23.49	17.44	0.81	27.07	19.71
25.00	0.98	7.96	1.47	24.09	19.67	1.47	22.95	18.33	0.89	27.34	21.11	1.14	24.90	19.56	0.81	28.48	21.83
PENNSYLVANIA / CUMBERLAND																	
5.00	0.98	7.96	1.34	20.00	14.60	1.23	18.62	10.66	1.13	19.31	11.10	0.98	20.68	11.97	0.77	23.35	13.66
10.00	0.98	7.96	1.34	21.25	16.06	1.23	20.02	12.78	1.13	20.72	13.22	0.98	22.09	14.09	0.77	24.75	15.78
15.00	0.98	7.96	1.34	22.50	17.52	1.23	21.43	14.91	1.13	22.13	15.35	0.98	23.50	16.21	0.77	26.16	17.90
20.00	0.98	7.96	1.34	23.75	18.99	1.23	22.84	17.03	1.13	23.53	17.47	0.98	24.90	18.34	0.77	27.57	20.03
25.00	0.98	7.96	1.34	25.00	20.45	1.23	24.25	19.15	1.13	24.94	19.59	0.98	26.31	20.46	0.77	28.98	22.15
PENNSYLVANIA / DAUPHIN																	
5.00	0.98	7.96	1.39	19.63	14.29	1.18	18.94	10.87	1.08	19.71	11.35	0.78	23.29	13.62	0.74	23.92	14.02
10.00	0.98	7.96	1.39	20.88	15.75	1.18	20.35	12.99	1.08	21.12	13.48	0.78	24.70	15.75	0.74	25.33	16.14
15.00	0.98	7.96	1.39	22.13	17.21	1.18	21.76	15.11	1.08	22.52	15.60	0.78	26.10	17.87	0.74	26.73	18.27
20.00	0.98	7.96	1.39	23.38	18.67	1.18	23.16	17.23	1.08	23.93	17.72	0.78	27.51	19.99	0.74	28.14	20.39
25.00	0.98	7.96	1.39	24.63	20.13	1.18	24.57	19.36	1.08	25.34	19.84	0.78	28.92	22.11	0.74	29.55	22.51
PENNSYLVANIA / ERIE																	
5.00	0.98	7.96	1.39	19.64	14.29	1.25	18.48	10.58	1.45	17.39	9.88	1.14	19.24	11.06	0.90	21.62	12.56
10.00	0.98	7.96	1.39	20.89	15.76	1.25	19.89	12.70	1.45	18.79	12.00	1.14	20.65	13.18	0.90	23.03	14.69
15.00	0.98	7.96	1.39	22.14	17.22	1.25	21.30	14.82	1.45	20.20	14.13	1.14	22.06	15.30	0.90	24.43	16.81
20.00	0.98	7.96	1.39	23.39	18.68	1.25	22.70	16.94	1.45	21.61	16.25	1.14	23.47	17.43	0.90	25.84	18.93
25.00	0.98	7.96	1.39	24.64	20.14	1.25	24.11	19.07	1.45	23.02	18.37	1.14	24.87	19.55	0.90	27.25	21.05
PENNSYLVANIA / FAYETTE																	
5.00	0.98	7.96	1.46	19.14	13.87	1.22	18.72	10.73	1.27	18.35	10.49	0.00	0.00	0.00	0.81	22.80	13.31
10.00	0.98	7.96	1.46	20.39	15.33	1.22	20.13	12.85	1.27	19.75	12.61	0.00	0.00	0.00	0.81	24.21	15.44
15.00	0.98	7.96	1.46	21.64	16.79	1.22	21.53	14.97	1.27	21.16	14.73	0.00	0.00	0.00	0.81	25.62	17.56
20.00	0.98	7.96	1.46	22.89	18.25	1.22	22.94	17.09	1.27	22.57	16.86	0.00	0.00	0.00	0.81	27.02	19.68
25.00	0.98	7.96	1.46	24.14	19.71	1.22	24.35	19.22	1.27	23.97	18.98	0.00	0.00	0.00	0.81	28.43	21.80

Table C-1. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
PENNSYLVANIA / FRANKLIN																	
5.00	0.98	7.96	1.37	19.79	14.42	1.24	18.53	10.61	1.14	19.22	11.04	0.91	21.41	12.43	0.73	24.22	14.22
10.00	0.98	7.96	1.37	21.04	15.88	1.24	19.94	12.73	1.14	20.63	13.17	0.91	22.82	14.56	0.73	25.63	16.34
15.00	0.98	7.96	1.37	22.29	17.34	1.24	21.35	14.85	1.14	22.04	15.29	0.91	24.23	16.68	0.73	27.04	18.46
20.00	0.98	7.96	1.37	23.53	18.80	1.24	22.76	16.98	1.14	23.44	17.41	0.91	25.63	18.80	0.73	28.45	20.58
25.00	0.98	7.96	1.37	24.78	20.26	1.24	24.16	19.10	1.14	24.85	19.53	0.91	27.04	20.92	0.73	29.85	22.71
PENNSYLVANIA / FULTON																	
5.00	0.98	7.96	1.29	20.44	14.97	0.96	20.89	12.10	1.01	20.35	11.76	0.37	37.69	22.75	0.71	24.49	14.38
10.00	0.98	7.96	1.29	21.69	16.44	0.96	22.30	14.23	1.01	21.75	13.88	0.37	39.09	24.87	0.71	25.90	16.51
15.00	0.98	7.96	1.29	22.94	17.90	0.96	23.71	16.35	1.01	23.16	16.00	0.37	40.50	27.00	0.71	27.30	18.63
20.00	0.98	7.96	1.29	24.19	19.36	0.96	25.11	18.47	1.01	24.57	18.12	0.37	41.90	29.12	0.71	28.71	20.75
25.00	0.98	7.96	1.29	25.44	20.82	0.96	26.52	20.59	1.01	25.98	20.25	0.37	43.32	31.24	0.71	30.12	22.87
PENNSYLVANIA / HUNTINGDON																	
5.00	0.98	7.96	1.48	18.98	13.73	0.99	20.54	11.88	1.21	18.77	10.76	0.00	0.00	0.00	0.68	25.05	14.74
10.00	0.98	7.96	1.48	20.23	15.19	0.99	21.95	14.00	1.21	20.18	12.88	0.00	0.00	0.00	0.68	26.46	16.86
15.00	0.98	7.96	1.48	21.48	16.65	0.99	23.36	16.13	1.21	21.59	15.01	0.00	0.00	0.00	0.68	27.87	18.99
20.00	0.98	7.96	1.48	22.73	18.11	0.99	24.76	18.25	1.21	23.00	17.13	0.00	0.00	0.00	0.68	29.28	21.11
25.00	0.98	7.96	1.48	23.98	19.58	0.99	26.17	20.37	1.21	24.40	19.25	0.00	0.00	0.00	0.68	30.68	23.23
PENNSYLVANIA / INDIANA																	
5.00	0.98	7.96	1.35	19.95	14.55	0.99	20.60	11.92	1.05	19.99	11.53	0.59	27.48	16.28	0.78	23.30	13.63
10.00	0.98	7.96	1.35	21.20	16.01	0.99	22.01	14.04	1.05	21.40	13.65	0.59	28.89	18.40	0.78	24.70	15.75
15.00	0.98	7.96	1.35	22.44	17.48	0.99	23.41	16.16	1.05	22.80	15.78	0.59	30.29	20.52	0.78	26.11	17.87
20.00	0.98	7.96	1.35	23.69	18.94	0.99	24.82	18.29	1.05	24.21	17.90	0.59	31.70	22.65	0.78	27.52	19.99
25.00	0.98	7.96	1.35	24.94	20.40	0.99	26.23	20.41	1.05	25.62	20.02	0.59	33.11	24.77	0.78	28.93	22.12
PENNSYLVANIA / JEFFERSON																	
5.00	0.98	7.96	1.27	20.64	15.14	1.14	19.24	11.05	1.01	20.33	11.75	0.00	0.00	0.00	0.71	24.54	14.41
10.00	0.98	7.96	1.27	21.89	16.60	1.14	20.65	13.18	1.01	21.74	13.87	0.00	0.00	0.00	0.71	25.94	16.54
15.00	0.98	7.96	1.27	23.14	18.07	1.14	22.05	15.30	1.01	23.14	15.99	0.00	0.00	0.00	0.71	27.35	18.66
20.00	0.98	7.96	1.27	24.39	19.53	1.14	23.46	17.42	1.01	24.55	18.11	0.00	0.00	0.00	0.71	28.76	20.78
25.00	0.98	7.96	1.27	25.64	20.99	1.14	24.87	19.55	1.01	25.96	20.24	0.00	0.00	0.00	0.71	30.16	22.90

Table C-1. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
PENNSYLVANIA / JUNIATA																	
5.00	0.98	7.96	1.33	20.11	14.69	0.97	20.79	12.04	1.02	20.24	11.69	0.00	0.00	0.00	0.57	28.08	16.66
10.00	0.98	7.96	1.33	21.36	16.15	0.97	22.20	14.16	1.02	21.65	13.81	0.00	0.00	0.00	0.57	29.48	18.78
15.00	0.98	7.96	1.33	22.61	17.61	0.97	23.61	16.28	1.02	23.05	15.93	0.00	0.00	0.00	0.57	30.89	20.90
20.00	0.98	7.96	1.33	23.86	19.08	0.97	25.01	18.41	1.02	24.46	18.06	0.00	0.00	0.00	0.57	32.30	23.03
25.00	0.98	7.96	1.33	25.11	20.54	0.97	26.42	20.53	1.02	25.87	20.18	0.00	0.00	0.00	0.57	33.71	25.15
PENNSYLVANIA / LANCASTER																	
5.00	0.98	7.96	1.71	17.69	12.63	1.44	17.46	9.93	1.35	17.93	10.22	0.89	21.75	12.65	0.81	22.72	13.26
10.00	0.98	7.96	1.71	18.94	14.09	1.44	18.87	12.05	1.35	19.33	12.35	0.89	23.16	14.77	0.81	24.13	15.38
15.00	0.98	7.96	1.71	20.18	15.55	1.44	20.28	14.17	1.35	20.74	14.47	0.89	24.56	16.89	0.81	25.53	17.51
20.00	0.98	7.96	1.71	21.43	17.01	1.44	21.68	16.30	1.35	22.15	16.59	0.89	25.97	19.01	0.81	26.94	19.63
25.00	0.98	7.96	1.71	22.68	18.47	1.44	23.09	18.42	1.35	23.56	18.71	0.89	27.38	21.14	0.81	28.35	21.75
PENNSYLVANIA / LAURENCE																	
5.00	0.98	7.96	1.28	20.56	15.08	1.05	20.00	11.54	1.27	18.35	10.49	0.00	0.00	0.00	0.83	22.49	13.12
10.00	0.98	7.96	1.28	21.81	16.54	1.05	21.41	13.66	1.27	19.76	12.62	0.00	0.00	0.00	0.83	23.90	15.24
15.00	0.98	7.96	1.28	23.06	18.00	1.05	22.82	15.79	1.27	21.17	14.74	0.00	0.00	0.00	0.83	25.30	17.36
20.00	0.98	7.96	1.28	24.31	19.46	1.05	24.23	17.91	1.27	22.57	16.86	0.00	0.00	0.00	0.83	26.71	19.48
25.00	0.98	7.96	1.28	25.56	20.92	1.05	25.63	20.03	1.27	23.98	18.98	0.00	0.00	0.00	0.83	28.12	21.61
PENNSYLVANIA / LEBANON																	
5.00	0.98	7.96	1.55	18.58	13.39	1.35	17.93	10.23	1.37	17.82	10.16	0.86	22.13	12.88	0.77	23.48	13.74
10.00	0.98	7.96	1.55	19.83	14.85	1.35	19.34	12.35	1.37	19.23	12.28	0.86	23.53	15.01	0.77	24.89	15.87
15.00	0.98	7.96	1.55	21.08	16.31	1.35	20.74	14.47	1.37	20.64	14.40	0.86	24.94	17.13	0.77	26.29	17.99
20.00	0.98	7.96	1.55	22.33	17.77	1.35	22.15	16.59	1.37	22.05	16.53	0.86	26.35	19.25	0.77	27.70	20.11
25.00	0.98	7.96	1.55	23.58	19.24	1.35	23.56	18.72	1.37	23.45	18.65	0.86	27.75	21.38	0.77	29.11	22.23
PENNSYLVANIA / LEHIGH																	
5.00	0.98	7.96	1.42	19.45	14.13	1.31	18.13	10.35	1.06	19.90	11.47	0.00	0.00	0.00	0.87	21.91	12.75
10.00	0.98	7.96	1.42	20.70	15.59	1.31	19.54	12.48	1.06	21.31	13.60	0.00	0.00	0.00	0.87	23.32	14.87
15.00	0.98	7.96	1.42	21.95	17.05	1.31	20.95	14.60	1.06	22.71	15.72	0.00	0.00	0.00	0.87	24.73	17.00
20.00	0.98	7.96	1.42	23.20	18.51	1.31	22.36	16.72	1.06	24.12	17.84	0.00	0.00	0.00	0.87	26.14	19.12
25.00	0.98	7.96	1.42	24.45	19.97	1.31	23.76	18.84	1.06	25.53	19.96	0.00	0.00	0.00	0.87	27.54	21.24

Table C-1. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
PENNSYLVANIA / LUZERNE																	
5.00	0.98	7.96	1.18	21.53	15.91	0.93	21.27	12.34	1.26	18.41	10.53	0.65	25.73	15.17	0.76	23.52	13.77
10.00	0.98	7.96	1.18	22.78	17.37	0.93	22.67	14.46	1.26	19.82	12.65	0.65	27.14	17.29	0.76	24.93	15.89
15.00	0.98	7.96	1.18	24.03	18.83	0.93	24.08	16.59	1.26	21.23	14.78	0.65	28.55	19.42	0.76	26.34	18.01
20.00	0.98	7.96	1.18	25.28	20.29	0.93	25.49	18.71	1.26	22.64	16.90	0.65	29.95	21.54	0.76	27.74	20.14
25.00	0.98	7.96	1.18	26.53	21.75	0.93	26.90	20.83	1.26	24.04	19.02	0.65	31.36	23.66	0.76	29.15	22.26
PENNSYLVANIA / LYCOMING																	
5.00	0.98	7.96	1.32	20.17	14.75	0.86	22.13	12.89	0.77	23.45	13.73	0.00	0.00	0.00	0.74	23.90	14.01
10.00	0.98	7.96	1.32	21.42	16.21	0.86	23.53	15.01	0.77	24.86	15.85	0.00	0.00	0.00	0.74	25.30	16.13
15.00	0.98	7.96	1.32	22.67	17.67	0.86	24.94	17.13	0.77	26.27	17.97	0.00	0.00	0.00	0.74	26.71	18.25
20.00	0.98	7.96	1.32	23.92	19.13	0.86	26.35	19.25	0.77	27.68	20.10	0.00	0.00	0.00	0.74	28.12	20.38
25.00	0.98	7.96	1.32	25.17	20.59	0.86	27.76	21.38	0.77	29.08	22.22	0.00	0.00	0.00	0.74	29.53	22.50
PENNSYLVANIA / MERCER																	
5.00	0.98	7.96	1.47	19.07	13.80	1.11	19.49	11.21	1.06	19.91	11.48	0.47	31.68	18.94	0.78	23.29	13.62
10.00	0.98	7.96	1.47	20.32	15.27	1.11	20.89	13.34	1.06	21.32	13.60	0.47	33.08	21.06	0.78	24.70	15.75
15.00	0.98	7.96	1.47	21.57	16.73	1.11	22.30	15.46	1.06	22.73	15.73	0.47	34.49	23.19	0.78	26.10	17.87
20.00	0.98	7.96	1.47	22.81	18.19	1.11	23.71	17.58	1.06	24.13	17.85	0.47	35.90	25.31	0.78	27.51	19.99
25.00	0.98	7.96	1.47	24.06	19.65	1.11	25.12	19.70	1.06	25.54	19.97	0.47	37.31	27.43	0.78	28.92	22.11
PENNSYLVANIA / MIFFLIN																	
5.00	0.98	7.96	1.55	18.56	13.37	1.12	19.44	11.18	0.91	21.43	12.45	0.00	0.00	0.00	0.79	23.17	13.55
10.00	0.98	7.96	1.55	19.81	14.83	1.12	20.85	13.31	0.91	22.84	14.57	0.00	0.00	0.00	0.79	24.58	15.67
15.00	0.98	7.96	1.55	21.06	16.29	1.12	22.26	15.43	0.91	24.25	16.69	0.00	0.00	0.00	0.79	25.98	17.79
20.00	0.98	7.96	1.55	22.31	17.75	1.12	23.67	17.55	0.91	25.65	18.81	0.00	0.00	0.00	0.79	27.39	19.91
25.00	0.98	7.96	1.55	23.56	19.21	1.12	25.07	19.67	0.91	27.06	20.94	0.00	0.00	0.00	0.79	28.80	22.04
PENNSYLVANIA / MONROE																	
5.00	0.98	7.96	1.15	21.80	16.13	1.12	19.43	11.17	0.96	20.86	12.09	0.40	35.35	21.27	0.55	28.55	16.96
10.00	0.98	7.96	1.15	23.05	17.59	1.12	20.83	13.30	0.96	22.27	14.21	0.40	36.75	23.39	0.55	29.96	19.08
15.00	0.98	7.96	1.15	24.30	19.05	1.12	22.24	15.42	0.96	23.68	16.33	0.40	38.16	25.51	0.55	31.37	21.21
20.00	0.98	7.96	1.15	25.54	20.51	1.12	23.65	17.54	0.96	25.09	18.45	0.40	39.57	27.63	0.55	32.77	23.33
25.00	0.98	7.96	1.15	26.79	21.97	1.12	25.05	19.66	0.96	26.49	20.58	0.40	40.98	29.76	0.55	34.18	25.45

Table C-1. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
PENNSYLVANIA / MONTGOMERY																	
5.00	0.98	7.96	1.29	20.41	14.95	1.10	19.59	11.28	1.20	18.80	10.77	0.88	21.86	12.72	0.72	24.25	14.23
10.00	0.98	7.96	1.29	21.66	16.41	1.10	21.00	13.40	1.20	20.20	12.90	0.88	23.27	14.84	0.72	25.66	16.35
15.00	0.98	7.96	1.29	22.90	17.87	1.10	22.40	15.52	1.20	21.61	15.02	0.88	24.67	16.96	0.72	27.06	18.48
20.00	0.98	7.96	1.29	24.15	19.33	1.10	23.81	17.64	1.20	23.02	17.14	0.88	26.08	19.08	0.72	28.47	20.60
25.00	0.98	7.96	1.29	25.40	20.79	1.10	25.22	19.77	1.20	24.43	19.26	0.88	27.49	21.21	0.72	29.88	22.72
PENNSYLVANIA / MONTOUR																	
5.00	0.98	7.96	1.14	21.90	16.22	0.95	20.99	12.16	1.02	20.31	11.73	0.00	0.00	0.00	0.73	24.21	14.20
10.00	0.98	7.96	1.14	23.15	17.68	0.95	22.40	14.29	1.02	21.72	13.86	0.00	0.00	0.00	0.73	25.61	16.33
15.00	0.98	7.96	1.14	24.40	19.14	0.95	23.80	16.41	1.02	23.12	15.98	0.00	0.00	0.00	0.73	27.02	18.45
20.00	0.98	7.96	1.14	25.65	20.60	0.95	25.21	18.53	1.02	24.53	18.10	0.00	0.00	0.00	0.73	28.43	20.57
25.00	0.98	7.96	1.14	26.90	22.07	0.95	26.62	20.66	1.02	25.94	20.22	0.00	0.00	0.00	0.73	29.84	22.69
PENNSYLVANIA / NORTHAMPTON																	
5.00	0.98	7.96	1.31	20.28	14.84	1.39	17.68	10.07	1.15	19.15	11.00	0.00	0.00	0.00	0.82	22.61	13.19
10.00	0.98	7.96	1.31	21.53	16.30	1.39	19.09	12.19	1.15	20.56	13.12	0.00	0.00	0.00	0.82	24.02	15.31
15.00	0.98	7.96	1.31	22.78	17.76	1.39	20.50	14.31	1.15	21.97	15.25	0.00	0.00	0.00	0.82	25.42	17.44
20.00	0.98	7.96	1.31	24.03	19.22	1.39	21.90	16.44	1.15	23.38	17.37	0.00	0.00	0.00	0.82	26.83	19.56
25.00	0.98	7.96	1.31	25.28	20.68	1.39	23.31	18.56	1.15	24.78	19.49	0.00	0.00	0.00	0.82	28.24	21.68
PENNSYLVANIA / NORTHUMBERLAND																	
5.00	0.98	7.96	1.31	20.29	14.85	1.00	20.49	11.85	1.15	19.18	11.02	0.72	24.23	14.22	0.75	23.81	13.95
10.00	0.98	7.96	1.31	21.54	16.31	1.00	21.90	13.97	1.15	20.59	13.14	0.72	25.64	16.34	0.75	25.21	16.07
15.00	0.98	7.96	1.31	22.79	17.77	1.00	23.31	16.09	1.15	21.99	15.26	0.72	27.05	18.47	0.75	26.62	18.20
20.00	0.98	7.96	1.31	24.04	19.23	1.00	24.71	18.22	1.15	23.40	17.39	0.72	28.46	20.59	0.75	28.03	20.32
25.00	0.98	7.96	1.31	25.29	20.69	1.00	26.12	20.34	1.15	24.81	19.51	0.72	29.86	22.71	0.75	29.44	22.44
PENNSYLVANIA / PERRY																	
5.00	0.98	7.96	1.39	19.64	14.29	1.00	20.48	11.84	1.12	19.41	11.17	0.65	25.80	15.21	0.61	26.69	15.78
10.00	0.98	7.96	1.39	20.89	15.76	1.00	21.89	13.96	1.12	20.82	13.29	0.65	27.20	17.34	0.61	28.09	17.90
15.00	0.98	7.96	1.39	22.14	17.22	1.00	23.29	16.09	1.12	22.23	15.41	0.65	28.61	19.46	0.61	29.50	20.02
20.00	0.98	7.96	1.39	23.39	18.68	1.00	24.70	18.21	1.12	23.64	17.53	0.65	30.02	21.58	0.61	30.91	22.14
25.00	0.98	7.96	1.39	24.64	20.14	1.00	26.11	20.33	1.12	25.04	19.66	0.65	31.43	23.70	0.61	32.32	24.27

Table C-1. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
PENNSYLVANIA / SCHUYLKILL																	
5.00	0.98	7.96	1.18	21.45	15.84	0.97	20.82	12.06	0.98	20.67	11.96	1.27	18.40	10.52	0.71	24.50	14.39
10.00	0.98	7.96	1.18	22.70	17.30	0.97	22.23	14.18	0.98	22.08	14.08	1.27	19.80	12.64	0.71	25.91	16.51
15.00	0.98	7.96	1.18	23.95	18.76	0.97	23.64	16.30	0.98	23.48	16.21	1.27	21.21	14.77	0.71	27.31	18.63
20.00	0.98	7.96	1.18	25.20	20.22	0.97	25.05	18.43	0.98	24.89	18.33	1.27	22.62	16.89	0.71	28.72	20.76
25.00	0.98	7.96	1.18	26.45	21.68	0.97	26.45	20.55	0.98	26.30	20.45	1.27	24.02	19.01	0.71	30.13	22.88
PENNSYLVANIA / SNYDER																	
5.00	0.98	7.96	1.27	20.63	15.13	0.90	21.52	12.50	1.04	20.08	11.59	0.00	0.00	0.00	0.67	25.40	14.96
10.00	0.98	7.96	1.27	21.88	16.59	0.90	22.93	14.62	1.04	21.49	13.71	0.00	0.00	0.00	0.67	26.81	17.09
15.00	0.98	7.96	1.27	23.13	18.06	0.90	24.33	16.74	1.04	22.89	15.83	0.00	0.00	0.00	0.67	28.22	19.21
20.00	0.98	7.96	1.27	24.38	19.52	0.90	25.74	18.87	1.04	24.30	17.95	0.00	0.00	0.00	0.67	29.62	21.33
25.00	0.98	7.96	1.27	25.62	20.98	0.90	27.15	20.99	1.04	25.71	20.08	0.00	0.00	0.00	0.67	31.03	23.45
PENNSYLVANIA / SOMERSET																	
5.00	0.98	7.96	1.43	19.37	14.07	1.00	20.46	11.83	1.14	19.23	11.05	0.66	25.61	15.10	0.88	21.81	12.68
10.00	0.98	7.96	1.43	20.62	15.53	1.00	21.87	13.95	1.14	20.63	13.17	0.66	27.02	17.22	0.88	23.22	14.81
15.00	0.98	7.96	1.43	21.87	16.99	1.00	23.28	16.07	1.14	22.04	15.29	0.66	28.43	19.34	0.88	24.62	16.93
20.00	0.98	7.96	1.43	23.12	18.45	1.00	24.68	18.20	1.14	23.45	17.41	0.66	29.83	21.46	0.88	26.03	19.05
25.00	0.98	7.96	1.43	24.37	19.91	1.00	26.09	20.32	1.14	24.85	19.54	0.66	31.24	23.59	0.88	27.44	21.17
PENNSYLVANIA / TIOGA																	
5.00	0.98	7.96	1.21	21.22	15.64	1.46	17.37	9.87	0.81	22.82	13.32	0.00	0.00	0.00	0.64	26.09	15.40
10.00	0.98	7.96	1.21	22.47	17.10	1.46	18.78	11.99	0.81	24.23	15.45	0.00	0.00	0.00	0.64	27.50	17.52
15.00	0.98	7.96	1.21	23.72	18.56	1.46	20.19	14.12	0.81	25.63	17.57	0.00	0.00	0.00	0.64	28.90	19.64
20.00	0.98	7.96	1.21	24.97	20.03	1.46	21.59	16.24	0.81	27.04	19.69	0.00	0.00	0.00	0.64	30.31	21.76
25.00	0.98	7.96	1.21	26.22	21.49	1.46	23.00	18.36	0.81	28.45	21.81	0.00	0.00	0.00	0.64	31.72	23.89
PENNSYLVANIA / UNION																	
5.00	0.98	7.96	1.46	19.12	13.85	1.00	20.51	11.86	0.92	21.32	12.37	0.00	0.00	0.00	0.76	23.63	13.84
10.00	0.98	7.96	1.46	20.37	15.31	1.00	21.91	13.98	0.92	22.73	14.50	0.00	0.00	0.00	0.76	25.04	15.96
15.00	0.98	7.96	1.46	21.62	16.77	1.00	23.32	16.10	0.92	24.13	16.62	0.00	0.00	0.00	0.76	26.44	18.08
20.00	0.98	7.96	1.46	22.87	18.24	1.00	24.73	18.23	0.92	25.54	18.74	0.00	0.00	0.00	0.76	27.85	20.21
25.00	0.98	7.96	1.46	24.12	19.70	1.00	26.13	20.35	0.92	26.95	20.86	0.00	0.00	0.00	0.76	29.26	22.33

Table C-1. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ACRE	OATS BALES $/TON	OATS STACKS $/TON
PENNSYLVANIA / VENANGO																	
5.00	0.98	7.96	1.34	20.00	14.60	0.97	20.76	12.02	0.58	27.58	16.35	0.00	0.00	0.00	0.74	23.96	14.05
10.00	0.98	7.96	1.34	21.25	16.06	0.97	22.17	14.14	0.58	28.99	18.47	0.00	0.00	0.00	0.74	25.37	16.17
15.00	0.98	7.96	1.34	22.50	17.52	0.97	23.58	16.27	0.58	30.40	20.59	0.00	0.00	0.00	0.74	26.77	18.29
20.00	0.98	7.96	1.34	23.75	18.98	0.97	24.98	18.39	0.58	31.81	22.71	0.00	0.00	0.00	0.74	28.18	20.41
25.00	0.98	7.96	1.34	25.00	20.44	0.97	26.39	20.51	0.58	33.21	24.84	0.00	0.00	0.00	0.74	29.59	22.54
PENNSYLVANIA / WASHINGTON																	
5.00	0.98	7.96	1.29	20.40	14.94	1.33	17.99	10.26	1.16	19.08	10.95	0.00	0.00	0.00	0.76	23.63	13.84
10.00	0.98	7.96	1.29	21.65	16.40	1.33	19.40	12.39	1.16	20.48	13.07	0.00	0.00	0.00	0.76	25.03	15.96
15.00	0.98	7.96	1.29	22.90	17.86	1.33	20.81	14.51	1.16	21.89	15.20	0.00	0.00	0.00	0.76	26.44	18.08
20.00	0.98	7.96	1.29	24.15	19.33	1.33	22.21	16.63	1.16	23.30	17.32	0.00	0.00	0.00	0.76	27.85	20.20
25.00	0.98	7.96	1.29	25.40	20.79	1.33	23.62	18.75	1.16	24.70	19.44	0.00	0.00	0.00	0.76	29.26	22.33
PENNSYLVANIA / WESTMORELAND																	
5.00	0.98	7.96	1.33	20.11	14.69	1.16	19.08	10.95	1.15	19.15	11.00	0.00	0.00	0.00	0.77	23.41	13.70
10.00	0.98	7.96	1.33	21.36	16.15	1.16	20.49	13.08	1.15	20.56	13.12	0.00	0.00	0.00	0.77	24.82	15.82
15.00	0.98	7.96	1.33	22.61	17.60	1.16	21.90	15.20	1.15	21.96	15.24	0.00	0.00	0.00	0.77	26.23	17.95
20.00	0.98	7.96	1.33	23.85	19.07	1.16	23.30	17.32	1.15	23.37	17.37	0.00	0.00	0.00	0.77	27.63	20.07
25.00	0.98	7.96	1.33	25.10	20.53	1.16	24.71	19.45	1.15	24.78	19.49	0.00	0.00	0.00	0.77	29.04	22.19
PENNSYLVANIA / WYOMING																	
5.00	0.98	7.96	1.28	20.55	15.07	1.44	17.47	9.93	0.00	0.00	0.00	0.00	0.00	0.00	0.64	26.07	15.39
10.00	0.98	7.96	1.28	21.80	16.53	1.44	18.88	12.06	0.00	0.00	0.00	0.00	0.00	0.00	0.64	27.48	17.51
15.00	0.98	7.96	1.28	23.05	17.99	1.44	20.28	14.18	0.00	0.00	0.00	0.00	0.00	0.00	0.64	28.89	19.63
20.00	0.98	7.96	1.28	24.30	19.46	1.44	21.69	16.30	0.00	0.00	0.00	0.00	0.00	0.00	0.64	30.30	21.76
25.00	0.98	7.96	1.28	25.55	20.92	1.44	23.10	18.42	0.00	0.00	0.00	0.00	0.00	0.00	0.64	31.70	23.88
PENNSYLVANIA / YORK																	
5.00	0.98	7.96	1.30	20.39	14.94	1.26	18.45	10.55	1.22	18.69	10.70	1.09	19.67	11.33	0.77	23.40	13.69
10.00	0.98	7.96	1.30	21.64	16.40	1.26	19.86	12.68	1.22	20.09	12.83	1.09	21.08	13.45	0.77	24.81	15.82
15.00	0.98	7.96	1.30	22.89	17.86	1.26	21.26	14.80	1.22	21.50	14.95	1.09	22.49	15.57	0.77	26.22	17.94
20.00	0.98	7.96	1.30	24.14	19.32	1.26	22.67	16.92	1.22	22.91	17.07	1.09	23.89	17.70	0.77	27.62	20.06
25.00	0.98	7.96	1.30	25.39	20.78	1.26	24.08	19.04	1.22	24.31	19.19	1.09	25.30	19.82	0.77	29.03	22.18

Table C-2. Residue Collection Costs by County, Crop, and Baling Method for the Northeastern United States, 1985

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
NEW JERSEY / BURLINGTON																	
5.00	0.98	7.96	1.33	20.12	14.70	1.54	17.02	9.65	1.61	16.74	9.47	1.00	20.45	11.82	0.68	25.08	14.76
10.00	0.98	7.96	1.33	21.37	16.16	1.54	18.42	11.77	1.61	18.14	11.59	1.00	21.85	13.94	0.68	26.49	16.88
15.00	0.98	7.96	1.33	22.62	17.62	1.54	19.83	13.89	1.61	19.55	13.71	1.00	23.26	16.07	0.68	27.90	19.01
20.00	0.98	7.96	1.33	23.87	19.08	1.54	21.24	16.01	1.61	20.96	15.84	1.00	24.67	18.19	0.68	29.31	21.13
25.00	0.98	7.96	1.33	25.12	20.54	1.54	22.65	18.14	1.61	22.36	17.96	1.00	26.08	20.31	0.68	30.71	23.25
NEW JERSEY / CUMBERLAND																	
5.00	0.98	7.96	1.19	21.39	15.78	1.67	16.51	9.33	1.41	17.60	10.02	0.73	24.14	14.16	0.00	0.00	0.00
10.00	0.98	7.96	1.19	22.64	17.24	1.67	17.92	11.45	1.41	19.01	12.14	0.73	25.55	16.29	0.00	0.00	0.00
15.00	0.98	7.96	1.19	23.89	18.70	1.67	19.33	13.57	1.41	20.42	14.26	0.73	26.96	18.41	0.00	0.00	0.00
20.00	0.98	7.96	1.19	25.14	20.16	1.67	20.73	15.69	1.41	21.82	16.38	0.73	28.36	20.53	0.00	0.00	0.00
25.00	0.98	7.96	1.19	26.38	21.63	1.67	22.14	17.82	1.41	23.23	18.51	0.73	29.77	22.65	0.00	0.00	0.00
NEW JERSEY / GLOUCESTER																	
5.00	0.98	7.96	1.13	21.98	16.29	1.78	16.13	9.09	1.25	18.50	10.58	0.48	31.13	18.59	0.66	25.53	15.04
10.00	0.98	7.96	1.13	23.23	17.75	1.78	17.54	11.21	1.25	19.90	12.71	0.48	32.54	20.72	0.66	26.94	17.16
15.00	0.98	7.96	1.13	24.48	19.21	1.78	18.95	13.33	1.25	21.31	14.83	0.48	33.94	22.84	0.66	28.34	19.29
20.00	0.98	7.96	1.13	25.73	20.67	1.78	20.36	15.45	1.25	22.72	16.95	0.48	35.35	24.96	0.66	29.75	21.41
25.00	0.98	7.96	1.13	26.98	22.13	1.78	21.76	17.58	1.25	24.13	19.07	0.48	36.76	27.08	0.66	31.16	23.53
NEW JERSEY / MERCER																	
5.00	0.98	7.96	1.52	18.77	13.55	1.70	16.39	9.25	2.17	15.13	8.45	0.00	0.00	0.00	0.60	27.09	16.04
10.00	0.98	7.96	1.52	20.02	15.01	1.70	17.80	11.37	2.17	16.54	10.57	0.00	0.00	0.00	0.60	28.50	18.16
15.00	0.98	7.96	1.52	21.27	16.47	1.70	19.20	13.49	2.17	17.95	12.70	0.00	0.00	0.00	0.60	29.91	20.28
20.00	0.98	7.96	1.52	22.52	17.93	1.70	20.61	15.62	2.17	19.35	14.82	0.00	0.00	0.00	0.60	31.32	22.40
25.00	0.98	7.96	1.52	23.77	19.39	1.70	22.02	17.74	2.17	20.76	16.94	0.00	0.00	0.00	0.60	32.72	24.53
NEW JERSEY / MIDDLESEX																	
5.00	0.98	7.96	1.50	18.90	13.67	1.75	16.24	9.15	1.86	15.91	8.95	0.00	0.00	0.00	0.00	0.00	0.00
10.00	0.98	7.96	1.50	20.15	15.13	1.75	17.65	11.28	1.86	17.32	11.07	0.00	0.00	0.00	0.00	0.00	0.00
15.00	0.98	7.96	1.50	21.40	16.59	1.75	19.06	13.40	1.86	18.73	13.19	0.00	0.00	0.00	0.00	0.00	0.00
20.00	0.98	7.96	1.50	22.65	18.05	1.75	20.46	15.52	1.86	20.13	15.31	0.00	0.00	0.00	0.00	0.00	0.00
25.00	0.98	7.96	1.50	23.90	19.51	1.75	21.87	17.64	1.86	21.54	17.44	0.00	0.00	0.00	0.00	0.00	0.00

Table C-2. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
NEW JERSEY / MONMOUTH																	
5.00	0.98	7.96	1.20	21.26	15.67	1.59	16.81	9.51	1.57	16.87	9.55	0.87	21.95	12.78	0.00	0.00	0.00
10.00	0.98	7.96	1.20	22.51	17.13	1.59	18.21	11.64	1.57	18.28	11.68	0.87	23.36	14.90	0.00	0.00	0.00
15.00	0.98	7.96	1.20	23.76	18.60	1.59	19.62	13.76	1.57	19.68	13.80	0.87	24.77	17.02	0.00	0.00	0.00
20.00	0.98	7.96	1.20	25.01	20.06	1.59	21.03	15.88	1.57	21.09	15.92	0.87	26.18	19.14	0.00	0.00	0.00
25.00	0.98	7.96	1.20	26.26	21.52	1.59	22.44	18.00	1.57	22.50	18.04	0.87	27.58	21.27	0.00	0.00	0.00
NEW JERSEY / SALEM																	
5.00	0.98	7.96	1.53	18.67	13.47	1.76	16.20	9.13	1.54	17.01	9.64	0.92	21.38	12.41	0.77	23.49	13.75
10.00	0.98	7.96	1.53	19.92	14.93	1.76	17.60	11.25	1.54	18.42	11.77	0.92	22.79	14.54	0.77	24.89	15.87
15.00	0.98	7.96	1.53	21.17	16.39	1.76	19.01	13.37	1.54	19.83	13.89	0.92	24.20	16.66	0.77	26.30	17.99
20.00	0.98	7.96	1.53	22.42	17.85	1.76	20.42	15.49	1.54	21.24	16.01	0.92	25.60	18.78	0.77	27.71	20.12
25.00	0.98	7.96	1.53	23.67	19.31	1.76	21.83	17.62	1.54	22.64	18.13	0.92	27.01	20.90	0.77	29.12	22.24

Table C-2. Continued

NEW YORK

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
NEW YORK / ALLEGHANY																	
5.00	0.98	7.96	1.52	18.74	13.53	1.69	16.42	9.27	0.88	21.76	12.65	0.00	0.00	0.00	0.88	21.85	12.71
10.00	0.98	7.96	1.52	19.99	14.99	1.69	17.83	11.39	0.88	23.17	14.78	0.00	0.00	0.00	0.88	23.26	14.83
15.00	0.98	7.96	1.52	21.24	16.45	1.69	19.23	13.51	0.88	24.57	16.90	0.00	0.00	0.00	0.88	24.67	16.96
20.00	0.98	7.96	1.52	22.49	17.91	1.69	20.64	15.63	0.88	25.98	19.02	0.00	0.00	0.00	0.88	26.07	19.08
25.00	0.98	7.96	1.52	23.74	19.37	1.69	22.05	17.76	0.88	27.39	21.14	0.00	0.00	0.00	0.88	27.48	21.20
NEW YORK / CAYUGA																	
5.00	0.98	7.96	1.42	19.41	14.10	2.10	15.29	8.55	1.37	17.83	10.16	1.07	19.79	11.41	1.30	18.17	10.38
10.00	0.98	7.96	1.42	20.66	15.56	2.10	16.70	10.68	1.37	19.24	12.28	1.07	21.20	13.53	1.30	19.58	12.50
15.00	0.98	7.96	1.42	21.91	17.02	2.10	18.11	12.80	1.37	20.64	14.41	1.07	22.61	15.65	1.30	20.99	14.62
20.00	0.98	7.96	1.42	23.16	18.48	2.10	19.51	14.92	1.37	22.05	16.53	1.07	24.01	17.77	1.30	22.39	16.75
25.00	0.98	7.96	1.42	24.41	19.94	2.10	20.92	17.04	1.37	23.46	18.65	1.07	25.42	19.90	1.30	23.80	18.87
NEW YORK / CHAUTAUQUA																	
5.00	0.98	7.96	1.48	18.98	13.73	1.43	17.50	9.95	0.89	21.70	12.61	0.00	0.00	0.00	0.95	21.00	12.17
10.00	0.98	7.96	1.48	20.22	15.19	1.43	18.91	12.07	0.89	23.10	14.74	0.00	0.00	0.00	0.95	22.40	14.29
15.00	0.98	7.96	1.48	21.47	16.65	1.43	20.31	14.20	0.89	24.51	16.86	0.00	0.00	0.00	0.95	23.81	16.41
20.00	0.98	7.96	1.48	22.72	18.11	1.43	21.72	16.32	0.89	25.92	18.98	0.00	0.00	0.00	0.95	25.22	18.54
25.00	0.98	7.96	1.48	23.97	19.57	1.43	23.13	18.44	0.89	27.33	21.10	0.00	0.00	0.00	0.95	26.62	20.66
NEW YORK / CHEMUNG																	
5.00	0.98	7.96	1.11	22.20	16.47	1.85	15.93	8.95	1.19	18.92	10.85	0.00	0.00	0.00	0.96	20.85	12.08
10.00	0.98	7.96	1.11	23.44	17.93	1.85	17.33	11.08	1.19	20.33	12.97	0.00	0.00	0.00	0.96	22.26	14.20
15.00	0.98	7.96	1.11	24.69	19.39	1.85	18.74	13.20	1.19	21.73	15.10	0.00	0.00	0.00	0.96	23.67	16.32
20.00	0.98	7.96	1.11	25.94	20.85	1.85	20.15	15.32	1.19	23.14	17.22	0.00	0.00	0.00	0.96	25.07	18.44
25.00	0.98	7.96	1.11	27.19	22.31	1.85	21.56	17.44	1.19	24.55	19.34	0.00	0.00	0.00	0.96	26.48	20.57
NEW YORK / CHENANGO																	
5.00	0.98	7.96	1.54	18.63	13.43	1.72	16.35	9.22	0.00	0.00	0.00	0.00	0.00	0.00	1.03	20.16	11.64
10.00	0.98	7.96	1.54	19.88	14.89	1.72	17.76	11.34	0.00	0.00	0.00	0.00	0.00	0.00	1.03	21.57	13.76
15.00	0.98	7.96	1.54	21.13	16.35	1.72	19.16	13.47	0.00	0.00	0.00	0.00	0.00	0.00	1.03	22.97	15.88
20.00	0.98	7.96	1.54	22.37	17.81	1.72	20.57	15.59	0.00	0.00	0.00	0.00	0.00	0.00	1.03	24.38	18.01
25.00	0.98	7.96	1.54	23.62	19.27	1.72	21.98	17.71	0.00	0.00	0.00	0.00	0.00	0.00	1.03	25.79	20.13

Table C-2. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
NEW YORK / COLUMBIA																	
5.00	0.98	7.96	1.57	18.45	13.28	2.18	15.12	8.45	0.00	0.00	0.00	0.00	0.00	0.00	0.97	20.75	12.01
10.00	0.98	7.96	1.57	19.70	14.74	2.18	16.53	10.57	0.00	0.00	0.00	0.00	0.00	0.00	0.97	22.16	14.14
15.00	0.98	7.96	1.57	20.95	16.20	2.18	17.94	12.69	0.00	0.00	0.00	0.00	0.00	0.00	0.97	23.57	16.26
20.00	0.98	7.96	1.57	22.20	17.66	2.18	19.35	14.81	0.00	0.00	0.00	0.00	0.00	0.00	0.97	24.97	18.38
25.00	0.98	7.96	1.57	23.45	19.12	2.18	20.75	16.94	0.00	0.00	0.00	0.00	0.00	0.00	0.97	26.38	20.50
NEW YORK / CORTLAND																	
5.00	0.98	7.96	1.47	19.09	13.82	1.59	16.80	9.51	0.00	0.00	0.00	0.00	0.00	0.00	1.21	18.78	10.77
10.00	0.98	7.96	1.47	20.34	15.28	1.59	18.21	11.63	0.00	0.00	0.00	0.00	0.00	0.00	1.21	20.19	12.89
15.00	0.98	7.96	1.47	21.59	16.74	1.59	19.62	13.75	0.00	0.00	0.00	0.00	0.00	0.00	1.21	21.60	15.01
20.00	0.98	7.96	1.47	22.83	18.20	1.59	21.02	15.88	0.00	0.00	0.00	0.00	0.00	0.00	1.21	23.01	17.13
25.00	0.98	7.96	1.47	24.08	19.67	1.59	22.43	18.00	0.00	0.00	0.00	0.00	0.00	0.00	1.21	24.41	19.26
NEW YORK / DUTCHESS																	
5.00	0.98	7.96	1.57	18.46	13.29	1.86	15.90	8.94	0.00	0.00	0.00	0.00	0.00	0.00	0.94	21.11	12.24
10.00	0.98	7.96	1.57	19.71	14.75	1.86	17.31	11.06	0.00	0.00	0.00	0.00	0.00	0.00	0.94	22.52	14.36
15.00	0.98	7.96	1.57	20.96	16.21	1.86	18.72	13.19	0.00	0.00	0.00	0.00	0.00	0.00	0.94	23.92	16.49
20.00	0.98	7.96	1.57	22.21	17.67	1.86	20.13	15.31	0.00	0.00	0.00	0.00	0.00	0.00	0.94	25.33	18.61
25.00	0.98	7.96	1.57	23.46	19.13	1.86	21.53	17.43	0.00	0.00	0.00	0.00	0.00	0.00	0.94	26.74	20.73
NEW YORK / ERIE																	
5.00	0.98	7.96	1.37	19.81	14.43	1.79	16.12	9.08	1.32	18.06	10.31	1.18	18.99	10.90	1.07	19.86	11.45
10.00	0.98	7.96	1.37	21.05	15.89	1.79	17.53	11.20	1.32	19.47	12.43	1.18	20.40	13.02	1.07	21.27	13.57
15.00	0.98	7.96	1.37	22.30	17.36	1.79	18.94	13.32	1.32	20.87	14.55	1.18	21.81	15.14	1.07	22.68	15.70
20.00	0.98	7.96	1.37	23.55	18.82	1.79	20.34	15.45	1.32	22.28	16.67	1.18	23.22	17.27	1.07	24.09	17.82
25.00	0.98	7.96	1.37	24.80	20.28	1.79	21.75	17.57	1.32	23.69	18.80	1.18	24.62	19.39	1.07	25.49	19.94
NEW YORK / GENESEE																	
5.00	0.98	7.96	1.29	20.48	15.01	1.55	16.96	9.61	1.32	18.10	10.33	0.97	20.74	12.01	1.15	19.22	11.04
10.00	0.98	7.96	1.29	21.73	16.47	1.55	18.37	11.73	1.32	19.50	12.45	0.97	22.15	14.13	1.15	20.63	13.16
15.00	0.98	7.96	1.29	22.98	17.93	1.55	19.78	13.86	1.32	20.91	14.58	0.97	23.55	16.25	1.15	22.03	15.29
20.00	0.98	7.96	1.29	24.23	19.39	1.55	21.19	15.98	1.32	22.32	16.70	0.97	24.96	18.37	1.15	23.44	17.41
25.00	0.98	7.96	1.29	25.48	20.85	1.55	22.59	18.10	1.32	23.73	18.82	0.97	26.37	20.50	1.15	24.85	19.53

Table C-2. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
NEW YORK / JEFFERSON																	
5.00	0.98	7.96	1.06	22.87	17.05	2.19	15.09	8.42	1.14	19.26	11.07	0.00	0.00	0.00	0.97	20.78	12.03
10.00	0.98	7.96	1.06	24.12	18.51	2.19	16.50	10.55	1.14	20.67	13.19	0.00	0.00	0.00	0.97	22.19	14.15
15.00	0.98	7.96	1.06	25.37	19.97	2.19	17.90	12.67	1.14	22.08	15.32	0.00	0.00	0.00	0.97	23.59	16.28
20.00	0.98	7.96	1.06	26.62	21.43	2.19	19.31	14.79	1.14	23.49	17.44	0.00	0.00	0.00	0.97	25.00	18.40
25.00	0.98	7.96	1.06	27.87	22.89	2.19	20.72	16.91	1.14	24.89	19.56	0.00	0.00	0.00	0.97	26.41	20.52
NEW YORK / LIVINGSTON																	
5.00	0.98	7.96	1.12	22.18	16.46	1.73	16.31	9.20	0.89	21.72	12.63	0.00	0.00	0.00	1.13	19.36	11.13
10.00	0.98	7.96	1.12	23.43	17.92	1.73	17.71	11.32	0.89	23.13	14.75	0.00	0.00	0.00	1.13	20.77	13.26
15.00	0.98	7.96	1.12	24.68	19.38	1.73	19.12	13.44	0.89	24.54	16.88	0.00	0.00	0.00	1.13	22.18	15.38
20.00	0.98	7.96	1.12	25.93	20.84	1.73	20.53	15.56	0.89	25.95	19.00	0.00	0.00	0.00	1.13	23.59	17.50
25.00	0.98	7.96	1.12	27.18	22.30	1.73	21.94	17.69	0.89	27.35	21.12	0.00	0.00	0.00	1.13	24.99	19.62
NEW YORK / MADISON																	
5.00	0.98	7.96	1.46	19.11	13.84	1.98	15.58	8.73	1.10	19.53	11.24	1.29	18.27	10.44	1.30	18.22	10.41
10.00	0.98	7.96	1.46	20.36	15.30	1.98	16.99	10.86	1.10	20.94	13.36	1.29	19.68	12.56	1.30	19.63	12.53
15.00	0.98	7.96	1.46	21.61	16.76	1.98	18.39	12.98	1.10	22.35	15.49	1.29	21.09	14.69	1.30	21.03	14.65
20.00	0.98	7.96	1.46	22.86	18.22	1.98	19.80	15.10	1.10	23.76	17.61	1.29	22.49	16.81	1.30	22.44	16.78
25.00	0.98	7.96	1.46	24.11	19.69	1.98	21.21	17.22	1.10	25.16	19.73	1.29	23.90	18.93	1.30	23.85	18.90
NEW YORK / MONROE																	
5.00	0.98	7.96	1.23	20.98	15.43	1.72	16.34	9.22	0.90	21.60	12.55	1.37	17.81	10.15	1.12	19.43	11.18
10.00	0.98	7.96	1.23	22.23	16.89	1.72	17.75	11.34	0.90	23.00	14.67	1.37	19.22	12.27	1.12	20.84	13.30
15.00	0.98	7.96	1.23	23.47	18.35	1.72	19.16	13.46	0.90	24.41	16.80	1.37	20.62	14.39	1.12	22.25	15.42
20.00	0.98	7.96	1.23	24.72	19.81	1.72	20.56	15.59	0.90	25.82	18.92	1.37	22.03	16.52	1.12	23.65	17.54
25.00	0.98	7.96	1.23	25.97	21.27	1.72	21.97	17.71	0.90	27.23	21.04	1.37	23.44	18.64	1.12	25.06	19.67
NEW YORK / MONTGOMERY																	
5.00	0.98	7.96	1.48	19.03	13.78	1.81	16.04	9.02	1.88	15.86	8.91	0.00	0.00	0.00	1.06	19.94	11.50
10.00	0.98	7.96	1.48	20.28	15.24	1.81	17.44	11.15	1.88	17.26	11.03	0.00	0.00	0.00	1.06	21.35	13.62
15.00	0.98	7.96	1.48	21.53	16.70	1.81	18.85	13.27	1.88	18.67	13.16	0.00	0.00	0.00	1.06	22.75	15.74
20.00	0.98	7.96	1.48	22.78	18.16	1.81	20.26	15.39	1.88	20.08	15.28	0.00	0.00	0.00	1.06	24.16	17.87
25.00	0.98	7.96	1.48	24.03	19.62	1.81	21.67	17.52	1.88	21.49	17.40	0.00	0.00	0.00	1.06	25.57	19.99

Table C-2. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
NEW YORK / NIAGARA																	
5.00	0.98	7.96	1.36	19.85	14.47	1.59	16.79	9.50	1.89	15.83	8.89	0.00	0.00	0.00	1.11	19.46	11.19
10.00	0.98	7.96	1.36	21.10	15.93	1.59	18.20	11.63	1.89	17.24	11.02	0.00	0.00	0.00	1.11	20.86	13.32
15.00	0.98	7.96	1.36	22.35	17.40	1.59	19.61	13.75	1.89	18.64	13.14	0.00	0.00	0.00	1.11	22.27	15.44
20.00	0.98	7.96	1.36	23.60	18.86	1.59	21.01	15.87	1.89	20.05	15.26	0.00	0.00	0.00	1.11	23.68	17.56
25.00	0.98	7.96	1.36	24.85	20.32	1.59	22.42	17.99	1.89	21.46	17.38	0.00	0.00	0.00	1.11	25.09	19.68
NEW YORK / ONEIDA																	
5.00	0.98	7.96	1.45	19.20	13.92	2.07	15.37	8.60	1.75	16.22	9.14	0.00	0.00	0.00	1.35	17.92	10.22
10.00	0.98	7.96	1.45	20.45	15.38	2.07	16.78	10.72	1.75	17.63	11.27	0.00	0.00	0.00	1.35	19.33	12.34
15.00	0.98	7.96	1.45	21.70	16.84	2.07	18.18	12.85	1.75	19.04	13.39	0.00	0.00	0.00	1.35	20.74	14.47
20.00	0.98	7.96	1.45	22.95	18.30	2.07	19.59	14.97	1.75	20.45	15.51	0.00	0.00	0.00	1.35	22.15	16.59
25.00	0.98	7.96	1.45	24.20	19.76	2.07	21.00	17.09	1.75	21.85	17.63	0.00	0.00	0.00	1.35	23.55	18.71
NEW YORK / ONANDAGA																	
5.00	0.98	7.96	1.41	19.52	14.19	1.97	15.60	8.74	1.16	19.10	10.97	0.00	0.00	0.00	1.27	18.39	10.52
10.00	0.98	7.96	1.41	20.76	15.65	1.97	17.00	10.87	1.16	20.51	13.09	0.00	0.00	0.00	1.27	19.79	12.64
15.00	0.98	7.96	1.41	22.01	17.11	1.97	18.41	12.99	1.16	21.92	15.21	0.00	0.00	0.00	1.27	21.20	14.76
20.00	0.98	7.96	1.41	23.26	18.57	1.97	19.82	15.11	1.16	23.32	17.34	0.00	0.00	0.00	1.27	22.61	16.88
25.00	0.98	7.96	1.41	24.51	20.03	1.97	21.22	17.24	1.16	24.73	19.46	0.00	0.00	0.00	1.27	24.02	19.00
NEW YORK / ONTARIO																	
5.00	0.98	7.96	1.22	21.10	15.54	1.67	16.50	9.32	1.20	18.86	10.81	1.33	18.04	10.29	1.19	18.90	10.84
10.00	0.98	7.96	1.22	22.35	17.00	1.67	17.91	11.44	1.20	20.26	12.94	1.33	19.44	12.42	1.19	20.30	12.96
15.00	0.98	7.96	1.22	23.60	18.46	1.67	19.31	13.56	1.20	21.67	15.06	1.33	20.85	14.54	1.19	21.71	15.08
20.00	0.98	7.96	1.22	24.85	19.92	1.67	20.72	15.69	1.20	23.08	17.18	1.33	22.26	16.66	1.19	23.12	17.21
25.00	0.98	7.96	1.22	26.10	21.38	1.67	22.13	17.81	1.20	24.49	19.30	1.33	23.67	18.78	1.19	24.53	19.33
NEW YORK / ORLEANS																	
5.00	0.98	7.96	1.55	18.55	13.36	1.51	17.14	9.73	1.36	17.85	10.18	0.00	0.00	0.00	1.26	18.43	10.54
10.00	0.98	7.96	1.55	19.80	14.83	1.51	18.55	11.85	1.36	19.26	12.30	0.00	0.00	0.00	1.26	19.84	12.67
15.00	0.98	7.96	1.55	21.05	16.29	1.51	19.96	13.97	1.36	20.67	14.42	0.00	0.00	0.00	1.26	21.25	14.79
20.00	0.98	7.96	1.55	22.30	17.75	1.51	21.36	16.09	1.36	22.08	16.55	0.00	0.00	0.00	1.26	22.65	16.91
25.00	0.98	7.96	1.55	23.55	19.21	1.51	22.77	18.22	1.36	23.48	18.67	0.00	0.00	0.00	1.26	24.06	19.03

Table C-2. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
NEW YORK / OTSEGO																	
5.00	0.98	7.96	1.48	19.00	13.75	2.17	15.14	8.46	0.31	42.89	26.05	0.00	0.00	0.00	1.12	19.42	11.47
10.00	0.98	7.96	1.48	20.25	15.21	2.17	16.55	10.58	0.31	44.30	28.17	0.00	0.00	0.00	1.12	20.83	13.29
15.00	0.98	7.96	1.48	21.50	16.67	2.17	17.96	12.70	0.31	45.71	30.30	0.00	0.00	0.00	1.12	22.24	15.42
20.00	0.98	7.96	1.48	22.75	18.13	2.17	19.37	14.83	0.31	47.11	32.42	0.00	0.00	0.00	1.12	23.65	17.54
25.00	0.98	7.96	1.48	24.00	19.59	2.17	20.77	16.95	0.31	48.52	34.54	0.00	0.00	0.00	1.12	25.05	19.66
NEW YORK / SCHOHARIE																	
5.00	0.98	7.96	1.75	17.52	12.49	1.63	16.65	9.41	0.00	0.00	0.00	0.00	0.00	0.00	1.16	19.14	10.99
10.00	0.98	7.96	1.75	18.77	13.95	1.63	18.05	11.53	0.00	0.00	0.00	0.00	0.00	0.00	1.16	20.54	13.11
15.00	0.98	7.96	1.75	20.02	15.41	1.63	19.46	13.66	0.00	0.00	0.00	0.00	0.00	0.00	1.16	21.95	15.23
20.00	0.98	7.96	1.75	21.27	16.87	1.63	20.87	15.78	0.00	0.00	0.00	0.00	0.00	0.00	1.16	23.36	17.36
25.00	0.98	7.96	1.75	22.52	18.33	1.63	22.27	17.90	0.00	0.00	0.00	0.00	0.00	0.00	1.16	24.77	19.48
NEW YORK / SCHUYLER																	
5.00	0.98	7.96	1.33	20.08	14.67	1.65	16.58	9.37	1.16	19.12	10.98	0.00	0.00	0.00	1.02	20.27	11.71
10.00	0.98	7.96	1.33	21.33	16.13	1.65	17.99	11.49	1.16	20.53	13.10	0.00	0.00	0.00	1.02	21.68	13.83
15.00	0.98	7.96	1.33	22.58	17.59	1.65	19.40	13.62	1.16	21.94	15.23	0.00	0.00	0.00	1.02	23.08	15.95
20.00	0.98	7.96	1.33	23.83	19.05	1.65	20.81	15.74	1.16	23.34	17.35	0.00	0.00	0.00	1.02	24.49	18.08
25.00	0.98	7.96	1.33	25.08	20.51	1.65	22.21	17.86	1.16	24.75	19.47	0.00	0.00	0.00	1.02	25.90	20.20
NEW YORK / SENECA																	
5.00	0.98	7.96	1.22	21.10	15.54	1.77	16.16	9.10	1.24	18.55	10.62	0.00	0.00	0.00	1.29	18.24	10.42
10.00	0.98	7.96	1.22	22.35	17.00	1.77	17.57	11.23	1.24	19.96	12.74	0.00	0.00	0.00	1.29	19.65	12.55
15.00	0.98	7.96	1.22	23.60	18.46	1.77	18.98	13.35	1.24	21.37	14.86	0.00	0.00	0.00	1.29	21.06	14.67
20.00	0.98	7.96	1.22	24.85	19.92	1.77	20.38	15.47	1.24	22.77	16.99	0.00	0.00	0.00	1.29	22.46	16.79
25.00	0.98	7.96	1.22	26.10	21.38	1.77	21.79	17.59	1.24	24.18	19.11	0.00	0.00	0.00	1.29	23.87	18.91
NEW YORK / STEUBEN																	
5.00	0.98	7.96	1.41	19.48	14.16	1.61	16.72	9.46	1.16	19.08	10.95	0.00	0.00	0.00	1.12	19.43	11.18
10.00	0.98	7.96	1.41	20.73	15.62	1.61	18.13	11.58	1.16	20.48	13.07	0.00	0.00	0.00	1.12	20.84	13.30
15.00	0.98	7.96	1.41	21.98	17.08	1.61	19.54	13.71	1.16	21.89	15.20	0.00	0.00	0.00	1.12	22.24	15.42
20.00	0.98	7.96	1.41	23.23	18.54	1.61	20.95	15.83	1.16	23.30	17.32	0.00	0.00	0.00	1.12	23.65	17.54
25.00	0.98	7.96	1.41	24.48	20.00	1.61	22.35	17.95	1.16	24.71	19.44	0.00	0.00	0.00	1.12	25.06	19.67

Table C-2. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ACRE	OATS BALES $/TON	OATS STACKS $/TON
NEW YORK / TIOGA																	
5.00	0.98	7.96	1.49	18.97	13.72	1.32	18.07	10.31	0.00	0.00	0.00	0.00	0.00	0.00	1.06	19.90	11.48
10.00	0.98	7.96	1.49	20.22	15.18	1.32	19.48	12.44	0.00	0.00	0.00	0.00	0.00	0.00	1.06	21.31	13.60
15.00	0.98	7.96	1.49	21.47	16.64	1.32	20.88	14.56	0.00	0.00	0.00	0.00	0.00	0.00	1.06	22.72	15.72
20.00	0.98	7.96	1.49	22.72	18.11	1.32	22.29	16.68	0.00	0.00	0.00	0.00	0.00	0.00	1.06	24.13	17.84
25.00	0.98	7.96	1.49	23.97	19.57	1.32	23.70	18.80	0.00	0.00	0.00	0.00	0.00	0.00	1.06	25.53	19.97
NEW YORK / TOMPKINS																	
5.00	0.98	7.96	1.34	20.01	14.60	1.80	16.08	9.05	1.21	18.75	10.75	0.00	0.00	0.00	1.24	18.56	10.63
10.00	0.98	7.96	1.34	21.25	16.07	1.80	17.49	11.18	1.21	20.16	12.87	0.00	0.00	0.00	1.24	19.97	12.75
15.00	0.98	7.96	1.34	22.50	17.53	1.80	18.90	13.30	1.21	21.57	14.99	0.00	0.00	0.00	1.24	21.38	14.87
20.00	0.98	7.96	1.34	23.75	18.99	1.80	20.30	15.42	1.21	22.97	17.11	0.00	0.00	0.00	1.24	22.79	16.99
25.00	0.98	7.96	1.34	25.00	20.45	1.80	21.71	17.54	1.21	24.38	19.24	0.00	0.00	0.00	1.24	24.19	19.12
NEW YORK / WASHINGTON																	
5.00	0.98	7.96	1.56	18.51	13.33	2.27	14.94	8.33	0.00	0.00	0.00	0.00	0.00	0.00	1.01	20.37	11.77
10.00	0.98	7.96	1.56	19.76	14.79	2.27	16.35	10.45	0.00	0.00	0.00	0.00	0.00	0.00	1.01	21.78	13.89
15.00	0.98	7.96	1.56	21.01	16.25	2.27	17.76	12.58	0.00	0.00	0.00	0.00	0.00	0.00	1.01	23.18	16.02
20.00	0.98	7.96	1.56	22.26	17.71	2.27	19.16	14.70	0.00	0.00	0.00	0.00	0.00	0.00	1.01	24.59	18.14
25.00	0.98	7.96	1.56	23.51	19.17	2.27	20.57	16.82	0.00	0.00	0.00	0.00	0.00	0.00	1.01	26.00	20.26
NEW YORK / WAYNE																	
5.00	0.98	7.96	1.29	20.48	15.00	1.54	17.00	9.63	1.32	18.10	10.34	1.41	17.60	10.01	1.21	18.74	10.74
10.00	0.98	7.96	1.29	21.72	16.47	1.54	18.41	11.76	1.32	19.51	12.46	1.41	19.00	12.14	1.21	20.15	12.86
15.00	0.98	7.96	1.29	22.97	17.93	1.54	19.81	13.88	1.32	20.92	14.58	1.41	20.41	14.26	1.21	21.56	14.98
20.00	0.98	7.96	1.29	24.22	19.39	1.54	21.22	16.00	1.32	22.33	16.70	1.41	21.82	16.38	1.21	22.96	17.11
25.00	0.98	7.96	1.29	25.47	20.85	1.54	22.63	18.12	1.32	23.73	18.83	1.41	23.23	18.50	1.21	24.37	19.23
NEW YORK / WYOMING																	
5.00	0.98	7.96	1.28	20.57	15.08	1.61	16.72	9.46	2.03	15.46	8.66	0.96	20.84	12.07	1.10	19.58	11.27
10.00	0.98	7.96	1.28	21.82	16.54	1.61	18.13	11.58	2.03	16.87	10.78	0.96	22.24	14.19	1.10	20.98	13.39
15.00	0.98	7.96	1.28	23.06	18.00	1.61	19.54	13.71	2.03	18.27	12.90	0.96	23.65	16.31	1.10	22.39	15.51
20.00	0.98	7.96	1.28	24.31	19.46	1.61	20.95	15.83	2.03	19.68	15.03	0.96	25.06	18.44	1.10	23.80	17.64
25.00	0.98	7.96	1.28	25.56	20.93	1.61	22.35	17.95	2.03	21.09	17.15	0.96	26.47	20.56	1.10	25.21	19.76

Table C-2. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
NEW YORK / YATES																	
5.00	0.98	7.96	1.42	19.40	14.09	1.65	16.57	9.36	1.08	19.76	11.39	0.68	25.04	14.73	1.28	18.29	10.45
10.00	0.98	7.96	1.42	20.65	15.55	1.65	17.97	11.48	1.08	21.17	13.51	0.68	26.45	16.85	1.28	19.70	12.58
15.00	0.98	7.96	1.42	21.90	17.01	1.65	19.38	13.61	1.08	22.58	15.63	0.68	27.85	18.98	1.28	21.10	14.70
20.00	0.98	7.96	1.42	23.15	18.47	1.65	20.79	15.73	1.08	23.99	17.76	0.68	29.26	21.10	1.28	22.51	16.82
25.00	0.98	7.96	1.42	24.40	19.93	1.65	22.20	17.85	1.08	25.39	19.88	0.68	30.67	23.22	1.28	23.92	18.94

Table C-2. Continued

PENNSYLVANIA

DIST- ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
PENNSYLVANIA / ADAMS																	
5.00	0.98	7.96	1.21	21.19	15.61	1.28	18.32	10.47	1.38	17.76	10.12	1.38	17.77	10.13	0.85	22.20	12.93
10.00	0.98	7.96	1.21	22.44	17.07	1.28	19.73	12.59	1.38	19.17	12.24	1.38	19.18	12.25	0.85	23.61	15.05
15.00	0.98	7.96	1.21	23.68	18.53	1.28	21.13	14.72	1.38	20.58	14.36	1.38	20.59	14.37	0.85	25.01	17.18
20.00	0.98	7.96	1.21	24.93	19.99	1.28	22.54	16.84	1.38	21.98	16.49	1.38	22.00	16.49	0.85	26.42	19.30
25.00	0.98	7.96	1.21	26.18	21.45	1.28	23.95	18.96	1.38	23.39	18.61	1.38	23.40	18.62	0.85	27.83	21.42
PENNSYLVANIA / ARMSTRONG																	
5.00	0.98	7.96	1.46	19.14	13.87	1.12	19.38	11.14	1.54	17.00	9.64	0.00	0.00	0.00	0.88	21.79	12.67
10.00	0.98	7.96	1.46	20.39	15.33	1.12	20.79	13.27	1.54	18.41	11.76	0.00	0.00	0.00	0.88	23.19	14.79
15.00	0.98	7.96	1.46	21.64	16.79	1.12	22.19	15.39	1.54	19.82	13.88	0.00	0.00	0.00	0.88	24.60	16.92
20.00	0.98	7.96	1.46	22.89	18.25	1.12	23.60	17.51	1.54	21.23	16.01	0.00	0.00	0.00	0.88	26.01	19.04
25.00	0.98	7.96	1.46	24.14	19.71	1.12	25.01	19.63	1.54	22.63	18.13	0.00	0.00	0.00	0.88	27.42	21.16
PENNSYLVANIA / BEAVER																	
5.00	0.98	7.96	1.54	18.62	13.42	1.72	16.33	9.21	2.11	15.27	8.54	0.00	0.00	0.00	1.12	19.39	11.15
10.00	0.98	7.96	1.54	19.87	14.88	1.72	17.74	11.33	2.11	16.68	10.66	0.00	0.00	0.00	1.12	20.80	13.27
15.00	0.98	7.96	1.54	21.12	16.34	1.72	19.15	13.46	2.11	18.09	12.79	0.00	0.00	0.00	1.12	22.21	15.40
20.00	0.98	7.96	1.54	22.37	17.80	1.72	20.55	15.58	2.11	19.50	14.91	0.00	0.00	0.00	1.12	23.61	17.52
25.00	0.98	7.96	1.54	23.61	19.27	1.72	21.96	17.70	2.11	20.90	17.03	0.00	0.00	0.00	1.12	25.02	19.64
PENNSYLVANIA / BEDFORD																	
5.00	0.98	7.96	1.59	18.35	13.20	1.33	18.02	10.28	1.62	16.70	9.44	1.00	20.47	11.84	0.93	21.18	12.28
10.00	0.98	7.96	1.59	19.60	14.66	1.33	19.43	12.40	1.62	18.11	11.57	1.00	21.88	13.96	0.93	22.58	14.41
15.00	0.98	7.96	1.59	20.85	16.12	1.33	20.83	14.53	1.62	19.51	13.69	1.00	23.29	16.08	0.93	23.99	16.53
20.00	0.98	7.96	1.59	22.10	17.58	1.33	22.24	16.65	1.62	20.92	15.81	1.00	24.69	18.20	0.93	25.40	18.65
25.00	0.98	7.96	1.59	23.35	19.04	1.33	23.65	18.77	1.62	22.33	17.93	1.00	26.10	20.33	0.93	26.81	20.77
PENNSYLVANIA / BERKS																	
5.00	0.98	7.96	1.53	18.71	13.50	1.57	16.88	9.56	1.76	16.22	9.14	0.96	20.91	12.11	0.91	21.42	12.44
10.00	0.98	7.96	1.53	19.96	14.97	1.57	18.29	11.68	1.76	17.62	11.26	0.96	22.32	14.24	0.91	22.83	14.56
15.00	0.98	7.96	1.53	21.21	16.43	1.57	19.69	13.80	1.76	19.03	13.38	0.96	23.72	16.36	0.91	24.23	16.68
20.00	0.98	7.96	1.53	22.46	17.89	1.57	21.10	15.93	1.76	20.44	15.51	0.96	25.13	18.48	0.91	25.64	18.81
25.00	0.98	7.96	1.53	23.71	19.35	1.57	22.51	18.05	1.76	21.84	17.63	0.96	26.54	20.60	0.91	27.05	20.93

Table C-2. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
PENNSYLVANIA / BLAIR																	
5.00	0.98	7.96	1.57	18.43	13.27	1.36	17.88	10.19	1.85	15.93	8.96	1.14	19.26	11.07	0.99	20.61	11.92
10.00	0.98	7.96	1.57	19.68	14.73	1.36	19.29	12.31	1.85	17.34	11.08	1.14	20.67	13.19	0.99	22.02	14.05
15.00	0.98	7.96	1.57	20.93	16.19	1.36	20.69	14.44	1.85	18.75	13.20	1.14	22.07	15.31	0.99	23.42	16.17
20.00	0.98	7.96	1.57	22.18	17.65	1.36	22.10	16.56	1.85	20.16	15.33	1.14	23.48	17.44	0.99	24.83	18.29
25.00	0.98	7.96	1.57	23.43	19.11	1.36	23.51	18.68	1.85	21.56	17.45	1.14	24.89	19.56	0.99	26.24	20.41
PENNSYLVANIA / BRADFORD																	
5.00	0.98	7.96	1.29	20.44	14.98	1.28	18.34	10.48	1.13	19.32	11.11	0.00	0.00	0.00	0.84	22.33	13.01
10.00	0.98	7.96	1.29	21.69	16.44	1.28	19.75	12.61	1.13	20.73	13.23	0.00	0.00	0.00	0.84	23.74	15.14
15.00	0.98	7.96	1.29	22.94	17.90	1.28	21.15	14.73	1.13	22.13	15.35	0.00	0.00	0.00	0.84	25.14	17.26
20.00	0.98	7.96	1.29	24.19	19.36	1.28	22.56	16.85	1.13	23.54	17.47	0.00	0.00	0.00	0.84	26.55	19.38
25.00	0.98	7.96	1.29	25.44	20.82	1.28	23.97	18.97	1.13	24.95	19.60	0.00	0.00	0.00	0.84	27.96	21.50
PENNSYLVANIA / BUCKS																	
5.00	0.98	7.96	1.37	19.83	14.45	1.39	17.70	10.08	1.53	17.04	9.66	1.19	18.89	10.83	0.86	22.11	12.87
10.00	0.98	7.96	1.37	21.08	15.91	1.39	19.11	12.20	1.53	18.45	11.78	1.19	20.29	12.95	0.86	23.51	14.99
15.00	0.98	7.96	1.37	22.33	17.37	1.39	20.52	14.33	1.53	19.85	13.91	1.19	21.70	15.08	0.86	24.92	17.12
20.00	0.98	7.96	1.37	23.57	18.83	1.39	21.93	16.45	1.53	21.26	16.03	1.19	23.11	17.20	0.86	26.33	19.24
25.00	0.98	7.96	1.37	24.82	20.30	1.39	23.33	18.57	1.53	22.67	18.15	1.19	24.51	19.32	0.86	27.73	21.36
PENNSYLVANIA / BUTLER																	
5.00	0.98	7.96	1.45	19.22	13.93	1.39	17.70	10.08	1.69	16.43	9.28	1.33	18.04	10.30	1.04	20.14	11.62
10.00	0.98	7.96	1.45	20.46	15.39	1.39	19.11	12.20	1.69	17.84	11.40	1.33	19.45	12.42	1.04	21.54	13.75
15.00	0.98	7.96	1.45	21.71	16.85	1.39	20.52	14.33	1.69	19.25	13.52	1.33	20.86	14.54	1.04	22.95	15.87
20.00	0.98	7.96	1.45	22.96	18.31	1.39	21.93	16.45	1.69	20.66	15.64	1.33	22.27	16.67	1.04	24.36	17.99
25.00	0.98	7.96	1.45	24.21	19.77	1.39	23.33	18.57	1.69	22.06	17.77	1.33	23.67	18.79	1.04	25.77	20.11
PENNSYLVANIA / CAMBRIA																	
5.00	0.98	7.96	1.22	21.11	15.55	1.37	17.81	10.15	1.74	16.25	9.16	0.97	20.80	12.04	1.01	20.36	11.77
10.00	0.98	7.96	1.22	22.36	17.01	1.37	19.22	12.27	1.74	17.66	11.28	0.97	22.20	14.17	1.01	21.77	13.89
15.00	0.98	7.96	1.22	23.61	18.47	1.37	20.62	14.39	1.74	19.07	13.41	0.97	23.61	16.29	1.01	23.18	16.01
20.00	0.98	7.96	1.22	24.86	19.93	1.37	22.03	16.52	1.74	20.47	15.53	0.97	25.02	18.41	1.01	24.59	18.14
25.00	0.98	7.96	1.22	26.11	21.39	1.37	23.44	18.64	1.74	21.88	17.65	0.97	26.43	20.53	1.01	25.99	20.26

Table C-2. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
PENNSYLVANIA / CARBON																	
5.00	0.98	7.96	0.88	25.60	19.37	1.11	19.52	11.23	1.20	18.84	10.81	0.88	21.79	12.67	0.74	23.88	14.00
10.00	0.98	7.96	0.88	26.85	20.83	1.11	20.92	13.35	1.20	20.25	12.93	0.88	23.20	14.79	0.74	25.29	16.12
15.00	0.98	7.96	0.88	28.10	22.29	1.11	22.33	15.48	1.20	21.66	15.05	0.88	24.60	16.92	0.74	26.70	18.24
20.00	0.98	7.96	0.88	29.35	23.75	1.11	23.74	17.60	1.20	23.07	17.17	0.88	26.01	19.04	0.74	28.10	20.37
25.00	0.98	7.96	0.88	30.60	25.22	1.11	25.15	19.72	1.20	24.47	19.30	0.88	27.42	21.16	0.74	29.51	22.49
PENNSYLVANIA / CENTRE																	
5.00	0.98	7.96	1.47	19.09	13.83	1.41	17.61	10.02	1.52	17.10	9.70	1.90	15.79	8.87	1.00	20.51	11.86
10.00	0.98	7.96	1.47	20.34	15.29	1.41	19.02	12.15	1.52	18.51	11.82	1.90	17.20	10.99	1.00	21.92	13.98
15.00	0.98	7.96	1.47	21.59	16.75	1.41	20.43	14.27	1.52	19.91	13.94	1.90	18.61	13.11	1.00	23.32	16.11
20.00	0.98	7.96	1.47	22.84	18.21	1.41	21.83	16.39	1.52	21.32	16.07	1.90	20.01	15.24	1.00	24.73	18.23
25.00	0.98	7.96	1.47	24.09	19.67	1.41	23.24	18.51	1.52	22.73	18.19	1.90	21.42	17.36	1.00	26.14	20.35
PENNSYLVANIA / CHESTER																	
5.00	0.98	7.96	1.65	17.99	12.89	1.64	16.61	9.39	1.81	16.05	9.03	1.00	20.51	11.86	0.96	20.90	12.11
10.00	0.98	7.96	1.65	19.24	14.35	1.64	18.01	11.51	1.81	17.45	11.15	1.00	21.92	13.99	0.96	22.30	14.23
15.00	0.98	7.96	1.65	20.49	15.81	1.64	19.42	13.63	1.81	18.86	13.28	1.00	23.33	16.11	0.96	23.71	16.35
20.00	0.98	7.96	1.65	21.74	17.27	1.64	20.83	15.75	1.81	20.27	15.40	1.00	24.74	18.23	0.96	25.12	18.47
25.00	0.98	7.96	1.65	22.99	18.73	1.64	22.23	17.88	1.81	21.68	17.52	1.00	26.14	20.35	0.96	26.52	20.60
PENNSYLVANIA / CLARION																	
5.00	0.98	7.96	1.55	18.60	13.40	1.10	19.59	11.27	1.11	19.46	11.20	0.00	0.00	0.00	0.94	21.14	12.26
10.00	0.98	7.96	1.55	19.84	14.86	1.10	20.99	13.40	1.11	20.87	13.32	0.00	0.00	0.00	0.94	22.55	14.39
15.00	0.98	7.96	1.55	21.09	16.32	1.10	22.40	15.52	1.11	22.28	15.44	0.00	0.00	0.00	0.94	23.96	16.51
20.00	0.98	7.96	1.55	22.34	17.79	1.10	23.81	17.64	1.11	23.68	17.56	0.00	0.00	0.00	0.94	25.37	18.63
25.00	0.98	7.96	1.55	23.59	19.25	1.10	25.21	19.76	1.11	25.09	19.69	0.00	0.00	0.00	0.94	26.77	20.75
PENNSYLVANIA / CLINTON																	
5.00	0.98	7.96	1.56	18.52	13.34	1.17	19.03	10.92	1.84	15.94	8.97	0.00	0.00	0.00	0.89	21.75	12.64
10.00	0.98	7.96	1.56	19.77	14.80	1.17	20.44	13.05	1.84	17.35	11.09	0.00	0.00	0.00	0.89	23.15	14.77
15.00	0.98	7.96	1.56	21.02	16.26	1.17	21.85	15.17	1.84	18.76	13.21	0.00	0.00	0.00	0.89	24.56	16.89
20.00	0.98	7.96	1.56	22.26	17.72	1.17	23.25	17.29	1.84	20.17	15.33	0.00	0.00	0.00	0.89	25.97	19.01
25.00	0.98	7.96	1.56	23.51	19.18	1.17	24.66	19.41	1.84	21.57	17.46	0.00	0.00	0.00	0.89	27.38	21.13

Table C-2. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
PENNSYLVANIA / COLUMBIA																	
5.00	0.98	7.96	1.27	20.61	15.12	1.21	18.74	10.74	1.27	18.38	10.51	1.03	20.21	11.67	0.98	20.71	11.99
10.00	0.98	7.96	1.27	21.86	16.58	1.21	20.15	12.86	1.27	19.79	12.63	1.03	21.62	13.80	0.98	22.12	14.11
15.00	0.98	7.96	1.27	23.10	18.04	1.21	21.55	14.98	1.27	21.20	14.76	1.03	23.03	15.92	0.98	23.53	16.23
20.00	0.98	7.96	1.27	24.35	19.50	1.21	22.96	17.11	1.27	22.60	16.88	1.03	24.44	18.04	0.98	24.93	18.36
25.00	0.98	7.96	1.27	25.60	20.96	1.21	24.37	19.23	1.27	24.01	19.00	1.03	25.84	20.16	0.98	26.34	20.48
PENNSYLVANIA / CRAWFORD																	
5.00	0.98	7.96	1.54	18.63	13.43	1.77	16.17	9.11	1.23	18.62	10.66	1.38	17.74	10.10	0.98	20.68	11.97
10.00	0.98	7.96	1.54	19.88	14.89	1.77	17.57	11.23	1.23	20.03	12.79	1.38	19.15	12.23	0.98	22.09	14.09
15.00	0.98	7.96	1.54	21.13	16.35	1.77	18.98	13.35	1.23	21.44	14.91	1.38	20.55	14.35	0.98	23.49	16.21
20.00	0.98	7.96	1.54	22.38	17.81	1.77	20.39	15.47	1.23	22.84	17.03	1.38	21.96	16.47	0.98	24.90	18.34
25.00	0.98	7.96	1.54	23.63	19.27	1.77	21.79	17.60	1.23	24.25	19.15	1.38	23.37	18.59	0.98	26.31	20.46
PENNSYLVANIA / CUMBERLAND																	
5.00	0.98	7.96	1.44	19.29	13.99	1.49	17.22	9.77	1.55	16.96	9.61	1.19	18.87	10.82	0.94	21.07	12.22
10.00	0.98	7.96	1.44	20.54	15.45	1.49	18.62	11.90	1.55	18.37	11.73	1.19	20.27	12.94	0.94	22.48	14.34
15.00	0.98	7.96	1.44	21.78	16.91	1.49	20.03	14.02	1.55	19.78	13.86	1.19	21.68	15.06	0.94	23.89	16.46
20.00	0.98	7.96	1.44	23.03	18.37	1.49	21.44	16.14	1.55	21.18	15.98	1.19	23.09	17.19	0.94	25.30	18.59
25.00	0.98	7.96	1.44	24.28	19.83	1.49	22.85	18.26	1.55	22.59	18.10	1.19	24.49	19.31	0.94	26.70	20.71
PENNSYLVANIA / DAUPHIN																	
5.00	0.98	7.96	1.47	19.07	13.81	1.43	17.48	9.94	1.49	17.24	9.79	0.96	20.92	12.12	0.90	21.53	12.50
10.00	0.98	7.96	1.47	20.32	15.27	1.43	18.89	12.06	1.49	18.65	11.91	0.96	22.33	14.24	0.90	22.93	14.63
15.00	0.98	7.96	1.47	21.57	16.73	1.43	20.29	14.18	1.49	20.06	14.03	0.96	23.73	16.37	0.90	24.34	16.75
20.00	0.98	7.96	1.47	22.82	18.19	1.43	21.70	16.31	1.49	21.46	16.16	0.96	25.14	18.49	0.90	25.75	18.87
25.00	0.98	7.96	1.47	24.07	19.65	1.43	23.11	18.43	1.49	22.87	18.28	0.96	26.55	20.61	0.90	27.15	20.99
PENNSYLVANIA / ERIE																	
5.00	0.98	7.96	1.47	19.08	13.81	1.52	17.11	9.70	1.97	15.60	8.75	1.39	17.72	10.09	1.08	19.70	11.35
10.00	0.98	7.96	1.47	20.33	15.27	1.52	18.52	11.83	1.97	17.01	10.87	1.39	19.13	12.21	1.08	21.11	13.47
15.00	0.98	7.96	1.47	21.58	16.73	1.52	19.92	13.95	1.97	18.42	12.99	1.39	20.53	14.34	1.08	22.52	15.59
20.00	0.98	7.96	1.47	22.82	18.20	1.52	21.33	16.07	1.97	19.82	15.12	1.39	21.94	16.46	1.08	23.92	17.72
25.00	0.98	7.96	1.47	24.07	19.66	1.52	22.74	18.19	1.97	21.23	17.24	1.39	23.35	18.58	1.08	25.33	19.84

Table C-2. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
PENNSYLVANIA / FAYETTE																	
5.00	0.98	7.96	1.53	18.67	13.47	1.47	17.30	9.82	1.73	16.28	9.18	0.00	0.00	0.00	0.98	20.64	11.94
10.00	0.98	7.96	1.53	19.92	14.93	1.47	18.71	11.95	1.73	17.69	11.30	0.00	0.00	0.00	0.98	22.05	14.07
15.00	0.98	7.96	1.53	21.17	16.39	1.47	20.11	14.07	1.73	19.10	13.43	0.00	0.00	0.00	0.98	23.46	16.19
20.00	0.98	7.96	1.53	22.42	17.85	1.47	21.52	16.19	1.73	20.51	15.55	0.00	0.00	0.00	0.98	24.86	18.31
25.00	0.98	7.96	1.53	23.67	19.31	1.47	22.93	18.32	1.73	21.91	17.67	0.00	0.00	0.00	0.98	26.27	20.43
PENNSYLVANIA / FRANKLIN																	
5.00	0.98	7.96	1.46	19.16	13.88	1.51	17.15	9.73	1.57	16.90	9.57	1.12	19.45	11.19	0.88	21.77	12.66
10.00	0.98	7.96	1.46	20.41	15.35	1.51	18.56	11.85	1.57	18.31	11.69	1.12	20.85	13.31	0.88	23.17	14.78
15.00	0.98	7.96	1.46	21.66	16.81	1.51	19.96	13.97	1.57	19.71	13.82	1.12	22.26	15.43	0.88	24.58	16.90
20.00	0.98	7.96	1.46	22.91	18.27	1.51	21.37	16.10	1.57	21.12	15.94	1.12	23.67	17.55	0.88	25.99	19.02
25.00	0.98	7.96	1.46	24.16	19.73	1.51	22.78	18.22	1.57	22.53	18.06	1.12	25.08	19.68	0.88	27.39	21.15
PENNSYLVANIA / FULTON																	
5.00	0.98	7.96	1.40	19.59	14.25	1.17	19.03	10.92	1.39	17.68	10.07	0.47	31.68	18.94	0.87	21.97	12.79
10.00	0.98	7.96	1.40	20.83	15.71	1.17	20.44	13.05	1.39	19.09	12.19	0.47	33.09	21.07	0.87	23.38	14.91
15.00	0.98	7.96	1.40	22.08	17.17	1.17	21.85	15.17	1.39	20.50	14.31	0.47	34.50	23.19	0.87	24.79	17.03
20.00	0.98	7.96	1.40	23.33	18.63	1.17	23.26	17.29	1.39	21.91	16.44	0.47	35.90	25.31	0.87	26.20	19.16
25.00	0.98	7.96	1.40	24.58	20.09	1.17	24.66	19.42	1.39	23.31	18.56	0.47	37.31	27.43	0.87	27.60	21.28
PENNSYLVANIA / HUNTINGDON																	
5.00	0.98	7.96	1.56	18.52	13.34	1.21	18.76	10.75	1.65	16.59	9.37	0.00	0.00	0.00	0.84	22.42	13.07
10.00	0.98	7.96	1.56	19.77	14.80	1.21	20.16	12.87	1.65	17.99	11.50	0.00	0.00	0.00	0.84	23.82	15.19
15.00	0.98	7.96	1.56	21.02	16.26	1.21	21.57	14.99	1.65	19.40	13.62	0.00	0.00	0.00	0.84	25.23	17.31
20.00	0.98	7.96	1.56	22.27	17.72	1.21	22.98	17.12	1.65	20.81	15.74	0.00	0.00	0.00	0.84	26.64	19.44
25.00	0.98	7.96	1.56	23.52	19.18	1.21	24.38	19.24	1.65	22.22	17.86	0.00	0.00	0.00	0.84	28.04	21.56
PENNSYLVANIA / INDIANA																	
5.00	0.98	7.96	1.44	19.25	13.96	1.20	18.80	10.78	1.44	17.44	9.91	0.73	24.15	14.17	0.95	21.03	12.19
10.00	0.98	7.96	1.44	20.50	15.42	1.20	20.21	12.90	1.44	18.84	12.03	0.73	25.56	16.29	0.95	22.44	14.32
15.00	0.98	7.96	1.44	21.75	16.88	1.20	21.62	15.02	1.44	20.25	14.16	0.73	26.97	18.41	0.95	23.85	16.44
20.00	0.98	7.96	1.44	23.00	18.35	1.20	23.02	17.15	1.44	21.66	16.28	0.73	28.37	20.54	0.95	25.26	18.56
25.00	0.98	7.96	1.44	24.25	19.81	1.20	24.43	19.27	1.44	23.06	18.40	0.73	29.78	22.66	0.95	26.66	20.68

Table C-2. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
PENNSYLVANIA / JEFFERSON																	
5.00	0.98	7.96	1.37	19.76	14.40	1.39	17.72	10.09	1.40	17.67	10.06	0.00	0.00	0.00	0.87	22.01	12.81
10.00	0.98	7.96	1.37	21.01	15.86	1.39	19.12	12.21	1.40	19.08	12.18	0.00	0.00	0.00	0.87	23.42	14.93
15.00	0.98	7.96	1.37	22.26	17.32	1.39	20.53	14.33	1.40	20.49	14.31	0.00	0.00	0.00	0.87	24.83	17.06
20.00	0.98	7.96	1.37	23.51	18.78	1.39	21.94	16.46	1.40	21.89	16.43	0.00	0.00	0.00	0.87	26.23	19.18
25.00	0.98	7.96	1.37	24.76	20.24	1.39	23.34	18.58	1.40	23.30	18.55	0.00	0.00	0.00	0.87	27.64	21.30
PENNSYLVANIA / JUNIATA																	
5.00	0.98	7.96	1.43	19.35	14.04	1.18	18.95	10.87	1.41	17.61	10.02	0.00	0.00	0.00	0.70	24.76	14.55
10.00	0.98	7.96	1.43	20.60	15.50	1.18	20.36	13.00	1.41	19.02	12.14	0.00	0.00	0.00	0.70	26.17	16.68
15.00	0.98	7.96	1.43	21.84	16.96	1.18	21.77	15.12	1.41	20.42	14.27	0.00	0.00	0.00	0.70	27.57	18.80
20.00	0.98	7.96	1.43	23.09	18.43	1.18	23.18	17.24	1.41	21.83	16.39	0.00	0.00	0.00	0.70	28.98	20.92
25.00	0.98	7.96	1.43	24.34	19.89	1.18	24.58	19.36	1.41	23.24	18.51	0.00	0.00	0.00	0.70	30.39	23.04
PENNSYLVANIA / LANCASTER																	
5.00	0.98	7.96	1.80	17.29	12.29	1.74	16.28	9.18	1.83	15.99	8.99	1.08	19.71	11.35	0.99	20.58	11.90
10.00	0.98	7.96	1.80	18.53	13.75	1.74	17.69	11.30	1.83	17.39	11.12	1.08	21.12	13.48	0.99	21.98	14.03
15.00	0.98	7.96	1.80	19.78	15.21	1.74	19.10	13.43	1.83	18.80	13.24	1.08	22.53	15.60	0.99	23.39	16.15
20.00	0.98	7.96	1.80	21.03	16.67	1.74	20.50	15.55	1.83	20.21	15.36	1.08	23.93	17.72	0.99	24.80	18.27
25.00	0.98	7.96	1.80	22.28	18.13	1.74	21.91	17.67	1.83	21.62	17.48	1.08	25.34	19.84	0.99	26.21	20.39
PENNSYLVANIA / LAURENCE																	
5.00	0.98	7.96	1.38	19.70	14.34	1.28	18.33	10.48	1.73	16.29	9.18	0.00	0.00	0.00	1.01	20.39	11.79
10.00	0.98	7.96	1.38	20.95	15.80	1.28	19.74	12.60	1.73	17.70	11.31	0.00	0.00	0.00	1.01	21.80	13.91
15.00	0.98	7.96	1.38	22.19	17.26	1.28	21.14	14.72	1.73	19.10	13.43	0.00	0.00	0.00	1.01	23.21	16.03
20.00	0.98	7.96	1.38	23.44	18.72	1.28	22.55	16.84	1.73	20.51	15.55	0.00	0.00	0.00	1.01	24.62	18.16
25.00	0.98	7.96	1.38	24.69	20.18	1.28	23.96	18.97	1.73	21.92	17.67	0.00	0.00	0.00	1.01	26.02	20.28
PENNSYLVANIA / LEBANON																	
5.00	0.98	7.96	1.63	18.14	13.01	1.63	16.66	9.42	1.86	15.91	8.95	1.05	20.01	11.54	0.93	21.18	12.29
10.00	0.98	7.96	1.63	19.39	14.48	1.63	18.07	11.54	1.86	17.32	11.07	1.05	21.42	13.66	0.93	22.59	14.41
15.00	0.98	7.96	1.63	20.64	15.94	1.63	19.48	13.67	1.86	18.73	13.19	1.05	22.82	15.79	0.93	23.99	16.53
20.00	0.98	7.96	1.63	21.89	17.40	1.63	20.88	15.79	1.86	20.14	15.31	1.05	24.23	17.91	0.93	25.40	18.65
25.00	0.98	7.96	1.63	23.14	18.86	1.63	22.29	17.91	1.86	21.54	17.44	1.05	25.64	20.03	0.93	26.81	20.78

Table C-2. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ACRE	OATS BALES $/TON	OATS STACKS $/TON
PENNSYLVANIA / LEHIGH																	
5.00	0.98	7.96	1.49	18.96	13.71	1.58	16.83	9.53	1.46	17.37	9.87	0.00	0.00	0.00	1.06	19.94	11.50
10.00	0.98	7.96	1.49	20.21	15.18	1.58	18.23	11.65	1.46	18.78	11.99	0.00	0.00	0.00	1.06	21.34	13.62
15.00	0.98	7.96	1.49	21.46	16.64	1.58	19.64	13.77	1.46	20.19	14.12	0.00	0.00	0.00	1.06	22.75	15.74
20.00	0.98	7.96	1.49	22.71	18.10	1.58	21.05	15.89	1.46	21.59	16.24	0.00	0.00	0.00	1.06	24.16	17.86
25.00	0.98	7.96	1.49	23.96	19.56	1.58	22.46	18.02	1.46	23.00	18.36	0.00	0.00	0.00	1.06	25.57	19.99
PENNSYLVANIA / LUZERNE																	
5.00	0.98	7.96	1.28	20.56	15.08	1.13	19.33	11.11	1.72	16.33	9.21	0.81	22.81	13.32	0.93	21.21	12.31
10.00	0.98	7.96	1.28	21.81	16.54	1.13	20.74	13.24	1.72	17.74	11.33	0.81	24.22	15.44	0.93	22.62	14.43
15.00	0.98	7.96	1.28	23.06	18.00	1.13	22.15	15.36	1.72	19.15	13.46	0.81	25.63	17.57	0.93	24.03	16.55
20.00	0.98	7.96	1.28	24.31	19.46	1.13	23.55	17.48	1.72	20.55	15.58	0.81	27.04	19.69	0.93	25.43	18.67
25.00	0.98	7.96	1.28	25.56	20.92	1.13	24.96	19.60	1.72	21.96	17.70	0.81	28.44	21.81	0.93	26.84	20.80
PENNSYLVANIA / LYCOMING																	
5.00	0.98	7.96	1.43	19.38	14.07	1.05	20.01	11.54	1.07	19.80	11.41	0.00	0.00	0.00	0.91	21.51	12.49
10.00	0.98	7.96	1.43	20.63	15.53	1.05	21.42	13.67	1.07	21.21	13.54	0.00	0.00	0.00	0.91	22.92	14.62
15.00	0.98	7.96	1.43	21.88	16.99	1.05	22.82	15.79	1.07	22.62	15.66	0.00	0.00	0.00	0.91	24.32	16.74
20.00	0.98	7.96	1.43	23.13	18.45	1.05	24.23	17.91	1.07	24.03	17.78	0.00	0.00	0.00	0.91	25.73	18.86
25.00	0.98	7.96	1.43	24.38	19.92	1.05	25.64	20.03	1.07	25.43	19.90	0.00	0.00	0.00	0.91	27.14	20.98
PENNSYLVANIA / MERCER																	
5.00	0.98	7.96	1.54	18.60	13.41	1.35	17.91	10.22	1.45	17.38	9.88	0.59	27.30	16.17	0.95	21.03	12.19
10.00	0.98	7.96	1.54	19.85	14.87	1.35	19.32	12.34	1.45	18.79	12.00	0.59	28.71	18.29	0.95	22.44	14.31
15.00	0.98	7.96	1.54	21.10	16.33	1.35	20.73	14.46	1.45	20.20	14.12	0.59	30.12	20.41	0.95	23.84	16.44
20.00	0.98	7.96	1.54	22.35	17.79	1.35	22.14	16.58	1.45	21.60	16.24	0.59	31.52	22.53	0.95	25.25	18.56
25.00	0.98	7.96	1.54	23.60	19.25	1.35	23.54	18.71	1.45	23.01	18.37	0.59	32.93	24.66	0.95	26.66	20.68
PENNSYLVANIA / MIFFLIN																	
5.00	0.98	7.96	1.63	18.12	12.99	1.36	17.88	10.19	1.26	18.43	10.54	0.00	0.00	0.00	0.96	20.93	12.13
10.00	0.98	7.96	1.63	19.36	14.45	1.36	19.29	12.32	1.26	19.84	12.67	0.00	0.00	0.00	0.96	22.34	14.25
15.00	0.98	7.96	1.63	20.61	15.92	1.36	20.69	14.44	1.26	21.25	14.79	0.00	0.00	0.00	0.96	23.75	16.37
20.00	0.98	7.96	1.63	21.86	17.38	1.36	22.10	16.56	1.26	22.65	16.91	0.00	0.00	0.00	0.96	25.16	18.50
25.00	0.98	7.96	1.63	23.11	18.84	1.36	23.51	18.68	1.26	24.06	19.03	0.00	0.00	0.00	0.96	26.56	20.62

Table C-2. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
PENNSYLVANIA / MONROE																	
5.00	0.98	7.96	1.25	20.79	15.28	1.36	17.87	10.18	1.33	18.04	10.30	0.51	29.99	17.87	0.68	25.13	14.79
10.00	0.98	7.96	1.25	22.04	16.74	1.36	19.27	12.31	1.33	19.45	12.42	0.51	31.40	19.99	0.68	26.53	16.91
15.00	0.98	7.96	1.25	23.29	18.20	1.36	20.68	14.43	1.33	20.85	14.54	0.51	32.81	22.12	0.68	27.94	19.03
20.00	0.98	7.96	1.25	24.54	19.66	1.36	22.09	16.55	1.33	22.26	16.66	0.51	34.21	24.24	0.68	29.35	21.16
25.00	0.98	7.96	1.25	25.79	21.12	1.36	23.49	18.67	1.33	23.67	18.79	0.51	35.62	26.36	0.68	30.76	23.28
PENNSYLVANIA / MONTGOMERY																	
5.00	0.98	7.96	1.40	19.55	14.22	1.33	18.00	10.27	1.64	16.60	9.38	1.07	19.80	11.41	0.88	21.78	12.67
10.00	0.98	7.96	1.40	20.80	15.68	1.33	19.40	12.39	1.64	18.01	11.50	1.07	21.20	13.53	0.88	23.19	14.79
15.00	0.98	7.96	1.40	22.05	17.14	1.33	20.81	14.51	1.64	19.42	13.63	1.07	22.61	15.65	0.88	24.60	16.91
20.00	0.98	7.96	1.40	23.30	18.60	1.33	22.22	16.63	1.64	20.82	15.75	1.07	24.02	17.78	0.88	26.01	19.04
25.00	0.98	7.96	1.40	24.55	20.06	1.33	23.63	18.76	1.64	22.23	17.87	1.07	25.43	19.90	0.88	27.41	21.16
PENNSYLVANIA / MONTOUR																	
5.00	0.98	7.96	1.24	20.89	15.36	1.16	19.11	10.97	1.40	17.66	10.05	0.00	0.00	0.00	0.89	21.75	12.65
10.00	0.98	7.96	1.24	22.14	16.82	1.16	20.52	13.10	1.40	19.06	12.17	0.00	0.00	0.00	0.89	23.16	14.77
15.00	0.98	7.96	1.24	23.39	18.28	1.16	21.93	15.22	1.40	20.47	14.30	0.00	0.00	0.00	0.89	24.57	16.89
20.00	0.98	7.96	1.24	24.64	19.74	1.16	23.33	17.34	1.40	21.88	16.42	0.00	0.00	0.00	0.89	25.97	19.02
25.00	0.98	7.96	1.24	25.89	21.20	1.16	24.74	19.46	1.40	23.29	18.54	0.00	0.00	0.00	0.89	27.38	21.14
PENNSYLVANIA / NORTHAMPTON																	
5.00	0.98	7.96	1.42	19.44	14.12	1.68	16.46	9.29	1.58	16.85	9.54	0.00	0.00	0.00	1.00	20.49	11.85
10.00	0.98	7.96	1.42	20.69	15.58	1.68	17.87	11.42	1.58	18.26	11.66	0.00	0.00	0.00	1.00	21.90	13.97
15.00	0.98	7.96	1.42	21.94	17.05	1.68	19.28	13.54	1.58	19.67	13.79	0.00	0.00	0.00	1.00	23.30	16.09
20.00	0.98	7.96	1.42	23.19	18.51	1.68	20.68	15.66	1.58	21.07	15.91	0.00	0.00	0.00	1.00	24.71	18.22
25.00	0.98	7.96	1.42	24.44	19.97	1.68	22.09	17.78	1.58	22.48	18.03	0.00	0.00	0.00	1.00	26.12	20.34
PENNSYLVANIA / NORTHUMBERLAND																	
5.00	0.98	7.96	1.42	19.45	14.13	1.22	18.72	10.72	1.57	16.87	9.55	0.89	21.66	12.59	0.91	21.44	12.45
10.00	0.98	7.96	1.42	20.70	15.59	1.22	20.12	12.85	1.57	18.28	11.68	0.89	23.06	14.71	0.91	22.84	14.57
15.00	0.98	7.96	1.42	21.95	17.06	1.22	21.53	14.97	1.57	19.69	13.80	0.89	24.47	16.83	0.91	24.25	16.69
20.00	0.98	7.96	1.42	23.20	18.52	1.22	22.94	17.09	1.57	21.09	15.92	0.89	25.88	18.96	0.91	25.66	18.82
25.00	0.98	7.96	1.42	24.45	19.98	1.22	24.34	19.21	1.57	22.50	18.04	0.89	27.29	21.08	0.91	27.07	20.94

Table C-2. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
							PENNSYLVANIA / PERRY										
5.00	0.98	7.96	1.47	19.08	13.81	1.22	18.71	10.72	1.53	17.03	9.66	0.81	22.86	13.35	0.75	23.69	13.88
10.00	0.98	7.96	1.47	20.33	15.27	1.22	20.11	12.84	1.53	18.44	11.78	0.81	24.27	15.48	0.75	25.10	16.00
15.00	0.98	7.96	1.47	21.58	16.73	1.22	21.52	14.96	1.53	19.85	13.90	0.81	25.68	17.60	0.75	26.50	18.12
20.00	0.98	7.96	1.47	22.82	18.20	1.22	22.93	17.09	1.53	21.26	16.02	0.81	27.09	19.72	0.75	27.91	20.24
25.00	0.98	7.96	1.47	24.07	19.66	1.22	24.34	19.21	1.53	22.66	18.15	0.81	28.49	21.84	0.75	29.32	22.37
							PENNSYLVANIA / SCHUYLKILL										
5.00	0.98	7.96	1.28	20.49	15.01	1.18	18.98	10.89	1.35	17.91	10.21	1.53	17.04	9.66	0.87	21.98	12.79
10.00	0.98	7.96	1.28	21.74	16.48	1.18	20.39	13.01	1.35	19.31	12.33	1.53	18.45	11.78	0.87	23.39	14.92
15.00	0.98	7.96	1.28	22.99	17.94	1.18	21.79	15.14	1.35	20.72	14.45	1.53	19.85	13.90	0.87	24.79	17.04
20.00	0.98	7.96	1.28	24.24	19.40	1.18	23.20	17.26	1.35	22.13	16.58	1.53	21.26	16.03	0.87	26.20	19.16
25.00	0.98	7.96	1.28	25.49	20.86	1.18	24.61	19.38	1.35	23.53	18.70	1.53	22.67	18.15	0.87	27.61	21.28
							PENNSYLVANIA / SNYDER										
5.00	0.98	7.96	1.37	19.75	14.39	1.11	19.53	11.24	1.43	17.50	9.95	0.00	0.00	0.00	0.82	22.69	13.24
10.00	0.98	7.96	1.37	21.00	15.85	1.11	20.94	13.36	1.43	18.90	12.07	0.00	0.00	0.00	0.82	24.10	15.36
15.00	0.98	7.96	1.37	22.25	17.31	1.11	22.34	15.48	1.43	20.31	14.20	0.00	0.00	0.00	0.82	25.50	17.49
20.00	0.98	7.96	1.37	23.50	18.77	1.11	23.75	17.61	1.43	21.72	16.32	0.00	0.00	0.00	0.82	26.91	19.61
25.00	0.98	7.96	1.37	24.75	20.23	1.11	25.16	19.73	1.43	23.13	18.44	0.00	0.00	0.00	0.82	28.32	21.73
							PENNSYLVANIA / SOMERSET										
5.00	0.98	7.96	1.50	18.89	13.66	1.22	18.69	10.71	1.57	16.90	9.57	0.81	22.72	13.26	1.07	19.85	11.44
10.00	0.98	7.96	1.50	20.14	15.12	1.22	20.10	12.83	1.57	18.31	11.70	0.81	24.13	15.39	1.07	21.26	13.57
15.00	0.98	7.96	1.50	21.39	16.58	1.22	21.51	14.95	1.57	19.72	13.82	0.81	25.54	17.51	1.07	22.67	15.69
20.00	0.98	7.96	1.50	22.64	18.04	1.22	22.91	17.08	1.57	21.12	15.94	0.81	26.94	19.63	1.07	24.07	17.81
25.00	0.98	7.96	1.50	23.89	19.50	1.22	24.32	19.20	1.57	22.53	18.06	0.81	28.35	21.75	1.07	25.48	19.93
							PENNSYLVANIA / TIOGA										
5.00	0.98	7.96	1.31	20.29	14.84	1.76	16.21	9.14	1.13	19.38	11.14	0.00	0.00	0.00	0.78	23.22	13.58
10.00	0.98	7.96	1.31	21.54	16.30	1.76	17.62	11.26	1.13	20.78	13.26	0.00	0.00	0.00	0.78	24.63	15.70
15.00	0.98	7.96	1.31	22.78	17.77	1.76	19.03	13.38	1.13	22.19	15.39	0.00	0.00	0.00	0.78	26.04	17.83
20.00	0.98	7.96	1.31	24.03	19.23	1.76	20.43	15.50	1.13	23.60	17.51	0.00	0.00	0.00	0.78	27.44	19.95
25.00	0.98	7.96	1.31	25.28	20.69	1.76	21.84	17.63	1.13	25.00	19.63	0.00	0.00	0.00	0.78	28.85	22.07

Table C-2. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
PENNSYLVANIA / UNION																	
5.00	0.98	7.96	1.54	18.65	13.45	1.21	18.73	10.73	1.27	18.35	10.49	0.00	0.00	0.00	0.92	21.30	12.36
10.00	0.98	7.96	1.54	19.90	14.91	1.21	20.13	12.85	1.27	19.76	12.62	0.00	0.00	0.00	0.92	22.70	14.48
15.00	0.98	7.96	1.54	21.15	16.37	1.21	21.54	14.98	1.27	21.17	14.74	0.00	0.00	0.00	0.92	24.11	16.61
20.00	0.98	7.96	1.54	22.40	17.84	1.21	22.95	17.10	1.27	22.58	16.86	0.00	0.00	0.00	0.92	25.52	18.73
25.00	0.98	7.96	1.54	23.65	19.30	1.21	24.36	19.22	1.27	23.98	18.98	0.00	0.00	0.00	0.92	26.93	20.85
PENNSYLVANIA / VENANGO																	
5.00	0.98	7.96	1.44	19.28	13.99	1.19	18.93	10.86	0.83	22.53	13.14	0.00	0.00	0.00	0.90	21.56	12.52
10.00	0.98	7.96	1.44	20.53	15.45	1.19	20.34	12.98	0.83	23.93	15.26	0.00	0.00	0.00	0.90	22.96	14.65
15.00	0.98	7.96	1.44	21.78	16.91	1.19	21.74	15.10	0.83	25.34	17.38	0.00	0.00	0.00	0.90	24.37	16.77
20.00	0.98	7.96	1.44	23.03	18.37	1.19	23.15	17.23	0.83	26.75	19.51	0.00	0.00	0.00	0.90	25.78	18.89
25.00	0.98	7.96	1.44	24.28	19.83	1.19	24.56	19.35	0.83	28.16	21.63	0.00	0.00	0.00	0.90	27.18	21.01
PENNSYLVANIA / WASHINGTON																	
5.00	0.98	7.96	1.40	19.55	14.22	1.61	16.71	9.45	1.59	16.80	9.51	0.00	0.00	0.00	0.92	21.29	12.36
10.00	0.98	7.96	1.40	20.80	15.68	1.61	18.12	11.58	1.59	18.20	11.63	0.00	0.00	0.00	0.92	22.70	14.48
15.00	0.98	7.96	1.40	22.05	17.14	1.61	19.53	13.70	1.59	19.61	13.75	0.00	0.00	0.00	0.92	24.11	16.60
20.00	0.98	7.96	1.40	23.30	18.60	1.61	20.93	15.82	1.59	21.02	15.87	0.00	0.00	0.00	0.92	25.52	18.73
25.00	0.98	7.96	1.40	24.55	20.06	1.61	22.34	17.94	1.59	22.43	18.00	0.00	0.00	0.00	0.92	26.92	20.85
PENNSYLVANIA / WESTMORELAND																	
5.00	0.98	7.96	1.43	19.34	14.04	1.41	17.59	10.01	1.58	16.85	9.54	0.00	0.00	0.00	0.94	21.12	12.25
10.00	0.98	7.96	1.43	20.59	15.50	1.41	19.00	12.13	1.58	18.26	11.66	0.00	0.00	0.00	0.94	22.53	14.37
15.00	0.98	7.96	1.43	21.84	16.96	1.41	20.40	14.25	1.58	19.66	13.78	0.00	0.00	0.00	0.94	23.94	16.50
20.00	0.98	7.96	1.43	23.09	18.42	1.41	21.81	16.38	1.58	21.07	15.91	0.00	0.00	0.00	0.94	25.35	18.62
25.00	0.98	7.96	1.43	24.34	19.88	1.41	23.22	18.50	1.58	22.48	18.03	0.00	0.00	0.00	0.94	26.75	20.74
PENNSYLVANIA / WYOMING																	
5.00	0.98	7.96	1.38	19.69	14.33	1.73	16.29	9.18	0.00	0.00	0.00	0.00	0.00	0.00	0.78	23.21	13.57
10.00	0.98	7.96	1.38	20.94	15.79	1.73	17.70	11.31	0.00	0.00	0.00	0.00	0.00	0.00	0.78	24.62	15.70
15.00	0.98	7.96	1.38	22.19	17.26	1.73	19.10	13.43	0.00	0.00	0.00	0.00	0.00	0.00	0.78	26.03	17.82
20.00	0.98	7.96	1.38	23.44	18.72	1.73	20.51	15.55	0.00	0.00	0.00	0.00	0.00	0.00	0.78	27.44	19.94
25.00	0.98	7.96	1.38	24.69	20.18	1.73	21.92	17.68	0.00	0.00	0.00	0.00	0.00	0.00	0.78	28.84	22.06

Table C-2. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
								PENNSYLVANIA / YORK									
5.00	0.98	7.96	1.40	19.54	14.21	1.52	17.08	9.69	1.66	16.52	9.33	1.32	18.06	10.31	0.94	21.12	12.25
10.00	0.98	7.96	1.40	20.79	15.67	1.52	18.49	11.81	1.66	17.93	11.46	1.32	19.47	12.43	0.94	22.52	14.37
15.00	0.98	7.96	1.40	22.04	17.13	1.52	19.89	13.93	1.66	19.34	13.58	1.32	20.88	14.55	0.94	23.93	16.49
20.00	0.98	7.96	1.40	23.29	18.59	1.52	21.30	16.05	1.66	20.74	15.70	1.32	22.28	16.68	0.94	25.34	18.61
25.00	0.98	7.96	1.40	24.54	20.06	1.52	22.71	18.18	1.66	22.15	17.82	1.32	23.69	18.80	0.94	26.75	20.74

Table C-3. Residue Collection Costs by County, Crop, and Baling Method for the Northeastern United States, 1990

NEW JERSEY

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
NEW JERSEY / BURLINGTON																	
5.00	0.98	7.96	1.33	20.12	14.70	1.54	17.02	9.65	1.61	16.74	9.47	1.00	20.45	11.82	0.68	25.08	14.76
10.00	0.98	7.96	1.33	21.37	16.16	1.54	18.42	11.77	1.61	18.14	11.59	1.00	21.85	13.94	0.68	26.49	16.88
15.00	0.98	7.96	1.33	22.62	17.62	1.54	19.83	13.89	1.61	19.55	13.71	1.00	23.26	16.07	0.68	27.90	19.01
20.00	0.98	7.96	1.33	23.87	19.08	1.54	21.24	16.01	1.61	20.96	15.84	1.00	24.67	18.19	0.68	29.31	21.13
25.00	0.98	7.96	1.33	25.12	20.54	1.54	22.65	18.14	1.61	22.36	17.96	1.00	26.08	20.31	0.68	30.71	23.25
NEW JERSEY / CUMBERLAND																	
5.00	0.98	7.96	1.19	21.39	15.78	1.67	16.51	9.33	1.41	17.60	10.02	0.73	24.14	14.16	0.00	0.00	0.00
10.00	0.98	7.96	1.19	22.64	17.24	1.67	17.92	11.45	1.41	19.01	12.14	0.73	25.55	16.29	0.00	0.00	0.00
15.00	0.98	7.96	1.19	23.89	18.70	1.67	19.33	13.57	1.41	20.42	14.26	0.73	26.96	18.41	0.00	0.00	0.00
20.00	0.98	7.96	1.19	25.14	20.16	1.67	20.73	15.69	1.41	21.82	16.38	0.73	28.36	20.53	0.00	0.00	0.00
25.00	0.98	7.96	1.19	26.38	21.63	1.67	22.14	17.82	1.41	23.23	18.51	0.73	29.77	22.65	0.00	0.00	0.00
NEW JERSEY / GLOUCESTER																	
5.00	0.98	7.96	1.13	21.98	16.29	1.78	16.13	9.09	1.25	18.50	10.58	0.48	31.13	18.59	0.66	25.53	15.04
10.00	0.98	7.96	1.13	23.23	17.75	1.78	17.54	11.21	1.25	19.90	12.71	0.48	32.54	20.72	0.66	26.94	17.16
15.00	0.98	7.96	1.13	24.48	19.21	1.78	18.95	13.33	1.25	21.31	14.83	0.48	33.94	22.84	0.66	28.34	19.29
20.00	0.98	7.96	1.13	25.73	20.67	1.78	20.36	15.45	1.25	22.72	16.95	0.48	35.35	24.96	0.66	29.75	21.41
25.00	0.98	7.96	1.13	26.98	22.13	1.78	21.76	17.58	1.25	24.13	19.07	0.48	36.76	27.08	0.66	31.16	23.53
NEW JERSEY / MERCER																	
5.00	0.98	7.96	1.52	18.77	13.55	1.70	16.39	9.25	2.17	15.13	8.45	0.00	0.00	0.00	0.60	27.09	16.04
10.00	0.98	7.96	1.52	20.02	15.01	1.70	17.80	11.37	2.17	16.54	10.57	0.00	0.00	0.00	0.60	28.50	18.16
15.00	0.98	7.96	1.52	21.27	16.47	1.70	19.20	13.49	2.17	17.95	12.70	0.00	0.00	0.00	0.60	29.91	20.28
20.00	0.98	7.96	1.52	22.52	17.93	1.70	20.61	15.62	2.17	19.35	14.82	0.00	0.00	0.00	0.60	31.32	22.40
25.00	0.98	7.96	1.52	23.77	19.39	1.70	22.02	17.74	2.17	20.76	16.94	0.00	0.00	0.00	0.60	32.72	24.53
NEW JERSEY / MIDDLESEX																	
5.00	0.98	7.96	1.50	18.90	13.67	1.75	16.24	9.15	1.86	15.91	8.95	0.00	0.00	0.00	0.00	0.00	0.00
10.00	0.98	7.96	1.50	20.15	15.13	1.75	17.65	11.28	1.86	17.32	11.07	0.00	0.00	0.00	0.00	0.00	0.00
15.00	0.98	7.96	1.50	21.40	16.59	1.75	19.06	13.40	1.86	18.73	13.19	0.00	0.00	0.00	0.00	0.00	0.00
20.00	0.98	7.96	1.50	22.65	18.05	1.75	20.46	15.52	1.86	20.13	15.31	0.00	0.00	0.00	0.00	0.00	0.00
25.00	0.98	7.96	1.50	23.90	19.51	1.75	21.87	17.64	1.86	21.54	17.44	0.00	0.00	0.00	0.00	0.00	0.00

Table C-3. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
NEW JERSEY / MONMOUTH																	
5.00	0.98	7.96	1.20	21.26	15.67	1.59	16.81	9.51	1.57	16.87	9.55	0.87	21.95	12.78	0.00	0.00	0.00
10.00	0.98	7.96	1.20	22.51	17.13	1.59	18.21	11.64	1.57	18.28	11.68	0.87	23.36	14.90	0.00	0.00	0.00
15.00	0.98	7.96	1.20	23.76	18.60	1.59	19.62	13.76	1.57	19.68	13.80	0.87	24.77	17.02	0.00	0.00	0.00
20.00	0.98	7.96	1.20	25.01	20.06	1.59	21.03	15.88	1.57	21.09	15.92	0.87	26.18	19.14	0.00	0.00	0.00
25.00	0.98	7.96	1.20	26.26	21.52	1.59	22.44	18.00	1.57	22.50	18.04	0.87	27.58	21.27	0.00	0.00	0.00
NEW JERSEY / SALEM																	
5.00	0.98	7.96	1.53	18.67	13.47	1.76	16.20	9.13	1.54	17.01	9.64	0.92	21.38	12.44	0.77	23.49	13.75
10.00	0.98	7.96	1.53	19.92	14.93	1.76	17.60	11.25	1.54	18.42	11.77	0.92	22.79	14.54	0.77	24.89	15.87
15.00	0.98	7.96	1.53	21.17	16.39	1.76	19.01	13.37	1.54	19.83	13.89	0.92	24.20	16.66	0.77	26.30	17.99
20.00	0.98	7.96	1.53	22.42	17.85	1.76	20.42	15.49	1.54	21.24	16.01	0.92	25.60	18.78	0.77	27.71	20.12
25.00	0.98	7.96	1.53	23.67	19.31	1.76	21.83	17.62	1.54	22.64	18.13	0.92	27.01	20.90	0.77	29.12	22.24

Table C-3. Continued

NEW YORK

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
NEW YORK / ALLEGHANY																	
5.00	0.98	7.96	1.52	18.74	13.53	1.69	16.42	9.27	0.88	21.76	12.65	0.00	0.00	0.00	0.88	21.85	12.71
10.00	0.98	7.96	1.52	19.99	14.99	1.69	17.83	11.39	0.88	23.17	14.78	0.00	0.00	0.00	0.88	23.26	14.83
15.00	0.98	7.96	1.52	21.24	16.45	1.69	19.23	13.51	0.88	24.57	16.90	0.00	0.00	0.00	0.88	24.67	16.96
20.00	0.98	7.96	1.52	22.49	17.91	1.69	20.64	15.63	0.88	25.98	19.02	0.00	0.00	0.00	0.88	26.07	19.08
25.00	0.98	7.96	1.52	23.74	19.37	1.69	22.05	17.76	0.88	27.39	21.14	0.00	0.00	0.00	0.88	27.48	21.20
NEW YORK / CAYUGA																	
5.00	0.98	7.96	1.42	19.41	14.10	2.10	15.29	8.55	1.37	17.83	10.16	1.07	19.79	11.41	1.30	18.17	10.38
10.00	0.98	7.96	1.42	20.66	15.56	2.10	16.70	10.68	1.37	19.24	12.28	1.07	21.20	13.53	1.30	19.58	12.50
15.00	0.98	7.96	1.42	21.91	17.02	2.10	18.11	12.80	1.37	20.64	14.41	1.07	22.61	15.65	1.30	20.99	14.62
20.00	0.98	7.96	1.42	23.16	18.48	2.10	19.51	14.92	1.37	22.05	16.53	1.07	24.01	17.77	1.30	22.39	16.75
25.00	0.98	7.96	1.42	24.41	19.94	2.10	20.92	17.04	1.37	23.46	18.65	1.07	25.42	19.90	1.30	23.80	18.87
NEW YORK / CHAUTAUQUA																	
5.00	0.98	7.96	1.48	18.98	13.73	1.43	17.50	9.95	0.89	21.70	12.61	0.00	0.00	0.00	0.95	21.00	12.17
10.00	0.98	7.96	1.48	20.22	15.19	1.43	18.91	12.07	0.89	23.10	14.74	0.00	0.00	0.00	0.95	22.40	14.29
15.00	0.98	7.96	1.48	21.47	16.65	1.43	20.31	14.20	0.89	24.51	16.86	0.00	0.00	0.00	0.95	23.81	16.41
20.00	0.98	7.96	1.48	22.72	18.11	1.43	21.72	16.32	0.89	25.92	18.98	0.00	0.00	0.00	0.95	25.22	18.54
25.00	0.98	7.96	1.48	23.97	19.57	1.43	23.13	18.44	0.89	27.33	21.10	0.00	0.00	0.00	0.95	26.62	20.66
NEW YORK / CHEMUNG																	
5.00	0.98	7.96	1.11	22.20	16.47	1.85	15.93	8.95	1.19	18.92	10.85	0.00	0.00	0.00	0.96	20.85	12.08
10.00	0.98	7.96	1.11	23.44	17.93	1.85	17.33	11.08	1.19	20.33	12.97	0.00	0.00	0.00	0.96	22.26	14.20
15.00	0.98	7.96	1.11	24.69	19.39	1.85	18.74	13.20	1.19	21.73	15.10	0.00	0.00	0.00	0.96	23.67	16.32
20.00	0.98	7.96	1.11	25.94	20.85	1.85	20.15	15.32	1.19	23.14	17.22	0.00	0.00	0.00	0.96	25.07	18.44
25.00	0.98	7.96	1.11	27.19	22.31	1.85	21.56	17.44	1.19	24.55	19.34	0.00	0.00	0.00	0.96	26.48	20.57
NEW YORK / CHENANGO																	
5.00	0.98	7.96	1.54	18.63	13.43	1.72	16.35	9.22	0.00	0.00	0.00	0.00	0.00	0.00	1.03	20.16	11.64
10.00	0.98	7.96	1.54	19.88	14.89	1.72	17.76	11.34	0.00	0.00	0.00	0.00	0.00	0.00	1.03	21.57	13.76
15.00	0.98	7.96	1.54	21.13	16.35	1.72	19.16	13.47	0.00	0.00	0.00	0.00	0.00	0.00	1.03	22.97	15.88
20.00	0.98	7.96	1.54	22.37	17.81	1.72	20.57	15.59	0.00	0.00	0.00	0.00	0.00	0.00	1.03	24.38	18.01
25.00	0.98	7.96	1.54	23.62	19.27	1.72	21.98	17.71	0.00	0.00	0.00	0.00	0.00	0.00	1.03	25.79	20.13

Table C-3. Continued

DIST- ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
NEW YORK / COLUMBIA																	
5.00	0.98	7.96	1.57	18.45	13.28	2.18	15.12	8.45	0.00	0.00	0.00	0.00	0.00	0.00	0.97	20.75	12.01
10.00	0.98	7.96	1.57	19.70	14.74	2.18	16.53	10.57	0.00	0.00	0.00	0.00	0.00	0.00	0.97	22.16	14.14
15.00	0.98	7.96	1.57	20.95	16.20	2.18	17.94	12.69	0.00	0.00	0.00	0.00	0.00	0.00	0.97	23.57	16.26
20.00	0.98	7.96	1.57	22.20	17.66	2.18	19.35	14.81	0.00	0.00	0.00	0.00	0.00	0.00	0.97	24.97	18.38
25.00	0.98	7.96	1.57	23.45	19.12	2.18	20.75	16.94	0.00	0.00	0.00	0.00	0.00	0.00	0.97	26.38	20.50
NEW YORK / CORTLAND																	
5.00	0.98	7.96	1.47	19.09	13.82	1.59	16.80	9.51	0.00	0.00	0.00	0.00	0.00	0.00	1.21	18.78	10.77
10.00	0.98	7.96	1.47	20.34	15.28	1.59	18.21	11.63	0.00	0.00	0.00	0.00	0.00	0.00	1.21	20.19	12.89
15.00	0.98	7.96	1.47	21.59	16.74	1.59	19.62	13.75	0.00	0.00	0.00	0.00	0.00	0.00	1.21	21.60	15.01
20.00	0.98	7.96	1.47	22.83	18.20	1.59	21.02	15.88	0.00	0.00	0.00	0.00	0.00	0.00	1.21	23.01	17.13
25.00	0.98	7.96	1.47	24.08	19.67	1.59	22.43	18.00	0.00	0.00	0.00	0.00	0.00	0.00	1.21	24.41	19.26
NEW YORK / DUTCHESS																	
5.00	0.98	7.96	1.57	18.46	13.29	1.86	15.90	8.94	0.00	0.00	0.00	0.00	0.00	0.00	0.94	21.41	12.24
10.00	0.98	7.96	1.57	19.71	14.75	1.86	17.31	11.06	0.00	0.00	0.00	0.00	0.00	0.00	0.94	22.52	14.36
15.00	0.98	7.96	1.57	20.96	16.21	1.86	18.72	13.19	0.00	0.00	0.00	0.00	0.00	0.00	0.94	23.92	16.49
20.00	0.98	7.96	1.57	22.21	17.67	1.86	20.13	15.31	0.00	0.00	0.00	0.00	0.00	0.00	0.94	25.33	18.61
25.00	0.98	7.96	1.57	23.46	19.13	1.86	21.53	17.43	0.00	0.00	0.00	0.00	0.00	0.00	0.94	26.74	20.73
NEW YORK / ERIE																	
5.00	0.98	7.96	1.37	19.81	14.43	1.79	16.12	9.08	1.32	18.06	10.31	1.18	18.99	10.90	1.07	19.86	11.45
10.00	0.98	7.96	1.37	21.05	15.89	1.79	17.53	11.20	1.32	19.47	12.43	1.18	20.40	13.02	1.07	21.27	13.57
15.00	0.98	7.96	1.37	22.30	17.36	1.79	18.94	13.32	1.32	20.87	14.55	1.18	21.81	15.14	1.07	22.68	15.70
20.00	0.98	7.96	1.37	23.55	18.82	1.79	20.34	15.45	1.32	22.28	16.67	1.18	23.22	17.27	1.07	24.09	17.82
25.00	0.98	7.96	1.37	24.80	20.28	1.79	21.75	17.57	1.32	23.69	18.80	1.18	24.62	19.39	1.07	25.49	19.94
NEW YORK / GENESEE																	
5.00	0.98	7.96	1.29	20.48	15.01	1.55	16.96	9.61	1.32	18.10	10.33	0.97	20.74	12.01	1.15	19.22	11.04
10.00	0.98	7.96	1.29	21.73	16.47	1.55	18.37	11.73	1.32	19.50	12.45	0.97	22.15	14.13	1.15	20.63	13.16
15.00	0.98	7.96	1.29	22.98	17.93	1.55	19.78	13.86	1.32	20.91	14.58	0.97	23.55	16.25	1.15	22.03	15.29
20.00	0.98	7.96	1.29	24.23	19.39	1.55	21.19	15.98	1.32	22.32	16.70	0.97	24.96	18.37	1.15	23.44	17.41
25.00	0.98	7.96	1.29	25.48	20.85	1.55	22.59	18.10	1.32	23.73	18.82	0.97	26.37	20.50	1.15	24.85	19.53

Table C-3. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
NEW YORK / JEFFERSON																	
5.00	0.98	7.96	1.06	22.87	17.05	2.19	15.09	8.42	1.14	19.26	11.07	0.00	0.00	0.00	0.97	20.78	12.03
10.00	0.98	7.96	1.06	24.12	18.51	2.19	16.50	10.55	1.14	20.67	13.19	0.00	0.00	0.00	0.97	22.19	14.15
15.00	0.98	7.96	1.06	25.37	19.97	2.19	17.90	12.67	1.14	22.08	15.32	0.00	0.00	0.00	0.97	23.59	16.28
20.00	0.98	7.96	1.06	26.62	21.43	2.19	19.31	14.79	1.14	23.49	17.44	0.00	0.00	0.00	0.97	25.00	18.40
25.00	0.98	7.96	1.06	27.87	22.89	2.19	20.72	16.91	1.14	24.89	19.56	0.00	0.00	0.00	0.97	26.41	20.52
NEW YORK / LIVINGSTON																	
5.00	0.98	7.96	1.12	22.18	16.46	1.73	16.31	9.20	0.89	21.72	12.63	0.00	0.00	0.00	1.13	19.36	11.13
10.00	0.98	7.96	1.12	23.43	17.92	1.73	17.71	11.32	0.89	23.13	14.75	0.00	0.00	0.00	1.13	20.77	13.26
15.00	0.98	7.96	1.12	24.68	19.38	1.73	19.12	13.44	0.89	24.54	16.88	0.00	0.00	0.00	1.13	22.18	15.38
20.00	0.98	7.96	1.12	25.93	20.84	1.73	20.53	15.56	0.89	25.95	19.00	0.00	0.00	0.00	1.13	23.59	17.50
25.00	0.98	7.96	1.12	27.18	22.30	1.73	21.94	17.69	0.89	27.35	21.12	0.00	0.00	0.00	1.13	24.99	19.62
NEW YORK / MADISON																	
5.00	0.98	7.96	1.46	19.11	13.84	1.98	15.58	8.73	1.10	19.53	11.24	1.29	18.27	10.44	1.30	18.22	10.41
10.00	0.98	7.96	1.46	20.36	15.30	1.98	16.99	10.86	1.10	20.94	13.36	1.29	19.68	12.56	1.30	19.63	12.53
15.00	0.98	7.96	1.46	21.61	16.76	1.98	18.39	12.98	1.10	22.35	15.49	1.29	21.09	14.69	1.30	21.03	14.65
20.00	0.98	7.96	1.46	22.86	18.22	1.98	19.80	15.10	1.10	23.76	17.61	1.29	22.49	16.81	1.30	22.44	16.78
25.00	0.98	7.96	1.46	24.11	19.69	1.98	21.21	17.22	1.10	25.16	19.73	1.29	23.90	18.93	1.30	23.85	18.90
NEW YORK / MONROE																	
5.00	0.98	7.96	1.23	20.98	15.43	1.72	16.34	9.22	0.90	21.60	12.55	1.37	17.81	10.15	1.12	19.43	11.18
10.00	0.98	7.96	1.23	22.23	16.89	1.72	17.75	11.34	0.90	23.00	14.67	1.37	19.22	12.27	1.12	20.84	13.30
15.00	0.98	7.96	1.23	23.47	18.35	1.72	19.16	13.46	0.90	24.41	16.80	1.37	20.62	14.39	1.12	22.25	15.42
20.00	0.98	7.96	1.23	24.72	19.81	1.72	20.56	15.59	0.90	25.82	18.92	1.37	22.03	16.52	1.12	23.65	17.54
25.00	0.98	7.96	1.23	25.97	21.27	1.72	21.97	17.71	0.90	27.23	21.04	1.37	23.44	18.64	1.12	25.06	19.67
NEW YORK / MONTGOMERY																	
5.00	0.98	7.96	1.48	19.03	13.78	1.81	16.04	9.02	1.88	15.86	8.91	0.00	0.00	0.00	1.06	19.94	11.50
10.00	0.98	7.96	1.48	20.28	15.24	1.81	17.44	11.15	1.88	17.26	11.03	0.00	0.00	0.00	1.06	21.35	13.62
15.00	0.98	7.96	1.48	21.53	16.70	1.81	18.85	13.27	1.88	18.67	13.16	0.00	0.00	0.00	1.06	22.75	15.74
20.00	0.98	7.96	1.48	22.78	18.16	1.81	20.26	15.39	1.88	20.08	15.28	0.00	0.00	0.00	1.06	24.16	17.87
25.00	0.98	7.96	1.48	24.03	19.62	1.81	21.67	17.52	1.88	21.49	17.40	0.00	0.00	0.00	1.06	25.57	19.99

Table C-3. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
NEW YORK / NIAGARA																	
5.00	0.98	7.96	1.36	19.85	14.47	1.59	16.79	9.50	1.89	15.83	8.89	0.00	0.00	0.00	1.11	19.46	11.19
10.00	0.98	7.96	1.36	21.10	15.93	1.59	18.20	11.63	1.89	17.24	11.02	0.00	0.00	0.00	1.11	20.86	13.32
15.00	0.98	7.96	1.36	22.35	17.40	1.59	19.61	13.75	1.89	18.64	13.14	0.00	0.00	0.00	1.11	22.27	15.44
20.00	0.98	7.96	1.36	23.60	18.86	1.59	21.01	15.87	1.89	20.05	15.26	0.00	0.00	0.00	1.11	23.68	17.56
25.00	0.98	7.96	1.36	24.85	20.32	1.59	22.42	17.99	1.89	21.46	17.38	0.00	0.00	0.00	1.11	25.09	19.68
NEW YORK / ONEIDA																	
5.00	0.98	7.96	1.45	19.20	13.92	2.07	15.37	8.60	1.75	16.22	9.14	0.00	0.00	0.00	1.35	17.92	10.22
10.00	0.98	7.96	1.45	20.45	15.38	2.07	16.78	10.72	1.75	17.63	11.27	0.00	0.00	0.00	1.35	19.33	12.34
15.00	0.98	7.96	1.45	21.70	16.84	2.07	18.18	12.85	1.75	19.04	13.39	0.00	0.00	0.00	1.35	20.74	14.47
20.00	0.98	7.96	1.45	22.95	18.30	2.07	19.59	14.97	1.75	20.45	15.51	0.00	0.00	0.00	1.35	22.15	16.59
25.00	0.98	7.96	1.45	24.20	19.76	2.07	21.00	17.09	1.75	21.85	17.63	0.00	0.00	0.00	1.35	23.55	18.71
NEW YORK / ONANDAGA																	
5.00	0.98	7.96	1.41	19.52	14.19	1.97	15.60	8.74	1.16	19.10	10.97	0.00	0.00	0.00	1.27	18.39	10.51
10.00	0.98	7.96	1.41	20.76	15.65	1.97	17.00	10.87	1.16	20.51	13.09	0.00	0.00	0.00	1.27	19.79	12.64
15.00	0.98	7.96	1.41	22.01	17.11	1.97	18.41	12.99	1.16	21.92	15.21	0.00	0.00	0.00	1.27	21.20	14.76
20.00	0.98	7.96	1.41	23.26	18.57	1.97	19.82	15.11	1.16	23.32	17.34	0.00	0.00	0.00	1.27	22.61	16.88
25.00	0.98	7.96	1.41	24.51	20.03	1.97	21.22	17.24	1.16	24.73	19.46	0.00	0.00	0.00	1.27	24.02	19.00
NEW YORK / ONTARIO																	
5.00	0.98	7.96	1.22	21.10	15.54	1.67	16.50	9.32	1.20	18.86	10.81	1.33	18.04	10.29	1.19	18.90	10.84
10.00	0.98	7.96	1.22	22.35	17.00	1.67	17.91	11.44	1.20	20.26	12.94	1.33	19.44	12.42	1.19	20.30	12.96
15.00	0.98	7.96	1.22	23.60	18.46	1.67	19.31	13.56	1.20	21.67	15.06	1.33	20.85	14.54	1.19	21.71	15.08
20.00	0.98	7.96	1.22	24.85	19.92	1.67	20.72	15.69	1.20	23.08	17.18	1.33	22.26	16.66	1.19	23.12	17.21
25.00	0.98	7.96	1.22	26.10	21.38	1.67	22.13	17.81	1.20	24.49	19.30	1.33	23.67	18.78	1.19	24.53	19.33
NEW YORK / ORLEANS																	
5.00	0.98	7.96	1.55	18.55	13.36	1.51	17.14	9.73	1.36	17.85	10.18	0.00	0.00	0.00	1.26	18.43	10.54
10.00	0.98	7.96	1.55	19.80	14.83	1.51	18.55	11.85	1.36	19.26	12.30	0.00	0.00	0.00	1.26	19.84	12.67
15.00	0.98	7.96	1.55	21.05	16.29	1.51	19.96	13.97	1.36	20.67	14.42	0.00	0.00	0.00	1.26	21.25	14.79
20.00	0.98	7.96	1.55	22.30	17.75	1.51	21.36	16.09	1.36	22.08	16.55	0.00	0.00	0.00	1.26	22.65	16.91
25.00	0.98	7.96	1.55	23.55	19.21	1.51	22.77	18.22	1.36	23.48	18.67	0.00	0.00	0.00	1.26	24.06	19.03

Table C-3. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ACRE	OATS BALES $/TON	OATS STACKS $/TON
NEW YORK / OTSEGO																	
5.00	0.98	7.96	1.48	19.00	13.75	2.17	15.14	8.46	0.31	42.89	26.05	0.00	0.00	0.00	1.12	19.42	11.17
10.00	0.98	7.96	1.48	20.25	15.21	2.17	16.55	10.58	0.31	44.30	28.17	0.00	0.00	0.00	1.12	20.83	13.29
15.00	0.98	7.96	1.48	21.50	16.67	2.17	17.96	12.70	0.31	45.71	30.30	0.00	0.00	0.00	1.12	22.24	15.42
20.00	0.98	7.96	1.48	22.75	18.13	2.17	19.37	14.83	0.31	47.11	32.42	0.00	0.00	0.00	1.12	23.65	17.54
25.00	0.98	7.96	1.48	24.00	19.59	2.17	20.77	16.95	0.31	48.52	34.54	0.00	0.00	0.00	1.12	25.05	19.66
NEW YORK / SCHOHARIE																	
5.00	0.98	7.96	1.75	17.52	12.49	1.63	16.65	9.41	0.00	0.00	0.00	0.00	0.00	0.00	1.16	19.14	10.99
10.00	0.98	7.96	1.75	18.77	13.95	1.63	18.05	11.53	0.00	0.00	0.00	0.00	0.00	0.00	1.16	20.54	13.11
15.00	0.98	7.96	1.75	20.02	15.41	1.63	19.46	13.66	0.00	0.00	0.00	0.00	0.00	0.00	1.16	21.95	15.23
20.00	0.98	7.96	1.75	21.27	16.87	1.63	20.87	15.78	0.00	0.00	0.00	0.00	0.00	0.00	1.16	23.36	17.36
25.00	0.98	7.96	1.75	22.52	18.33	1.63	22.27	17.90	0.00	0.00	0.00	0.00	0.00	0.00	1.16	24.77	19.48
NEW YORK / SCHUYLER																	
5.00	0.98	7.96	1.33	20.08	14.67	1.65	16.58	9.37	1.16	19.12	10.98	0.00	0.00	0.00	1.02	20.27	11.71
10.00	0.98	7.96	1.33	21.33	16.13	1.65	17.99	11.49	1.16	20.53	13.10	0.00	0.00	0.00	1.02	21.68	13.83
15.00	0.98	7.96	1.33	22.58	17.59	1.65	19.40	13.62	1.16	21.94	15.23	0.00	0.00	0.00	1.02	23.08	15.95
20.00	0.98	7.96	1.33	23.83	19.05	1.65	20.81	15.74	1.16	23.34	17.35	0.00	0.00	0.00	1.02	24.49	18.08
25.00	0.98	7.96	1.33	25.08	20.51	1.65	22.21	17.86	1.16	24.75	19.47	0.00	0.00	0.00	1.02	25.90	20.20
NEW YORK / SENECA																	
5.00	0.98	7.96	1.22	21.10	15.54	1.77	16.16	9.10	1.24	18.55	10.62	0.00	0.00	0.00	1.29	18.24	10.42
10.00	0.98	7.96	1.22	22.35	17.00	1.77	17.57	11.23	1.24	19.96	12.74	0.00	0.00	0.00	1.29	19.65	12.55
15.00	0.98	7.96	1.22	23.60	18.46	1.77	18.98	13.35	1.24	21.37	14.86	0.00	0.00	0.00	1.29	21.06	14.67
20.00	0.98	7.96	1.22	24.85	19.92	1.77	20.38	15.47	1.24	22.77	16.99	0.00	0.00	0.00	1.29	22.46	16.79
25.00	0.98	7.96	1.22	26.10	21.38	1.77	21.79	17.59	1.24	24.18	19.11	0.00	0.00	0.00	1.29	23.87	18.91
NEW YORK / STEUBEN																	
5.00	0.98	7.96	1.41	19.48	14.16	1.61	16.72	9.46	1.16	19.08	10.95	0.00	0.00	0.00	1.12	19.43	11.18
10.00	0.98	7.96	1.41	20.73	15.62	1.61	18.13	11.58	1.16	20.48	13.07	0.00	0.00	0.00	1.12	20.84	13.30
15.00	0.98	7.96	1.41	21.98	17.08	1.61	19.54	13.71	1.16	21.89	15.20	0.00	0.00	0.00	1.12	22.24	15.42
20.00	0.98	7.96	1.41	23.23	18.54	1.61	20.95	15.83	1.16	23.30	17.32	0.00	0.00	0.00	1.12	23.65	17.54
25.00	0.98	7.96	1.41	24.48	20.00	1.61	22.35	17.95	1.16	24.71	19.44	0.00	0.00	0.00	1.12	25.06	19.67

Table C-3. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
NEW YORK / TIOGA																	
5.00	0.98	7.96	1.49	18.97	13.72	1.32	18.07	10.31	0.00	0.00	0.00	0.00	0.00	0.00	1.06	19.90	11.48
10.00	0.98	7.96	1.49	20.22	15.18	1.32	19.48	12.44	0.00	0.00	0.00	0.00	0.00	0.00	1.06	21.31	13.60
15.00	0.98	7.96	1.49	21.47	16.64	1.32	20.88	14.56	0.00	0.00	0.00	0.00	0.00	0.00	1.06	22.72	15.72
20.00	0.98	7.96	1.49	22.72	18.11	1.32	22.29	16.68	0.00	0.00	0.00	0.00	0.00	0.00	1.06	24.13	17.84
25.00	0.98	7.96	1.49	23.97	19.57	1.32	23.70	18.80	0.00	0.00	0.00	0.00	0.00	0.00	1.06	25.53	19.97
NEW YORK / TOMPKINS																	
5.00	0.98	7.96	1.34	20.01	14.60	1.80	16.08	9.05	1.21	18.75	10.75	0.00	0.00	0.00	1.24	18.56	10.63
10.00	0.98	7.96	1.34	21.25	16.07	1.80	17.49	11.18	1.21	20.16	12.87	0.00	0.00	0.00	1.24	19.97	12.75
15.00	0.98	7.96	1.34	22.50	17.53	1.80	18.90	13.30	1.21	21.57	14.99	0.00	0.00	0.00	1.24	21.38	14.87
20.00	0.98	7.96	1.34	23.75	18.99	1.80	20.30	15.42	1.21	22.97	17.11	0.00	0.00	0.00	1.24	22.79	16.99
25.00	0.98	7.96	1.34	25.00	20.45	1.80	21.71	17.54	1.21	24.38	19.24	0.00	0.00	0.00	1.24	24.19	19.12
NEW YORK / WASHINGTON																	
5.00	0.98	7.96	1.56	18.51	13.33	2.27	14.94	8.33	0.00	0.00	0.00	0.00	0.00	0.00	1.01	20.37	11.77
10.00	0.98	7.96	1.56	19.76	14.79	2.27	16.35	10.45	0.00	0.00	0.00	0.00	0.00	0.00	1.01	21.78	13.89
15.00	0.98	7.96	1.56	21.01	16.25	2.27	17.76	12.58	0.00	0.00	0.00	0.00	0.00	0.00	1.01	23.18	16.02
20.00	0.98	7.96	1.56	22.26	17.71	2.27	19.16	14.70	0.00	0.00	0.00	0.00	0.00	0.00	1.01	24.59	18.14
25.00	0.98	7.96	1.56	23.51	19.17	2.27	20.57	16.82	0.00	0.00	0.00	0.00	0.00	0.00	1.01	26.00	20.26
NEW YORK / WAYNE																	
5.00	0.98	7.96	1.29	20.48	15.00	1.54	17.00	9.63	1.32	18.10	10.34	1.41	17.60	10.01	1.21	18.74	10.74
10.00	0.98	7.96	1.29	21.72	16.47	1.54	18.41	11.76	1.32	19.51	12.46	1.41	19.00	12.14	1.21	20.15	12.86
15.00	0.98	7.96	1.29	22.97	17.93	1.54	19.81	13.88	1.32	20.92	14.58	1.41	20.41	14.26	1.21	21.56	14.98
20.00	0.98	7.96	1.29	24.22	19.39	1.54	21.22	16.00	1.32	22.33	16.70	1.41	21.82	16.38	1.21	22.96	17.11
25.00	0.98	7.96	1.29	25.47	20.85	1.54	22.63	18.12	1.32	23.73	18.83	1.41	23.23	18.50	1.21	24.37	19.23
NEW YORK / WYOMING																	
5.00	0.98	7.96	1.28	20.57	15.08	1.61	16.72	9.46	2.03	15.46	8.66	0.96	20.84	12.07	1.10	19.58	11.27
10.00	0.98	7.96	1.28	21.82	16.54	1.61	18.13	11.58	2.03	16.87	10.78	0.96	22.24	14.19	1.10	20.98	13.39
15.00	0.98	7.96	1.28	23.06	18.00	1.61	19.54	13.71	2.03	18.27	12.90	0.96	23.65	16.31	1.10	22.39	15.51
20.00	0.98	7.96	1.28	24.31	19.46	1.61	20.95	15.83	2.03	19.68	15.03	0.96	25.06	18.44	1.10	23.80	17.64
25.00	0.98	7.96	1.28	25.56	20.93	1.61	22.35	17.95	2.03	21.09	17.15	0.96	26.47	20.56	1.10	25.21	19.76

Table C-3. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
NEW YORK / YATES																	
5.00	0.98	7.96	1.42	19.40	14.09	1.65	16.57	9.36	1.08	19.76	11.39	0.68	25.04	14.73	1.28	18.29	10.45
10.00	0.98	7.96	1.42	20.65	15.55	1.65	17.97	11.48	1.08	21.17	13.51	0.68	26.45	16.85	1.28	19.70	12.58
15.00	0.98	7.96	1.42	21.90	17.01	1.65	19.38	13.61	1.08	22.58	15.63	0.68	27.85	18.98	1.28	21.10	14.70
20.00	0.98	7.96	1.42	23.15	18.47	1.65	20.79	15.73	1.08	23.99	17.76	0.68	29.26	21.10	1.28	22.51	16.82
25.00	0.98	7.96	1.42	24.40	19.93	1.65	22.20	17.85	1.08	25.39	19.88	0.68	30.67	23.22	1.28	23.92	18.94

Table C-3. Continued

PENNSYLVANIA

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ACRE	OATS BALES $/TON	OATS STACKS $/TON
PENNSYLVANIA / ADAMS																	
5.00	0.98	7.96	1.21	21.19	15.61	1.28	18.32	10.47	1.38	17.76	10.12	1.38	17.77	10.13	0.85	22.20	12.93
10.00	0.98	7.96	1.21	22.44	17.07	1.28	19.73	12.59	1.38	19.17	12.24	1.38	19.18	12.25	0.85	23.61	15.05
15.00	0.98	7.96	1.21	23.68	18.53	1.28	21.13	14.72	1.38	20.58	14.36	1.38	20.59	14.37	0.85	25.01	17.18
20.00	0.98	7.96	1.21	24.93	19.99	1.28	22.54	16.84	1.38	21.98	16.49	1.38	22.00	16.49	0.85	26.42	19.30
25.00	0.98	7.96	1.21	26.18	21.45	1.28	23.95	18.96	1.38	23.39	18.61	1.38	23.40	18.62	0.85	27.83	21.42
PENNSYLVANIA / ARMSTRONG																	
5.00	0.98	7.96	1.46	19.14	13.87	1.12	19.38	11.14	1.54	17.00	9.64	0.00	0.00	0.00	0.88	21.79	12.67
10.00	0.98	7.96	1.46	20.39	15.33	1.12	20.79	13.27	1.54	18.41	11.76	0.00	0.00	0.00	0.88	23.19	14.79
15.00	0.98	7.96	1.46	21.64	16.79	1.12	22.19	15.39	1.54	19.82	13.88	0.00	0.00	0.00	0.88	24.60	16.92
20.00	0.98	7.96	1.46	22.89	18.25	1.12	23.60	17.51	1.54	21.23	16.01	0.00	0.00	0.00	0.88	26.01	19.04
25.00	0.98	7.96	1.46	24.14	19.71	1.12	25.01	19.63	1.54	22.63	18.13	0.00	0.00	0.00	0.88	27.42	21.16
PENNSYLVANIA / BEAVER																	
5.00	0.98	7.96	1.54	18.62	13.42	1.72	16.33	9.21	2.11	15.27	8.54	0.00	0.00	0.00	1.12	19.39	11.15
10.00	0.98	7.96	1.54	19.87	14.88	1.72	17.74	11.33	2.11	16.68	10.66	0.00	0.00	0.00	1.12	20.80	13.27
15.00	0.98	7.96	1.54	21.12	16.34	1.72	19.15	13.46	2.11	18.09	12.79	0.00	0.00	0.00	1.12	22.21	15.40
20.00	0.98	7.96	1.54	22.37	17.80	1.72	20.55	15.58	2.11	19.50	14.91	0.00	0.00	0.00	1.12	23.61	17.52
25.00	0.98	7.96	1.54	23.61	19.27	1.72	21.96	17.70	2.11	20.90	17.03	0.00	0.00	0.00	1.12	25.02	19.64
PENNSYLVANIA / BEDFORD																	
5.00	0.98	7.96	1.59	18.35	13.20	1.33	18.02	10.28	1.62	16.70	9.44	1.00	20.47	11.84	0.93	21.18	12.28
10.00	0.98	7.96	1.59	19.60	14.66	1.33	19.43	12.40	1.62	18.11	11.57	1.00	21.88	13.96	0.93	22.58	14.41
15.00	0.98	7.96	1.59	20.85	16.12	1.33	20.83	14.53	1.62	19.51	13.69	1.00	23.29	16.08	0.93	23.99	16.53
20.00	0.98	7.96	1.59	22.10	17.58	1.33	22.24	16.65	1.62	20.92	15.81	1.00	24.69	18.20	0.93	25.40	18.65
25.00	0.98	7.96	1.59	23.35	19.04	1.33	23.65	18.77	1.62	22.33	17.93	1.00	26.10	20.33	0.93	26.81	20.77
PENNSYLVANIA / BERKS																	
5.00	0.98	7.96	1.53	18.71	13.50	1.57	16.88	9.56	1.76	16.22	9.14	0.96	20.91	12.11	0.91	21.42	12.44
10.00	0.98	7.96	1.53	19.96	14.97	1.57	18.29	11.68	1.76	17.62	11.26	0.96	22.32	14.24	0.91	22.83	14.56
15.00	0.98	7.96	1.53	21.21	16.43	1.57	19.69	13.80	1.76	19.03	13.38	0.96	23.72	16.36	0.91	24.23	16.68
20.00	0.98	7.96	1.53	22.46	17.89	1.57	21.10	15.93	1.76	20.44	15.51	0.96	25.13	18.48	0.91	25.64	18.81
25.00	0.98	7.96	1.53	23.71	19.35	1.57	22.51	18.05	1.76	21.84	17.63	0.96	26.54	20.60	0.91	27.05	20.93

Table C-3. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
PENNSYLVANIA / BLAIR																	
5.00	0.98	7.96	1.57	18.43	13.27	1.36	17.88	10.19	1.85	15.93	8.96	1.14	19.26	11.07	0.99	20.61	11.92
10.00	0.98	7.96	1.57	19.68	14.73	1.36	19.29	12.31	1.85	17.34	11.08	1.14	20.67	13.19	0.99	22.02	14.05
15.00	0.98	7.96	1.57	20.93	16.19	1.36	20.69	14.44	1.85	18.75	13.20	1.14	22.07	15.31	0.99	23.42	16.17
20.00	0.98	7.96	1.57	22.18	17.65	1.36	22.10	16.56	1.85	20.16	15.33	1.14	23.48	17.44	0.99	24.83	18.29
25.00	0.98	7.96	1.57	23.43	19.11	1.36	23.51	18.68	1.85	21.56	17.45	1.14	24.89	19.56	0.99	26.24	20.41
PENNSYLVANIA / BRADFORD																	
5.00	0.98	7.96	1.29	20.44	14.98	1.28	18.34	10.48	1.13	19.32	11.11	0.00	0.00	0.00	0.84	22.33	13.01
10.00	0.98	7.96	1.29	21.69	16.44	1.28	19.75	12.61	1.13	20.73	13.23	0.00	0.00	0.00	0.84	23.74	15.14
15.00	0.98	7.96	1.29	22.94	17.90	1.28	21.15	14.73	1.13	22.13	15.35	0.00	0.00	0.00	0.84	25.14	17.26
20.00	0.98	7.96	1.29	24.19	19.36	1.28	22.56	16.85	1.13	23.54	17.47	0.00	0.00	0.00	0.84	26.55	19.38
25.00	0.98	7.96	1.29	25.44	20.82	1.28	23.97	18.97	1.13	24.95	19.60	0.00	0.00	0.00	0.84	27.96	21.50
PENNSYLVANIA / BUCKS																	
5.00	0.98	7.96	1.37	19.83	14.45	1.39	17.70	10.08	1.53	17.04	9.66	1.19	18.89	10.83	0.86	22.11	12.87
10.00	0.98	7.96	1.37	21.08	15.91	1.39	19.11	12.20	1.53	18.45	11.78	1.19	20.29	12.95	0.86	23.51	14.99
15.00	0.98	7.96	1.37	22.33	17.37	1.39	20.52	14.33	1.53	19.85	13.91	1.19	21.70	15.08	0.86	24.92	17.12
20.00	0.98	7.96	1.37	23.57	18.83	1.39	21.93	16.45	1.53	21.26	16.03	1.19	23.11	17.20	0.86	26.33	19.24
25.00	0.98	7.96	1.37	24.82	20.30	1.39	23.33	18.57	1.53	22.67	18.15	1.19	24.51	19.32	0.86	27.73	21.36
PENNSYLVANIA / BUTLER																	
5.00	0.98	7.96	1.45	19.22	13.93	1.39	17.70	10.08	1.69	16.43	9.28	1.33	18.04	10.30	1.04	20.14	11.62
10.00	0.98	7.96	1.45	20.46	15.39	1.39	19.11	12.20	1.69	17.84	11.40	1.33	19.45	12.42	1.04	21.54	13.75
15.00	0.98	7.96	1.45	21.71	16.85	1.39	20.52	14.33	1.69	19.25	13.52	1.33	20.86	14.54	1.04	22.95	15.87
20.00	0.98	7.96	1.45	22.96	18.31	1.39	21.93	16.45	1.69	20.66	15.64	1.33	22.27	16.67	1.04	24.36	17.99
25.00	0.98	7.96	1.45	24.21	19.77	1.39	23.33	18.57	1.69	22.06	17.77	1.33	23.67	18.79	1.04	25.77	20.11
PENNSYLVANIA / CAMBRIA																	
5.00	0.98	7.96	1.22	21.11	15.55	1.37	17.81	10.15	1.74	16.25	9.16	0.97	20.80	12.04	1.01	20.36	11.77
10.00	0.98	7.96	1.22	22.36	17.01	1.37	19.22	12.27	1.74	17.66	11.28	0.97	22.20	14.17	1.01	21.77	13.89
15.00	0.98	7.96	1.22	23.61	18.47	1.37	20.62	14.39	1.74	19.07	13.41	0.97	23.61	16.29	1.01	23.18	16.01
20.00	0.98	7.96	1.22	24.86	19.93	1.37	22.03	16.52	1.74	20.47	15.53	0.97	25.02	18.41	1.01	24.59	18.14
25.00	0.98	7.96	1.22	26.11	21.39	1.37	23.44	18.64	1.74	21.88	17.65	0.97	26.43	20.53	1.01	25.99	20.26

Table C-3. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
PENNSYLVANIA / CARBON																	
5.00	0.98	7.96	0.88	25.60	19.37	1.11	19.52	11.23	1.20	18.84	10.84	0.88	21.79	12.67	0.74	23.88	14.00
10.00	0.98	7.96	0.88	26.85	20.83	1.11	20.92	13.35	1.20	20.25	12.93	0.88	23.20	14.79	0.74	25.29	16.12
15.00	0.98	7.96	0.88	28.10	22.29	1.11	22.33	15.48	1.20	21.66	15.05	0.88	24.60	16.92	0.74	26.70	18.24
20.00	0.98	7.96	0.88	29.35	23.75	1.11	23.74	17.60	1.20	23.07	17.17	0.88	26.01	19.04	0.74	28.10	20.37
25.00	0.98	7.96	0.88	30.60	25.22	1.11	25.15	19.72	1.20	24.47	19.30	0.88	27.42	21.16	0.74	29.51	22.49
PENNSYLVANIA / CENTRE																	
5.00	0.98	7.96	1.47	19.09	13.83	1.41	17.61	10.02	1.52	17.10	9.70	1.90	15.79	8.87	1.00	20.51	11.86
10.00	0.98	7.96	1.47	20.34	15.29	1.41	19.02	12.15	1.52	18.51	11.82	1.90	17.20	10.99	1.00	21.92	13.98
15.00	0.98	7.96	1.47	21.59	16.75	1.41	20.43	14.27	1.52	19.91	13.94	1.90	18.61	13.11	1.00	23.32	16.11
20.00	0.98	7.96	1.47	22.84	18.21	1.41	21.83	16.39	1.52	21.32	16.07	1.90	20.01	15.24	1.00	24.73	18.23
25.00	0.98	7.96	1.47	24.09	19.67	1.41	23.24	18.51	1.52	22.73	18.19	1.90	21.42	17.36	1.00	26.14	20.35
PENNSYLVANIA / CHESTER																	
5.00	0.98	7.96	1.65	17.99	12.89	1.64	16.61	9.39	1.81	16.05	9.03	1.00	20.51	11.86	0.96	20.90	12.11
10.00	0.98	7.96	1.65	19.24	14.35	1.64	18.01	11.51	1.81	17.45	11.15	1.00	21.92	13.99	0.96	22.30	14.23
15.00	0.98	7.96	1.65	20.49	15.81	1.64	19.42	13.63	1.81	18.86	13.28	1.00	23.33	16.11	0.96	23.71	16.35
20.00	0.98	7.96	1.65	21.74	17.27	1.64	20.83	15.75	1.81	20.27	15.40	1.00	24.74	18.23	0.96	25.12	18.47
25.00	0.98	7.96	1.65	22.99	18.73	1.64	22.23	17.88	1.81	21.68	17.52	1.00	26.14	20.35	0.96	26.52	20.60
PENNSYLVANIA / CLARION																	
5.00	0.98	7.96	1.55	18.60	13.40	1.10	19.59	11.27	1.11	19.46	11.20	0.00	0.00	0.00	0.94	21.14	12.26
10.00	0.98	7.96	1.55	19.84	14.86	1.10	20.99	13.40	1.11	20.87	13.32	0.00	0.00	0.00	0.94	22.55	14.39
15.00	0.98	7.96	1.55	21.09	16.32	1.10	22.40	15.52	1.11	22.28	15.44	0.00	0.00	0.00	0.94	23.96	16.51
20.00	0.98	7.96	1.55	22.34	17.79	1.10	23.81	17.64	1.11	23.68	17.56	0.00	0.00	0.00	0.94	25.37	18.63
25.00	0.98	7.96	1.55	23.59	19.25	1.10	25.21	19.76	1.11	25.09	19.69	0.00	0.00	0.00	0.94	26.77	20.75
PENNSYLVANIA / CLINTON																	
5.00	0.98	7.96	1.56	18.52	13.34	1.17	19.03	10.92	1.84	15.94	8.97	0.00	0.00	0.00	0.89	21.75	12.64
10.00	0.98	7.96	1.56	19.77	14.80	1.17	20.44	13.05	1.84	17.35	11.09	0.00	0.00	0.00	0.89	23.15	14.77
15.00	0.98	7.96	1.56	21.02	16.26	1.17	21.85	15.17	1.84	18.76	13.21	0.00	0.00	0.00	0.89	24.56	16.89
20.00	0.98	7.96	1.56	22.26	17.72	1.17	23.25	17.29	1.84	20.17	15.33	0.00	0.00	0.00	0.89	25.97	19.01
25.00	0.98	7.96	1.56	23.51	19.18	1.17	24.66	19.41	1.84	21.57	17.46	0.00	0.00	0.00	0.89	27.38	21.13

Table C-3. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
PENNSYLVANIA / COLUMBIA																	
5.00	0.98	7.96	1.27	20.61	15.12	1.21	18.74	10.74	1.27	18.38	10.51	1.03	20.21	11.67	0.98	20.71	11.99
10.00	0.98	7.96	1.27	21.86	16.58	1.21	20.15	12.86	1.27	19.79	12.63	1.03	21.62	13.80	0.98	22.12	14.11
15.00	0.98	7.96	1.27	23.10	18.04	1.21	21.55	14.98	1.27	21.20	14.76	1.03	23.03	15.92	0.98	23.53	16.23
20.00	0.98	7.96	1.27	24.35	19.50	1.21	22.96	17.11	1.27	22.60	16.88	1.03	24.44	18.04	0.98	24.93	18.36
25.00	0.98	7.96	1.27	25.60	20.96	1.21	24.37	19.23	1.27	24.01	19.00	1.03	25.84	20.16	0.98	26.34	20.48
PENNSYLVANIA / CRAWFORD																	
5.00	0.98	7.96	1.54	18.63	13.43	1.77	16.17	9.11	1.23	18.62	10.66	1.38	17.74	10.10	0.98	20.68	11.97
10.00	0.98	7.96	1.54	19.88	14.89	1.77	17.57	11.23	1.23	20.03	12.79	1.38	19.15	12.23	0.98	22.09	14.09
15.00	0.98	7.96	1.54	21.13	16.35	1.77	18.98	13.35	1.23	21.44	14.91	1.38	20.55	14.35	0.98	23.49	16.21
20.00	0.98	7.96	1.54	22.38	17.81	1.77	20.39	15.47	1.23	22.84	17.03	1.38	21.96	16.47	0.98	24.90	18.34
25.00	0.98	7.96	1.54	23.63	19.27	1.77	21.79	17.60	1.23	24.25	19.15	1.38	23.37	18.59	0.98	26.31	20.46
PENNSYLVANIA / CUMBERLAND																	
5.00	0.98	7.96	1.44	19.29	13.99	1.49	17.22	9.77	1.55	16.96	9.61	1.19	18.87	10.82	0.94	21.07	12.22
10.00	0.98	7.96	1.44	20.54	15.45	1.49	18.62	11.90	1.55	18.37	11.73	1.19	20.27	12.94	0.94	22.48	14.34
15.00	0.98	7.96	1.44	21.78	16.91	1.49	20.03	14.02	1.55	19.78	13.86	1.19	21.68	15.06	0.94	23.89	16.46
20.00	0.98	7.96	1.44	23.03	18.37	1.49	21.44	16.14	1.55	21.18	15.98	1.19	23.09	17.19	0.94	25.30	18.59
25.00	0.98	7.96	1.44	24.28	19.83	1.49	22.85	18.26	1.55	22.59	18.10	1.19	24.49	19.31	0.94	26.70	20.71
PENNSYLVANIA / DAUPHIN																	
5.00	0.98	7.96	1.47	19.07	13.81	1.43	17.48	9.94	1.49	17.24	9.79	0.96	20.92	12.12	0.90	21.53	12.50
10.00	0.98	7.96	1.47	20.32	15.27	1.43	18.89	12.06	1.49	18.65	11.91	0.96	22.33	14.24	0.90	22.93	14.63
15.00	0.98	7.96	1.47	21.57	16.73	1.43	20.29	14.18	1.49	20.06	14.03	0.96	23.73	16.37	0.90	24.34	16.75
20.00	0.98	7.96	1.47	22.82	18.19	1.43	21.70	16.31	1.49	21.46	16.16	0.96	25.14	18.49	0.90	25.75	18.87
25.00	0.98	7.96	1.47	24.07	19.65	1.43	23.11	18.43	1.49	22.87	18.28	0.96	26.55	20.61	0.90	27.15	20.99
PENNSYLVANIA / ERIE																	
5.00	0.98	7.96	1.47	19.08	13.81	1.52	17.11	9.70	1.97	15.60	8.75	1.39	17.72	10.09	1.08	19.70	11.35
10.00	0.98	7.96	1.47	20.33	15.27	1.52	18.52	11.83	1.97	17.01	10.87	1.39	19.13	12.21	1.08	21.11	13.47
15.00	0.98	7.96	1.47	21.58	16.73	1.52	19.92	13.95	1.97	18.42	12.99	1.39	20.53	14.34	1.08	22.52	15.59
20.00	0.98	7.96	1.47	22.82	18.20	1.52	21.33	16.07	1.97	19.82	15.12	1.39	21.94	16.46	1.08	23.92	17.72
25.00	0.98	7.96	1.47	24.07	19.66	1.52	22.74	18.19	1.97	21.23	17.24	1.39	23.35	18.58	1.08	25.33	19.84

Table C-3. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
PENNSYLVANIA / FAYETTE																	
5.00	0.98	7.96	1.53	18.67	13.47	1.47	17.30	9.82	1.73	16.28	9.18	0.00	0.00	0.00	0.98	20.64	11.94
10.00	0.98	7.96	1.53	19.92	14.93	1.47	18.71	11.95	1.73	17.69	11.30	0.00	0.00	0.00	0.98	22.05	14.07
15.00	0.98	7.96	1.53	21.17	16.39	1.47	20.11	14.07	1.73	19.10	13.43	0.00	0.00	0.00	0.98	23.46	16.19
20.00	0.98	7.96	1.53	22.42	17.85	1.47	21.52	16.19	1.73	20.51	15.55	0.00	0.00	0.00	0.98	24.86	18.31
25.00	0.98	7.96	1.53	23.67	19.31	1.47	22.93	18.32	1.73	21.91	17.67	0.00	0.00	0.00	0.98	26.27	20.43
PENNSYLVANIA / FRANKLIN																	
5.00	0.98	7.96	1.46	19.16	13.88	1.51	17.15	9.73	1.57	16.90	9.57	1.12	19.45	11.19	0.88	21.77	12.66
10.00	0.98	7.96	1.46	20.41	15.35	1.51	18.56	11.85	1.57	18.31	11.69	1.12	20.85	13.31	0.88	23.17	14.78
15.00	0.98	7.96	1.46	21.66	16.81	1.51	19.96	13.97	1.57	19.71	13.82	1.12	22.26	15.43	0.88	24.58	16.90
20.00	0.98	7.96	1.46	22.91	18.27	1.51	21.37	16.10	1.57	21.12	15.94	1.12	23.67	17.55	0.88	25.99	19.02
25.00	0.98	7.96	1.46	24.16	19.73	1.51	22.78	18.22	1.57	22.53	18.06	1.12	25.08	19.68	0.88	27.39	21.15
PENNSYLVANIA / FULTON																	
5.00	0.98	7.96	1.40	19.59	14.25	1.17	19.03	10.92	1.39	17.68	10.07	0.47	31.68	18.94	0.87	21.97	12.79
10.00	0.98	7.96	1.40	20.83	15.71	1.17	20.44	13.05	1.39	19.09	12.19	0.47	33.09	21.07	0.87	23.38	14.91
15.00	0.98	7.96	1.40	22.08	17.17	1.17	21.85	15.17	1.39	20.50	14.31	0.47	34.50	23.19	0.87	24.79	17.03
20.00	0.98	7.96	1.40	23.33	18.63	1.17	23.26	17.29	1.39	21.91	16.44	0.47	35.90	25.31	0.87	26.20	19.16
25.00	0.98	7.96	1.40	24.58	20.09	1.17	24.66	19.42	1.39	23.31	18.56	0.47	37.31	27.43	0.87	27.60	21.28
PENNSYLVANIA / HUNTINGDON																	
5.00	0.98	7.96	1.56	18.52	13.34	1.21	18.76	10.75	1.65	16.59	9.37	0.00	0.00	0.00	0.84	22.42	13.07
10.00	0.98	7.96	1.56	19.77	14.80	1.21	20.16	12.87	1.65	17.99	11.50	0.00	0.00	0.00	0.84	23.82	15.19
15.00	0.98	7.96	1.56	21.02	16.26	1.21	21.57	14.99	1.65	19.40	13.62	0.00	0.00	0.00	0.84	25.23	17.31
20.00	0.98	7.96	1.56	22.27	17.72	1.21	22.98	17.12	1.65	20.81	15.74	0.00	0.00	0.00	0.84	26.64	19.44
25.00	0.98	7.96	1.56	23.52	19.18	1.21	24.38	19.24	1.65	22.22	17.86	0.00	0.00	0.00	0.84	28.04	21.56
PENNSYLVANIA / INDIANA																	
5.00	0.98	7.96	1.44	19.25	13.96	1.20	18.80	10.78	1.44	17.44	9.91	0.73	24.15	14.17	0.95	21.03	12.19
10.00	0.98	7.96	1.44	20.50	15.42	1.20	20.21	12.90	1.44	18.84	12.03	0.73	25.56	16.29	0.95	22.44	14.32
15.00	0.98	7.96	1.44	21.75	16.88	1.20	21.62	15.02	1.44	20.25	14.16	0.73	26.97	18.41	0.95	23.85	16.44
20.00	0.98	7.96	1.44	23.00	18.35	1.20	23.02	17.15	1.44	21.66	16.28	0.73	28.37	20.54	0.95	25.26	18.56
25.00	0.98	7.96	1.44	24.25	19.81	1.20	24.43	19.27	1.44	23.06	18.40	0.73	29.78	22.66	0.95	26.66	20.68

Table C-3. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
							PENNSYLVANIA / JEFFERSON										
5.00	0.98	7.96	1.37	19.76	14.40	1.39	17.72	10.09	1.40	17.67	10.06	0.00	0.00	0.00	0.87	22.01	12.81
10.00	0.98	7.96	1.37	21.01	15.86	1.39	19.12	12.21	1.40	19.08	12.18	0.00	0.00	0.00	0.87	23.42	14.93
15.00	0.98	7.96	1.37	22.26	17.32	1.39	20.53	14.33	1.40	20.49	14.31	0.00	0.00	0.00	0.87	24.83	17.06
20.00	0.98	7.96	1.37	23.51	18.78	1.39	21.94	16.46	1.40	21.89	16.43	0.00	0.00	0.00	0.87	26.23	19.18
25.00	0.98	7.96	1.37	24.76	20.24	1.39	23.34	18.58	1.40	23.30	18.55	0.00	0.00	0.00	0.87	27.64	21.30
							PENNSYLVANIA / JUNIATA										
5.00	0.98	7.96	1.43	19.35	14.04	1.18	18.95	10.87	1.41	17.61	10.02	0.00	0.00	0.00	0.70	24.76	14.55
10.00	0.98	7.96	1.43	20.60	15.50	1.18	20.36	13.00	1.41	19.02	12.14	0.00	0.00	0.00	0.70	26.17	16.68
15.00	0.98	7.96	1.43	21.84	16.96	1.18	21.77	15.12	1.41	20.42	14.27	0.00	0.00	0.00	0.70	27.57	18.80
20.00	0.98	7.96	1.43	23.09	18.43	1.18	23.18	17.24	1.41	21.83	16.39	0.00	0.00	0.00	0.70	28.98	20.92
25.00	0.98	7.96	1.43	24.34	19.89	1.18	24.58	19.36	1.41	23.24	18.51	0.00	0.00	0.00	0.70	30.39	23.04
							PENNSYLVANIA / LANCASTER										
5.00	0.98	7.96	1.80	17.29	12.29	1.74	16.28	9.18	1.83	15.99	8.99	1.08	19.71	11.35	0.99	20.58	11.90
10.00	0.98	7.96	1.80	18.53	13.75	1.74	17.69	11.30	1.83	17.39	11.12	1.08	21.12	13.48	0.99	21.98	14.03
15.00	0.98	7.96	1.80	19.78	15.21	1.74	19.10	13.43	1.83	18.80	13.24	1.08	22.53	15.60	0.99	23.39	16.15
20.00	0.98	7.96	1.80	21.03	16.67	1.74	20.50	15.55	1.83	20.21	15.36	1.08	23.93	17.72	0.99	24.80	18.27
25.00	0.98	7.96	1.80	22.28	18.13	1.74	21.91	17.67	1.83	21.62	17.48	1.08	25.34	19.84	0.99	26.21	20.39
							PENNSYLVANIA / LAURENCE										
5.00	0.98	7.96	1.38	19.70	14.34	1.28	18.33	10.48	1.73	16.29	9.18	0.00	0.00	0.00	1.01	20.39	11.79
10.00	0.98	7.96	1.38	20.95	15.80	1.28	19.74	12.60	1.73	17.70	11.31	0.00	0.00	0.00	1.01	21.80	13.91
15.00	0.98	7.96	1.38	22.19	17.26	1.28	21.14	14.72	1.73	19.10	13.43	0.00	0.00	0.00	1.01	23.21	16.03
20.00	0.98	7.96	1.38	23.44	18.72	1.28	22.55	16.84	1.73	20.51	15.55	0.00	0.00	0.00	1.01	24.62	18.16
25.00	0.98	7.96	1.38	24.69	20.18	1.28	23.96	18.97	1.73	21.92	17.67	0.00	0.00	0.00	1.01	26.02	20.28
							PENNSYLVANIA / LEBANON										
5.00	0.98	7.96	1.63	18.14	13.01	1.63	16.66	9.42	1.86	15.91	8.95	1.05	20.01	11.54	0.93	21.18	12.29
10.00	0.98	7.96	1.63	19.39	14.48	1.63	18.07	11.54	1.86	17.32	11.07	1.05	21.42	13.66	0.93	22.59	14.41
15.00	0.98	7.96	1.63	20.64	15.94	1.63	19.48	13.67	1.86	18.73	13.19	1.05	22.82	15.79	0.93	23.99	16.53
20.00	0.98	7.96	1.63	21.89	17.40	1.63	20.88	15.79	1.86	20.14	15.31	1.05	24.23	17.91	0.93	25.40	18.65
25.00	0.98	7.96	1.63	23.14	18.86	1.63	22.29	17.91	1.86	21.54	17.44	1.05	25.64	20.03	0.93	26.81	20.78

Table C-3. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
PENNSYLVANIA / LEHIGH																	
5.00	0.98	7.96	1.49	18.96	13.71	1.58	16.83	9.53	1.46	17.37	9.87	0.00	0.00	0.00	1.06	19.94	11.50
10.00	0.98	7.96	1.49	20.21	15.18	1.58	18.23	11.65	1.46	18.78	11.99	0.00	0.00	0.00	1.06	21.34	13.62
15.00	0.98	7.96	1.49	21.46	16.64	1.58	19.64	13.77	1.46	20.19	14.12	0.00	0.00	0.00	1.06	22.75	15.74
20.00	0.98	7.96	1.49	22.71	18.10	1.58	21.05	15.89	1.46	21.59	16.24	0.00	0.00	0.00	1.06	24.16	17.86
25.00	0.98	7.96	1.49	23.96	19.56	1.58	22.46	18.02	1.46	23.00	18.36	0.00	0.00	0.00	1.06	25.57	19.99
PENNSYLVANIA / LUZERNE																	
5.00	0.98	7.96	1.28	20.56	15.08	1.13	19.33	11.11	1.72	16.33	9.21	0.81	22.81	13.32	0.93	21.21	12.31
10.00	0.98	7.96	1.28	21.81	16.54	1.13	20.74	13.24	1.72	17.74	11.33	0.81	24.22	15.44	0.93	22.62	14.43
15.00	0.98	7.96	1.28	23.06	18.00	1.13	22.15	15.36	1.72	19.15	13.46	0.81	25.63	17.57	0.93	24.03	16.55
20.00	0.98	7.96	1.28	24.31	19.46	1.13	23.55	17.48	1.72	20.55	15.58	0.81	27.04	19.69	0.93	25.43	18.67
25.00	0.98	7.96	1.28	25.56	20.92	1.13	24.96	19.60	1.72	21.96	17.70	0.81	28.44	21.81	0.93	26.84	20.80
PENNSYLVANIA / LYCOMING																	
5.00	0.98	7.96	1.43	19.38	14.07	1.05	20.01	11.54	1.07	19.80	11.41	0.00	0.00	0.00	0.91	21.51	12.49
10.00	0.98	7.96	1.43	20.63	15.53	1.05	21.42	13.67	1.07	21.21	13.54	0.00	0.00	0.00	0.91	22.92	14.62
15.00	0.98	7.96	1.43	21.88	16.99	1.05	22.82	15.79	1.07	22.62	15.66	0.00	0.00	0.00	0.91	24.32	16.74
20.00	0.98	7.96	1.43	23.13	18.45	1.05	24.23	17.91	1.07	24.03	17.78	0.00	0.00	0.00	0.91	25.73	18.86
25.00	0.98	7.96	1.43	24.38	19.92	1.05	25.64	20.03	1.07	25.43	19.90	0.00	0.00	0.00	0.91	27.14	20.98
PENNSYLVANIA / MERCER																	
5.00	0.98	7.96	1.54	18.60	13.41	1.35	17.91	10.22	1.45	17.38	9.88	0.59	27.30	16.17	0.95	21.03	12.19
10.00	0.98	7.96	1.54	19.85	14.87	1.35	19.32	12.34	1.45	18.79	12.00	0.59	28.71	18.29	0.95	22.44	14.31
15.00	0.98	7.96	1.54	21.10	16.33	1.35	20.73	14.46	1.45	20.20	14.12	0.59	30.12	20.41	0.95	23.84	16.44
20.00	0.98	7.96	1.54	22.35	17.79	1.35	22.14	16.58	1.45	21.60	16.24	0.59	31.52	22.53	0.95	25.25	18.56
25.00	0.98	7.96	1.54	23.60	19.25	1.35	23.54	18.71	1.45	23.01	18.37	0.59	32.93	24.66	0.95	26.66	20.68
PENNSYLVANIA / MIFFLIN																	
5.00	0.98	7.96	1.63	18.12	12.99	1.36	17.88	10.19	1.26	18.43	10.54	0.00	0.00	0.00	0.96	20.93	12.13
10.00	0.98	7.96	1.63	19.36	14.45	1.36	19.29	12.32	1.26	19.84	12.67	0.00	0.00	0.00	0.96	22.34	14.25
15.00	0.98	7.96	1.63	20.61	15.92	1.36	20.69	14.44	1.26	21.25	14.79	0.00	0.00	0.00	0.96	23.75	16.37
20.00	0.98	7.96	1.63	21.86	17.38	1.36	22.10	16.56	1.26	22.65	16.91	0.00	0.00	0.00	0.96	25.16	18.50
25.00	0.98	7.96	1.63	23.11	18.84	1.36	23.51	18.68	1.26	24.06	19.03	0.00	0.00	0.00	0.96	26.56	20.62

Table C-3. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
PENNSYLVANIA / MONROE																	
5.00	0.98	7.96	1.25	20.79	15.28	1.36	17.87	10.18	1.33	18.04	10.30	0.51	29.99	17.87	0.68	25.13	14.79
10.00	0.98	7.96	1.25	22.04	16.74	1.36	19.27	12.31	1.33	19.45	12.42	0.51	31.40	19.99	0.68	26.53	16.91
15.00	0.98	7.96	1.25	23.29	18.20	1.36	20.68	14.43	1.33	20.85	14.54	0.51	32.81	22.12	0.68	27.94	19.03
20.00	0.98	7.96	1.25	24.54	19.66	1.36	22.09	16.55	1.33	22.26	16.66	0.51	34.21	24.24	0.68	29.35	21.16
25.00	0.98	7.96	1.25	25.79	21.12	1.36	23.49	18.67	1.33	23.67	18.79	0.51	35.62	26.36	0.68	30.76	23.28
PENNSYLVANIA / MONTGOMERY																	
5.00	0.98	7.96	1.40	19.55	14.22	1.33	18.00	10.27	1.64	16.60	9.38	1.07	19.80	11.41	0.88	21.78	12.67
10.00	0.98	7.96	1.40	20.80	15.68	1.33	19.40	12.39	1.64	18.01	11.50	1.07	21.20	13.53	0.88	23.19	14.79
15.00	0.98	7.96	1.40	22.05	17.14	1.33	20.81	14.51	1.64	19.42	13.63	1.07	22.61	15.65	0.88	24.60	16.91
20.00	0.98	7.96	1.40	23.30	18.60	1.33	22.22	16.63	1.64	20.82	15.75	1.07	24.02	17.78	0.88	26.01	19.04
25.00	0.98	7.96	1.40	24.55	20.06	1.33	23.63	18.76	1.64	22.23	17.87	1.07	25.43	19.90	0.88	27.41	21.16
PENNSYLVANIA / MONTOUR																	
5.00	0.98	7.96	1.24	20.89	15.36	1.16	19.11	10.97	1.40	17.66	10.05	0.00	0.00	0.00	0.89	21.75	12.65
10.00	0.98	7.96	1.24	22.14	16.82	1.16	20.52	13.10	1.40	19.06	12.17	0.00	0.00	0.00	0.89	23.16	14.77
15.00	0.98	7.96	1.24	23.39	18.28	1.16	21.93	15.22	1.40	20.47	14.30	0.00	0.00	0.00	0.89	24.57	16.89
20.00	0.98	7.96	1.24	24.64	19.74	1.16	23.33	17.34	1.40	21.88	16.42	0.00	0.00	0.00	0.89	25.97	19.02
25.00	0.98	7.96	1.24	25.89	21.20	1.16	24.74	19.46	1.40	23.29	18.54	0.00	0.00	0.00	0.89	27.38	21.14
PENNSYLVANIA / NORTHAMPTON																	
5.00	0.98	7.96	1.42	19.44	14.12	1.68	16.46	9.29	1.58	16.85	9.54	0.00	0.00	0.00	1.00	20.49	11.85
10.00	0.98	7.96	1.42	20.69	15.58	1.68	17.87	11.42	1.58	18.26	11.66	0.00	0.00	0.00	1.00	21.90	13.97
15.00	0.98	7.96	1.42	21.94	17.05	1.68	19.28	13.54	1.58	19.67	13.79	0.00	0.00	0.00	1.00	23.30	16.09
20.00	0.98	7.96	1.42	23.19	18.51	1.68	20.68	15.66	1.58	21.07	15.91	0.00	0.00	0.00	1.00	24.71	18.22
25.00	0.98	7.96	1.42	24.44	19.97	1.68	22.09	17.78	1.58	22.48	18.03	0.00	0.00	0.00	1.00	26.12	20.34
PENNSYLVANIA / NORTHUMBERLAND																	
5.00	0.98	7.96	1.42	19.45	14.13	1.22	18.72	10.72	1.57	16.87	9.55	0.89	21.66	12.59	0.91	21.44	12.45
10.00	0.98	7.96	1.42	20.70	15.59	1.22	20.12	12.85	1.57	18.28	11.68	0.89	23.06	14.71	0.91	22.84	14.57
15.00	0.98	7.96	1.42	21.95	17.06	1.22	21.53	14.97	1.57	19.69	13.80	0.89	24.47	16.83	0.91	24.25	16.69
20.00	0.98	7.96	1.42	23.20	18.52	1.22	22.94	17.09	1.57	21.09	15.92	0.89	25.88	18.96	0.91	25.66	18.82
25.00	0.98	7.96	1.42	24.45	19.98	1.22	24.34	19.21	1.57	22.50	18.04	0.89	27.29	21.08	0.91	27.07	20.94

Table C-3. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ACRE	OATS BALES $/TON	OATS STACKS $/TON
PENNSYLVANIA / PERRY																	
5.00	0.98	7.96	1.47	19.08	13.81	1.22	18.71	10.72	1.53	17.03	9.66	0.81	22.86	13.35	0.75	23.69	13.88
10.00	0.98	7.96	1.47	20.33	15.27	1.22	20.11	12.84	1.53	18.44	11.78	0.81	24.27	15.48	0.75	25.10	16.00
15.00	0.98	7.96	1.47	21.58	16.73	1.22	21.52	14.96	1.53	19.85	13.90	0.81	25.68	17.60	0.75	26.50	18.12
20.00	0.98	7.96	1.47	22.82	18.20	1.22	22.93	17.09	1.53	21.26	16.02	0.81	27.09	19.72	0.75	27.91	20.24
25.00	0.98	7.96	1.47	24.07	19.66	1.22	24.34	19.21	1.53	22.66	18.15	0.81	28.49	21.84	0.75	29.32	22.37
PENNSYLVANIA / SCHUYLKILL																	
5.00	0.98	7.96	1.28	20.49	15.01	1.18	18.98	10.89	1.35	17.91	10.21	1.53	17.04	9.66	0.87	21.98	12.79
10.00	0.98	7.96	1.28	21.74	16.48	1.18	20.39	13.01	1.35	19.31	12.33	1.53	18.45	11.78	0.87	23.39	14.92
15.00	0.98	7.96	1.28	22.99	17.94	1.18	21.79	15.14	1.35	20.72	14.45	1.53	19.85	13.90	0.87	24.79	17.04
20.00	0.98	7.96	1.28	24.24	19.40	1.18	23.20	17.26	1.35	22.13	16.58	1.53	21.26	16.03	0.87	26.20	19.16
25.00	0.98	7.96	1.28	25.49	20.86	1.18	24.61	19.38	1.35	23.53	18.70	1.53	22.67	18.15	0.87	27.61	21.28
PENNSYLVANIA / SNYDER																	
5.00	0.98	7.96	1.37	19.75	14.39	1.11	19.53	11.24	1.43	17.50	9.95	0.00	0.00	0.00	0.82	22.69	13.24
10.00	0.98	7.96	1.37	21.00	15.85	1.11	20.94	13.36	1.43	18.90	12.07	0.00	0.00	0.00	0.82	24.10	15.36
15.00	0.98	7.96	1.37	22.25	17.31	1.11	22.34	15.48	1.43	20.31	14.20	0.00	0.00	0.00	0.82	25.50	17.49
20.00	0.98	7.96	1.37	23.50	18.77	1.11	23.75	17.61	1.43	21.72	16.32	0.00	0.00	0.00	0.82	26.91	19.61
25.00	0.98	7.96	1.37	24.75	20.23	1.11	25.16	19.73	1.43	23.13	18.44	0.00	0.00	0.00	0.82	28.32	21.73
PENNSYLVANIA / SOMERSET																	
5.00	0.98	7.96	1.50	18.89	13.66	1.22	18.69	10.71	1.57	16.90	9.57	0.81	22.72	13.26	1.07	19.85	11.44
10.00	0.98	7.96	1.50	20.14	15.12	1.22	20.10	12.83	1.57	18.31	11.70	0.81	24.13	15.39	1.07	21.26	13.57
15.00	0.98	7.96	1.50	21.39	16.58	1.22	21.51	14.95	1.57	19.72	13.82	0.81	25.54	17.51	1.07	22.67	15.69
20.00	0.98	7.96	1.50	22.64	18.04	1.22	22.91	17.08	1.57	21.12	15.94	0.81	26.94	19.63	1.07	24.07	17.81
25.00	0.98	7.96	1.50	23.89	19.50	1.22	24.32	19.20	1.57	22.53	18.06	0.81	28.35	21.75	1.07	25.48	19.93
PENNSYLVANIA / TIOGA																	
5.00	0.98	7.96	1.31	20.29	14.84	1.76	16.21	9.14	1.13	19.38	11.14	0.00	0.00	0.00	0.78	23.22	13.58
10.00	0.98	7.96	1.31	21.54	16.30	1.76	17.62	11.26	1.13	20.78	13.26	0.00	0.00	0.00	0.78	24.63	15.70
15.00	0.98	7.96	1.31	22.78	17.77	1.76	19.03	13.38	1.13	22.19	15.39	0.00	0.00	0.00	0.78	26.04	17.83
20.00	0.98	7.96	1.31	24.03	19.23	1.76	20.43	15.50	1.13	23.60	17.51	0.00	0.00	0.00	0.78	27.44	19.95
25.00	0.98	7.96	1.31	25.28	20.69	1.76	21.84	17.63	1.13	25.00	19.63	0.00	0.00	0.00	0.78	28.85	22.07

Table C-3. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ ACRE	OATS BALES $/TON	OATS STACKS $/TON
PENNSYLVANIA / UNION																	
5.00	0.98	7.96	1.54	18.65	13.45	1.21	18.73	10.73	1.27	18.35	10.49	0.00	0.00	0.00	0.92	21.30	12.36
10.00	0.98	7.96	1.54	19.90	14.91	1.21	20.13	12.85	1.27	19.76	12.62	0.00	0.00	0.00	0.92	22.70	14.48
15.00	0.98	7.96	1.54	21.15	16.37	1.21	21.54	14.98	1.27	21.17	14.74	0.00	0.00	0.00	0.92	24.11	16.61
20.00	0.98	7.96	1.54	22.40	17.84	1.21	22.95	17.10	1.27	22.58	16.86	0.00	0.00	0.00	0.92	25.52	18.73
25.00	0.98	7.96	1.54	23.65	19.30	1.21	24.36	19.22	1.27	23.98	18.98	0.00	0.00	0.00	0.92	26.93	20.85
PENNSYLVANIA / VENANGO																	
5.00	0.98	7.96	1.44	19.28	13.99	1.19	18.93	10.86	0.83	22.53	13.14	0.00	0.00	0.00	0.90	21.56	12.52
10.00	0.98	7.96	1.44	20.53	15.45	1.19	20.34	12.98	0.83	23.93	15.26	0.00	0.00	0.00	0.90	22.96	14.65
15.00	0.98	7.96	1.44	21.78	16.91	1.19	21.74	15.10	0.83	25.34	17.38	0.00	0.00	0.00	0.90	24.37	16.77
20.00	0.98	7.96	1.44	23.03	18.37	1.19	23.15	17.23	0.83	26.75	19.51	0.00	0.00	0.00	0.90	25.78	18.89
25.00	0.98	7.96	1.44	24.28	19.83	1.19	24.56	19.35	0.83	28.16	21.63	0.00	0.00	0.00	0.90	27.18	21.01
PENNSYLVANIA / WASHINGTON																	
5.00	0.98	7.96	1.40	19.55	14.22	1.61	16.71	9.45	1.59	16.80	9.51	0.00	0.00	0.00	0.92	21.29	12.36
10.00	0.98	7.96	1.40	20.80	15.68	1.61	18.12	11.58	1.59	18.20	11.63	0.00	0.00	0.00	0.92	22.70	14.48
15.00	0.98	7.96	1.40	22.05	17.14	1.61	19.53	13.70	1.59	19.61	13.75	0.00	0.00	0.00	0.92	24.11	16.60
20.00	0.98	7.96	1.40	23.30	18.60	1.61	20.93	15.82	1.59	21.02	15.87	0.00	0.00	0.00	0.92	25.52	18.73
25.00	0.98	7.96	1.40	24.55	20.06	1.61	22.34	17.94	1.59	22.43	18.00	0.00	0.00	0.00	0.92	26.92	20.85
PENNSYLVANIA / WESTMORELAND																	
5.00	0.98	7.96	1.43	19.34	14.04	1.41	17.59	10.01	1.58	16.85	9.54	0.00	0.00	0.00	0.94	21.12	12.25
10.00	0.98	7.96	1.43	20.59	15.50	1.41	19.00	12.13	1.58	18.26	11.66	0.00	0.00	0.00	0.94	22.53	14.37
15.00	0.98	7.96	1.43	21.84	16.96	1.41	20.40	14.25	1.58	19.66	13.78	0.00	0.00	0.00	0.94	23.94	16.50
20.00	0.98	7.96	1.43	23.09	18.42	1.41	21.81	16.38	1.58	21.07	15.91	0.00	0.00	0.00	0.94	25.35	18.62
25.00	0.98	7.96	1.43	24.34	19.88	1.41	23.22	18.50	1.58	22.48	18.03	0.00	0.00	0.00	0.94	26.75	20.74
PENNSYLVANIA / WYOMING																	
5.00	0.98	7.96	1.38	19.69	14.33	1.73	16.29	9.18	0.00	0.00	0.00	0.00	0.00	0.00	0.78	23.21	13.57
10.00	0.98	7.96	1.38	20.94	15.79	1.73	17.70	11.31	0.00	0.00	0.00	0.00	0.00	0.00	0.78	24.62	15.70
15.00	0.98	7.96	1.38	22.19	17.26	1.73	19.10	13.43	0.00	0.00	0.00	0.00	0.00	0.00	0.78	26.03	17.82
20.00	0.98	7.96	1.38	23.44	18.72	1.73	20.51	15.55	0.00	0.00	0.00	0.00	0.00	0.00	0.78	27.44	19.94
25.00	0.98	7.96	1.38	24.69	20.18	1.73	21.92	17.68	0.00	0.00	0.00	0.00	0.00	0.00	0.78	28.84	22.06

Table C-3. Continued

DIST-ANCE MILES AVG	FUEL COST $/GAL	LABOR COST $/HR	CORN RES TONS/ACRE	CORN BALES $/TON	CORN STACKS $/TON	WHEAT RES TONS/ACRE	WHEAT BALES $/TON	WHEAT STACKS $/TON	BARLEY RES TONS/ACRE	BARLEY BALES $/TON	BARLEY STACKS $/TON	RYE RES TONS/ACRE	RYE BALES $/TON	RYE STACKS $/TON	OATS RES TONS/ACRE	OATS BALES $/TON	OATS STACKS $/TON
PENNSYLVANIA / YORK																	
5.00	0.98	7.96	1.40	19.54	14.21	1.52	17.08	9.69	1.66	16.52	9.33	1.32	18.06	10.31	0.94	21.12	12.25
10.00	0.98	7.96	1.40	20.79	15.67	1.52	18.49	11.81	1.66	17.93	11.46	1.32	19.47	12.43	0.94	22.52	14.37
15.00	0.98	7.96	1.40	22.04	17.13	1.52	19.89	13.93	1.66	19.34	13.58	1.32	20.88	14.55	0.94	23.93	16.49
20.00	0.98	7.96	1.40	23.29	18.59	1.52	21.30	16.05	1.66	20.74	15.70	1.32	22.28	16.68	0.94	25.34	18.61
25.00	0.98	7.96	1.40	24.54	20.06	1.52	22.71	18.18	1.66	22.15	17.82	1.32	23.69	18.80	0.94	26.75	20.74

Appendix D

Table D-1. DRY TONS OF DAIRY MANURE AVAILABLE FOR METHANE CONVERSION ON FARMS WITH OVER 50, 100, 200, AND 500 HEAD BY COUNTY CONNECTICUT

COUNTY	MANURE ON DAIRY FARMS 50-99 HEAD	MANURE ON DAIRY FARMS 100-199 HEAD	MANURE ON DAIRY FARMS 200-499 HEAD	MANURE ON DAIRY FARMS OVER 500 HEAD
FAIRFIELD	1220.	271.	0.	0.
HARTFORD	3578.	2121.	1237.	0.
LITCHFIELD	7187.	8102.	2439.	0.
MIDDLESEX	1031.	1031.	0.	0.
NEW HAVEN	2505.	1753.	1169.	0.
NEW LONDON	6902.	4688.	1823.	0.
TOLLAND	2726.	3115.	6057.	1298.
WINDHAM	6159.	8649.	4892.	0.
STATE TOTALS	31307.	29730.	17617.	1298.

Table D-1. Continued

MAINE

COUNTY	MANURE ON DAIRY FARMS 50-99 HEAD	MANURE ON DAIRY FARMS 100-199 HEAD	MANURE ON DAIRY FARMS 200-499 HEAD	MANURE ON DAIRY FARMS OVER 500 HEAD
ANDROSCOGGIN	3581.	4348.	0.	0.
AROOSTOOK	1981.	495.	0.	0.
CUMBERLAND	2962.	1481.	0.	0.
FRANKLIN	1556.	718.	558.	0.
HANCOCK	0.	0.	0.	0.
KENNEBEC	7163.	3770.	2346.	0.
KNOX	509.	0.	0.	0.
LINCOLN	490.	490.	0.	0.
OXFORD	1865.	466.	1088.	0.
PENOBSCOT	6211.	4400.	0.	0.
PISCATAQUIS	1007.	288.	672.	0.
SAGADAHOC	1060.	0.	0.	0.
SOMERSET	5565.	2330.	1812.	0.
WALDO	2470.	2080.	0.	0.
WASHINGTON	665.	0.	0.	0.
YORK	3080.	493.	0.	0.
STATE TOTALS	40164.	21358.	6476.	0.

Table D-1. Continued

MASSACHUSETTS

COUNTY	MANURE ON DAIRY FARMS 5C-99 HEAD	MANURE ON DAIRY FARMS 100-199 HEAD	MANURE ON DAIRY FARMS 20C-499 HEAD	MANURE ON DAIRY FARMS OVER 5CC HEAD
BARNSTABLE	0.	C.	0.	0.
BERKSHIRE	5461.	4220.	2317.	0.
BRISTCL	4955.	1982.	1734.	0.
DUKES	0.	0.	0.	0.
ESSEX	757.	1009.	1177.	0.
FRANKLIN	5536.	2372.	2460.	0.
HAMPDEN	1462.	2193.	568.	0.
HAMPSHIRE	4433.	2026.	1773.	0.
MIDDLESEX	1171.	781.	6C7.	0.
NANTUCKET	0.	0.	0.	0.
NORFOLK	603.	241.	0.	0.
PLYMOUTH	1167.	1038.	1211.	1297.
SUFFOLK	C.	C.	0.	0.
WCRCHESTER	8459.	6507.	1215.	0.
STATE TOTALS	34003.	22369.	13063.	1297.

Table D-1. Continued

NEW HAMPSHIRE

COUNTY	MANURE CN DAIRY FARMS 5C-99 HEAD	MANURE CN DAIRY FARMS 100-199 HEAD	MANURE ON DAIRY FARMS 20C-499 HEAD	MANURE ON DAIRY FARMS OVER 50C HEAD
BELKNAP	C.	272.	0.	0.
CARROLL	641.	256.	598.	0.
CHESHIRE	2364.	1418.	22C6.	0.
COOS	3965.	1057.	617.	0.
GRAFTON	5906.	2887.	0.	0.
MILLSBOROUGH	2347.	1104.	0.	0.
MERRIMACK	2665.	2791.	592.	0.
RCCKINGHAM	1497.	1247.	0.	0.
STRAFFORD	1254.	684.	532.	0.
SULLIVAN	1974.	1053.	1228.	0.
STATE TOTALS	22612.	12771.	5774.	0.

Table D-1. Continued

NEW JERSEY

COUNTY	MANURE ON DAIRY FARMS 50-99 HEAD	MANURE ON DAIRY FARMS 100-199 HEAD	MANURE ON DAIRY FARMS 200-499 HEAD	MANURE ON DAIRY FARMS OVER 500 HEAD
ATLANTIC	0.	0.	0.	0.
BERGEN	0.	0.	0.	0.
BURLINGTON	4272.	2071.	2416.	0.
CAMDEN	0.	0.	0.	0.
CAPE MAY	0.	0.	0.	0.
CUMBERLAND	623.	747.	0.	0.
ESSEX	237.	0.	0.	0.
GLOUCESTER	1064.	236.	552.	0.
HUDSON	0.	0.	0.	0.
HUNTERDON	7136.	2907.	0.	0.
MERCER	0.	302.	0.	0.
MIDDLESEX	237.	237.	0.	0.
MONMOUTH	747.	995.	0.	0.
MORRIS	487.	243.	568.	0.
OCEAN	282.	0.	0.	0.
PASSAIC	0.	0.	0.	0.
SALEM	3837.	4704.	2311.	0.
SOMERSET	619.	1486.	0.	1239.
SUSSEX	8718.	3333.	1197.	0.
UNION	0.	0.	0.	0.
WARREN	10673.	2829.	2400.	0.
STATE TOTALS	38931.	20092.	9443.	1239.

Table D-1. Continued

NEW YORK

COUNTY	MANURE ON DAIRY FARMS 50-99 HEAD	MANURE ON DAIRY FARMS 100-199 HEAD	MANURE ON DAIRY FARMS 200-499 HEAD	MANURE ON DAIRY FARMS OVER 500 HEAD
ALBANY	2723.	1421.	553.	0.
ALLEGHANY	10576.	3966.	617.	0.
BRONX	0.	0.	0.	0.
BROOME	9422.	4711.	2443.	0.
CATTARAUGUS	22881.	6722.	2413.	0.
CAYUGA	18103.	11461.	4254.	1302.
CHAUTAUQUA	24442.	8888.	1830.	0.
CHEMUNG	3958.	1532.	596.	0.
CHENANGO	24107.	7811.	3142.	0.
CLINTON	17496.	7893.	3069.	0.
COLUMBIA	13496.	10527.	2519.	0.
CORTLAND	21258.	10110.	3024.	1296.
DELAWARE	28992.	9573.	2553.	1368.
DUTCHESS	7593.	7459.	2486.	0.
ERIE	15818.	8172.	4306.	1318.
ESSEX	3478.	1987.	0.	0.
FRANKLIN	20555.	5139.	631.	0.
FULTON	4918.	1035.	0.	0.
GENESEE	7617.	8241.	10489.	1249.
GREENE	2911.	1323.	0.	0.
HAMILTON	0.	0.	0.	0.
HERKIMER	23866.	7384.	1231.	0.
JEFFERSON	38003.	14465.	3682.	1315.
KINGS	0.	0.	0.	0.
LEWIS	37811.	8756.	1857.	0.
LIVINGSTON	10337.	10210.	5360.	1276.
MADISON	32684.	13803.	2431.	0.
MONROE	5526.	2827.	1799.	0.
MONTGOMERY	20559.	7241.	603.	0.
NASSAU	0.	0.	0.	0.
MANHATTAN	0.	0.	0.	0.

Table D-1. Continued

NEW YORK

COUNTY	MANURE ON DAIRY FARMS 50-99 HEAD	MANURE ON DAIRY FARMS 100-199 HEAD	MANURE ON DAIRY FARMS 200-499 HEAD	MANURE ON DAIRY FARMS OVER 500 HEAD
NIAGARA	5651.	4468.	613.	0.
ONEIDA	31659.	8787.	3015.	0.
ONONDAGA	14391.	10034.	1848.	0.
ONTARIO	9931.	6173.	0.	0.
ORANGE	15331.	4937.	2425.	0.
ORLEANS	4231.	1742.	1162.	0.
OSWEGO	7267.	3825.	0.	0.
OTSEGO	28797.	7097.	637.	0.
PUTNAM	0.	484.	0.	0.
QUEENS	0.	0.	0.	0.
RENNSELAER	9763.	2569.	1199.	0.
RICHMOND	0.	0.	0.	0.
ROCKLAND	0.	242.	0.	0.
ST LAWRENCE	36894.	13100.	624.	0.
SARATOGA	6368.	2079.	1213.	0.
SCHENECTADY	791.	264.	0.	0.
SCHOHARIE	10509.	4992.	1839.	1314.
SCHUYLER	2829.	1029.	0.	0.
SENECA	3369.	1555.	605.	0.
STEUBEN	20848.	9583.	3022.	0.
SUFFOLK	98.	0.	447.	0.
SULLIVAN	5964.	1815.	0.	0.
TIOGA	12129.	5598.	622.	0.
TOMPKINS	7725.	3347.	1802.	0.
ULSTER	3880.	776.	0.	0.
WARREN	126.	0.	0.	0.
WASHINGTON	25479.	15157.	6097.	0.
WAYNE	6897.	1533.	596.	0.
WESTCHESTER	251.	0.	0.	0.
WYOMING	22962.	15907.	11374.	0.
YATES	3120.	2246.	582.	0.
STATE TOTALS	726388.	311996.	101612.	10438.

Table D-1. Continued

PENNSYLVANIA

COUNTY	MANURE ON DAIRY FARMS 50-99 HEAD	MANURE ON DAIRY FARMS 100-199 HEAD	MANURE ON DAIRY FARMS 200-499 HEAD	MANURE ON DAIRY FARMS OVER 500 HEAD
ADAMS	4997.	4356.	598.	0.
ALLEGHANY	698.	233.	0.	0.
ARMSTRONG	3189.	1020.	0.	0.
BEAVER	2761.	0.	0.	0.
BEDFORD	12680.	5283.	0.	0.
BERKS	22830.	10637.	4237.	0.
BLAIR	10551.	2976.	0.	0.
BRADFORD	32969.	8648.	0.	0.
BUCKS	5529.	1759.	1759.	0.
BUTLER	2509.	251.	0.	0.
CAMBRIA	2416.	242.	0.	0.
CAMERON	0.	0.	0.	0.
CARBON	368.	0.	0.	0.
CENTRE	8379.	2578.	1203.	0.
CHESTER	20367.	7311.	6702.	1306.
CLARION	3668.	759.	0.	0.
CLEARFIELD	1483.	494.	0.	0.
CLINTON	2275.	803.	0.	0.
COLUMBIA	1680.	1551.	603.	0.
CRAWFORD	12446.	4927.	0.	0.
CUMBERLAND	10994.	5625.	3579.	0.
DAUPHIN	4795.	1865.	0.	1332.
DELAWARE	114.	229.	534.	0.
ELK	136.	271.	0.	0.
ERIE	10226.	2360.	0.	0.
FAYETTE	2448.	734.	0.	0.
FOREST	373.	0.	0.	0.
FRANKLIN	29076.	18364.	5951.	0.
FULTON	5829.	1267.	0.	0.
GREENE	948.	474.	0.	0.
HUNTINGDON	7728.	2280.	1182.	0.

Table D-1. Continued

PENNSYLVANIA

COUNTY	MANURE ON DAIRY FARMS 50-99 HEAD	MANURE ON DAIRY FARMS 100-199 HEAD	MANURE ON DAIRY FARMS 200-499 HEAD	MANURE ON DAIRY FARMS OVER 500 HEAD
INDIANA	5709.	1297.	0.	0.
JEFFERSON	4013.	251.	585.	0.
JUNIATA	4758.	1322.	0.	0.
LACKAWANNA	2454.	258.	0.	0.
LANCASTER	48656.	17095.	6137.	2630.
LAWRENCE	4869.	1281.	0.	0.
LEBANON	13151.	6111.	1860.	0.
LEHIGH	1092.	243.	566.	0.
LUZERNE	2233.	496.	0.	0.
LYCOMING	4904.	1549.	602.	0.
MCKEAN	535.	267.	0.	0.
MERCER	7987.	998.	1165.	0.
MIFFLIN	8041.	2334.	605.	0.
MONROE	106.	213.	0.	0.
MONTGOMERY	3177.	2912.	1235.	0.
MONTOUR	1367.	497.	0.	0.
NORTHAMPTON	5093.	4179.	3657.	0.
NORTHUMBERLAND	3123.	750.	0.	0.
PERRY	4626.	1850.	0.	0.
PHILADELPHIA	0.	0.	0.	0.
PIKE	0.	0.	0.	0.
POTTER	5986.	0.	0.	0.
SCHUYLKILL	2877.	250.	584.	0.
SNYDER	3373.	1038.	0.	0.
SOMERSET	16555.	3389.	0.	0.
SULLIVAN	2693.	0.	0.	0.
SUSQUEHANNA	19120.	4249.	1239.	0.
TIOGA	16245.	4226.	1233.	0.
UNION	4018.	804.	0.	0.
VENANGO	1236.	742.	0.	0.
WARREN	2341.	2081.	607.	0.

Table D-1. Continued

PENNSYLVANIA

COUNTY	MANURE ON DAIRY FARMS 50-99 HEAD	MANURE ON DAIRY FARMS 100-199 HEAD	MANURE ON DAIRY FARMS 200-499 HEAD	MANURE ON DAIRY FARMS OVER 500 HEAD
WASHINGTON	8394.	1253.	0.	0.
WAYNE	10272.	2668.	0.	0.
WESTMORELAND	5060.	1298.	606.	0.
WYOMING	6490.	1082.	0.	0.
YORK	11195.	6849.	1229.	0.
STATE TOTALS	466212.	161128.	48260.	5268.

Table D-1. Continued

RHODE ISLAND

COUNTY	MANURE ON DAIRY FARMS 50-99 HEAD	MANURE ON DAIRY FARMS 100-199 HEAD	MANURE ON DAIRY FARMS 200-499 HEAD	MANURE ON DAIRY FARMS OVER 500 HEAD
BRISTOL	122.	245.	0.	0.
KENT	290.	0.	0.	0.
NEWPORT	1159.	773.	0.	0.
PROVIDENCE	913.	261.	0.	0.
WASHINGTON	617.	0.	0.	0.
STATE TOTALS	3102.	1278.	0.	0.

Table D-1. Continued

VERMONT

COUNTY	MANURE ON DAIRY FARMS 50-99 HEAD	MANURE ON DAIRY FARMS 100-199 HEAD	MANURE ON DAIRY FARMS 200-499 HEAD	MANURE ON DAIRY FARMS OVER 500 HEAD
ADDISON	32327.	21817.	4346.	0.
BENNINGTON	2904.	505.	589.	0.
CALEDONIA	8504.	4896.	0.	0.
CHITTENDEN	12242.	7033.	1823.	1302.
ESSEX	1685.	778.	605.	0.
FRANKLIN	33804.	18982.	4247.	1300.
GRAND ISLE	4161.	757.	1177.	0.
LAMOILLE	5955.	3441.	1235.	0.
ORANGE	8738.	2786.	2364.	0.
ORLEANS	21413.	7714.	4345.	1330.
RUTLAND	15751.	3873.	0.	0.
WASHINGTON	5836.	2235.	579.	0.
WINDHAM	2717.	1482.	4035.	0.
WINDSOR	5193.	1236.	1731.	0.
STATE TOTALS	161230.	77535.	27076.	3933.

Table D-2. DRY TONS OF FEEDLOT MANURE AVAILABLE FCR METHANE CONVERSION ON FARMS WITH OVER 50, 10C, 20C, AND 500 HEAD BY CCUNTY
CONNECTICUT

COUNTY	MANURE CN FEEDLOTS 50-99 HEAD	MANURE CN FEEDLOTS 100-199 HEAD	MANURE ON FEEDLOTS 200-499 HEAD	MANURE ON FEEDLOTS OVER 50C HEAD
FAIRFIELD	C.	0.	0.	0.
HARTFORD	0.	0.	376.	0.
LITCHFIELD	0.	0.	0.	0.
MIDDLESEX	C.	C.	0.	0.
NEW HAVEN	0.	73.	0.	0.
NEW LCNDON	37.	0.	0.	0.
TCLLAND	0.	C.	0.	0.
WINDHAM	0.	0.	0.	0.
STATE TOTALS	37.	73.	376.	0.

Table D-2. Continued

MAINE

COUNTY	MANURE ON FEEDLOTS 50-99 HEAD	MANURE ON FEEDLOTS 100-199 HEAD	MANURE ON FEEDLOTS 200-499 HEAD	MANURE ON FEEDLOTS OVER 500 HEAD
ANDROSCOGGIN	0.	0.	0.	0.
AROOSTOOK	0.	0.	0.	0.
CUMBERLAND	68.	0.	0.	0.
FRANKLIN	0.	0.	0.	0.
HANCOCK	0.	0.	0.	0.
KENNEBEC	31.	0.	274.	0.
KNOX	0.	0.	0.	0.
LINCOLN	0.	0.	0.	0.
OXFORD	31.	0.	0.	0.
PENOBSCOT	0.	0.	0.	0.
PISCATAQUIS	0.	0.	0.	0.
SAGADAHOC	0.	0.	0.	0.
SOMERSET	0.	0.	142.	0.
WALDO	0.	0.	0.	0.
WASHINGTON	0.	0.	0.	0.
YORK	0.	0.	0.	0.
STATE TOTALS	130.	0.	415.	0.

Table D-2. Continued

MASSACHUSETTS

COUNTY	MANURE ON FEEDLOTS 50-99 HEAD	MANURE ON FEEDLOTS 100-199 HEAD	MANURE ON FEEDLOTS 200-499 HEAD	MANURE ON FEEDLOTS OVER 500 HEAD
BARNSTABLE	0.	0.	0.	0.
BERKSHIRE	0.	0.	0.	0.
BRISTOL	41.	81.	0.	405.
DUKES	0.	0.	0.	0.
ESSEX	34.	0.	0.	0.
FRANKLIN	38.	0.	0.	0.
HAMPDEN	0.	0.	0.	0.
HAMPSHIRE	40.	0.	0.	0.
MIDDLESEX	0.	0.	0.	0.
NANTUCKET	0.	0.	0.	0.
NORFOLK	0.	0.	0.	0.
PLYMOUTH	0.	0.	0.	0.
SUFFOLK	0.	0.	0.	0.
WORCHESTER	0.	0.	0.	0.
STATE TOTALS	153.	81.	0.	405.

Table D-2. Continued

NEW HAMPSHIRE

COUNTY	MANURE ON FEEDLOTS 50-99 HEAD	MANURE ON FEEDLOTS 100-199 HEAD	MANURE ON FEEDLOTS 200-499 HEAD	MANURE ON FEEDLOTS OVER 500 HEAD
BELKNAP	0.	0.	0.	0.
CARROLL	0.	0.	0.	0.
CHESHIRE	37.	0.	0.	0.
COOS	0.	0.	0.	0.
GRAFTON	0.	0.	0.	0.
HILLSBOROUGH	36.	72.	0.	358.
MERRIMACK	0.	0.	0.	0.
ROCKINGHAM	0.	0.	0.	0.
STRAFFORD	0.	0.	0.	0.
SULLIVAN	0.	0.	0.	0.
STATE TOTALS	73.	72.	0.	358.

Table D-2. Continued

NEW JERSEY

COUNTY	MANURE ON FEEDLOTS 50-99 HEAD	MANURE ON FEEDLOTS 100-199 HEAD	MANURE ON FEEDLOTS 200-499 HEAD	MANURE ON FEEDLOTS OVER 500 HEAD
ATLANTIC	0.	0.	0.	0.
BERGEN	0.	0.	0.	0.
BURLINGTON	75.	0.	0.	0.
CAMDEN	47.	0.	0.	0.
CAPE MAY	47.	0.	0.	0.
CUMBERLAND	32.	0.	0.	0.
ESSEX	0.	0.	0.	0.
GLOUCESTER	35.	0.	0.	0.
HUDSON	0.	0.	0.	0.
HUNTERDON	0.	66.	0.	0.
MERCER	0.	0.	0.	0.
MIDDLESEX	42.	84.	0.	0.
MONMOUTH	0.	0.	175.	0.
MORRIS	0.	0.	0.	0.
OCEAN	0.	0.	0.	0.
PASSAIC	0.	0.	0.	0.
SALEM	38.	0.	0.	0.
SOMERSET	0.	69.	0.	0.
SUSSEX	37.	0.	0.	0.
UNION	0.	0.	0.	0.
WARREN	110.	0.	0.	0.
STATE TOTALS	463.	220.	175.	0.

Table D-2. Continued

NEW YORK

COUNTY	MANURE ON FEEDLOTS 50-99 HEAD	MANURE ON FEEDLOTS 100-199 HEAD	MANURE ON FEEDLOTS 200-499 HEAD	MANURE ON FEEDLOTS OVER 500 HEAD
ALBANY	0.	0.	192.	411.
ALLEGHANY	33.	0.	0.	0.
BRONX	0.	0.	0.	0.
BROOME	31.	0.	0.	0.
CATTARAUGUS	0.	0.	0.	0.
CAYUGA	137.	68.	0.	0.
CHAUTAUQUA	0.	68.	0.	0.
CHEMUNG	0.	0.	0.	0.
CHENANGO	0.	0.	145.	0.
CLINTON	90.	359.	0.	0.
COLUMBIA	34.	0.	0.	0.
CORTLAND	0.	0.	144.	0.
DELAWARE	36.	0.	0.	0.
DUTCHESS	170.	0.	0.	425.
ERIE	72.	0.	0.	0.
ESSEX	34.	0.	0.	0.
FRANKLIN	0.	0.	0.	0.
FULTON	0.	0.	0.	0.
GENESEE	325.	0.	189.	0.
GREENE	0.	0.	0.	0.
HAMILTON	0.	0.	0.	0.
HERKIMER	0.	223.	0.	0.
JEFFERSON	0.	78.	0.	0.
KINGS	0.	0.	0.	0.
LEWIS	0.	0.	0.	0.
LIVINGSTON	117.	78.	0.	0.
MADISON	35.	0.	0.	0.
MONROE	38.	77.	0.	0.
MONTGOMERY	37.	0.	0.	0.
NASSAU	0.	0.	0.	0.
MANHATTAN	0.	0.	0.	0.

Table D-2. Continued

NEW YORK

COUNTY	MANURE CN FEEDLOTS 50-99 HEAD	MANURE ON FEEDLOTS 100-199 HEAD	MANURE ON FEEDLCTS 200-499 HEAD	MANURE ON FEEDLOTS OVER 5CO HEAD
NIAGARA	155.	310.	0.	517.
CNEIDA	0.	75.	0.	0.
ONONDAGA	C.	0.	0.	0.
ONTARIO	67.	67.	466.	0.
ORANGE	99.	C.	0.	330.
ORLEANS	121.	322.	376.	0.
OSWEGO	35.	0.	0.	0.
OTSEGO	65.	0.	152.	0.
PUTNAM	C.	0.	0.	0.
QUEENS	C.	C.	0.	0.
RENNSELAER	0.	C.	0.	0.
RICHMOND	C.	C.	0.	0.
RCCKLAND	0.	0.	0.	0.
ST LAWRENCE	35.	C.	0.	0.
SARATCGA	0.	0.	0.	0.
SCHENECTADY	0.	C.	0.	0.
SCHOHARIE	0.	0.	161.	0.
SCHUYLER	0.	65.	0.	0.
SENECA	74.	C.	0.	0.
STEUBEN	109.	72.	0.	0.
SUFFOLK	53.	0.	0.	0.
SULLIVAN	39.	C.	0.	0.
TIOGA	0.	142.	0.	0.
TCMPKINS	36.	C.	0.	0.
ULSTER	0.	0.	198.	0.
WARREN	37.	0.	0.	0.
WASHINGTON	34.	C.	0.	0.
WAYNE	76.	C.	0.	0.
WESTCHESTER	0.	0.	0.	0.
WYOMING	117.	78.	0.	0.
YATES	117.	C.	0.	0.
STATE TOTALS	2457.	2083.	2C24.	1683.

Table D-2. Continued

PENNSYLVANIA

COUNTY	MANURE ON FEEDLOTS 50-99 HEAD	MANURE ON FEEDLOTS 100-199 HEAD	MANURE ON FEEDLOTS 200-499 HEAD	MANURE ON FEEDLOTS OVER 500 HEAD
ADAMS	1208.	468.	1637.	0.
ALLEGHANY	0.	0.	0.	0.
ARMSTRONG	342.	76.	177.	0.
BEAVER	0.	0.	180.	0.
BEDFORD	182.	218.	170.	0.
BERKS	1904.	1297.	2647.	405.
BLAIR	289.	330.	0.	0.
BRADFORD	36.	146.	510.	0.
BUCKS	232.	232.	361.	387.
BUTLER	356.	214.	166.	0.
CAMBRIA	0.	78.	181.	0.
CAMERON	0.	0.	0.	0.
CARBON	0.	0.	0.	0.
CENTRE	145.	362.	169.	362.
CHESTER	473.	291.	849.	364.
CLARION	118.	236.	0.	0.
CLEARFIELD	33.	0.	0.	0.
CLINTON	160.	0.	0.	532.
COLUMBIA	77.	77.	0.	0.
CRAWFORD	107.	142.	0.	0.
CUMBERLAND	390.	468.	546.	0.
DAUPHIN	426.	619.	722.	774.
DELAWARE	0.	0.	0.	0.
ELK	0.	0.	0.	0.
ERIE	42.	168.	197.	842.
FAYETTE	153.	77.	0.	0.
FOREST	0.	0.	0.	0.
FRANKLIN	578.	540.	1259.	0.
FULTON	38.	0.	0.	381.
GREENE	35.	0.	0.	0.
HUNTINGDON	126.	84.	196.	421.

Table D-2. Continued

PENNSYLVANIA

COUNTY	MANURE ON FEEDLOTS 50-99 HEAD	MANURE ON FEEDLOTS 100-199 HEAD	MANURE ON FEEDLOTS 200-499 HEAD	MANURE ON FEEDLOTS OVER 500 HEAD
INDIANA	302.	243.	0.	1289.
JEFFERSON	0.	0.	206.	0.
JUNIATA	77.	77.	0.	0.
LACKAWANNA	0.	0.	0.	0.
LANCASTER	12840.	13971.	13190.	8263.
LAWRENCE	271.	0.	0.	0.
LEBANON	1754.	2232.	744.	399.
LEHIGH	42.	83.	0.	0.
LUZERNE	31.	0.	0.	0.
LYCOMING	110.	73.	343.	0.
MCKEAN	0.	0.	0.	0.
MERCER	265.	227.	0.	379.
MIFFLIN	37.	0.	0.	0.
MONROE	75.	75.	0.	0.
MONTGOMERY	126.	84.	197.	422.
MONTOUR	0.	73.	339.	0.
NORTHAMPTON	193.	0.	0.	0.
NORTHUMBERLAND	677.	398.	558.	0.
PERRY	190.	227.	177.	0.
PHILADELPHIA	109.	72.	0.	0.
PIKE	0.	0.	0.	0.
POTTER	41.	0.	0.	0.
SCHUYLKILL	375.	75.	175.	375.
SNYDER	413.	248.	193.	0.
SOMERSET	341.	76.	177.	0.
SULLIVAN	0.	0.	0.	0.
SUSQUEHANNA	111.	74.	0.	0.
TIOGA	0.	77.	0.	0.
UNION	688.	459.	713.	0.
VENANGO	33.	0.	0.	0.
WARREN	35.	0.	0.	0.

Table D-2. Continued

PENNSYLVANIA

COUNTY	MANURE ON FEEDLOTS 50-99 HEAD	MANURE ON FEEDLOTS 100-199 HEAD	MANURE ON FEEDLOTS 200-499 HEAD	MANURE ON FEEDLOTS OVER 500 HEAD
WASHINGTON	72.	0.	0.	0.
WAYNE	35.	0.	0.	0.
WESTMORELAND	105.	0.	163.	0.
WYOMING	0.	0.	141.	0.
YORK	1131.	1454.	2450.	1520.
STATE TOTALS	27928.	26421.	29734.	17114.

Table D-2. Continued

RHODE ISLAND

COUNTY	MANURE ON FEEDLOTS 50-99 HEAD	MANURE ON FEEDLOTS 100-199 HEAD	MANURE ON FEEDLOTS 200-499 HEAD	MANURE ON FEEDLOTS OVER 500 HEAD
BRISTOL	0.	0.	0.	0.
KENT	0.	0.	0.	0.
NEWPORT	0.	0.	0.	0.
PROVIDENCE	0.	0.	0.	0.
WASHINGTON	0.	0.	0.	0.
STATE TOTALS	0.	0.	0.	0.

Table D-2. Continued

VERMONT

COUNTY	MANURE ON FEEDLOTS 50-99 HEAD	MANURE ON FEEDLOTS 100-199 HEAD	MANURE ON FEEDLOTS 200-499 HEAD	MANURE ON FEEDLOTS OVER 500 HEAD
ADDISON	73.	0.	0.	0.
BENNINGTON	0.	0.	0.	0.
CALEDONIA	0.	0.	0.	0.
CHITTENDEN	0.	229.	0.	0.
ESSEX	0.	0.	0.	0.
FRANKLIN	0.	0.	221.	0.
GRAND ISLE	0.	0.	0.	0.
LAMOILLE	0.	0.	0.	0.
ORANGE	35.	0.	0.	0.
ORLEANS	0.	0.	0.	0.
RUTLAND	0.	68.	0.	0.
WASHINGTON	0.	0.	0.	0.
WINDHAM	0.	0.	0.	0.
WINDSOR	0.	0.	0.	0.
STATE TOTALS	108.	297.	221.	0.

Table D-3. DRY TONS OF HOG MANURE AVAILABLE FOR METHANE CONVERSION ON FARMS WITH OVER 100, 2C0, 500, AND 100C HEAD BY COUNTY CONNECTICUT

COUNTY	MANURE ON HOG FARMS 100-199 HEAD	MANURE ON HOG FARMS 200-499 HEAD	MANURE ON HOG FARMS 500-999 HEAD	MANURE ON HOG FARMS OVER 1000 HEAD
FAIRFIELD	0.	0.	C.	0.
HARTFORD	44.	52.	0.	0.
LITCHFIELD	4.	10.	0.	0.
MIDDLESEX	5.	0.	0.	0.
NEW HAVEN	17.	13.	0.	0.
NEW LONDON	6.	27.	29.	48.
TOLLAND	5.	12.	0.	0.
WINDHAM	12.	41.	0.	0.
STATE TOTALS	94.	156.	29.	48.

Table D-3. Continued

MAINE

COUNTY	MANURE ON HOG FARMS 100-199 HEAD	MANURE ON HOG FARMS 200-499 HEAD	MANURE ON HOG FARMS 500-999 HEAD	MANURE ON HOG FARMS OVER 1000 HEAD
ANDROSCOGGIN	5.	0.	0.	0.
AROOSTOOK	9.	0.	0.	0.
CUMBERLAND	12.	28.	0.	0.
FRANKLIN	0.	0.	0.	0.
HANCOCK	0.	0.	0.	0.
KENNEBEC	16.	0.	26.	0.
KNOX	0.	0.	0.	0.
LINCOLN	0.	0.	0.	0.
OXFORD	0.	0.	0.	0.
PENOBSCOT	15.	12.	0.	0.
PISCATAQUIS	0.	0.	0.	0.
SAGADAHOC	0.	0.	0.	0.
SOMERSET	5.	0.	0.	0.
WALDO	17.	13.	0.	0.
WASHINGTON	0.	0.	0.	0.
YORK	10.	0.	0.	0.
STATE TOTALS	89.	53.	26.	0.

Table D-3. Continued

MASSACHUSETTS

COUNTY	MANURE ON HOG FARMS 1CO-199 HEAD	MANURE ON HCG FARMS 200-499 HEAD	MANURE ON HOG FARMS 500-999 HEAD	MANURE ON HOG FARMS OVER 10CC HEAD
BARNSTABLE	0.	0.	0.	0.
BERKSHIRE	0.	0.	0.	0.
BRISTCL	62.	187.	154.	51.
DUKES	0.	0.	0.	0.
ESSEX	11.	50.	54.	0.
FRANKLIN	0.	0.	0.	0.
HAMPDEN	9.	22.	0.	91.
HAMPSHIRE	7.	67.	36.	60.
MIDDLESEX	44.	64.	137.	325.
NANTUCKET	0.	0.	0.	0.
NORFOLK	6.	0.	57.	0.
PLYMOUTH	14.	145.	35.	58.
SUFFOLK	0.	0.	0.	0.
WCRCHESTER	96.	119.	169.	237.
STATE TOTALS	248.	654.	642.	822.

Table D-3. Continued

NEW HAMPSHIRE

COUNTY	MANURE ON HOG FARMS 100-199 HEAD	MANURE ON HOG FARMS 20C-499 HEAD	MANURE ON HOG FARMS 500-999 HEAD	MANURE ON HCG FARMS OVER 1000 HEAD
BELKNAP	5.	0.	0.	0.
CARROLL	19.	15.	0.	0.
CHESHIRE	6.	0.	C.	0.
CCOS	7.	0.	0.	0.
GRAFTCN	6.	13.	0.	0.
MILLSBOROUGH	23.	82.	29.	0.
MERRIMACK	10.	24.	0.	0.
RCCKINGHAM	0.	55.	C.	0.
STRAFFORD	20.	0.	0.	0.
SULLIVAN	0.	0.	C.	0.
STATE TOTALS	97.	190.	29.	0.

Table D-3. Continued

NEW JERSEY

COUNTY	MANURE ON HOG FARMS 1C0-199 HEAD	MANURE ON HOG FARMS 200-499 HEAD	MANURE CN HOG FARMS 500-999 HEAD	MANURE ON HOG FARMS OVER 1CC0 HEAD
ATLANTIC	43.	14.	C.	0.
BERGEN	0.	0.	0.	0.
BURLINGTON	61.	65.	43.	574.
CAMDEN	0.	0.	0.	0.
CAPE MAY	17.	65.	43.	195.
CUMBERLAND	9.	87.	C.	640.
ESSEX	0.	0.	C.	0.
GLOUCESTER	38.	89.	191.	1163.
HUDSON	0.	0.	0.	0.
HUNTERDON	20.	57.	0.	0.
MERCER	13.	31.	0.	0.
MIDDLESEX	12.	29.	0.	51.
MONMOUTH	35.	65.	0.	193.
MORRIS	5.	13.	0.	0.
OCEAN	7.	49.	C.	58.
PASSAIC	0.	0.	C.	0.
SALEM	11.	65.	56.	0.
SOMERSET	7.	31.	67.	0.
SUSSEX	14.	11.	0.	0.
UNION	0.	0.	C.	0.
WARREN	18.	0.	0.	0.
STATE TOTALS	310.	671.	400.	2874.

Table D-3. Continued

NEW YORK

COUNTY	MANURE ON HOG FARMS 100-199 HEAD	MANURE ON HOG FARMS 200-499 HEAD	MANURE ON HOG FARMS 500-999 HEAD	MANURE ON HOG FARMS OVER 1000 HEAD
ALBANY	11.	13.	0.	47.
ALLEGHANY	30.	69.	0.	62.
BRONX	0.	0.	0.	0.
BROOME	10.	0.	0.	0.
CATTARAUGUS	44.	13.	0.	0.
CAYUGA	48.	84.	240.	305.
CHAUTAUQUA	23.	53.	0.	47.
CHEMUNG	0.	15.	0.	52.
CHENANGO	0.	0.	0.	0.
CLINTON	6.	0.	0.	0.
COLUMBIA	5.	13.	0.	0.
CORTLAND	11.	13.	0.	0.
DELAWARE	18.	0.	0.	0.
DUTCHESS	26.	0.	43.	136.
ERIE	36.	73.	0.	0.
ESSEX	0.	12.	27.	0.
FRANKLIN	0.	0.	0.	0.
FULTON	0.	14.	0.	0.
GENESEE	79.	156.	91.	51.
GREENE	10.	0.	0.	0.
HAMILTON	0.	0.	0.	0.
HERKIMER	6.	14.	0.	0.
JEFFERSON	0.	10.	0.	0.
KINGS	0.	0.	0.	0.
LEWIS	6.	0.	0.	0.
LIVINGSTON	37.	29.	61.	0.
MADISON	0.	0.	0.	0.
MONROE	31.	36.	52.	0.
MONTGOMERY	0.	12.	0.	0.
NASSAU	0.	0.	0.	0.
MANHATTAN	0.	0.	0.	0.

Table D-3. Continued

NEW YORK

COUNTY	MANURE ON HOG FARMS 100-199 HEAD	MANURE ON HOG FARMS 200-499 HEAD	MANURE ON HOG FARMS 500-999 HEAD	MANURE ON HOG FARMS OVER 1000 HEAD
NIAGARA	86.	163.	81.	0.
ONEIDA	15.	35.	0.	0.
ONONDAGA	21.	12.	0.	0.
ONTARIO	37.	43.	123.	51.
ORANGE	24.	11.	24.	0.
ORLEANS	80.	93.	199.	47.
OSWEGO	10.	0.	0.	0.
OTSEGO	5.	0.	0.	0.
PUTNAM	6.	0.	0.	0.
QUEENS	0.	0.	0.	0.
RENNSELAER	25.	59.	0.	0.
RICHMOND	0.	0.	0.	0.
ROCKLAND	0.	0.	0.	0.
ST LAWRENCE	23.	40.	0.	48.
SARATOGA	11.	13.	0.	0.
SCHENECTADY	6.	0.	28.	0.
SCHOHARIE	9.	0.	0.	0.
SCHUYLER	26.	12.	0.	43.
SENECA	76.	89.	158.	105.
STEUBEN	31.	12.	0.	0.
SUFFOLK	0.	10.	0.	0.
SULLIVAN	6.	44.	0.	0.
TIOGA	11.	0.	0.	0.
TOMPKINS	15.	48.	26.	0.
ULSTER	11.	26.	0.	47.
WARREN	0.	0.	0.	0.
WASHINGTON	0.	22.	0.	0.
WAYNE	47.	82.	59.	49.
WESTCHESTER	0.	0.	31.	0.
WYOMING	64.	41.	29.	0.
YATES	65.	96.	59.	185.
STATE TOTALS	1149.	1581.	1331.	1277.

Table D-3. Continued

PENNSYLVANIA

CCUNTY	MANURE ON HOG FARMS 100-199 HEAD	MANURE ON HOG FARMS 200-499 HEAD	MANURE ON HOG FARMS 500-999 HEAD	MANURE ON HOG FARMS OVER 1000 HEAD
ADAMS	198.	280.	240.	533.
ALLEGHANY	22.	0.	0.	0.
ARMSTRONG	23.	67.	86.	48.
BEAVER	44.	26.	0.	0.
BEDFORD	90.	131.	169.	47.
BERKS	264.	575.	616.	1549.
BLAIR	11.	52.	139.	0.
BRADFCRD	51.	53.	29.	0.
BUCKS	87.	76.	81.	0.
BUTLER	126.	205.	192.	91.
CAMBRIA	44.	29.	63.	53.
CAMERON	0.	0.	0.	0.
CARBON	6.	52.	0.	0.
CENTRE	57.	146.	114.	47.
CHESTER	82.	268.	246.	372.
CLARION	43.	63.	C.	0.
CLEARFIELD	15.	24.	C.	0.
CLINTON	34.	27.	57.	0.
CCLUMBIA	97.	226.	85.	47.
CRAWFORD	86.	100.	80.	0.
CUMBERLAND	113.	348.	358.	99.
DAUPHIN	116.	190.	203.	239.
DELAWARE	0.	0.	C.	145.
ELK	6.	0.	C.	0.
ERIE	22.	39.	28.	0.
FAYETTE	26.	49.	26.	0.
FCREST	5.	0.	0.	0.
FRANKLIN	242.	414.	680.	662.
FULTON	72.	84.	0.	0.
GREENE	4.	21.	C.	0.
HUNTINGDON	44.	103.	32.	53.

Table D-3. Continued

PENNSYLVANIA

COUNTY	MANURE ON HOG FARMS 100-199 HEAD	MANURE ON HOG FARMS 200-499 HEAD	MANURE ON HOG FARMS 500-999 HEAD	MANURE ON HOG FARMS OVER 1000 HEAD
INDIANA	135.	296.	0.	141.
JEFFERSON	23.	13.	0.	0.
JUNIATA	72.	167.	358.	99.
LACKAWANNA	0.	15.	0.	53.
LANCASTER	1802.	5447.	5064.	4768.
LAWRENCE	43.	114.	54.	0.
LEBANON	191.	574.	707.	435.
LEHIGH	64.	163.	54.	407.
LUZERNE	24.	34.	48.	0.
LYCOMING	48.	112.	27.	0.
MCKEAN	5.	0.	0.	0.
MERCER	50.	39.	55.	0.
MIFFLIN	98.	143.	123.	51.
MONROE	15.	24.	0.	0.
MONTGOMERY	74.	200.	143.	298.
MONTOUR	43.	29.	31.	427.
NORTHAMPTON	52.	54.	0.	0.
NORTHUMBERLAND	146.	259.	350.	910.
PERRY	96.	111.	53.	0.
PHILADELPHIA	0.	0.	0.	0.
PIKE	0.	0.	0.	0.
POTTER	6.	0.	0.	0.
SCHUYLKILL	115.	310.	332.	558.
SNYDER	168.	274.	224.	572.
SOMERSET	124.	198.	170.	47.
SULLIVAN	6.	0.	0.	0.
SUSQUEHANNA	17.	27.	0.	0.
TIOGA	11.	25.	26.	0.
UNION	98.	269.	288.	291.
VENANGO	35.	13.	0.	0.
WARREN	6.	0.	0.	0.

Table D-3. Continued

PENNSYLVANIA

COUNTY	MANURE ON HOG FARMS 100-199 HEAD	MANURE ON HOG FARMS 200-499 HEAD	MANURE ON HOG FARMS 500-999 HEAD	MANURE ON HOG FARMS OVER 1000 HEAD
WASHINGTON	44.	64.	28.	0.
WAYNE	0.	0.	0.	0.
WESTMORELAND	63.	49.	26.	0.
WYOMING	5.	0.	27.	0.
YORK	331.	493.	628.	629.
STATE TOTALS	6041.	13163.	12340.	13674.

Table D-3. Continued

RHODE ISLAND

COUNTY	MANURE ON HOG FARMS 100-199 HEAD	MANURE ON HOG FARMS 200-499 HEAD	MANURE ON HOG FARMS 500-999 HEAD	MANURE ON HOG FARMS OVER 1000 HEAD
BRISTOL	0.	12.	0.	0.
KENT	0.	12.	0.	0.
NEWPORT	6.	13.	29.	48.
PROVIDENCE	51.	40.	29.	0.
WASHINGTON	11.	26.	0.	0.
STATE TOTALS	68.	104.	57.	48.

Table D-3. Continued

VERMONT

COUNTY	MANURE ON HOG FARMS 100-199 HEAD	MANURE ON HOG FARMS 200-499 HEAD	MANURE ON HOG FARMS 500-999 HEAD	MANURE ON HOG FARMS OVER 1000 HEAD
ADDISON	12.	0.	0.	0.
BENNINGTON	0.	0.	0.	0.
CALEDONIA	0.	0.	0.	0.
CHITTENDEN	5.	0.	0.	0.
ESSEX	0.	0.	0.	0.
FRANKLIN	0.	11.	0.	0.
GRAND ISLE	0.	9.	0.	0.
LAMOILLE	10.	0.	0.	0.
ORANGE	0.	10.	0.	0.
ORLEANS	16.	12.	0.	0.
RUTLAND	6.	0.	0.	0.
WASHINGTON	10.	11.	24.	0.
WINDHAM	0.	0.	0.	0.
WINDSOR	11.	13.	0.	0.
STATE TOTALS	69.	66.	24.	0.

Table D-4. DRY TONS OF LAYER MANURE AVAILABLE FOR METHANE CONVERSION ON FARMS WITH OVER 10, 20, 50, AND 100 THOUSAND BIRDS BY COUNTY CONNECTICUT

COUNTY	MANURE ON POULTRY FARMS 10000-19999 HENS	MANURE ON POULTRY FARMS 20000-49999 HENS	MANURE ON POULTRY FARMS 50000-99999 HENS	MANURE ON POULTRY FARMS OVER 100000 HENS
FAIRFIELD	0.	348.	0.	0.
HARTFORD	0.	0.	0.	2175.
LITCHFIELD	151.	1058.	0.	0.
MIDDLESEX	289.	0.	2169.	1928.
NEW HAVEN	144.	1342.	0.	0.
NEW LONDON	1506.	2811.	1506.	18906.
TOLLAND	144.	381.	0.	0.
WINDHAM	818.	5724.	4089.	6542.
STATE TOTALS	3051.	11665.	7764.	29551.

Table D-4. Continued

MAINE

COUNTY	MANURE ON POULTRY FARMS 10000-19999 HENS	MANURE ON POULTRY FARMS 20000-49999 HENS	MANURE ON POULTRY FARMS 50000-99999 HENS	MANURE ON POULTRY FARMS OVER 100000 HENS
ANDROSCOGGIN	230.	575.	2300.	37662.
AROOSTOOK	115.	0.	0.	0.
CUMBERLAND	164.	2678.	820.	0.
FRANKLIN	149.	694.	0.	0.
HANCOCK	115.	0.	0.	0.
KENNEBEC	1344.	3448.	1344.	1791.
KNOX	1064.	2171.	0.	0.
LINCOLN	148.	1379.	0.	0.
OXFORD	0.	1150.	0.	0.
PENOBSCOT	392.	2746.	1308.	0.
PISCATAQUIS	0.	575.	0.	0.
SAGADAHOC	164.	765.	0.	0.
SOMERSET	830.	2906.	692.	1845.
WALDO	693.	3556.	1386.	0.
WASHINGTON	0.	978.	0.	0.
YORK	453.	1585.	1132.	3020.
STATE TOTALS	5859.	25206.	8981.	44318.

Table D-4. Continued

MASSACHUSETTS

COUNTY	MANURE ON POULTRY FARMS 1CCOO-19999 HENS	MANURE ON POULTRY FARMS 2COOO-49999 HENS	MANURE ON POULTRY FARMS 50000-99999 HENS	MANURE ON POULTRY FARMS OVER 100000 HENS
BARNSTABLE	0.	0.	0.	0.
BERKSHIRE	144.	670.	0.	0.
BRISTCL	271.	0.	678.	0.
DUKES	0.	0.	0.	0.
ESSEX	300.	0.	0.	0.
FRANKLIN	156.	0.	0.	0.
HAMPDEN	0.	0.	0.	0.
HAMPSHIRE	175.	4C9.	0.	2335.
MIDDLESEX	544.	634.	680.	0.
NANTUCKET	0.	0.	0.	0.
NCRFOLK	0.	0.	0.	0.
PLYMOUTH	0.	0.	0.	0.
SUFFOLK	0.	0.	0.	0.
WORCHESTER	425.	1652.	7C8.	1889.
STATE TOTALS	2015.	3366.	2066.	4224.

Table D-4. Continued

NEW HAMPSHIRE

COUNTY	MANURE ON POULTRY FARMS 10000-19999 HENS	MANURE ON POULTRY FARMS 20000-49999 HENS	MANURE ON POULTRY FARMS 50000-99999 HENS	MANURE ON POULTRY FARMS OVER 100000 HENS
BELKNAP	0.	357.	0.	0.
CARROLL	0.	0.	0.	0.
CHESHIRE	190.	444.	0.	0.
COOS	135.	0.	0.	0.
GRAFTON	0.	714.	0.	0.
HILLSBOROUGH	578.	2697.	0.	0.
MERRIMACK	138.	322.	0.	0.
ROCKINGHAM	115.	0.	0.	1329.
STRAFFORD	135.	0.	765.	0.
SULLIVAN	0.	0.	0.	0.
STATE TOTALS	1291.	4534.	765.	1329.

Table D-4. Continued

NEW JERSEY

COUNTY	MANURE ON POULTRY FARMS 10000-19999 HENS	MANURE ON POULTRY FARMS 20000-49999 HENS	MANURE ON POULTRY FARMS 50000-99999 HENS	MANURE ON POULTRY FARMS OVER 100000 HENS
ATLANTIC	0.	0.	818.	0.
BERGEN	72.	0.	0.	0.
BURLINGTON	158.	0.	0.	0.
CAMDEN	0.	0.	0.	0.
CAPE MAY	0.	0.	0.	0.
CUMBERLAND	282.	659.	706.	0.
ESSEX	72.	0.	0.	0.
GLOUCESTER	292.	340.	0.	0.
HUDSON	0.	0.	0.	0.
HUNTERDON	184.	0.	918.	0.
MERCER	0.	0.	0.	0.
MIDDLESEX	0.	0.	0.	0.
MONMOUTH	410.	0.	683.	0.
MORRIS	0.	0.	0.	0.
OCEAN	0.	0.	0.	0.
PASSAIC	72.	0.	0.	0.
SALEM	0.	267.	575.	1525.
SOMERSET	0.	0.	0.	2181.
SUSSEX	0.	0.	0.	0.
UNION	0.	0.	0.	0.
WARREN	0.	0.	0.	0.
STATE TOTALS	1542.	1266.	3699.	3706.

Table D-4. Continued

NEW YORK

COUNTY	MANURE ON POULTRY FARMS 10000-19999 HENS	MANURE ON POULTRY FARMS 20000-49999 HENS	MANURE ON POULTRY FARMS 50000-99999 HENS	MANURE ON POULTRY FARMS OVER 100000 HENS
ALBANY	0.	804.	0.	0.
ALLEGHANY	344.	402.	0.	0.
BRONX	0.	0.	0.	0.
BROOME	0.	327.	0.	0.
CATTARAUGUS	254.	296.	0.	0.
CAYUGA	135.	631.	676.	1802.
CHAUTAUQUA	115.	250.	0.	0.
CHEMUNG	230.	0.	0.	1249.
CHENANGO	191.	893.	0.	2553.
CLINTON	0.	0.	861.	0.
COLUMBIA	140.	327.	701.	0.
CORTLAND	0.	402.	0.	0.
DELAWARE	0.	321.	0.	0.
DUTCHESS	0.	0.	0.	0.
ERIE	134.	314.	0.	3586.
ESSEX	0.	0.	0.	0.
FRANKLIN	0.	0.	0.	0.
FULTON	0.	402.	0.	0.
GENESEE	329.	384.	0.	0.
GREENE	0.	285.	0.	0.
HAMILTON	0.	0.	0.	0.
HERKIMER	0.	0.	0.	0.
JEFFERSON	696.	0.	0.	0.
KINGS	0.	0.	0.	0.
LEWIS	0.	0.	0.	0.
LIVINGSTON	129.	300.	643.	0.
MADISON	0.	402.	0.	0.
MONROE	0.	357.	0.	0.
MONTGOMERY	0.	0.	0.	0.
NASSAU	0.	0.	0.	0.
MANHATTAN	0.	0.	0.	0.

Table D-4. Continued

NEW YORK

COUNTY	MANURE ON POULTRY FARMS 10000-19999 HENS	MANURE ON POULTRY FARMS 20000-49999 HENS	MANURE ON POULTRY FARMS 50000-99999 HENS	MANURE ON POULTRY FARMS OVER 100000 HENS
NIAGARA	267.	312.	0.	0.
ONEIDA	0.	0.	861.	0.
ONONDAGA	744.	694.	744.	0.
ONTARIO	292.	1361.	729.	0.
ORANGE	0.	1555.	0.	0.
ORLEANS	173.	807.	0.	0.
OSWEGO	0.	0.	0.	0.
OTSEGO	287.	0.	718.	0.
PUTNAM	0.	0.	0.	0.
QUEENS	0.	0.	0.	0.
RENNSELAER	0.	0.	0.	2297.
RICHMOND	0.	0.	0.	0.
ROCKLAND	0.	0.	0.	0.
ST LAWRENCE	0.	0.	0.	0.
SARATOGA	161.	377.	0.	0.
SCHENECTADY	0.	402.	0.	0.
SCHOHARIE	0.	0.	0.	0.
SCHUYLER	0.	402.	0.	0.
SENECA	157.	366.	784.	0.
STEUBEN	253.	589.	0.	1683.
SUFFOLK	0.	0.	0.	0.
SULLIVAN	328.	1916.	3285.	17097.
TIOGA	0.	794.	1702.	0.
TOMPKINS	148.	344.	0.	1968.
ULSTER	283.	659.	706.	0.
WARREN	0.	0.	0.	0.
WASHINGTON	0.	0.	0.	2297.
WAYNE	0.	0.	0.	4594.
WESTCHESTER	0.	0.	0.	0.
WYOMING	137.	0.	0.	0.
YATES	294.	0.	0.	0.
STATE TOTALS	6221.	17676.	12412.	39127.

Table D-4. Continued

PENNSYLVANIA

CCUNTY	MANURE ON POULTRY FARMS 10000-19999 HENS	MANURE ON POULTRY FARMS 20000-49999 HENS	MANURE ON POULTRY FARMS 50000-99999 HENS	MANURE ON POULTRY FARMS OVER 100000 HENS
ADAMS	1687.	984.	1405.	0.
ALLEGHANY	292.	0.	0.	0.
ARMSTRONG	0.	247.	0.	0.
BEAVER	130.	0.	0.	0.
BEDFORD	0.	284.	0.	0.
BERKS	872.	2712.	1453.	0.
BLAIR	477.	0.	0.	0.
BRADFORD	572.	668.	0.	0.
BUCKS	122.	284.	0.	0.
BUTLER	306.	715.	0.	0.
CAMBRIA	163.	381.	0.	0.
CAMERON	0.	0.	0.	0.
CARBON	154.	0.	0.	0.
CENTRE	313.	0.	0.	0.
CHESTER	305.	1069.	1527.	0.
CLARION	0.	486.	0.	0.
CLEARFIELD	0.	0.	0.	0.
CLINTON	0.	0.	0.	0.
COLUMBIA	149.	348.	0.	0.
CRAWFORD	0.	0.	911.	0.
CUMBERLAND	1139.	664.	712.	0.
DAUPHIN	712.	1328.	712.	0.
DELAWARE	0.	0.	0.	0.
ELK	0.	751.	0.	0.
ERIE	0.	264.	0.	0.
FAYETTE	71.	0.	0.	2145.
FOREST	0.	0.	0.	0.
FRANKLIN	924.	718.	1540.	0.
FULTON	0.	0.	0.	0.
GREENE	0.	0.	0.	0.
HUNTINGDON	0.	0.	0.	0.

Table D-4. Continued

PENNSYLVANIA

COUNTY	MANURE ON POULTRY FARMS 10000-19999 HENS	MANURE ON POULTRY FARMS 20000-49999 HENS	MANURE ON POULTRY FARMS 50000-99999 HENS	MANURE ON POULTRY FARMS OVER 100000 HENS
INDIANA	0.	0.	0.	0.
JEFFERSON	0.	0.	0.	0.
JUNIATA	1169.	0.	730.	0.
LACKAWANNA	0.	0.	0.	2145.
LANCASTER	11269.	23373.	25042.	12592.
LAWRENCE	176.	410.	0.	0.
LEBANON	782.	1824.	1563.	0.
LEHIGH	132.	0.	659.	0.
LUZERNE	142.	332.	0.	0.
LYCOMING	0.	831.	0.	0.
MCKEAN	0.	0.	0.	0.
MERCER	259.	0.	0.	0.
MIFFLIN	230.	0.	0.	1455.
MONROE	0.	0.	0.	0.
MONTGOMERY	281.	1641.	1407.	0.
MONTOUR	0.	0.	804.	0.
NORTHAMPTON	546.	850.	0.	0.
NORTHUMBERLAND	906.	1410.	0.	0.
PERRY	174.	1217.	869.	0.
PHILADELPHIA	0.	0.	0.	0.
PIKE	0.	0.	0.	0.
POTTER	0.	0.	804.	0.
SCHUYLKILL	769.	2511.	769.	4100.
SNYDER	467.	0.	779.	0.
SOMERSET	406.	0.	0.	0.
SULLIVAN	0.	0.	0.	0.
SUSQUEHANNA	230.	0.	0.	1374.
TIOGA	339.	791.	848.	0.
UNION	382.	422.	0.	0.
VENANGO	0.	0.	0.	0.
WARREN	0.	375.	0.	0.

Table D-4. Continued

PENNSYLVANIA

COUNTY	MANURE ON POULTRY FARMS 10000-19999 HENS	MANURE ON POULTRY FARMS 20000-49999 HENS	MANURE ON POULTRY FARMS 50000-99999 HENS	MANURE ON POULTRY FARMS OVER 100000 HENS
WASHINGTON	0.	536.	0.	0.
WAYNE	127.	297.	0.	1698.
WESTMORELAND	272.	1270.	0.	0.
WYOMING	330.	0.	0.	0.
YORK	1715.	1455.	0.	0.
STATE TOTALS	29472.	51450.	42534.	25510.

Table D-4. Continued

RHODE ISLAND

COUNTY	MANURE ON POULTRY FARMS 10000-19999 HENS	MANURE ON POULTRY FARMS 20000-49999 HENS	MANURE ON POULTRY FARMS 50000-99999 HENS	MANURE ON POULTRY FARMS OVER 100000 HENS
BRISTOL	0.	0.	0.	0.
KENT	0.	0.	0.	0.
NEWPORT	53.	0.	0.	0.
PROVIDENCE	593.	1038.	0.	0.
WASHINGTON	0.	0.	597.	0.
STATE TOTALS	646.	1038.	597.	0.

Table D-4. Continued

VERMONT

COUNTY	MANURE ON POULTRY FARMS 10000-19999 HENS	MANURE ON POULTRY FARMS 20000-49999 HENS	MANURE ON POULTRY FARMS 50000-99999 HENS	MANURE ON POULTRY FARMS OVER 100000 HENS
ADDISON	0.	409.	0.	0.
BENNINGTON	0.	0.	0.	0.
CALEDONIA	0.	0.	0.	2338.
CHITTENDEN	128.	298.	0.	0.
ESSEX	0.	0.	0.	0.
FRANKLIN	77.	409.	0.	0.
GRAND ISLE	0.	0.	0.	0.
LAMOILLE	0.	818.	0.	0.
ORANGE	115.	0.	0.	0.
ORLEANS	0.	0.	0.	0.
RUTLAND	0.	0.	0.	0.
WASHINGTON	155.	0.	0.	0.
WINDHAM	137.	0.	0.	0.
WINDSOR	0.	0.	0.	0.
STATE TOTALS	612.	1934.	0.	2338.

Table D-5. DRY TONS OF BROILER MANURE AVAILABLE FOR METHANE CONVERSION ON FARMS WITH OVER 30, 60, 100, AND 500 THOUSAND BIRDS BY COUNTY

CONNECTICUT

COUNTY	MANURE ON BROILER FARMS 30000-59999 BIRDS	MANURE ON BROILER FARMS 60000-99999 BIRDS	MANURE ON BROILER FARMS 100000-499999 BIRDS	MANURE ON BROILER FARMS OVER 500000 BIRDS
FAIRFIELD	0.	0.	0.	0.
HARTFORD	0.	0.	0.	0.
LITCHFIELD	0.	0.	0.	0.
MIDDLESEX	0.	0.	0.	0.
NEW HAVEN	0.	0.	0.	0.
NEW LONDON	0.	0.	0.	0.
TOLLAND	54.	0.	0.	0.
WINDHAM	90.	180.	187.	0.
STATE TOTALS	144.	180.	187.	0.

Table D-5. Continued

MAINE

COUNTY	MANURE ON BROILER FARMS 30000-59999 BIRDS	MANURE ON BROILER FARMS 60000-99999 BIRDS	MANURE ON BROILER FARMS 100000-499999 BIRDS	MANURE ON BROILER FARMS OVER 500000 BIRDS
ANDROSCOGGIN	0.	62.	4158.	3720.
AROOSTOOK	0.	0.	0.	0.
CUMBERLAND	30.	0.	2272.	0.
FRANKLIN	0.	120.	1662.	0.
HANCOCK	0.	215.	1073.	0.
KENNEBEC	115.	682.	12274.	852.
KNOX	34.	60.	3136.	0.
LINCOLN	0.	68.	1522.	0.
OXFORD	0.	71.	2117.	882.
PENOBSCOT	37.	0.	2498.	0.
PISCATAQUIS	0.	0.	0.	0.
SAGADAHOC	0.	0.	1859.	0.
SOMERSET	112.	200.	3994.	832.
WALDO	268.	720.	14515.	6411.
WASHINGTON	0.	0.	0.	0.
YORK	36.	385.	1924.	0.
STATE TOTALS	633.	2581.	53045.	12697.

Table D-5. Continued

MASSACHUSETTS

CCUNTY	MANURE ON BROILER FARMS 30000-59999 BIRDS	MANURE ON BROILER FARMS 60000-99999 BIRDS	MANURE ON BROILER FARMS 100000-499999 BIRDS	MANURE ON BROILER FARMS OVER 500000 BIRDS
BARNSTABLE	0.	0.	0.	0.
BERKSHIRE	0.	0.	0.	0.
BRISTOL	0.	0.	0.	0.
DUKES	0.	0.	0.	0.
ESSEX	79.	0.	0.	0.
FRANKLIN	0.	0.	0.	0.
HAMPDEN	0.	0.	0.	0.
HAMPSHIRE	0.	0.	0.	0.
MIDDLESEX	39.	0.	0.	0.
NANTUCKET	0.	0.	0.	0.
NORFOLK	0.	0.	0.	0.
PLYMOUTH	0.	0.	0.	0.
SUFFOLK	0.	0.	0.	0.
WORCHESTER	0.	0.	0.	0.
STATE TOTALS	118.	0.	0.	0.

Table D-5. Continued

NEW HAMPSHIRE

COUNTY	MANURE ON BROILER FARMS 30000-59999 BIRDS	MANURE ON BROILER FARMS 60000-99999 BIRDS	MANURE ON BROILER FARMS 100000-499999 BIRDS	MANURE ON BROILER FARMS OVER 500000 BIRDS
BELKNAP	0.	0.	0.	0.
CARROLL	0.	0.	0.	0.
CHESHIRE	0.	0.	0.	0.
COOS	0.	0.	0.	0.
GRAFTON	0.	0.	0.	0.
HILLSBOROUGH	0.	0.	0.	0.
MERRIMACK	0.	0.	0.	0.
ROCKINGHAM	47.	83.	0.	0.
STRAFFORD	0.	0.	0.	0.
SULLIVAN	0.	0.	0.	0.
STATE TOTALS	47.	83.	0.	0.

Table D-5. Continued

NEW JERSEY

COUNTY	MANURE ON BROILER FARMS 30000-59999 BIRDS	MANURE ON BROILER FARMS 60000-99999 BIRDS	MANURE ON BROILER FARMS 100000-499999 BIRDS	MANURE ON BROILER FARMS OVER 500000 BIRDS
ATLANTIC	0.	0.	0.	0.
BERGEN	0.	0.	0.	0.
BURLINGTON	0.	0.	0.	0.
CAMDEN	0.	0.	0.	0.
CAPE MAY	0.	0.	0.	0.
CUMBERLAND	48.	0.	0.	0.
ESSEX	0.	0.	0.	0.
GLOUCESTER	93.	0.	0.	0.
HUDSON	0.	0.	0.	0.
HUNTERDON	0.	0.	0.	0.
MERCER	0.	0.	0.	0.
MIDDLESEX	43.	0.	0.	0.
MONMOUTH	0.	0.	0.	0.
MORRIS	0.	0.	0.	0.
OCEAN	0.	0.	0.	0.
PASSAIC	0.	0.	0.	0.
SALEM	0.	0.	287.	0.
SOMERSET	0.	0.	0.	0.
SUSSEX	0.	0.	0.	0.
UNION	0.	0.	0.	0.
WARREN	0.	0.	0.	0.
STATE TOTALS	185.	0.	287.	0.

Table D-5. Continued

NEW YORK

COUNTY	MANURE ON BROILER FARMS 30000-59999 BIRDS	MANURE ON BROILER FARMS 60000-99999 BIRDS	MANURE ON BROILER FARMS 100000-499999 BIRDS	MANURE ON BROILER FARMS OVER 500000 BIRDS
ALBANY	0.	0.	0.	0.
ALLEGHANY	30.	0.	0.	0.
BRONX	0.	0.	0.	0.
BROOME	0.	0.	0.	0.
CATTARAUGUS	0.	0.	0.	0.
CAYUGA	0.	0.	0.	0.
CHAUTAUQUA	0.	0.	0.	0.
CHEMUNG	0.	0.	0.	0.
CHENANGO	0.	0.	0.	0.
CLINTON	0.	0.	0.	0.
COLUMBIA	0.	0.	0.	0.
CORTLAND	0.	0.	0.	0.
DELAWARE	0.	0.	0.	0.
DUTCHESS	0.	0.	0.	0.
ERIE	30.	0.	0.	0.
ESSEX	0.	0.	0.	0.
FRANKLIN	0.	0.	0.	0.
FULTON	0.	0.	0.	0.
GENESEE	0.	0.	0.	0.
GREENE	0.	0.	0.	0.
HAMILTON	0.	0.	0.	0.
HERKIMER	0.	0.	0.	0.
JEFFERSON	0.	0.	0.	0.
KINGS	0.	0.	0.	0.
LEWIS	0.	0.	0.	0.
LIVINGSTON	0.	0.	0.	0.
MADISON	0.	0.	0.	0.
MONROE	0.	0.	0.	0.
MONTGOMERY	0.	0.	0.	0.
NASSAU	0.	0.	0.	0.
MANHATTAN	0.	0.	0.	0.

Table D-5. Continued

NEW YORK

CCUNTY	MANURE ON BROILER FARMS 3C000-59999 BIRDS	MANURE ON BROILER FARMS 6CC00-99999 BIRDS	MANURE ON BROILER FARMS 100000-499999 BIRDS	MANURE ON BROILER FARMS OVER 500000 BIRDS
NIAGARA	0.	0.	0.	0.
ONEIDA	0.	0.	0.	0.
CNONDAGA	0.	0.	0.	0.
CNTARIO	0.	0.	0.	0.
ORANGE	0.	0.	0.	0.
ORLEANS	0.	0.	0.	0.
OSWEGO	0.	0.	0.	0.
OTSEGO	0.	0.	0.	0.
PUTNAM	0.	0.	0.	0.
QUEENS	0.	0.	0.	0.
RENNSELAER	0.	0.	0.	0.
RICHMOND	0.	0.	0.	0.
ROCKLAND	0.	0.	0.	0.
ST LAWRENCE	0.	0.	0.	0.
SARATOGA	0.	0.	0.	0.
SCHENECTADY	0.	0.	0.	0.
SCHOHARIE	0.	0.	0.	0.
SCHUYLER	0.	0.	0.	0.
SENECA	0.	0.	0.	0.
STEUBEN	0.	0.	0.	0.
SUFFOLK	0.	60.	2C1.	0.
SULLIVAN	0.	0.	0.	0.
TIOGA	0.	0.	0.	0.
TOMPKINS	0.	0.	0.	0.
ULSTER	0.	0.	0.	0.
WARREN	0.	0.	0.	0.
WASHINGTON	0.	0.	0.	0.
WAYNE	0.	0.	0.	0.
WESTCHESTER	0.	0.	0.	0.
WYOMING	0.	0.	0.	0.
YATES	0.	0.	0.	0.
STATE TOTALS	60.	60.	2C1.	0.

Table D-5. Continued

PENNSYLVANIA

COUNTY	MANURE ON BROILER FARMS 30000-59999 BIRDS	MANURE ON BROILER FARMS 60000-99999 BIRDS	MANURE ON BROILER FARMS 100000-499999 BIRDS	MANURE ON BROILER FARMS OVER 500000 BIRDS
ADAMS	60.	360.	3139.	1308.
ALLEGHANY	35.	0.	0.	0.
ARMSTRONG	0.	0.	0.	0.
BEAVER	0.	0.	0.	0.
BEDFORD	0.	0.	0.	0.
BERKS	0.	0.	1783.	2836.
BLAIR	0.	0.	0.	0.
BRADFORD	0.	0.	0.	0.
BUCKS	0.	0.	0.	0.
BUTLER	0.	0.	0.	0.
CAMBRIA	0.	0.	170.	0.
CAMERON	0.	0.	0.	0.
CARBON	0.	0.	0.	0.
CENTRE	0.	0.	0.	0.
CHESTER	40.	0.	1878.	0.
CLARION	0.	0.	0.	0.
CLEARFIELD	0.	0.	0.	0.
CLINTON	0.	0.	0.	0.
COLUMBIA	121.	120.	403.	0.
CRAWFORD	0.	0.	0.	0.
CUMBERLAND	0.	0.	646.	0.
DAUPHIN	60.	60.	2177.	0.
DELAWARE	0.	0.	0.	0.
ELK	0.	0.	0.	0.
ERIE	0.	0.	0.	0.
FAYETTE	0.	0.	0.	0.
FOREST	0.	0.	0.	0.
FRANKLIN	36.	0.	1201.	0.
FULTON	0.	0.	0.	0.
GREENE	0.	0.	0.	0.
HUNTINGDON	0.	0.	170.	568.

Table D-5. Continued

PENNSYLVANIA

COUNTY	MANURE ON BROILER FARMS 30000-59999 BIRDS	MANURE ON BROILER FARMS 60000-99999 BIRDS	MANURE ON BROILER FARMS 100000-499999 BIRDS	MANURE ON BROILER FARMS OVER 500000 BIRDS
INDIANA	0.	0.	0.	0.
JEFFERSON	0.	0.	0.	0.
JUNIATA	155.	300.	3924.	0.
LACKAWANNA	0.	0.	0.	0.
LANCASTER	609.	609.	23606.	12860.
LAWRENCE	0.	0.	0.	0.
LEBANON	83.	220.	4408.	3745.
LEHIGH	0.	0.	0.	0.
LUZERNE	0.	0.	0.	0.
LYCOMING	0.	0.	0.	0.
MCKEAN	0.	0.	0.	0.
MERCER	0.	0.	0.	0.
MIFFLIN	36.	256.	1918.	0.
MONROE	0.	0.	0.	0.
MONTGOMERY	0.	60.	170.	0.
MONTOUR	37.	65.	0.	0.
NORTHAMPTON	0.	0.	0.	0.
NORTHUMBERLAND	227.	134.	755.	839.
PERRY	45.	160.	0.	2740.
PHILADELPHIA	0.	0.	0.	0.
PIKE	0.	0.	0.	0.
POTTER	0.	0.	0.	0.
SCHUYLKILL	90.	240.	707.	0.
SNYDER	315.	280.	3149.	0.
SOMERSET	0.	0.	0.	0.
SULLIVAN	0.	0.	0.	0.
SUSQUEHANNA	0.	0.	0.	0.
TIOGA	0.	60.	0.	0.
UNION	173.	0.	575.	0.
VENANGO	0.	0.	0.	0.
WARREN	0.	0.	0.	0.

Table D-5. Continued

PENNSYLVANIA

COUNTY	MANURE ON BROILER FARMS 30000-59999 BIRDS	MANURE ON BROILER FARMS 60000-99999 BIRDS	MANURE ON BROILER FARMS 100000-499999 BIRDS	MANURE ON BROILER FARMS OVER 500000 BIRDS
WASHINGTON	0.	0.	0.	0.
WAYNE	0.	0.	0.	0.
WESTMORELAND	0.	0.	0.	0.
WYOMING	0.	0.	0.	0.
YORK	151.	201.	2261.	1675.
STATE TOTALS	2271.	3125.	53041.	26570.

Table D-5. Continued

RHODE ISLAND

COUNTY	MANURE ON BROILER FARMS 30000-59999 BIRDS	MANURE ON BROILER FARMS 60000-99999 BIRDS	MANURE ON BROILER FARMS 100000-499999 BIRDS	MANURE ON BROILER FARMS OVER 500000 BIRDS
BRISTOL	0.	0.	0.	0.
KENT	0.	0.	0.	0.
NEWPORT	0.	0.	0.	0.
PROVIDENCE	0.	0.	0.	0.
WASHINGTON	0.	0.	0.	0.
STATE TOTALS	0.	0.	0.	0.

Table D-5. Continued

VERMONT

COUNTY	MANURE ON BROILER FARMS 30000-59999 BIRDS	MANURE ON BROILER FARMS 60000-99999 BIRDS	MANURE ON BROILER FARMS 100000-499999 BIRDS	MANURE ON BROILER FARMS OVER 500000 BIRDS
ADDISON	0.	0.	0.	0.
BENNINGTON	0.	0.	0.	0.
CALEDONIA	0.	0.	0.	0.
CHITTENDEN	0.	0.	0.	0.
ESSEX	0.	0.	0.	0.
FRANKLIN	0.	0.	0.	0.
GRAND ISLE	0.	0.	0.	0.
LAMOILLE	0.	0.	0.	0.
ORANGE	0.	0.	0.	0.
ORLEANS	0.	0.	0.	0.
RUTLAND	0.	0.	0.	0.
WASHINGTON	0.	0.	0.	0.
WINDHAM	0.	0.	0.	0.
WINDSOR	0.	0.	0.	0.
STATE TOTALS	0.	0.	0.	0.

Appendix E

CONNECTICUT

Table E-1. COUNTY INVENTORIES OF TOTAL AND ECONOMICALLY RECOVERABLE MANURE (DRY TONS)

COUNTY	TOTAL MANURE	ECONOMICALLY RECOVERABLE MANURE	% RECCV	DENS/ SQ.MILE	DAIRY	BEEF	FEEDER	HOGS	SHEEP	TURKEYS	HENS	BROILERS
FAIRFIELD	3315.	2855.	0.86	4.54	2159.1	19.4	53.2	3.4	5.6	0.0	609.8	4.5
HARTFORD	12055.	10143.	0.84	13.71	9348.1	73.1	590.8	123.1	6.8	0.5	0.0	0.2
LITCHFIELD	28619.	24540.	0.86	26.48	22677.0	136.9	229.1	48.0	30.3	1.0	1418.0	0.1
MIDDLESEX	8550.	7701.	0.90	20.60	2998.4	45.6	51.9	13.7	7.1	0.1	4583.6	0.1
NEW HAVEN	10820.	9549.	0.88	15.73	7314.5	38.0	153.4	48.5	17.1	0.0	1976.1	1.1
NEW LONDON	45853.	42978.	0.94	64.34	17223.5	79.5	256.6	128.2	22.4	1.9	25265.1	1.2
TOLLAND	16611.	14416.	0.87	34.58	14207.4	52.9	101.4	33.9	18.1	2.0	0.0	0.0
WINDHAM	44882.	41498.	0.92	80.82	22041.6	79.9	114.3	71.2	22.9	0.6	18682.8	484.3
STATE TOTAL	170704.	153679.	0.90		97969.5	525.3	1550.7	470.1	130.3	6.0	52535.3	491.4

NOTE: CALCULATIONS ARE BASED ON PROCEDURES DESCRIBED IN THE TEXT.
INPUT DATA WERE OBTAINED FROM THE 1978 CENSUS OF AGRICULTURE.

Table E-1. Continued

MAINE

COUNTY	TOTAL MANURE	ECONOMICALLY RECOVERABLE MANURE	% RECOV	DENS/ SQ.MILE	DAIRY	BEEF	FEEDER	HOGS	SHEEP	TURKEYS	HENS	BROILERS
ANDROSCOGGIN	21001.	19311.	0.92	40.72	11134.6	39.0	117.9	13.5	17.0	0.3	0.0	7989.2
AROOSTOOK	8782.	6626.	0.75	0.97	6263.4	130.3	187.0	38.1	6.6	0.5	0.0	0.0
CUMBERLAND	14689.	13033.	0.89	14.83	6400.7	80.4	260.3	82.9	16.7	0.4	3803.9	2388.1
FRANKLIN	8501.	7572.	0.89	4.44	4818.2	34.8	62.3	6.8	7.9	0.2	860.4	1781.0
HANCOCK	1711.	1542.	0.90	1.01	196.1	12.1	23.2	6.6	11.2	0.2	0.0	1292.6
KENNEBEC	44547.	41152.	0.92	47.20	18213.8	120.3	417.9	64.7	17.0	0.0	8370.0	13947.9
KNOX	8670.	8263.	0.95	22.45	1619.8	17.7	53.8	4.8	29.2	0.6	3298.7	3238.8
LINCOLN	5511.	4987.	0.90	10.99	1672.7	28.5	56.2	3.7	23.3	0.0	1610.9	1591.7
OXFORD	10433.	9095.	0.87	4.35	5820.2	61.0	114.9	12.4	13.4	1.1	0.0	3071.8
PENOBSCOT	26063.	23337.	0.90	6.84	15890.0	82.6	147.3	55.7	25.4	0.3	4598.4	2537.5
PISCATAQUIS	4294.	3579.	0.83	0.92	3492.5	27.6	34.8	0.7	23.1	0.0	0.0	0.0
SAGADAHOC	3627.	3159.	0.87	12.25	1908.1	18.8	29.3	2.8	47.6	0.1	1151.8	0.0
SOMERSET	30502.	27913.	0.92	7.13	15807.6	72.9	291.4	22.9	21.0	0.1	6540.5	5156.7
WALDO	39786.	38025.	0.96	51.50	9722.6	52.7	168.6	50.2	74.9	0.4	6023.2	21932.3
WASHINGTON	2421.	2107.	0.87	0.82	1041.3	15.6	24.4	13.9	18.6	1.1	992.3	0.0
YORK	18067.	16434.	0.91	16.43	7055.7	72.7	147.9	36.4	30.5	2.6	6741.1	2346.8
STATE TOTAL	248604.	226134.	0.91		111057.0	866.9	2137.3	416.1	383.4	7.8	43991.3	67274.4

NOTE: CALCULATIONS ARE BASED ON PROCEDURES DESCRIBED IN THE TEXT.
INPUT DATA WERE OBTAINED FROM THE 1978 CENSUS OF AGRICULTURE.

Table E-1. Continued

MASSACHUSETTS

COUNTY	TOTAL MANURE	ECONOMICALLY RECOVERABLE MANURE	% RECOV	DENS/ SQ.MILE	DAIRY	BEEF	FEEDER	HOGS	SHEEP	TURKEYS	HENS	BROILERS
BARNSTABLE	94.	82.	0.87	0.22	58.8	0.0	0.0	1.3	4.8	0.0	17.5	0.1
BERKSHIRE	17714.	15384.	0.87	16.31	14307.4	65.8	59.9	15.0	8.1	8.6	919.5	0.0
BRISTOL	16217.	13747.	0.85	24.80	10916.9	89.8	713.6	483.9	16.3	28.7	1495.4	2.2
DUKES	286.	110.	0.38	1.05	62.8	14.4	12.8	6.9	7.2	0.0	5.4	0.1
ESSEX	5806.	4893.	0.84	9.95	4027.9	33.7	102.0	138.1	23.2	5.4	552.8	10.4
FRANKLIN	18341.	15959.	0.87	22.51	15429.1	59.0	135.0	23.0	9.2	1.2	302.1	0.0
HAMPDEN	8356.	6963.	0.83	11.29	6269.3	40.9	53.8	156.6	39.0	402.6	0.0	1.2
HAMPSHIRE	17162.	15268.	0.89	28.90	11634.6	43.9	100.8	196.0	20.1	3.0	3269.9	0.1
MIDDLESEX	9194.	7505.	0.82	9.14	4345.6	75.4	68.4	602.5	20.1	162.9	2225.3	4.9
NANTUCKET	1.	0.	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NORFOLK	2302.	1902.	0.83	4.86	1478.6	15.8	56.2	79.6	20.9	0.0	250.9	0.1
PLYMOUTH	7259.	6310.	0.87	9.64	5673.2	14.8	39.7	278.7	16.2	1.3	285.8	0.1
SUFFOLK	1.	0.	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WORCESTER	34126.	29501.	0.86	19.53	23312.4	149.9	264.0	679.8	42.2	4.4	5047.6	0.5
STATE TOTAL	136862.	117625.	0.86		97516.4	603.3	1606.3	2661.4	227.3	618.1	14372.3	19.7

NOTE: CALCULATIONS ARE BASED ON PROCEDURES DESCRIBED IN THE TEXT.
INPUT DATA WERE OBTAINED FROM THE 1978 CENSUS OF AGRICULTURE.

Table E-1. Continued

NEW HAMPSHIRE

COUNTY	TOTAL MANURE	ECONOMICALLY RECOVERABLE MANURE	% RECOV	DENS/ SQ.MILE	DAIRY	BEEF	FEEDER	HOGS	SHEEP	TURKEYS	HENS	BROILERS
BELKNAP	1758.	1321.	0.75	3.30	1276.6	25.7	0.0	13.7	4.9	0.4	0.0	0.1
CARROLL	2448.	2014.	0.82	2.13	1717.8	18.9	0.0	49.6	10.2	0.1	217.6	0.0
CHESHIRE	9397.	8017.	0.85	11.15	6887.0	53.1	113.6	19.1	21.9	0.3	922.0	0.0
COOS	10787.	9332.	0.87	5.14	9199.0	37.1	59.3	19.9	16.1	0.0	0.0	0.0
GRAFTON	15965.	13739.	0.86	7.90	13491.7	63.0	129.5	38.1	16.2	0.0	0.0	0.2
HILLSBOROUGH	11537.	10414.	0.90	11.75	5381.0	32.2	529.1	171.8	27.7	3.3	3766.9	1.4
MERRIMACK	11148.	9775.	0.88	10.50	8738.2	28.8	127.1	73.2	47.6	6.3	753.2	0.2
ROCKINGHAM	7076.	6068.	0.86	8.75	4141.6	42.6	78.8	93.0	25.1	21.2	1654.9	10.3
STRAFFORD	3970.	3286.	0.83	8.74	3198.4	27.5	19.6	26.3	12.7	1.2	0.0	0.3
SULLIVAN	6497.	5591.	0.86	10.36	5492.8	24.7	20.8	6.6	21.0	0.2	24.8	0.0
STATE TOTAL	80582.	69555.	0.86		60024.2	353.5	1077.8	511.2	203.6	32.8	7339.4	12.6

NOTE: CALCULATIONS ARE BASED ON PROCEDURES DESCRIBED IN THE TEXT.
INPUT DATA WERE OBTAINED FROM THE 1978 CENSUS OF AGRICULTURE.

Table E-1. Continued

NEW JERSEY

COUNTY	TOTAL MANURE	ECONOMICALLY RECOVERABLE MANURE	% RECOV	DENS/ SQ.MILE	DAIRY	BEEF	FEEDER	HOGS	SHEEP	TURKEYS	HENS	BROILERS
ATLANTIC	318.	189.	0.59	0.33	90.2	7.1	13.4	76.0	2.0	0.5	0.0	0.0
BERGEN	10.	7.	0.67	0.03	0.0	0.0	0.0	3.3	1.7	0.0	0.0	1.8
BURLINGTON	12451.	10710.	0.86	13.10	9363.8	26.1	104.5	787.1	16.6	0.0	411.6	0.2
CAMDEN	61.	51.	0.84	0.23	0.0	0.0	35.4	11.7	3.8	0.0	0.0	0.0
CAPE MAY	536.	358.	0.67	1.34	0.0	0.0	0.0	352.1	0.0	0.0	5.5	0.0
CUMBERLAND	5738.	4786.	0.83	9.57	1843.3	31.8	22.0	776.6	4.1	0.0	2034.0	73.9
ESSEX	1.	0.	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	C.0	0.0
GLOUCESTER	6337.	4855.	0.77	14.77	2214.0	40.8	216.3	1551.3	1.6	0.0	712.2	119.3
HUDSON	1.	0.	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HUNTERDON	19744.	15919.	0.81	37.64	13021.0	199.8	663.5	170.7	92.8	1.2	1766.5	3.4
MERCER	1660.	1010.	0.61	4.42	735.4	47.6	57.4	60.3	13.2	0.0	89.7	6.2
MIDDLESEX	1293.	1049.	0.81	3.37	600.1	10.4	219.3	106.7	8.9	0.5	100.0	2.6
MONMOUTH	5133.	4355.	0.85	9.13	2057.1	30.7	307.3	388.5	14.1	0.0	1554.1	3.1
MORRIS	2616.	1935.	0.74	4.13	1557.0	43.1	214.5	37.1	12.9	5.2	65.0	0.2
OCEAN	1366.	1170.	0.86	1.82	413.8	7.3	17.7	137.8	0.0	0.0	593.2	0.0
PASSAIC	1.	0.	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SALEM	18264.	15501.	0.85	42.45	12411.2	114.7	261.5	217.9	12.6	0.0	2461.9	20.9
SOMERSET	6680.	4831.	0.72	15.74	4269.1	112.7	240.1	134.2	62.8	8.2	0.0	3.9
SUSSEX	20174.	16699.	0.83	31.64	15956.7	149.6	248.7	49.7	31.3	1.2	261.3	0.5
UNION	1.	0.	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WARREN	23078.	20075.	0.87	55.46	19374.7	73.1	450.9	52.4	21.6	0.2	95.0	7.4
STATE TOTAL	125462.	103498.	0.82		83907.2	894.9	3072.7	4913.3	299.8	17.0	10150.1	243.5

NOTE: CALCULATIONS ARE BASED ON PROCEDURES DESCRIBED IN THE TEXT.
INPUT DATA WERE OBTAINED FROM THE 1978 CENSUS OF AGRICULTURE.

Table E-1. Continued

NEW YORK

COUNTY	TOTAL MANURE	ECONOMICALLY RECOVERABLE MANURE	% RECOV	DENS/ SQ.MILE	DAIRY	BEEF	FEEDER	HOGS	SHEEP	TURKEYS	HENS	BROILERS
ALBANY	12743.	8866.	0.70	16.82	7467.5	274.1	1069.2	53.2	0.0	1.7	0.0	0.6
ALLEGANY	50668.	35756.	0.71	34.12	30407.3	991.5	1644.2	23.6	85.8	1623.6	911.7	68.2
BRONX	75.	37.	0.50	0.04	0.0	0.0	0.0	0.0	37.4	0.0	0.0	0.0
BROOME	37043.	26194.	0.71	36.74	24016.4	740.5	906.1	13.3	15.8	7.8	492.6	1.5
CATTARAUGUS	78854.	57015.	0.72	43.21	53131.3	1443.1	1650.3	32.6	21.3	24.8	709.0	2.8
CAYUGA	71730.	51764.	0.72	74.16	44871.6	1354.7	2022.4	47.5	38.1	1.0	3427.8	0.9
CHAUTAUQUA	89567.	62651.	0.70	57.94	58529.9	1849.0	2197.2	43.3	28.4	2.9	0.0	0.4
CHEMUNG	16481.	11859.	0.72	28.56	9532.4	322.1	472.3	11.8	9.4	1.6	1509.6	0.1
CHENANGO	82579.	61290.	0.74	67.80	54086.3	1384.0	1647.3	26.9	26.8	0.7	4116.3	2.1
CLINTON	59511.	42060.	0.71	39.72	39604.3	1182.8	1225.7	43.0	4.0	0.0	0.0	0.7
COLUMBIA	48758.	35141.	0.72	54.46	31391.7	916.6	1442.6	19.1	24.5	4.0	1342.0	0.4
CORTLAND	66004.	47304.	0.72	94.17	45159.9	1237.0	831.0	27.8	47.5	0.5	0.0	0.3
DELAWARE	92709.	67954.	0.73	47.10	64018.8	1598.5	1812.2	27.1	26.8	3.0	466.1	1.6
DUTCHESS	35405.	24083.	0.68	29.65	20619.9	813.4	2129.9	63.9	33.4	21.8	399.2	0.9
ERIE	63834.	48388.	0.76	45.81	41345.7	978.5	1443.8	51.5	47.2	17.3	4478.8	25.3
ESSEX	11910.	8013.	0.67	4.43	7394.9	278.2	291.4	5.3	7.3	2.6	33.0	0.7
FRANKLIN	57964.	41620.	0.72	24.88	39729.8	1080.7	662.9	8.0	24.8	1.7	112.0	0.4
FULTON	13647.	9775.	0.72	19.64	9189.2	258.3	319.6	2.3	5.3	0.0	0.0	0.5
GENESEE	51722.	36934.	0.71	73.68	33439.0	996.3	1513.4	70.5	63.5	6.0	843.8	1.2
GREENE	11606.	8245.	0.71	12.61	7267.5	230.0	372.1	7.4	16.0	0.0	352.4	0.0
HAMILTON	1.	0.	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
HERKIMER	71651.	52386.	0.73	36.54	49762.3	1245.9	1198.2	27.2	3.8	0.0	148.6	0.2
JEFFERSON	121281.	88818.	0.73	68.60	83975.9	2098.1	1853.8	31.4	6.8	27.0	824.4	1.1
KINGS	1.	0.	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LEWIS	86188.	65007.	0.75	50.30	62806.9	1289.5	895.1	12.3	0.6	0.7	0.0	1.4
LIVINGSTON	55370.	38277.	0.69	59.95	34041.0	1189.3	1650.9	46.7	187.1	0.8	1161.0	0.3
MADISON	89348.	64299.	0.72	97.29	60818.4	1659.4	1792.1	15.7	10.6	1.9	0.0	1.0
MONROE	20417.	14272.	0.70	21.13	12679.8	425.7	536.5	23.4	24.3	40.0	541.1	0.8
MONTGOMERY	60198.	43120.	0.72	105.67	41230.0	1132.7	692.3	18.2	15.2	2.3	29.2	0.1
NASSAU	117.	10.	0.08	0.03	0.0	9.8	0.0	0.0	0.0	0.0	0.0	0.0
MANHATTAN	1.	0.	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NIAGARA	26850.	19127.	0.71	35.94	15876.3	531.9	1780.5	125.9	37.0	3.1	764.2	8.5
ONEIDA	96538.	69305.	0.72	56.63	65264.0	1810.7	2144.6	30.2	15.0	39.2	0.0	1.6
ONONDAGA	53388.	38004.	0.71	47.82	33482.1	1052.2	1035.6	23.8	22.1	134.9	2245.2	8.0
ONTARIO	38980.	26939.	0.69	41.38	21722.0	861.4	1524.4	78.2	100.2	0.9	2651.3	0.5

Table E-1. Continued

NEW YORK

COUNTY	TOTAL MANURE	ECONOMICALLY RECOVERABLE MANURE	% RECCV	DENS/ SQ.MILE	DAIRY	BEEF	FEEDER	HOGS	SHEEP	TURKEYS	HENS	BROILERS
ORANGE	44171.	33733.	0.76	40.46	30107.2	640.8	1111.4	47.6	13.0	1.1	1811.8	0.3
ORLEANS	20770.	13698.	0.66	34.57	10030.5	531.1	1932.6	100.1	55.8	1.3	1046.2	0.3
OSWEGO	31108.	20958.	0.67	21.73	19286.4	725.5	845.0	13.7	10.4	1.0	74.3	2.0
OTSEGO	92435.	66835.	0.72	66.05	62206.8	1690.4	1646.6	35.8	56.2	1.0	1197.8	0.1
PUTNAM	363.	97.	0.27	0.42	0.0	23.6	61.1	3.0	4.4	0.0	4.6	0.0
QUEENS	1.	0.	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RENSSELAER	29863.	21206.	0.71	31.84	19868.8	583.7	722.2	13.1	14.9	2.3	0.0	0.7
RICHMOND	1.	0.	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ROCKLAND	1.	0.	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ST LAWRENCE	134039.	93961.	0.70	33.91	88527.3	2741.8	2399.4	32.8	32.0	1.2	225.8	0.5
SARATOGA	22915.	16137.	0.70	19.72	14389.8	468.7	521.8	7.0	13.7	2.7	732.5	0.6
SCHENECTADY	3807.	2663.	0.70	12.84	2408.1	79.0	166.8	7.0	2.2	0.0	0.0	0.1
SCHOHARIE	44968.	32196.	0.72	51.65	30317.1	850.4	918.3	19.7	27.7	4.5	57.9	0.2
SCHUYLER	12189.	8320.	0.68	25.21	7398.8	272.6	596.3	14.1	37.6	0.1	0.0	0.2
SENECA	15471.	10735.	0.69	32.52	8067.6	345.1	837.7	24.7	26.4	0.0	1432.8	0.5
STEUBEN	89853.	62840.	0.70	44.55	55708.1	1876.0	2355.4	60.4	131.3	2.3	2706.0	0.3
SUFFOLK	1815.	1559.	0.86	1.67	774.6	15.0	56.8	6.8	0.0	2.9	400.4	302.5
SULLIVAN	20942.	14889.	0.71	15.25	12783.8	411.0	1380.2	14.1	12.0	276.2	0.0	11.6
TIOGA	42758.	31029.	0.73	59.26	26559.8	794.9	947.0	34.9	6.3	2.1	2682.3	1.6
TOMPKINS	32696.	23401.	0.72	48.55	18668.7	650.8	1275.8	22.8	42.1	1.6	2736.6	2.5
ULSTER	14010.	10448.	0.75	9.16	6838.0	249.9	1144.4	26.4	35.5	3.7	2146.2	4.0
WARREN	664.	414.	0.62	0.46	286.3	14.1	41.5	3.9	60.3	0.0	8.2	0.0
WASHINGTON	88932.	63755.	0.72	76.21	60643.9	1672.9	1407.1	22.1	6.9	1.0	0.0	1.0
WAYNE	25366.	17157.	0.68	28.30	15199.7	589.4	1313.0	49.8	2.9	1.6	0.0	0.7
WESTCHESTER	1147.	615.	0.54	1.39	451.0	39.9	67.2	2.8	41.0	0.0	10.9	1.9
WYOMING	94716.	68060.	0.72	113.84	64063.9	1760.9	1795.7	42.0	124.9	0.2	272.4	0.6
YATES	15432.	10929.	0.71	31.84	9293.2	313.6	850.5	35.3	0.0	0.0	433.2	2.9
STATE TOTAL	2553553.	1830130.	0.72		1666728.0	46576.9	63151.6	1651.0	1743.7	2278.6	45539.2	467.1

NOTE: CALCULATIONS ARE BASED ON PROCEDURES DESCRIBED IN THE TEXT.
INPUT DATA WERE OBTAINED FROM THE 1978 CENSUS OF AGRICULTURE.

Table E-1. Continued

PENNSYLVANIA

COUNTY	TOTAL MANURE	ECONOMICALLY RECOVERABLE MANURE	% RECOV	DENS/ SQ.MILE	DAIRY	BEEF	FEEDER	HOGS	SHEEP	TURKEYS	HENS	BROILERS
ADAMS	49931.	40841.	0.82	77.63	15691.9	346.6	5153.2	1480.5	51.4	8580.8	4646.9	4889.2
ALLEGHENY	4811.	3323.	0.69	4.59	2265.0	104.6	272.5	58.0	39.4	47.4	478.0	58.2
ARMSTRONG	16387.	11920.	0.73	18.29	9285.3	290.5	1579.4	375.3	45.6	0.2	343.1	0.4
BEAVER	11080.	8127.	0.73	18.47	6863.5	190.2	580.4	127.8	31.1	0.1	333.1	0.8
BEDFORD	45571.	36284.	0.80	35.63	32827.1	478.3	1756.6	670.6	36.6	0.4	512.0	1.9
BERKS	91413.	80112.	0.88	92.98	54566.8	272.1	9678.8	3414.8	68.7	1429.7	6002.6	4678.8
BLAIR	27138.	23602.	0.87	44.52	21227.8	92.0	1159.1	303.4	14.5	0.1	804.3	0.5
BRADFORD	87948.	76655.	0.87	66.79	73162.9	264.4	1366.8	237.4	142.2	0.8	1480.9	0.1
BUCKS	19335.	16654.	0.86	27.12	13219.1	81.0	1812.8	376.1	39.7	285.7	838.0	1.9
BUTLER	22787.	16072.	0.71	20.23	10738.4	452.6	2374.3	845.6	109.0	0.3	1539.5	12.3
CAMBRIA	10840.	7458.	0.69	10.79	5130.0	238.1	1000.2	313.8	30.9	0.5	743.9	0.3
CAMERON	314.	217.	0.69	0.56	194.1	6.7	12.2	0.0	0.0	4.0	0.0	0.0
CARBON	1927.	1683.	0.87	4.15	1039.3	6.3	132.6	95.6	10.2	0.0	396.4	2.7
CENTRE	34694.	29039.	0.84	26.06	25859.7	222.9	1817.1	498.6	78.0	2.5	559.0	1.1
CHESTER	68989.	59228.	0.86	77.87	48601.4	332.4	3375.2	1098.7	78.8	228.9	3586.3	1925.9
CLARION	15400.	11532.	0.75	19.34	9216.7	246.7	1187.8	209.8	22.3	0.1	647.7	0.6
CLEARFIELD	9036.	7088.	0.78	6.26	6508.6	106.8	357.4	63.2	16.7	0.3	34.9	0.4
CLINTON	11088.	9394.	0.85	10.40	7618.5	69.3	1177.4	169.5	0.0	0.0	359.3	0.2
COLUMBIA	15105.	11881.	0.79	103.92	8065.6	175.7	1142.6	696.5	39.3	3.0	827.1	931.1
CRAWFORD	53482.	43519.	0.81	42.95	40069.1	477.1	1223.8	425.4	47.0	0.9	1274.1	1.5
CUMBERLAND	49022.	42517.	0.87	76.57	34703.8	181.1	2939.5	1182.7	58.1	10.9	2772.1	669.1
DAUPHIN	26707.	23233.	0.87	44.84	12636.7	138.5	3798.0	959.5	50.8	32.7	3280.5	2335.9
DELAWARE	1653.	1267.	0.77	6.94	1021.7	18.0	42.2	146.2	0.0	0.0	39.3	0.0
ELK	3099.	2247.	0.73	2.82	2078.7	55.3	90.4	22.1	0.0	0.3	0.0	0.4
ERIE	39037.	33015.	0.85	40.61	30171.9	233.0	1957.0	169.2	21.3	1.7	460.2	0.9
FAYETTE	17514.	10700.	0.61	13.36	8738.2	517.7	1206.1	193.5	42.7	1.0	0.0	0.6
FOREST	1174.	856.	0.73	2.06	755.0	20.7	51.3	10.8	0.0	0.0	18.3	0.0
FRANKLIN	95507.	82962.	0.87	109.96	70768.5	312.3	4078.4	2362.2	57.6	9.2	4090.7	1283.0
FULTON	16317.	13008.	0.80	29.92	11566.0	169.0	893.9	292.7	15.7	0.5	70.4	0.2
GREENE	14307.	5943.	0.42	10.27	4296.5	669.5	373.9	65.6	473.1	0.4	63.4	0.1
HUNTINGDON	24734.	20522.	0.83	22.97	18251.0	179.7	1569.0	355.9	27.9	0.3	112.6	25.3
INDIANA	28416.	21981.	0.77	26.64	16417.5	375.4	4095.5	784.0	77.0	14.0	214.9	2.3
JEFFERSON	14780.	11181.	0.76	17.16	10150.1	219.1	711.2	86.3	14.6	0.0	0.0	0.1
JUNIATA	28663.	25523.	0.89	66.18	16211.6	52.6	973.3	663.5	38.3	903.1	1989.9	4491.1
LACKAWANNA	8910.	7338.	0.82	16.16	7069.4	65.3	81.3	96.0	20.0	0.0	0.0	6.1

NOTE: CALCULATIONS ARE BASED ON PROCEDURES DESCRIBED IN THE TEXT.
INPUT DATA WERE OBTAINED FROM THE 1978 CENSUS OF AGRICULTURE.

Table E-1. Continued

PENNSYLVANIA

COUNTY	TOTAL MANURE	ECONOMICALLY RECOVERABLE MANURE	% RECOV	DENS/ SQ.MILE	DAIRY	BEEF	FEEDER	HOGS	SHEEP	TURKEYS	HENS	BROILERS
LANCASTER	397889.	365093.	0.92	385.99	161380.4	395.7	59291.4	18285.5	193.1	3440.1	83976.1	38130.4
LAWRENCE	21854.	17342.	0.79	47.22	14429.0	241.2	1251.3	389.7	56.2	0.3	971.8	2.5
LEBANON	61960.	55711.	0.90	153.41	32952.6	137.4	6860.9	2064.3	35.2	0.8	5190.1	8469.7
LEHIGH	8789.	7267.	0.83	20.89	4231.8	55.3	826.1	808.2	16.3	57.4	1271.4	1.0
LUZERNE	9716.	8027.	0.83	9.02	6830.2	76.4	253.0	152.7	12.0	0.3	702.6	0.2
LYCOMING	24284.	20138.	0.83	16.57	17137.2	182.6	1425.5	382.5	35.7	12.8	960.9	0.7
MCKEAN	6001.	4463.	0.74	4.49	4208.3	93.9	113.6	22.2	25.0	0.0	0.0	0.0
MERCER	35043.	26598.	0.76	39.69	22637.8	509.1	2422.6	417.5	112.3	2.8	492.5	3.6
MIFFLIN	34128.	30028.	0.88	69.63	24451.7	91.0	584.7	663.7	37.9	34.0	1907.3	2257.9
MONROE	2236.	1639.	0.73	2.66	894.2	35.4	338.5	62.9	7.5	211.9	88.8	0.2
MONTGOMERY	21881.	18875.	0.86	37.98	12230.8	100.0	1630.1	819.9	47.2	267.7	3767.8	11.7
MONTOUR	8066.	6375.	0.79	49.07	4655.4	78.7	883.5	596.3	5.3	0.2	0.0	156.0
NORTHAMPTON	22928.	20423.	0.89	54.29	17813.7	39.4	782.1	155.1	17.3	0.0	1612.7	2.2
NORTHUMBERLAND	22070.	18042.	0.82	39.85	8236.2	166.9	2967.0	1852.4	49.7	910.7	3314.6	544.2
PERRY	28822.	24699.	0.86	44.85	14282.0	132.0	1604.5	387.7	28.2	2700.4	2600.3	2964.1
PHILADELPHIA	1.	0.	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PIKE	53.	51.	0.95	0.09	0.0	0.0	34.8	4.9	0.0	0.0	11.1	0.0
POTTER	14471.	11959.	0.83	10.94	11618.9	108.1	189.4	19.4	23.0	0.0	0.0	0.0
SCHUYLKILL	23626.	21128.	0.89	26.89	7004.7	85.6	2053.6	1436.1	26.9	76.1	9327.2	1118.0
SNYDER	26497.	23210.	0.88	71.03	14399.6	82.5	1813.4	1488.2	20.3	23.1	1550.9	3832.1
SOMERSET	48275.	40220.	0.83	37.30	36500.1	324.6	1891.7	737.0	56.1	0.8	707.0	2.6
SULLIVAN	6585.	5442.	0.83	11.36	5249.6	49.1	83.1	22.4	7.7	2.0	27.8	0.0
SUSQUEHANNA	54235.	47212.	0.87	56.74	44665.7	177.3	558.5	86.6	70.8	0.3	1653.0	0.3
TIOGA	50011.	42605.	0.85	37.18	39612.2	257.0	416.1	100.9	127.7	3.3	2088.1	0.1
UNION	21531.	18661.	0.87	58.65	12481.8	74.8	2522.2	1043.7	19.4	358.2	1309.0	852.2
VENANGO	8531.	5715.	0.67	8.42	4879.0	196.6	421.0	110.8	51.4	0.3	54.9	0.7
WARREN	14700.	12466.	0.85	13.75	12115.1	77.1	216.9	34.7	22.3	0.2	0.0	0.2
WASHINGTON	36339.	23702.	0.65	27.68	20355.2	897.6	1086.4	241.9	360.1	12.7	746.5	1.8
WAYNE	38398.	33280.	0.87	44.90	30540.6	152.5	254.8	31.1	34.4	1.3	2261.6	3.4
WESTMORELAND	34086.	25275.	0.74	24.64	20215.9	555.2	1563.5	274.3	87.3	704.9	1863.8	10.1
WYOMING	18534.	15859.	0.86	39.82	14999.7	86.8	227.9	58.3	24.3	0.0	462.0	0.0
YORK	66465.	55636.	0.84	61.20	28897.3	460.8	10688.8	2575.9	107.9	3566.0	4992.8	4347.0
STATE TOTAL	2135107.	1804051.	0.84	1984.41	1286886.0	13582.2	165277.6	54377.4	3517.4	23948.4	172431.4	84035.4

NOTE: CALCULATIONS ARE BASED ON PROCEDURES DESCRIBED IN THE TEXT.
INPUT DATA WERE OBTAINED FROM THE 1978 CENSUS OF AGRICULTURE.

Table E-1. Continued

RHODE ISLAND

COUNTY	TOTAL MANURE	ECONOMICALLY RECOVERABLE MANURE	% RECOV	DENS/ SQ.MILE	DAIRY	BEEF	FEEDER	HOGS	SHEEP	TURKEYS	HENS	BROILERS
BRISTOL	998.	824.	0.83	32.99	815.8	7.5	0.0	0.0	0.0	0.0	0.7	0.0
KENT	771.	600.	0.78	3.45	590.3	9.6	0.0	0.0	0.0	0.0	0.0	0.0
NEWPORT	3650.	3000.	0.82	26.06	2739.5	26.5	129.5	101.1	3.5	0.0	0.0	0.0
PROVIDENCE	4801.	4251.	0.89	10.17	2243.4	19.4	53.2	131.5	21.5	0.0	1782.2	0.0
WASHINGTON	3562.	2899.	0.81	9.06	2782.7	29.1	29.3	48.0	9.8	0.0	0.0	0.0
STATE TOTAL	13783.	11574.	0.84	36.19	9171.6	92.1	212.0	280.5	34.8	0.0	1783.0	0.0

NOTE: CALCULATIONS ARE BASED ON PROCEDURES DESCRIBED IN THE TEXT.
INPUT DATA WERE OBTAINED FROM THE 1978 CENSUS OF AGRICULTURE.

Table E-1. Continued

VERMONT

COUNTY	TOTAL MANURE	ECONOMICALLY RECOVERABLE MANURE	% RECOV	DENS/ SQ.MILE	DAIRY	BEEF	FEEDER	HOGS	SHEEP	TURKEYS	HENS	BROILERS
ADDISON	75576.	67511.	0.89	86.15	67181.9	51.7	213.8	38.4	24.1	0.6	0.0	0.2
BENNINGTON	7011.	5923.	0.84	8.79	5808.5	38.9	47.7	3.8	12.6	0.0	11.9	0.1
CALEDONIA	23751.	20896.	0.88	34.10	20674.8	47.6	125.9	18.4	28.1	0.4	0.0	0.5
CHITTENDEN	32978.	29112.	0.88	54.63	28044.3	66.1	407.5	17.4	17.9	1.3	556.3	1.7
ESSEX	5478.	4763.	0.87	7.14	4726.0	17.3	16.5	0.0	0.0	0.0	3.7	0.0
FRANKLIN	81470.	73011.	0.90	110.72	72600.1	35.0	334.8	23.8	3.8	13.7	0.0	0.2
GRAND ISLE	8991.	7883.	0.88	95.03	7834.2	21.7	24.4	0.0	0.0	0.0	2.3	0.0
LAMOILLE	168C5.	14979.	0.89	31.65	14866.3	14.2	67.8	18.3	11.8	0.0	0.0	0.3
ORANGE	28389.	25037.	0.88	36.27	24592.9	51.6	160.7	33.5	38.1	0.2	159.9	0.6
ORLEANS	56492.	50433.	0.89	70.58	50123.1	42.0	102.0	42.9	14.9	0.4	107.7	0.2
RUTLAND	32045.	27937.	0.87	30.08	27465.8	94.1	220.6	22.2	13.9	0.3	119.4	0.6
WASHINGTON	17039.	14804.	0.87	20.89	14329.0	53.7	52.5	62.0	21.1	2.7	282.9	0.3
WINDHAM	12990.	11216.	0.86	14.35	10844.3	50.3	99.6	16.8	8.7	0.2	196.1	0.4
WINDSOR	16637.	13760.	0.83	14.27	13419.1	121.0	114.9	51.3	29.1	0.2	23.4	0.7
STATE TOTAL	415652.	367266.	0.88	380.86	362510.1	705.2	1988.8	348.8	224.1	20.0	1463.5	6.0

NOTE: CALCULATIONS ARE BASED ON PROCEDURES DESCRIBED IN THE TEXT.
INPUT DATA WERE OBTAINED FROM THE 1978 CENSUS OF AGRICULTURE.