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Can Rural Recycling Centers Work? Some Answers From Tennessee

A rural recycling center in Tennessee's Grainger County (population 16,000) has been helping the county get rid of its solid waste since 1983. The center buys aluminum, glass, paper, and other materials from county residents and resells them for reuse by industry. The center does not yet pay its own way. Some of its operating costs come from county funds and some startup costs were financed by the Tennessee Valley Authority. Not all benefits are of a kind that show up in an accountant's ledger, however.

In February 1983, a recycling center began operations in an abandoned school building in Grainger County, TN. The center originally accepted only paper, glass, and aluminum. But, as resale markets were identified, the center also accepted copper, plastic, brass, batteries, and radiators. In the 21 following months, the center purchased 233 tons of recycled materials, paying about $20,000 for them and selling them for about $31,000.

Grainger County's recycling center is remarkable mainly because it is located in a rural area. Rural recycling is often thought to be impractical because of the small volume of recyclable materials generated in such areas (because of small population base and low population density) and because of the distance from markets for recyclable materials, typically located in more urban areas.

Rural recycling facilities, whether private or municipal, are in fact few. Of 67 nonmetropolitan Tennessee counties (each less than 25,000 population), only 23 had recycling facilities that accepted aluminum cans as of January 1984, and only 10 had a facility that accepted something other than aluminum cans or scrap metal, such as glass or paper.

But, rural recycling can generate benefits by reducing the volume of waste and thus the cost of waste disposal in a landfill, by reducing roadside litter and improving the area's appearance, and by providing a source of supplemental income (though quite small) for local residents. Not all rural municipalities can operate an efficient recycling program, but some can. Facts presented here may spur some rural officials to investigate the possibilities in their own areas.

Startup of Grainger County's Recycling Center

In 1982, the Tennessee Valley Authority (TVA) allocated funds to establish demonstration recycling projects in rural parts of its region. Three projects are currently operating in Grainger County and Waynesboro, TN, and Athens, AL. Planning for three more centers is underway in Boone, NC, Columbia, TN, and Hopkinsville, KY.

Why Recycle?

In 1985, U.S. households produced approximately 204 million tons of solid waste. The Environmental Protection Agency estimates that up to 25 percent of these solid wastes can be recycled. For industry, the primary benefit from recycling is energy savings. The energy savings from producing aluminum with recycled rather than virgin materials is about 96 percent. For society, recycling generates benefits by conserving resources, reducing pollution from waste disposal, and reducing landfill costs.

In February 1983, Grainger County's center began operations. The center was started with funds from a State litter abatement grant and technical and financial assistance from TVA. An important factor in getting the center started was the innovation and energy of the litter grant coordinator, Jim Heimburger. Rather than use prisoners to clean up roadsides and then recycle some of the materials, his idea was to give county residents a financial incentive to collect materials from roadsides and from their own refuse for recycling. With support from county executive Norman Acuff, Heimburger approached TVA for funds. TVA provided $27,000 for Grainger County to purchase equipment and serve as a demonstration project for rural recycling. The center began by purchasing only paper, glass, and aluminum. Other materials were added as supplies developed and resale markets were identified. The center now recycles seven types of materials, including copper, brass, batteries, and radiators.

In this article we discuss three aspects of Grainger County's experience with recycling: general descriptive data on the operations of the center over a 21-month period (March 1983-November 1984); the center's economic feasibility; and the potential for expanding the center with a satellite substation in another part of the county.

Between March 1983 and November 1984, the center purchased 466,152 pounds (233 tons) of recyclable materials. Glass and paper constituted the greatest volume of materials, while aluminum cans accounted for approximately half of total payments (fig. 1). The center paid $20,421 to county residents during this period and received $26,827 from the resale of materials. In addition, at the end of this period, the center had an inventory of purchased materials valued at $4,924 (November 1984 prices). Incorporating this inventory value, the gross return from sales for the 21-month period was $11,330.

A total of 670 individuals, or 4 percent of the total county population, participated in the recycling program, making an average of 2.5 trips to the center over the 21 months. Average payment per participant was $30, ranging from less than $1 to $568, with the distribution as follows: 69 percent of the participants received $25 or less, 16 percent received between $25 and $50, 9 percent

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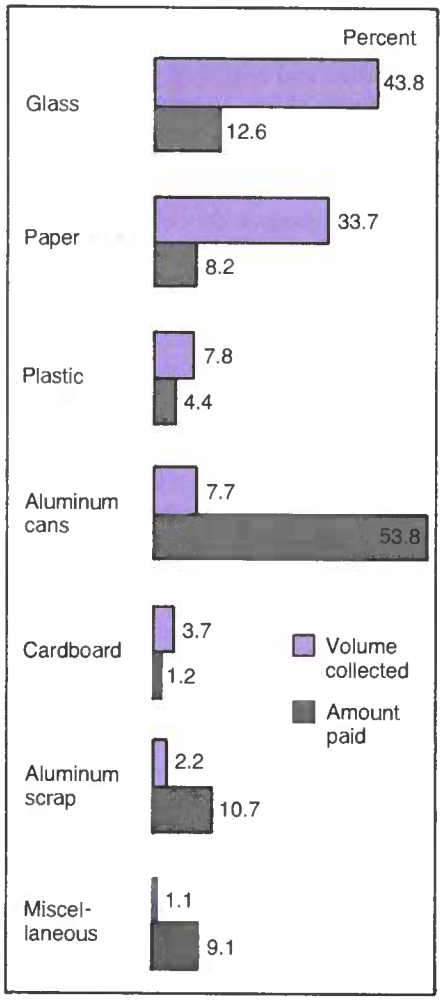
Figure 1
Glass and paper account for three-fourths of volume collected, aluminum for two-thirds of payout



received between $50 and $100, and 6 percent received more than $100. Thus, for most individuals, the supplemental income generated from recycling was relatively small. However, for some low-income individuals, income from recycling may represent a helpful addition to cash income.

But why did those who earned relatively little bother at all? Several explanations are possible. First, people may feel that recycling is a good thing to do. Recycling makes them feel good about doing their part to conserve resources and protect the environment. A second related reason would be to clean up roadsides littered by others. Again, the incentive to recycle is not monetary, but the satisfaction gained from improving the local environment. Third, recycling projects may be undertaken by civic groups to raise money for specific projects. Fourth, farmers may clear their fields and recycle the materials as a way of avoiding possible damage to equipment during fieldwork. There is a monetary incentive involved in the last two cases, but neither involves significant amounts of money.

Grainger County consists of five divisions (see map inset). We collected data on participation by residents in each division to determine how distance from the center influenced recycling activity. The Blaine and Rutledge divisions, closest to the center, accounted for 85 percent of total recycling trips, 84.6 percent of total materials recycled, and 83 percent of total payments received. In addition, per capita payment was highest for residents of the Rutledge division, roughly 8 miles from the center, and declined as distance from the center increased (fig. 2). Distance, therefore, does seem to be an important factor influencing a resident's involvement in recycling.

Participation in the recycling program changed over time. Payments from recycling were low during the first quarter (March to May 1983) of operation, increased through the next four quarters (June 1983 to May 1984), and declined in the final two quarters (June to November 1984). The initial period of slow growth reflects people's growing awareness of recycling and the center's operation. The growth period reflects increased awareness of recycling, as well as a drawing down of the inventory of recyclable materials in the county. During this period, people were likely clearing roadsides and dumps of accumulated materials and bringing them to the center. Once this backlog of materials was collected, payments leveled off, as waste generation and recycling balanced one another. Based on these observations, monthly payments from recycling in Grainger County could be expected to remain in the $1,000-$1,200 range as long as prices remain at the levels during the fourth and fifth quarters.

The price paid to participants for aluminum cans appears to be an important factor in recycling payouts. This price went from 20 cents per pound in the first quarter to 36 cents per pound in the fourth quarter, then down to 26 cents per pound in the last quarter. Subsequently, the price of aluminum fell to 22 cents per pound (June 1985) and rose again to 28 cents per pound in March 1986. In addition to the price of aluminum, seasonal factors, such as critical labor times for agricultural enterprises in the area, also appear to influence participation and payments. Competition for labor hours as a result of these agricultural enterprises may reduce recycling activity.

Without Public Funds, Center May Run in the Red

To estimate the net returns for the center, we have to consider some of its unique characteristics. First, the county provided the building and land used for the recycling center (an abandoned schoolhouse) at no cost. Second, the manager's salary came from a State grant. Third, a grant from TVA paid for the original equipment used to establish the center. Thus, the net return estimates for Grainger County cannot be used to draw general conclusions. We adjusted these returns to represent a more typical situation (table 1).

Gross returns from sales for Grainger County averaged $540 per month over the 21-month period. The representative center was assumed to process the same volume of materials, so gross returns are the same. Amortized capital costs for the equipment purchased by TVA were estimated to be $272 per month and were included only for the representative center. Actual monthly equipment maintenance expenses of $21 were included for both Grainger County and the representative center. Labor expenses for

Table 1—Recycling doesn't turn a profit without public funds

Item	Grainger County recycling center	Representative recycling center
	Dollars	
Gross returns on sales	540	540
Operating costs:		
Equipment	0[1]	272
maintenance	0[1]	21
Labor:		
Supervisor	0[2]	867
Part-time	290	290
Land and building rent	0[2]	450
Utilities	54	54
Transportation	28	28
Total	393	1,982
Net returns from operation	147	−1,442

[1]Provided by TVA.
[2]Provided by Grainger County.

Figure 2
The farther people have to go, the less likely they are to recycle

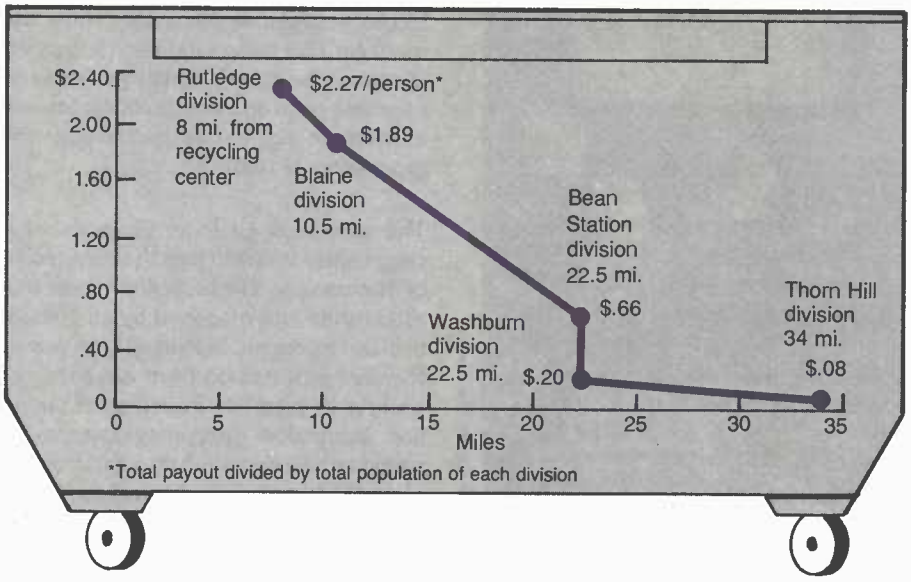
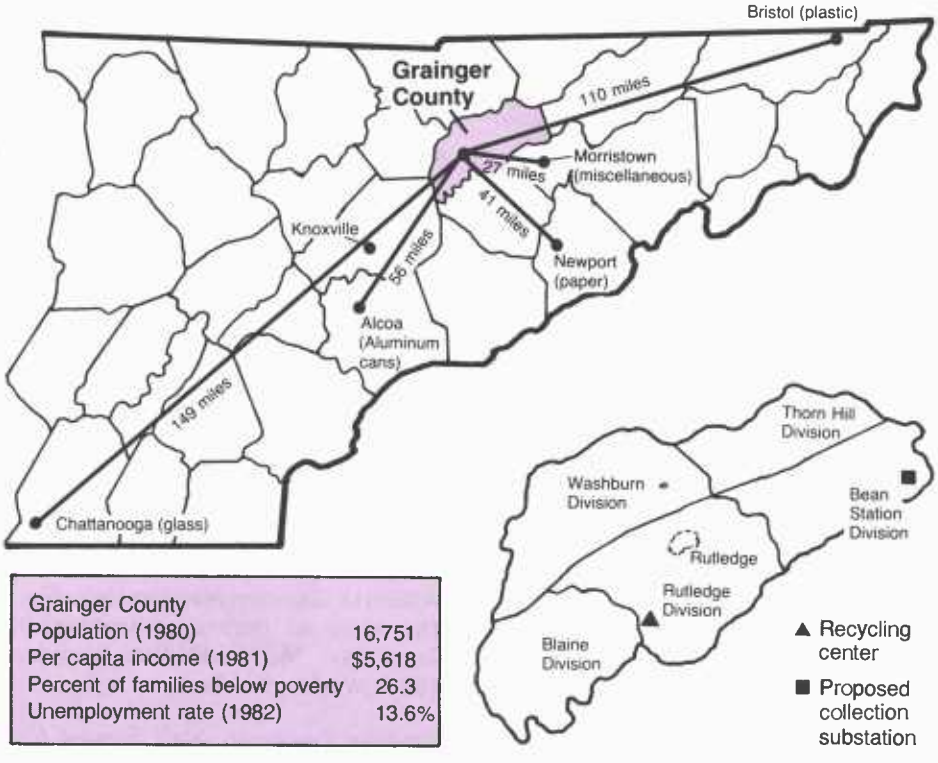


Figure 3
Markets and collection area for Grainger County's recycling center



Grainger County	
Population (1980)	16,751
Per capita income (1981)	$5,618
Percent of families below poverty	26.3
Unemployment rate (1982)	13.6%

the representative center were based on the actual part-time labor used in Grainger County, plus an estimate of the cost for a full-time supervisor. Utility costs were actual figures from Grainger County and averaged about $54 per month. Transportation costs (for all materials except glass, which was picked up by the buyer) were estimated to be $28 per month for the average amount of materials hauled to market.

We estimate that the representative recycling center would incur a net loss of about $1,442 per month, compared with a net profit of $147 per month for Grainger County's recycling center. These results highlight the importance of innovation and commitment at the county level in finding solutions to solid waste problems.

Recycling Saves County Money by Reducing Waste at Landfill

If a private firm were to consider the economic feasibility of a recycling center, the costs and returns described above would be the only ones considered. Those costs, however, do not take into account the cost savings to the county associated with the reduced amount of waste to be collected and disposed of.

The national average cost per ton of waste disposed of in a landfill was estimated to be $30 in 1976. This figure is based primarily on urban collection and disposal systems, which generally operate at higher cost than rural systems. Grainger County's landfill had total operating costs of $84,424 in 1982-83. We estimated annual capital expenses to be an additional $33,492, based on other studies conducted in the Southeast. Using TVA's assumption that 1.8 pounds per person per day of solid waste are collected in rural areas, we obtained a cost per ton of $21. Given the uncertainty surrounding this estimate, we used a range of waste collection and disposal costs of $20-$30 in calculating the cost savings to the county.

The recycling center processed 11.1 tons of materials each month, reducing the volume of solid waste sent to the landfill by approximately 2.5 percent, at an estimated cost savings in the range of $222-$333 per month. Including this cost saving would suggest the Grainger County recycling center generated positive net returns of $368-$479 per month, while the loss incurred by the representative recycling center would have been reduced to $1,109-$1,220 per month. Though the cost savings from reduced landfill use may not be evident or recognized in the county's immediate cash flow, it is no less real. In addition, extending the life of the existing landfill will postpone developing proposals, securing approval, and other costs associated with starting up a new one.

A recycling center can provide other benefits to the community. Grainger County residents received some additional income, although small, from recycling and the two additional jobs created at the

center. Other benefits, although more difficult to quantify, include a cleaner landscape, which may enhance the county's appeal as a recreation area, and reduced risk of spontaneous fires and air pollution from open dumping and burning.

More, and More Convenient, Collection Centers to Improve Volume of Materials Collected

Grainger County is establishing a system of attended convenience centers for waste collection that will replace the existing dumpsters located throughout the county. Each center has an attendant and is located at a convenient point in the county in terms of existing traffic patterns. These centers might also serve as collection points for recyclable materials in the more remote parts of the county by having the attendant collect and weigh the materials and provide payment. Recycled materials could then be transported to the recycling center as needed.

We estimate that a recycling substation in the Bean Station division (see map) would increase total payments by about $781 per month. The costs of establishing a substation would be minimal, as the primary need would be for a scale. Even including additional costs for transporting materials, a substation in Bean Station would generate positive net monthly returns, due in part to economies of size, and would improve the overall economic feasibility of the center. An additional 8.92 tons of materials per month would not have to be disposed of at the landfill, increasing those cost savings. A substation would also increase participation and, thus, some of the intangible benefits associated with recycling, such as increased community pride and spirit and more widespread aesthetic improvements in the county. TVA is developing a mobile collection unit to facilitate recycling. This type of innovation may help improve the effectiveness of rural recycling by taking into account the more dispersed rural populations.

Final Notes

To date, Grainger County's community officials and residents consider the recycling center a success. The center did receive grants and subsidies from the State, the county, and TVA, which enhanced its feasibility and success. A more representative recycling center of similar

Photo by the author

scale would probably operate with net losses. Nevertheless, Grainger County's experience shows that rural recycling can reduce the volume of materials going to the landfill or littering the rural roadside, thereby saving costs for waste disposal and improving the county's appearance. The center also generated some income through employment at the center as well as payments to participants. In considering a recycling center, a county government and its citizens have to weigh the cost savings from less landfill use and the more intangible benefits of aesthetic improvements and income generation, against the impact on its solid waste disposal budget.

One step has been ignored up to this point: identifying markets for recycled materials. Unless a center has reasonable assurance that it will be able to sell what it collects, it has no business purchasing those materials from residents. In addition, the price received must be high enough to allow the center to pay prices to residents that give sufficient incentive for recycling.

Despite Grainger County's proximity to the Knoxville metropolitan area (476,517 population), none of the center's five markets was in Knoxville, and their distance from the center ranged from 27 miles to 149 miles (see map). The center has learned, though, what it is like to lose a market and be subject to market price variations. In early 1985, the firm in Bristol stopped purchasing plastic. No alternative buyer has been found. Tons of plastic, which had been purchased from residents before the market was lost, now sit baled outside the center. The drop in aluminum can prices from 1983 to 1985 also affected the center, as volume collected declined significantly. Thus, the manager of a successful recycling operation must be able to identify markets and negotiate price and transportation, as well as oversee day-to-day purchasing and processing of materials.

The success of Grainger County's recycling center is due in part to the initiative of its manager. The recycling center was established and managed by an innovative and energetic individual who pulled together information from a number of sources to establish a successful operation. In addition, the county government supported the operation through donation of the land and building as well as allocating the grant money. This local government support enabled the recycling center to operate at lower cost than would otherwise be possible. Finally, the financial and technical assistance provided by TVA also reduced the startup costs of the operation. Other rural communities considering such an operation should involve local government officials as well as any outside funding organizations in the early stages of determining the feasibility of recycling in their areas.

Rural recycling programs designed for the realities of dispersed rural populations, with some form of collection substations, may enhance economic feasibility greatly. Commercial or industrial collection sites or mobile units may also play a role. Larger volumes ought to yield economies of size and provide greater bargaining power in negotiating with buyers of recycled materials. RDP

For Additional Reading...

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