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The Economics of Reducing the County Road System: Three Case Studies in Iowa
EXECUTIVE SUMMARY

University Research Program

Executive Summary
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16. Abstract

Presents a brief summary of the main research report, The Economics of Reducing the County Road System: Three Case Studies in Iowa # DOT/OST/P-34/86-035. The case studies are described, as well as the analytic methodology and research findings.

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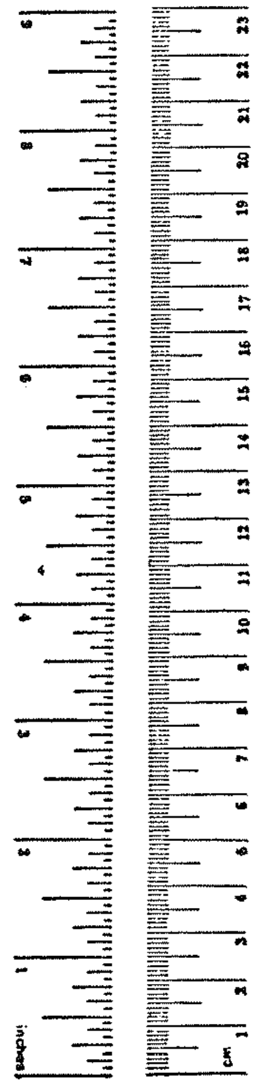
METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

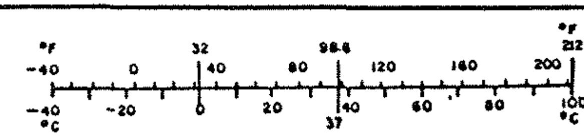
Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
	AREA			
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
	MASS (weight)			
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
	VOLUME			
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
	TEMPERATURE (exact)			
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
	AREA			
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
	MASS (weight)			
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
	VOLUME			
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
	TEMPERATURE (exact)			
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



Executive Summary

THE ECONOMICS OF REDUCING THE COUNTY ROAD SYSTEM: THREE CASE STUDIES IN IOWA

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Many of today's local rural roads and bridges were built in the late 1800s and early 1900s, when overland transportation was limited to horse and wagon or the newly built railroad lines. Farms were small, and farmers needed road access to homes, schools, churches and markets. During the 1920s and 1930s, local rural roads were surfaced, mainly with gravel, and some bridges were replaced to carry six to seven ton loads. Since then, farm numbers have declined but farm size has increased, and the number of heavy vehicles traveling on these roads has increased. Farmers are using large tandem axle and semitrailer trucks as well as large farm tractor-wagon combinations; and large, heavy and wide combines travel on these roads from farms to fields and fields to farms. Farm supply and marketing firms are using large tandem axle and semitrailer trucks for their pickups and deliveries. At the same time that heavier vehicles are increasingly used on these roads, revenues to reconstruct and maintain the present system to accommodate the changing needs of rural America are declining in real terms.

This study estimated the benefits to the traveling public of keeping groups of existing roads in the system. These benefits were then compared to the costs of retaining these roads in the local rural road system. The basic purpose of the study is to develop guidelines for local supervisors and engineers in evaluating local rural road investment or disinvestment proposals and to provide information to state legislatures in developing local rural road and bridge policies.

For this analysis, three case study areas of 100 square miles each were selected in Iowa. One study area, located in Hamilton County, has a relatively high agricultural tax base, a high percentage of paved roads, and relatively few bridges. The second study area, located in Shelby County, has a relatively low agricultural tax base, hilly terrain, a low percent of paved roads and a large number of bridges. The third study area, located in Linn County, has a relatively high agricultural tax base, a high percent of paved roads and a large number of non-farm households with commuters to Cedar Rapids and Waterloo.

A questionnaire was used to collect data from farm and non-farm residents in the three study areas. Data were obtained on the number of 1982 trips by origin, destination and type of vehicle.

A majority of the travel in the three study areas was for household purposes, including commuting to work, shopping and recreation. Almost 70 percent of the Linn County study area travel was for household purposes. Household travel in the Shelby and Hamilton County study areas represented 68 and 63 percent of total miles traveled. One-fourth of the Linn County study area travel miles was overhead traffic; overhead traffic travels through the area but does not originate and/or terminate in the area.

Farm travel, which includes all farm related traffic by automobiles, farm implements, farmer-owned trucks, and commercial vehicles which provide goods and services to farms, represented 30 and 35 percent of total miles driven in the Shelby and Hamilton study areas, but only five percent of total miles driven in the Linn study area. In each study area, pickup truck miles were about three-fourths of total farm related traffic. Farm equipment and other farm truck travel each represented about 10 percent of total farm travel in the three study areas. Post office and school bus miles were about two percent of total miles in the Shelby and Hamilton study areas and only 0.6 percent of the total miles in the Linn study area. Thus, household and farm traffic are the major sources of travel on local rural roads.

While household traffic was a very large percent of total miles traveled, household travel represented a relatively small percent of total vehicle travel costs in the rural study areas. In the Shelby County study area, household travel represented 70 percent of total miles driven, but only 55 percent of travel costs. In the Hamilton County study area, household travel represented 63 percent of total miles driven but only 47 percent of travel costs. This type of travel has lower costs because a high proportion of the miles driven is in automobiles which have a low cost per mile compared to other vehicles traveling on local rural roads.

The cost of farm related traffic is high relative to the total farm miles driven. Farm related miles in the Hamilton County study area was 35 percent of total miles driven but almost 49 percent of total travel costs. Farm equipment travel costs are even higher relative to total miles driven. For example, in the Hamilton County study area, farm equipment travel--tractors, tractor-wagons and combines--had only four percent of total miles driven but had 18 percent of total travel costs.

School bus and postal service travel represented about two percent of total miles driven in the Hamilton and Shelby County study areas, but they incurred about four percent of total travel costs.

Groups of roads were removed in each study area to estimate the benefits to the traveling public and the cost of keeping each group of roads in the study area road system. A benefit-cost ratio was then estimated for each group of roads. The benefits were defined as the savings to the traveling public from keeping the selected groups of roads in the road system. The costs in the benefit-cost ratio are the costs of keeping the roads in the system and include maintenance, resurfacing and reconstruction costs as well as the land rental value foregone--opportunity cost--by keeping the land in roads rather than in agricultural production. If the benefit-cost ratio is greater than one, the benefits to the traveling public exceed the cost of keeping the roads. If the ratio is less than one, the benefits to the traveling public are less than the cost of keeping the roads in the system. In the Hamilton and Shelby County study areas, additional groups of roads were removed from the system with the initial group of roads still out of the system. Benefit-cost ratios were then estimated for the additional groups of roads.

The estimated benefit-cost ratios varied by study area. In the Linn study area, nine miles of roads which served no property accesses were removed from the study area road network in the computer analysis to obtain the benefit-cost ratios. The benefit-cost ratio for these nine miles was 1.37. This means that the traveling public saves $1.37 in travel costs for each dollar spent to maintain the nine miles of Linn County roads. This high ratio is basically the result of a large number of rerouted household and school bus travel miles caused by the removal of the nine miles of Linn study area roads from the computerized network. In addition, the cost of rerouting a substantial number of high cost farm vehicle miles was high. The average daily traffic on the nine miles of roads removed from the Linn study area roads was 27 vehicles per day.

In the Shelby County analysis, three groups of roads were removed from the study area with computer simulations. None of the roads served property accesses. In the first solution, called the S_1 solution, 9.25 miles were removed from the study area road network. In the second solution, called S_2, an additional 6.75 miles of road were removed from the network, resulting in a total of 16 miles removed from the network. In the third solution, called S_3, an additional 5.25 miles were removed, making a total of 21.25 miles eliminated from the system. The benefit-cost ratios for the S_1, S_2 and S_3 solutions were 0.90, 3.22 and 7.01, respectively.

In the S_1 solution, the benefits to the public from keeping the roads were about equal to the cost of keeping the roads. The traffic levels on the S_1 roads were relatively low; the average daily traffic level was only seven vehicles per day. However, the cost of rerouting the low levels of traffic in S_1 was high because the traffic was rerouted relatively long distances over gravel roads which have high vehicle travel costs. The cost savings from removing the S_1 roads from the road system were relatively low because the rerouted traffic resulted in a large amount of variable maintenance and resurfacing costs being transferred to the roads which inherited the traffic. The largest savings from abandoning the S_1 roads were in the fixed road and bridge maintenance costs. No savings were gained from placing the land in agricultural production.

The highest benefit-cost ratios came from the S_2 and S_3 analyses. The major reasons for the high benefit-cost ratios in the S_2 and S_3 solutions were:

1. The relatively high traffic levels on the abandoned S_3 roads.
2. The small number of paved roads in the Shelby study area resulted in most of the rerouted traffic being inherited by gravel roads which have high vehicle travel costs.
3. The remaining gravel roads which inherited the rerouted S_2 and S_3 traffic incurred large increases in variable maintenance, resurfacing and reconstruction costs.
4. The land rental foregone because the land is in roads was zero.

Two sets of roads were removed from the Hamilton County study area. The first set, called H_1, included 17.75 miles of gravel roads that served no property accesses. The second set of roads, called H_2, consisted of 40 miles of gravel roads that served residence, farm and field accesses. The H_2 roads were not abandoned, but rather were converted to private drives in the computer road network.

The benefit-cost ratios computed for the Hamilton County study area were both less than one; this means that the benefits to the traveling public for keeping the H_1 and H_2 roads in the system were less than the costs of keeping the roads in the system. The benefit-cost ratio for the H_1 solution was 0.70 for the 17.75 miles of road that served no property accesses. The H_1 roads had about the same amount of traffic per day as the roads in the S_1 solution. However, the benefit-cost ratio for the H_1 roads was lower than the S_1 miles of roads for the following reasons:

1. The cost of rerouting the H_1 traffic was lower than for the the S_1 traffic because much of the H_1 traffic was rerouted onto paved roads which have lower travel costs per mile for all vehicles.
2. The amount of H_1 household rerouted traffic per mile of abandoned road was sharply lower than in the S_1 solution.
3. The resurfacing and reconstruction costs transferred to other roads was sharply lower in the Hamilton area than in the Shelby area. This is primarily because the Hamilton County study area contains a basic network of paved roads to handle the inherited traffic.
4. The net opportunity cost of keeping the land in roads was higher in the Hamilton study area than in the Shelby study area.

In the H_2 solution, 40 miles of roads which have residence accesses as well as farm and field accesses were converted to private roads in the computerized road network. The resulting benefit-cost ratio was the lowest of all estimated benefit-cost ratios. The major reason for the low H_2 ratio is that only three of the 40 miles of public roads that were converted to private drives had traffic that was rerouted because of the conversion to private drives. The other 37 miles of H_2 roads were already dead-end roads or had become dead-end roads when the 17.75 miles of H_1 roads were abandoned and the three miles of H_2 roads were converted to private drives. Any overhead traffic on the 37 miles of dead-end H_2 roads had been rerouted in the H_1 solution or in the H_2 solution when the three miles of road with property access were abandoned. Dead-end roads can be converted to private drives at no additional travel cost because overhead traffic is already rerouted around the dead-end road. Anyone using accesses on the dead-end road can do so by traveling on the private drive. The economic issue in converting dead-end roads to private drives is the savings in maintenance costs to the county or the public compared to the cost to the landowners of maintaining private drives. The average private road and bridge maintenance cost and private road reconstruction cost was $2,064 per mile per year of H_2 private drive.

The major conclusions from the study are:

- The major sources of vehicle miles on county roads are automobiles used for household purposes and pickup truck travel for farm purposes.
- Farm related travel represents a relatively small percent of total travel miles but a relatively high percent of total travel costs.
- In areas with a large non-farm population, only a small number of roads can be abandoned without increasing vehicle travel cost more than the savings from eliminating the roads.
- In areas with a relatively small rural population and a very large percent of gravel roads, only a small number of roads with no property accesses can be abandoned before the additional travel costs from the abandonment exceed the cost

savings from eliminating the roads from the system. A large number of rural southern Iowa counties do not have a basic network of paved roads to carry the traffic from the abandoned roads.

- In areas with a small rural population and a high percent of paved roads, a relatively large number of miles of county roads with no property accesses can be abandoned and the savings from abandoning the roads will exceed the additional travel costs. A large share of northern Iowa counties have a relatively high percent of paved roads. A strategy of county road abandonment in these areas would result in net transportation cost savings.
- Dead-end roads with property access can be converted to private drives with no additional travel costs. Public road maintenance costs exceed private drive maintenance costs. Therefore, a strategy of converting dead-end roads with property accesses to private drives would result in savings to the county which would exceed the maintenance and reconstruction costs to the property owners.

The public policy implications of these results are:

- There are limited potential cost savings from abandonment of county roads with no property accesses in areas with a large non-farm rural population.
- There may be potential savings from abandonment of roads with no property accesses in areas with a small rural population

and a large share of gravel roads if some gravel roads are resurfaced to create a core paved network. This alternative was not explored in this analysis.

- There are relatively high potential cost savings from abandonment of roads with no property accesses in areas with a small rural population and a core network of paved roads.
- The largest potential cost savings are likely to come from conversion of public dead-end gravel roads with property or residence accesses to private drives. This potential cost savings can be achieved in all areas regardless of the population or the physical condition of the remaining roads.
- However, a strategy of road abandonment and conversion of dead-end roads to private drives should be carried out simultaneously. An alternative which may yield as large cost savings as conversion to private drives is to convert low volume gravel roads with property access to lower service roads with lower maintenance costs. But this alternative was not examined in this analysis.
- In addition to all the economic costs associated with the abandonment of roads which are included in the determination of benefit-cost ratios in this study, there is one other possible cost which should be considered. There can be substantial legal costs and damage awards associated with a road abandonment. The possibility and extent of such costs depends in large part upon the state laws in effect in the various states. Since these costs vary widely from case to

case, it was not possible to include these costs in the benefit-cost ratios in this study.

It is possible that present laws in some states may preclude any possibility of road abandonment even though all other costs considered, including the shifting of road costs from the public to the private sector, indicate a net benefit from such abandonments. In fact, it may require changes in state laws, along with a major change in public policy and acceptance, before any of these changes could and would be implemented and accepted. Some of the areas which need to be addressed are:

1. An adequate method of compensation for change from public to private access.
2. A method of arbitration of disputes between adjoining landowners affected by the change and/or the local government authority.
3. Exemption of the local government authority from legal action upon completion of established guidelines.
4. Legislative consideration to strengthen existing laws regarding road abandonment and changing public roads to private roads.
5. A method of educating the public of the benefits and costs of alternative road system changes to enable the public to improve the quality of its input into the policy-making process.

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