CHOICES

AAEA Agricultural & Applied Economics Association

Volume 37. Quarter 3

Federal Funding Challenges Inhibit a Twenty-first Centry "New Deal" for Rural Broadband

Jamie Greig and Hannah Nelson

JEL Classifications: H54, L96, Q13, Q16, R11
Keywords: Broadband access, Federal funding, Infrastructure, Rural electric co-operatives

While the federal government focuses on broadband access as a key twenty-first century infrastructure initiative, one of the primary entities involved in rural broadband expansion, electric co-operatives, has shown a lack of appetite for the federal funding process. Electric co-operatives were the backbone of the Roosevelt administration's twentieth-century New Deal program and were vital to the expansion of electricity into rural areas. They cover 57% of U.S. landmass and have the potential to bring fiber broadband service to millions of rural homes, farms, and businesses. Yet, according to interviews conducted with National Rural Electric Co-operative Association staff by the University of Tennessee in 2021, only 200 of roughly 900 co-operatives in the U.S. have indicated that they would be willing to apply for federal funding to support residential broadband infrastructure deployment. Further, a survey of electric co-operatives by the University of Tennessee identified several barriers impeding federal broadband funding applications. While there are many barriers to internet infrastructure expansion and other providers with the potential to expand broadband service in rural areas, this study focuses on the specific federal funding barriers identified by a survey of rural electric cooperatives by the University of Tennessee, Knoxville.

A Digital Divide

Due to differences in methodology, researchers estimate that between 14.5 million and 162 million Americans do not have access to broadband internet (Federal Communications Commission, 2022; Microsoft, 2019); the majority of those without such access live in rural, low-income, and minority areas (Koutsouris, 2010; Prieger and Hu, 2008; Swenson and Ghertner, 2021; U.S. Department of Agriculture, 2019b). In fact, the states with the least internet connectivity are concentrated in the South and in high-poverty areas, and the states with the most internet connectivity tend to have limited rural populations (McNally, 2021). Additionally, the U.S. Department of Agriculture (USDA) has found that 22.3% of rural Americans and 27.7% of tribal Americans (compared to only 1.5% of urban Americans) lack broadband access at download/upload speeds of 25/3 megabits per second (Mbps) (U.S. Department of Agriculture, 2019b). A more recent study found that as many as 35.4% of tribal Americans may be without broadband access (Blackwater, 2020). The gap between those with and those without access to internet and internet-related technologies has been deemed the "digital divide" (Basu and Chakraborty, 2011; Cullen, 2001). The divide often refers to the differences in access between people in urban and rural areas, though it becomes more salient when considering inequalities related to socioeconomic status, location, education, age, and gender. Research has shown that men, people with higher incomes, and younger individuals use computers and internet more than their counterparts (Aubert, Schroeder, and Grimaudo, 2012; Broos and Roe, 2006; Lee, Park, and Hwang, 2015). Additionally, there's evidence that psychological factors—such as attitudes, norms, and perceived ease of use, usefulness, and risks—are associated with internet and technology use (Aubert, Schroeder, and Grimaudo, 2012; Broos and Roe, 2006; MacVaugh and Schiavone, 2010; Schmit and Severson, 2021).

The divide is further exacerbated by access to internet-reliant technologies. For example, low-income households are more likely to use smartphones than computers for internet access (Apptegy, 2021; Auxier and Anderson, 2021), but exclusively relying on mobile phones for internet access reinforces inequalities in online participation, digital skill sets, content creation, broadband access, and smartphone use (Lee, Park, and Hwang, 2015; Napoli and Obar, 2014). Lee, Park, and Hwang (2015) found that groups with less access to internet and internet-reliant devices were more likely to be women, older, low-income, less educated, and to use the internet less frequently than their counterparts. Galagedarage and Salman (2015) also found that a lack of access to internet infrastructure, affordable internet, and computer skills negatively influenced internet adoption.

Digital Agriculture

Internet access is imperative to support precision agriculture practices; precision agriculture not only has positive effects on individual incomes and business revenues but also burns 40% less fuel, uses 20%–50% less water, and reduces chemical application by 80% compared to traditional agricultural practices (U.S. Department of Agriculture, 2019a). Farming technology can assist with planting, fertilizing, harvesting, selling, cultivating, treating, weather reporting, entering new market opportunities, and more (Mahamood et al., 2016). In fact, technological innovation is one of the primary drivers of productivity, profitability, and competitiveness for family farms (Petry et al., 2019). Additionally, greater emphasis on the use of data in agriculture will likely lead to core changes in farming practices (Aubert, Schroeder, and Grimaudo, 2012), which will further separate farmers who do not have access to internet and related technologies from the market. Innovations tend to be adopted by resource-rich communities first, leading to greater differences in knowledge and access to government and commercial services as well as worsening other inequalities (Bhatti, Olsen, and Pederson, 2010). The digital divide may be slowing down potential technological developments and productivity of the farming industry (Basu and Chakraborty, 2011; Petry et al., 2019) and is therefore an important consideration for both academics and policy makers.

A Focus on Funding

Many programs and grants at the state and federal level have addressed unequal broadband infrastructure access and broadband adoption in rural areas. In December 2021, the Federal Communications Commission (FCC) launched the Affordable Connectivity Program, which replaced the early pandemic Emergency Broadband Benefit, to provide monthly discounts for household broadband access and for technology purchases (e.g., computers, laptops) (Federal Communications Commission, 2022). Perhaps the most significant federal investment toward broadband infrastructure expansion and adoption was the recently signed $1.2 trillion Infrastructure Investment and Jobs Act (H.R. 3684), which builds on existing funding for broadband deployment (National Telecommunications and Information Administration, 2022). The act specifically allocates $65 billion to closing the digital divide through several programs targeting different facets of broadband access, including the $42.45 billion Broadband Equity, Access and Deployment (BEAD) Program, the $1 billion “Middle Mile” Broadband Infrastructure Program, the $2 billion Tribal Broadband Connectivity Program, and the $2.75 billion Digital Equity Act Program. Further, the infrastructure bill adds $2 billion to the USDA ReConnect program, which targets less populated regions of the United States with the slowest internet.

The BEAD program is unique in that it provides funding to each state. All states receive a minimum of $100 million, with additional funding based on the number of unserved (defined as lacking broadband speeds of at least 25/3 Mbps, National Telecommunications and Information Administration, 2022), high-cost locations in each state. High-cost locations are usually determined by federal per diem rates (U.S. General Services Administration, 2021). The program also aids community anchor institutions (like libraries, hospitals, nonprofits, etc.) acquire access. The Middle Mile Program targets broadband infrastructure that does not connect directly to an end-user location, primarily using anchor institutions. Additional funding is provided for the preexisting Tribal Broadband Connectivity Program, a National Telecommunications and Information Administration (NTIA) program established under the Consolidated Appropriations Act of 2021, which funds broadband deployment on tribal lands, including telehealth, distance learning, and digital inclusion efforts. Last, the Digital Equity Act Program aims to promote adoption and use of broadband services in low-income, aging, incarcerated, veteran, minority, disabled, and rural individuals, focusing again on community anchor institutions (National Telecommunications and Information Administration, 2022).

Challenges to Rural Broadband Expansion

Despite increases in funding, there are many existing challenges to expanding broadband access. According to the FCC and USDA, more Native Americans than rural Americans lack broadband coverage at 25/3 Mbps (U.S. Department of Agriculture, 2019b), though funding for rural Americans far exceeds funding for Native Americans, representing inequitable distribution in existing and future broadband infrastructure that extends past location factors, like socioeconomic and race/ethnicity status.

There is also much debate on what threshold should be used to determine which areas should receive funding. For example, while the FCC defines unserved communities as those without access to internet at 25/3 Mbps, several states (like Missouri, Florida, and Oregon) define unserved areas as those without access to speeds of 10/1 Mbps (De Wit and Read, 2021). Therefore, areas may have internet speeds below the FCC guidelines but will not receive funding due to limitations in eligibility criteria. States such as Alaska also restrict funding to communities with populations below 20,000, unemployment rates above 19.5%, and broadband speeds below 0.77/0.20 Mbps (Regulatory Commission of Alaska, 2010). Colorado specifies areas without access to one satellite and one nonsatellite broadband provider (Colorado Broadband Office, 2020).

Further, states set caps on the amount of funding individual projects can receive. Kansas and Pennsylvania set a limit of $1 million, but California permits up to $10 million per project (De Wit and Read,

2021). Other criteria-specific forms of federal funding, such as the Low-Income Home Energy Assistance Program (LIHEAP), have historically served a small fraction of the eligible population (National Energy and Utility Affordability Coalition, 2022; Raimi et al., 2021), mainly due to funding limitations. Broadband needs constant investments to maintain and upgrade the network (Westling, 2022). A one-time BEAD payment will not guarantee sufficient future access for communities that do receive funding, and a one-time payment will not guarantee that other vulnerable populations that fall outside of specified requirements are reached. While these states' policies are attempts to identify and target areas with the most need, these limitations in definitions, requirements, and available funding ultimately restrict individuals' and households' ability to increase broadband affordability and access. Policy makers, then, should consider the role of future BEAD or similar program payments. Future research could also analyze the impacts that BEAD or similar programs have on achieving broadband deployment and reducing digital divides.

More importantly, most federal funding for broadband depends on the FCC's Form 477 broadband maps, which have many noted limitations. The form collects data from internet service providers (ISPs) about their service areas and has historically classified whole census blocks as having broadband service if just one home in the block "has" or (without major investment) "could" currently be served by a provider (Bode, 2022). ISPs like AT&T also have a record of opposing efforts to improve federal broadband mapping (Brodkin, 2020). Many efforts are being made to improve mapping methodologies, largely due to the 2020 Broadband Deployment Accuracy and Technological Availability (DATA) Act, which provided more than $98 million to the FCC (Bode, 2022). This is in addition to state regulations that limit co-operatives' ability to provide broadband services or that create roadblocks to establishing networks (Cooper, 2021). Further, there is some concern about the wording of the BEAD Program bill, as it states that award recipients must match funds equal to "not less than 25% of project costs," though the bill specifies "except in high-cost areas or as otherwise provided by this Act" (Engebretson, 2021). According to the Department of Transportation, the average cost of fiber broadband installation is $27,000/mile (Aman, 2017), though cost varies depending on aerial or underground deployment and the amount of work needed to prepare infrastructure (National Rural Telecommunications Cooperative, 2018). This means award recipients must be able to pay, on average, $6,750/mile up front to receive funding. Research also notes difficult-to-navigate funding processes (Das and Gabbard, 2021), monopolistic ownership of broadband services by telecommunication companies due to mergers after the Telecommunications Act of 1996 (Blackwater, 2020; Paulas, 2017), and high costs of infrastructure installation (Chao and Park, 2020; Horrigan and Duggan, 2015).

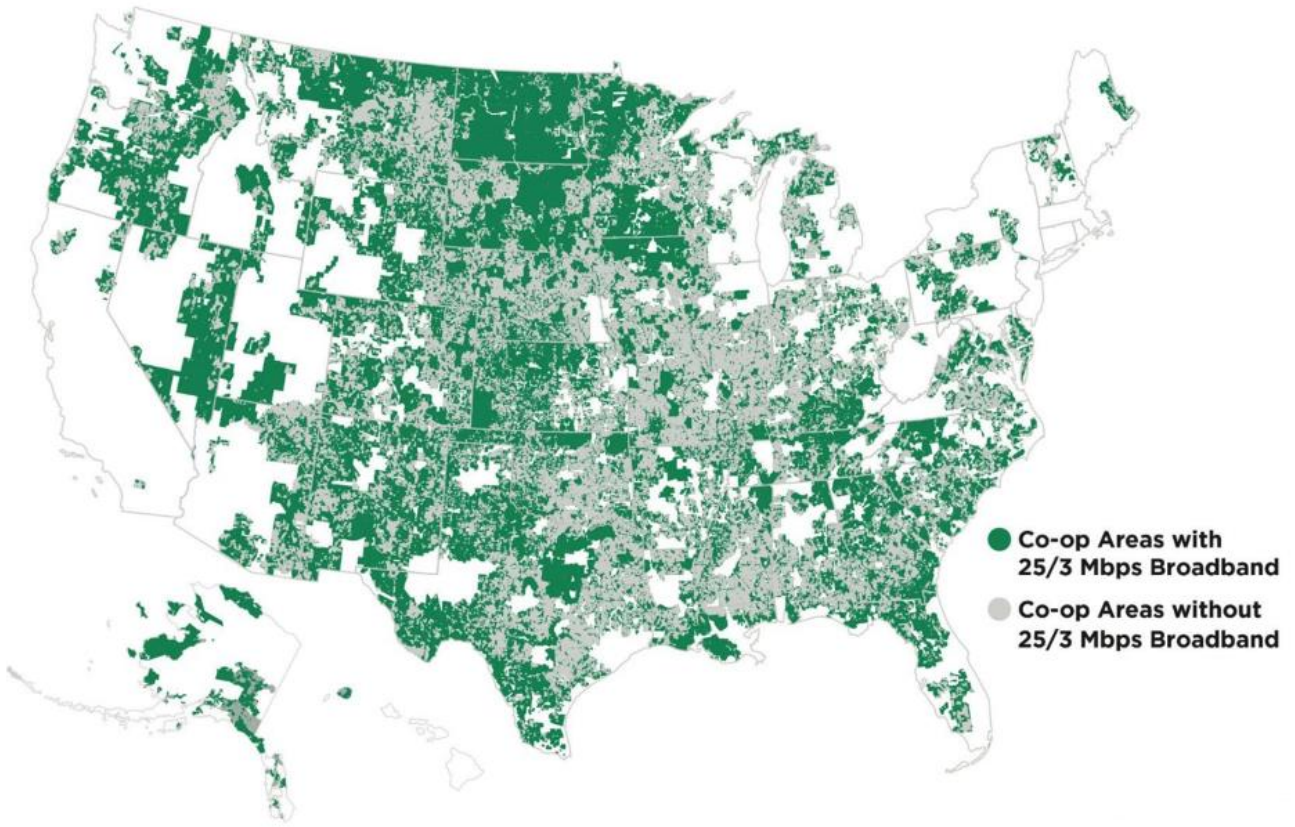
Electric Co-Operative Background and Potential Impact

Many similarities exist between the current conversation around lack of broadband internet in rural areas in the twenty-first century and programs to expand electricity in the twentieth century. Prior to the 1930s, only 10% of rural areas had access to electricity. Acknowledging this divide and its impact on the agricultural industry, such as many farmworkers moving to urban areas, the Roosevelt administration established the Rural Electrification Administration (REA) in 1936. This was a centerpiece of the New Deal, an economic stimulus package designed to reignite the U.S. economy after the Great Depression. The REA paved the way for thousands of member-owned and not-for-profit rural electric co-operatives. The aim of creating these co-operatives was to bring electricity to areas that had been neglected by private providers, which tend to see no short-term profits in these rural areas. Electric co-operatives are now one of the primary sources of electricity to farms, homes, and businesses in the rural United States, providing electricity to 57% of the U.S. land mass and reaching 42 million people (National Rural Electric Cooperative Association, 2021).

Electric co-operatives could serve an important role in bringing high-speed internet to rural farms and homes. According to data compiled by the National Rural Electric Cooperative Association (NRECA) in 2019 using FCC form 477 broadband provider records, 13.4 million people in 6.3 million households served by electric co-operatives lack broadband access (Figure 1). These entities have the potential to reach millions of rural residents through built-on fiber internet. Via this process, the co-operatives would add fiber lines to their existing electric poles and run fiber internet to their member-owners.

Electric co-operatives primarily invest in advanced telecommunications infrastructure, such as fiber internet, to support their energy distribution systems (National Rural Electric Cooperative Association, 2021). Their access to machines, equipment, and personnel makes the transition to retail fiber broadband deployment possible. However, despite record investment in rural broadband by state and federal agencies, only 200 of roughly 900 U.S. electric co-operatives currently offer or plan to offer retail broadband as a service (National Rural Electric Cooperative Association, 2021). To understand some of the barriers electric co-operatives face in expanding broadband access, the present study conducted interviews in 2021 to gather contextual data to aid in the development of a survey instrument. The survey aimed to identify the perceived challenges that electric co-operatives have in receiving and administering the funds required to provide broadband in

Figure 1. Electric Co-Operative Service Territories With/Without 25/3 Mbps Broadband Service



Source: National Rural Electric Cooperative Association (2019).

rural areas. The survey included questions regarding the cost of broadband infrastructure deployment as well as challenges related to federal funding applications identified through NRECA interviews. Three hundred electric co-operatives were identified through contact lists provided by NRECA and were contacted via email to participate in the survey. The survey received 137 complete responses. Due to the anonymity of respondents, we were not able to cross-reference responses with geographic locations.

Electric Co-Operative Broadband Profile

According to the interviews, of the roughly 900 electric co-operatives in the United States, there are only 200 NRECA member broadband deployment projects (including either, planned, in progress, and built to completion) located unevenly across 39 states. In 2021, electric co-operatives won federal bids equating to over $1.1 billion over 10 years to serve over 616,000 locations via the recent FCC Rural Digital Opportunity Fund Phase 1 auction. NRECA member projects also receive funding through the National Electric Cooperative Finance Corporation (CFC), a nonprofit finance cooperative, the national co-operative bank (CoBank), and various state loan and grant programs.

According to survey responses, the costs of co-operative broadband deployments vary depending on whether the project is aerial or underground and the amount of "make-ready" work necessary to prepare infrastructure (National Rural Telecommunications Cooperative, 2018); however, the average cost of fiber deployment in our study was between $16,500 and $26,520 per aerial mile, with a mean of $21,700. In addition, prior to deployment, it costs between $1,400 and $3,750 to prepare an existing pole for each fiber line attachment, a process referred to as "make ready." Age, pole condition, terrain, and other factors influence the cost of each pole attachment. Laying fiber cable underground costs between $36,000 and $59,000 per mile. Due to the costs and the labor necessary to lay underground fiber, 80%–95% of co-operative deployments are aerial, via pole attachments. Due to differences in the costs of the fiber line, installation, and premise equipment, connecting a home or business to the main fiber line, referred to as a "service drop," costs between $800 and $2,000. For co-operatives, the average "drop" length is 520 feet. Though total project capital expenditures vary widely, the 25th–75th percentile is $28 million to $84 million, with a median of around $65 million. The average internal rate-of-return (IRR) for co-operatives in our survey was 10%, with most respondents reporting IRR in the 8%–13%

range. Feasibility studies allow entities to project total project costs prior to deployment, and 76% of co-operatives reported higher real capital expenditures than their initial study projections. Business feasibility for electric co-operatives could be improved through government funding, tourism, and community support (Schmit and Severson, 2021).

Private Lenders Dominate Co-Operative Broadband Funding

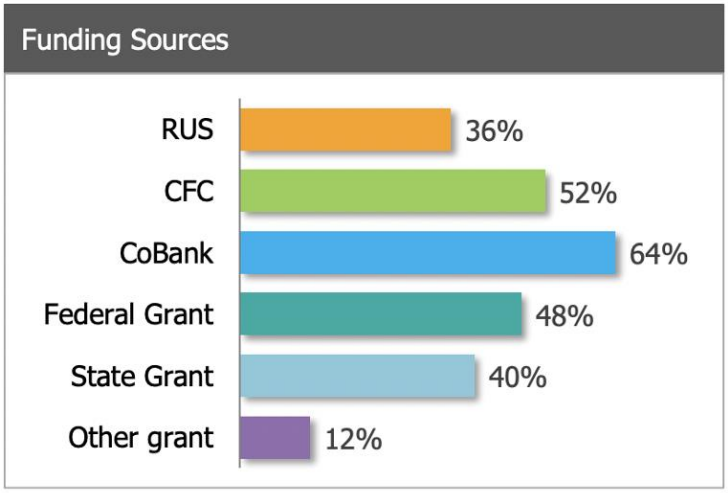
Most study co-operatives reported securing private loans for broadband projects from the CFC (52%) and CoBank (64%) (Fig. 2). An additional 36% reported receiving either a loan or grant from the USDA's Rural Utilities Services. Of these, 45% received funding from the Electric Infrastructure Loan and Loan Guarantee Program, which supports electric co-operatives that build smart energy grids integrated with broadband infrastructure. Another 42% received funding from the Re-Connect Program, which provides up to $2 billion specifically to connect homes and businesses within rural electric footprints. Of the 48% who reported having applied for or received federal funding, 24% mentioned the FCC's Connect America Fund and 21% mentioned the Rural Digital Opportunity Fund. In addition, 40% of co-operatives had applied for various state-administered funds and 80% reported using more than one source for potential funding.

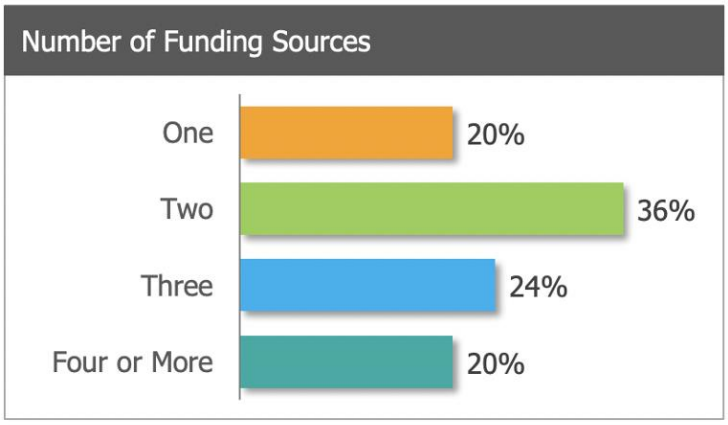
Federal Frustration

In relation to the lack of co-operatives taking advantage of federal funding, 70% of co-ops reported having a "poor" or "very poor" experience with the federal funding processes (Figure 3). Electric co-operatives who had applied for federal broadband funding have several recommendations for improvements that would encourage broader participation from the industry.

The complexity of funding applications and the staffing resources required to keep on top of compliance is burdensome for many electric co-operatives. Specifically, 34% of co-operatives reported that, as a broadband subsidiary, they have had difficulty supplying the necessary financial and other funding-compliant documents. Often co-operatives establish a subsidiary to comply with utility regulations that are designed to

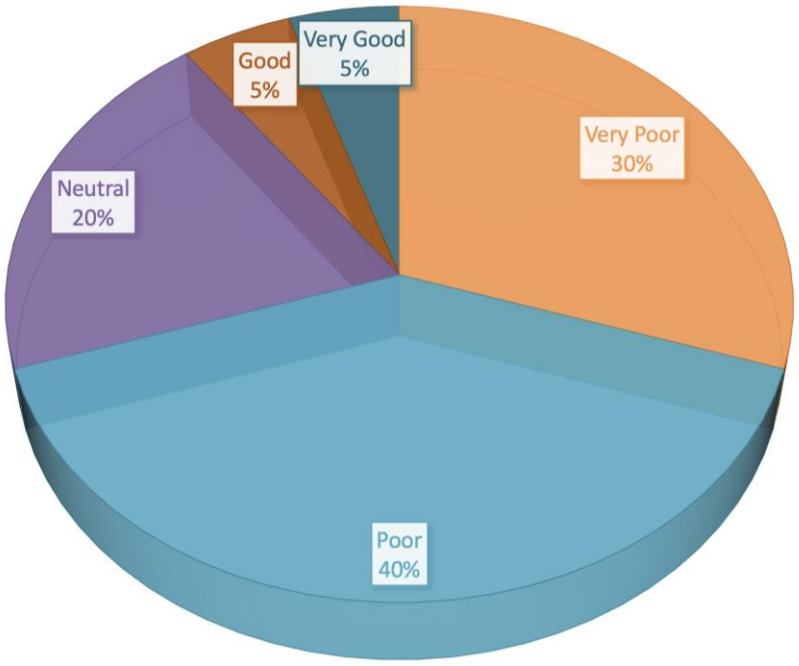
Figure 2. Electric Co-Operative "Primary" and "Number of" Funding Sources





Source: University of Tennessee, Knoxville, National Rural Electric Cooperative Association survey (2021).

Figure 3. Electric Co-Operative Experience with Federal Funding



Source: University of Tennessee, Knoxville, National Rural Electric Cooperative Association survey (2021).

protect the energy business; this leads to confusion in applications, where co-operatives must explain that the compliance documentation is technically housed or attached to its electric entity. Additionally, 68% felt that there should be a preproposal stage during which prospective applicants are vetted or applicants are provided with initial feedback. This would cut down the time spent by organizations on applications with little chance of success. Few electric co-operatives employ staff who are responsible for grant implementation and compliance. In this study, 100% of co-operatives reported they "agree" or "somewhat agree" that they often lacked the support staff needed to keep up with each federal agency's compliance rules. Support in this area, either through training or reducing the post-award administrative burden, would encourage greater participation.

One of the central pillars of the co-operative structure is local development. Given that these entities comprise local member-owners, they have a natural desire to seek investments in their local areas and businesses. Unsurprisingly, 72% of co-operatives believed that more weight in funding applications should be given to local providers than to national entities. Most co-operatives (56%) also reported knowledge of funding being given to national telecommunications entities, where the money either was not used within the stated timeframe or was used to build substandard or outdated infrastructure.

Consistent with previous literature, co-operatives in this study identified significant frustrations with the maps used to identify areas that currently have broadband. For instance, many federal funds require that an eligible area either have no current service providers or no previous internet funding recipients. As such, 85% of co-operatives reported that existing broadband service "availability" within their service territory had disqualified them from receiving funding for areas that lack service. Significantly, 100% reported that the maps used to assess broadband availability by federal agencies are inaccurate. The main criticism lies in the way these data are collected, as these data are self-reported by service providers. Providers are only required to report whether one household in a single census block has an existing service or has the potential to be served given existing infrastructure. Additionally, 90% of the study co-operatives reported that areas within their service territory were not eligible for additional funding due to prior funding being tied to an out-of-date benchmark, and 70% reported awareness of other entities receiving prior funding that had a backdated substandard commitment.

These obstacles and challenges in relation to federal funding help explain why, according to NRECA, only 22% of electric co-operatives "have applied" or "plan to apply" for federal broadband funding. By resolving federal funding issues and reducing challenges, electric cooperatives could provide a vital avenue to closing the rural digital divide. The opportunity is there for electric

co-operatives to do for broadband in the twenty-first century as they did for rural electrification in the twentieth.

Recommendations

Agencies could implement a range of measures to encourage electric co-operatives to apply for federal funding that supports broadband. Providing more guidance for subsidiary businesses could ease the administrative burden felt by entities without large numbers of award support staff. This could include working with regulatory bodies that control electric power distribution contracts to ensure that subsidiaries are following funding requirements or conducting training specifically with rural electric co-operative broadband subsidiaries. Including short-form preproposals in the funding process is also a measure that could reduce the likelihood that entities spend substantial amounts of time on proposals that are unlikely to succeed. Agencies could provide initial feedback to applicants at an early stage or provide an opportunity to invite well-formed proposals to a full submission stage. This would reduce the volume of proposals that make it to the final round and the overall burden on reviewers. In terms of the post-award compliance burden, agencies could provide support or training for smaller entities on how to manage the workflow, which could include examples of how workflow is managed in similar-sized entities. As for the awards, providing greater support to local providers or incentivizing local development (encouraging applicants to partner with local entities) might help garner more support from rural electric co-operatives. This could involve including a condition that a certain percentage of project funds must either be spent through a local procurement process or a local community benefits agreement. These kinds of agreements are usually contracts signed by an entity and the local municipality stating that certain additional community benefits will be accrued over the length of the project. This can range from education initiatives to investment in local businesses. Last, and most importantly, a concerted effort should be made to improve the accuracy and validity of broadband service maps. Many studies have suggested valid recommendations to improve these maps, and these should be consulted and acted upon to improve the rate of successful federal funding applications and awards (Bode, 2022; Kahan, 2019; U.S. Government Accountability Office, 2021).

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Author Information: Jamie Greig (jgreig@utk.edu) is Assistant Professor, Department of Agricultural Leadership, Education and Communication, University of Tennessee, Knoxville, Knoxville, TN. Hannah Nelson (hanrnels@vols.utk.edu) is Research Technician II, Department of Agricultural Leadership, Education and Communication, University of Tennessee, Knoxville, Knoxville, TN.

Acknowledgments: This paper was supported, in part, by the National Institute of Food and Agriculture Award Number 2020-68006-31183.