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ANALYSIS

North Carolina's FarmsSHARE: Farmers, Food Hubs, And Community-Based Organizations Sustain Healthy Food Programs

ABSTRACT The North Carolina FarmsSHARE program distributes healthy, locally sourced food to low-income households across nearly 100 counties in the state through the Department of Agriculture's Local Food Purchase Assistance Cooperative Agreement. In this article, we present insights from a cross-sectional survey of stakeholders who were involved in implementing the program. We explore measures of satisfaction, perceived value, economic impact, quality of food, and community relationships within each stakeholder group (farmers, food hubs, and community-based organizations). We also discuss FarmsSHARE's impact on local farms, businesses, and food systems. In 2024, FarmsSHARE connected 217 local farms, 16 food hubs, and 117 community-based organizations that worked together to distribute more than 72,000 healthy food boxes. Our findings suggest that FarmsSHARE is strengthening collaborations and local food systems, specifically through partnerships with farms owned by members of racial and ethnic minority groups, and improving access to nutritionally tailored healthy food boxes for low-income households. These insights can be used to guide efforts to integrate local food within the Food Is Medicine paradigm to address nutrition insecurity and promote more equitable food systems within communities.

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Poor diet quality is associated with more deaths than any other risk factor in the US.¹ Despite decades of interventions aimed at improving nutrition, research has documented rising rates of obesity and type 2 diabetes.² Obesity alone costs the US health care system nearly \$173 billion annually.³ At the same time, in 2023, approximately eighteen million US households experienced food insecurity, having limited or uncertain access to adequate food.⁴ The Department of Agriculture (USDA) has recognized that food insecurity and diet-

related disease can coexist, prompting an agencywide focus on the importance of addressing nutrition security.⁵

Food Is Medicine frameworks are emerging as potential solutions to address nutrition insecurity.^{6,7} Food Is Medicine encompasses a broad range of interventions that leverage access to nutritious food to manage, treat, and prevent chronic health conditions.⁸ Approaches vary widely in their scope, encompassing interventions connected to health systems as well as community-based programs.^{8–10} One Food Is Medicine approach includes providing low-income

households with nutritionally tailored healthy food boxes, which are similar to subsidized community-supported agriculture (CSA) shares that provide households with direct access to fresh, locally grown food.^{11,12} Tailored food boxes purchased through CSAs serve as preventive health interventions that improve dietary quality, reduce food insecurity, and support better health outcomes.^{13–16}

The USDA Local Food Purchase Assistance Cooperative Agreement Program (LFPA) in North Carolina, known as FarmsSHARE, exemplifies a Food Is Medicine approach by addressing nutrition insecurity through the distribution of nutritionally tailored, locally sourced food to low-income households. The program links three stakeholder groups—farmers, food hubs, and community-based organizations (CBOs)—that distribute locally sourced, healthy food boxes to nutrition-insecure households. For an overview of how FarmsSHARE works, see the diagram in online appendix exhibit 1.¹⁷ Although research shows the benefits of healthy food box interventions, there is a gap in exploring the perspectives of key stakeholders involved in the implementation and outcomes of these programs.¹⁸ Understanding the perceptions and participation of these stakeholders is crucial for gaining holistic insights into LFPA's effectiveness, fostering stakeholder engagement, and informing future decision making.¹⁹

The purpose of this work was to assess and describe the satisfaction, perceived value, economic impact, quality of food, and community relationships of FarmsSHARE across three stakeholder groups. We accomplished this through a survey aimed at gathering insights from these three groups. The findings will provide insights to inform future policy and funding decisions, including investments by federal and state governments, related to local food purchasing programs that address nutrition insecurity.

Background

In 2021, the USDA launched LFPA with funding from the American Rescue Plan to enhance nutrition security by allowing state, Tribal, and territorial governments to procure locally grown food and distribute it through food pantries, schools, and charitable organizations.²⁰ As of May 2023, all fifty states and Washington, D.C.; three territories (Puerto Rico, Guam, and Northern Mariana Islands); and at least twenty-nine Tribal governments had signed cooperative agreements with the USDA to implement LFPA.²¹ Recent work to evaluate LFPA's initial reach suggests that it is generating more economic opportunities for local farmers by connecting them

with federal food procurement programs. Roughly \$691 million of the dollars invested through LFPA allow for direct purchases from local farms, strengthening local and regional food systems.²²

In North Carolina, LFPA is executed by the Carolina Farm Stewardship Association under the name FarmsSHARE.²³ Originally launched by the Carolina Farm Stewardship Association in 2020, FarmsSHARE started receiving funding from LFPA in 2023. Through FarmsSHARE, regional food hubs purchase produce from local farmers at fair market value and distribute it via CBOs to people experiencing food and nutrition insecurity.²³ Exhibit 1 describes the three FarmsSHARE stakeholder groups and how they participate in the program.

There are several ways in which food-insecure households become eligible to receive food from the FarmsSHARE program. They may be enrolled through referrals from health care providers; screening at CBOs for diet-related health conditions and food assistance eligibility; walk-in enrollment on a first-come, first-served basis at CBOs; or referrals from social service agencies that operate programs such as the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) or Meals on Wheels.^{22,23}

By connecting local farmers, regional food hubs, and CBOs, FarmsSHARE supports nutrition as a cornerstone of health and well-being.^{24–26} In the first six months of the 2024 FarmsSHARE season, 72,873 food boxes were distributed through a network of 117 CBOs.²⁷ FarmsSHARE also paid \$2.7 million directly to local farmers.^{27,28} In this way, FarmsSHARE is addressing immediate food needs while strengthening local food and farm business systems, creating a win-win-win for farmers, communities, and families.^{23,24}

Study Data And Methods

STAKEHOLDER SURVEY Our survey was conducted in North Carolina, a geographically diverse state with urban hubs surrounded by vast rural areas, supporting a robust agricultural sector with eight million acres of farmland, making agriculture a key part of its economy.²⁹ An estimated one in seven adults and one in five children face food insecurity in North Carolina, and obesity rates in North Carolina are higher than the national average.^{30,31}

SURVEY DESIGN AND DATA COLLECTION We used a cross-sectional survey to gather insights from three key stakeholder groups involved in the FarmsSHARE program: local farmers (small- and medium-scale producers growing or raising food within the state), food hubs (regional or

EXHIBIT 1**Stakeholder groups participating in North Carolina's FarmsSHARE program**

Stakeholder group	Description	Role
Farmers	Small-scale growers who provide locally grown fruits, vegetables, grains, protein, and other food products.	Farmers apply through their regional food hub. They agree to provide goods at fair market value and adhere to food safety standards.
Food hubs	Organizations that aggregate and distribute local food from multiple farms.	Regional food hubs participate in FarmsSHARE by partnering with the CFSA. They are responsible for serving as the fiscal agent. Food hubs also manage the relationship between farmers and CBOs.
Community-based organizations (CBOs)	Nonprofits, food pantries, health departments, and other organizations with food distribution programs.	Organizations apply through the food hubs. They receive food from food hubs and distribute it to households with nutrition insecurity.

SOURCE Carolina Farm Stewardship Association (CFSA). **NOTE** This table describes the three stakeholder groups involved in FarmsSHARE and explains how they participate in the program.

ganizations that purchase from local farmers and then assemble and distribute food boxes through CBOs),³² and CBOs (organizations with food distribution programs, including food pantries, community health centers, faith-based groups, schools, senior housing authorities, and physician offices).

Each stakeholder group completed a tailored version of the survey, with both multiple choice and open-ended questions designed to collect information on food box procurement and distribution (for example, quantity, product types, and transportation), satisfaction with FarmsSHARE, the perceived value of participating in FarmsSHARE, economic impact, quality of food, and community relationships, as well as demographic information. We pilot-tested the surveys with a sample representing 5 percent of each stakeholder group to evaluate the construct validity of our survey tools and used feedback from this testing phase to further refine them. Additional details about our data collection and analysis are in section II of the appendix.¹⁷

Those eligible for the survey were given the option to complete the survey online or use a paper version. To increase response rates, participants were entered into a drawing for a gift card. The study was reviewed by the Institutional Review Board at Appalachian State University and deemed exempt from further review. We conducted the survey during a four-week period within the heightened summer distribution of the FarmsSHARE program, from June 24 to July 19, 2024.

DATA ANALYSIS We analyzed the survey data using descriptive statistics. We assessed satisfaction using two methods: the Net Promoter Score and a separate Likert scale question. The Net Promoter Score is a validated metric that measures how likely respondents are to recommend a program to a friend or colleague on a scale of

0 (not at all likely) to 10 (extremely likely).³³ Responses are then converted into an absolute number ranging from -100 to 100, with higher scores being more desirable.³³ The Likert scale question asked survey participants to “rate your satisfaction with the FarmsSHARE program,” with options of 5 (“strongly agree”), 4 (“agree”), 3 (“neutral”), 2 (“disagree”), and 1 (“strongly disagree”).

The survey also included questions that assessed the perceived value of participating in FarmsSHARE, economic impact, quality of food, and community relationships, all measured on a five-point Likert scale with options ranging from 5 (“strongly agree”) to 1 (“strongly disagree”). Responses were averaged within each domain (for example, perceived value) to generate a composite score. A detailed list of the questions used to determine the composite scores is in appendix exhibit 2.¹⁷

We used analysis of variance to determine whether there were statistically significant differences among the three stakeholder groups. We selected this method for determining whether there were significant differences in the average responses because it is the preferred method when comparing three or more groups. We characterized the responses to the open-ended questions to identify insights that could provide a richer context.

LIMITATIONS Although the survey achieved a strong response rate, the study’s survey design presented limitations. The cross-sectional nature of the survey captured only a snapshot in time, limiting our ability to assess the long-term impact of the program.³⁴ The open-ended responses were not sufficient for conducting qualitative thematic analysis, informing our decision to conduct future research using focus groups to explore stakeholders’ perspectives in greater depth. However, we present selected quotations

from these open-ended responses, to provide context for the quantitative findings.

Study Results

A total of 170 FarmsSHARE stakeholders completed the survey, representing sixteen food hubs (100 percent), sixty-five farmers (30 percent), and eighty-nine CBOs (77 percent). The geographic regions represented by the survey respondents closely mirror FarmsSHARE program enrollment, showing statistically representative findings across North Carolina. Exhibit 2 presents selected demographic characteristics and key attributes of respondents. There was a fairly even distribution of years participating in FarmsSHARE, with the majority of farmers being involved for three years. The FarmsSHARE food boxes typically accounted for 0–25 percent

of the total food boxes distributed by farmers and food hubs. For CBOs, the FarmsSHARE food boxes accounted for 26–50 percent of the total food boxes distributed.

Most farmers reported selling vegetables, fruit, and eggs to FarmsSHARE. Additional food items included meat (69 percent), herbs (69 percent), grains (63 percent), honey (56 percent), and dairy (31 percent). The most common method of supplying food to FarmsSHARE was through raw products from farmers, boxed by the food hub. Most of the households that received FarmsSHARE boxes (86.1 percent) were enrolled through screening at the CBO for diet-related health conditions and food assistance eligibility. The food boxes were picked up by recipients on site at CBOs (63.1 percent) or delivered to recipients' homes (36.9 percent) (data not shown).

EXHIBIT 2

Characteristics of FarmsSHARE survey respondents in North Carolina, by stakeholder group, June–July 2024

Characteristics	Farmers (n = 65)		Food hubs (n = 16)		CBOs (n = 89)	
	No.	%	No.	%	No.	%
Role or position						
Owner or director	57	87.7	8	50.0	42	47.2
Manager	5	7.7	7	43.8	30	33.7
Employee	1	1.5	1	6.2	3	3.4
Volunteer	2	3.1	0	0.0	9	10.1
Other	0	0.0	0	0.0	5	5.6
Race and ethnicity						
Asian or Pacific Islander	4	6.2	0	0.0	4	4.5
White or Caucasian	42	64.6	8	50.0	44	49.4
Black or African American	17	26.2	7	37.5	32	35.9
Indigenous or Native American	7	10.8	1	6.3	6	6.7
Hispanic or Latino	0	0.0	0	0.0	0	0.0
Other	2	3.1	0	0.0	3	3.4
Years participating in FarmsSHARE						
4	13	20.0	9	56.2	10	11.2
3	26	40.0	3	18.8	17	19.1
2	12	18.5	3	18.8	28	31.4
1 or less	14	21.5	3	18.8	34	38.2
Annual sales						
Less than \$50,000	26	40.0	0	0.0	— ^a	— ^a
\$50,000–\$100,000	18	27.7	1	6.0	— ^a	— ^a
\$100,001–\$250,000	11	16.9	6	37.5	— ^a	— ^a
\$250,001–\$500,000	13	20.0	2	12.0	— ^a	— ^a
\$500,001–\$1,000,000	3	4.6	4	24.0	— ^a	— ^a
\$1,000,001–\$2,500,000	0	0.0	2	12.0	— ^a	— ^a
\$2,500,001 or more	0	0.0	2	12.0	— ^a	— ^a
Percent of total food boxes going to FarmsSHARE						
0–10%	30	46.2	1	6.3	10	11.2
11–25%	16	24.6	8	50.0	18	20.2
26–50%	9	13.8	4	25.0	30	33.7
51–75%	5	7.7	3	18.8	17	19.1
76–100%	5	7.7	1	6.3	14	15.7

SOURCE Authors' analysis of survey data. **NOTE** This table presents characteristics for the farmers, food hubs, and community-based organizations (CBOs) (N = 170) who responded to the stakeholder survey. ^aNot applicable.

SATISFACTION AND PERCEIVED VALUE The average Net Promoter Score across the three stakeholder groups was 88.5 (data not shown). In addition to the Net Promoter Score, the survey confirmed that all three stakeholder groups—farmers, food hubs, and CBOs—were highly satisfied with the FarmsSHARE program, with average composite satisfaction scores of 4.5, 4.6, and 4.7, respectively, on a five-point scale (exhibit 3). Stakeholders rated the perceived value of the program highly, with farmers giving it an average composite score of 4.8, food hubs a score of 4.6, and CBOs a score of 4.8. The analysis of variance analysis comparing the three groups showed no significant differences between the mean scores, suggesting similar perceptions of the program. A detailed analysis by domain and stakeholder group, including average composite scores and standard deviations, is in appendix exhibit 3.¹⁷ One food hub emphasized its impact, stating, “FarmsSHARE is our flagship community program, and it’s beloved by our farm network, our staff, and the food box recipients.” A CBO echoed this sentiment, highlighting the program’s importance to their community: “We are so very thankful for our partnerships in this program. Our folks participating in our [food] distributions are saying they love the healthy, local foods!”

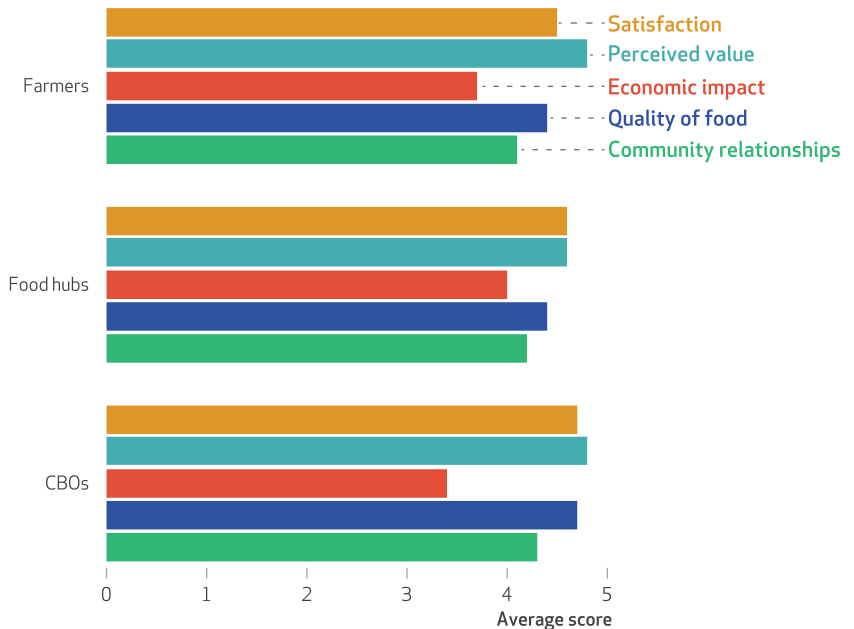
Exhibit 4 highlights the perceived value of the FarmsSHARE program at the organizational level. The results show that 94.7 percent of respondents agreed or strongly agreed that the program offers a good value-added service; 95.7 percent agreed or strongly agreed that participating in the program was worthwhile, considering any additional time or effort; and 84.7 percent of respondents agreed or strongly agreed that FarmsSHARE was the best choice for their organization.

STRENGTHENING COMMUNITY RELATIONSHIPS Respondents in all stakeholder groups strongly agreed or agreed that the program helped them build new community relationships (with composite scores from farmers, 4.1; food hubs, 4.2; and CBOs, 4.3) (exhibit 3). Because of FarmsSHARE, 93.8 percent of food hubs reported expanding the diversity of farm partners, such as reaching more growers from racial and ethnic minority populations (data not shown). In the open-ended responses, food hubs also reported partnering with more first-generation and woman-owned farms.

All of the food hubs expanded the number of farm partners, and 93.8 percent expanded the number of CBO partners (for example, food pantries or community health centers). As a result of participation in FarmsSHARE, food hubs reported engaging in new advocacy work in local

EXHIBIT 3

Stakeholders’ ratings of the FarmsSHARE program in North Carolina, average scores by domain category and stakeholder group, 2024



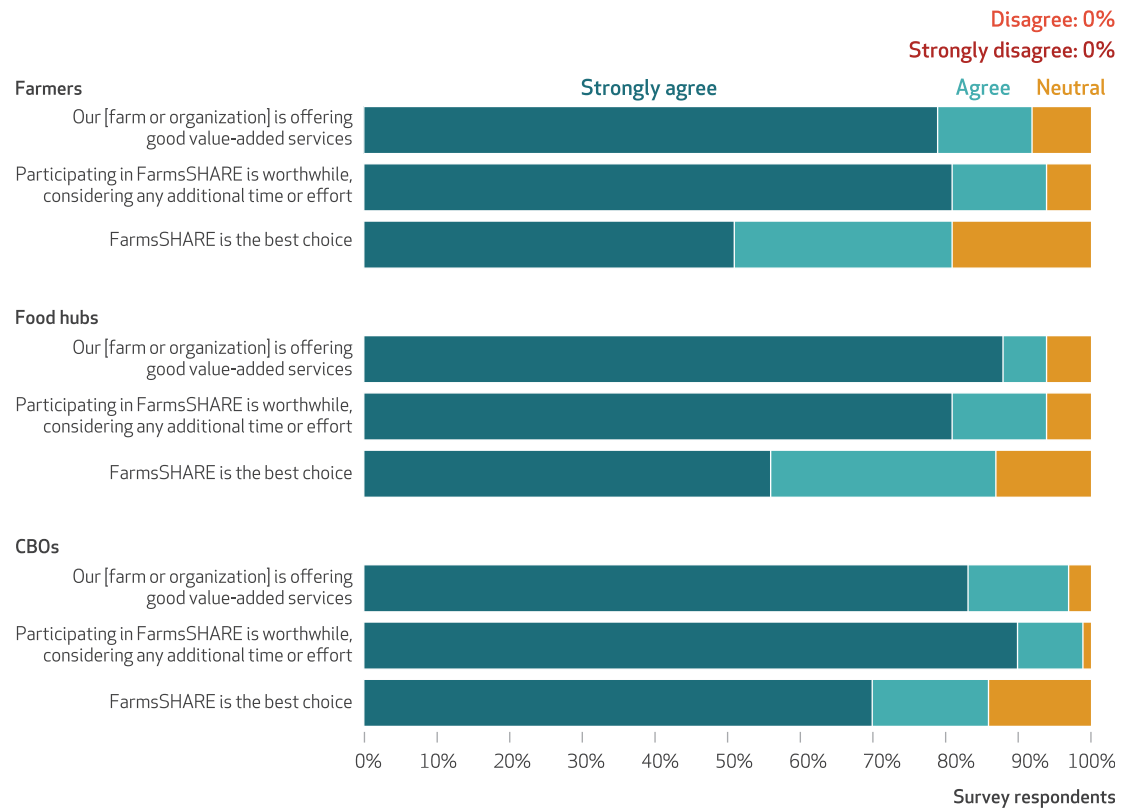
SOURCE Authors’ analysis of survey data. **NOTES** Average composite ratings by farmers, food hubs, and community-based organizations (CBOs) for satisfaction, perceived value, economic impact, quality of food distributed, and community relationships. Scores were calculated based on a 5-point scale (from 5, “strongly agree,” to 1, “strongly disagree”). A list of questions used to determine composite scores for each domain is in the appendix (see note 17 in text).

food systems or food security (53.2 percent), launching new community outreach initiatives (32.0 percent), and implementing additional education programs (26.0 percent). The education programs focused on promoting nutrition and healthy eating. One food hub described their education programs as, “We provide our [CBOs] with education on teaching local community members how to properly consume the fresh produce being provided to them.” In addition, many CBOs (84.2 percent) used this education to offer or expand wraparound services, including nutrition education (for example, cooking and nutrition classes), transportation, housing, and pharmacy services (data not shown).

LOCAL FARM AND BUSINESS OUTCOMES Nearly all farmers and food hubs reported experiencing a direct increase in revenue and selling more of their products at fair market value. In addition, 89.2 percent of farmers and 93.5 percent of food hubs reported hiring additional staff. Farms also reported extending the growing season (89.4 percent; data not shown). In an open-ended answer, one farmer shared, “As a young, first-generation farmer trying not to take on considerable debt and being highly limited by land access, having a market channel [such as Farms-

EXHIBIT 4

Stakeholders' perceived value of the FarmsSHARE program in North Carolina, by stakeholder group, 2024



SOURCE Authors' analysis of survey data. **NOTES** The exhibit shows 0% responses for two categories (disagree and strongly disagree) across all dimensions. Those categories were included to show that those categories were options on the survey. Perceived value was assessed using a 5-point Likert scale for each statement (from 5, "strongly agree," to 1, "strongly disagree"). The responses are based on the detailed questionnaire administered as part of the survey. Details are in appendix exhibit 2 (see note 17 in text). CBO is community-based organization.

SHARE] that's easy to sell to and does good for the community really lifts the burden of having to market our own products off of our shoulders. We love that the folks who benefit from this program are our friends, neighbors, and those who really need access to fresh food the most." This direct access to the FarmsSHARE market not only helps sustain farms but also strengthens the local food system by ensuring that healthy, locally grown produce reaches those who are most in need.

Stakeholders reported improvements in food safety practices (farmers, 64.2 percent; food hubs, 87.5 percent; and CBOs, 69.2 percent) and a decrease in the amount of food waste (farmers, 64.2 percent; food hubs, 87.5 percent; and CBOs, 71.0 percent). CBOs are also more willing to source local food for their food distribution, even when it comes at a higher cost. Notably, 91 percent of CBOs reported being more likely to prioritize local food sourcing after participating in FarmsSHARE (data not shown).

COMPARISON WITH OTHER PROGRAMS FarmsSHARE provides not only more food but also better food, in terms of nutrition (92.0 percent), compared with other food distribution programs. Most CBOs rated the nutritional quality as 5.0 (that is, very nutritious, containing a diverse range of fresh fruit, vegetables, and other healthy items). One CBO shared, "Since participating in FarmsSHARE, we have heard from clients that because of the fresh fruits and vegetables provided...they are much healthier and feel better." The majority rated the cultural appropriateness and diversity of food items as "excellent, with a wide variety of culturally diverse food options" or "very good, with some culturally diverse food options available" (94.2 percent) (data not shown).

Discussion

By surveying three of the main stakeholder groups involved in the LFPA-funded Farms-

We gained valuable insights into the practical application of a federal policy designed to support local food systems.

SHARE program in North Carolina, we gained valuable insights into the practical application of a federal policy designed to support local food systems. This analysis fills a critical gap in the literature by exploring the perspectives and roles of key stakeholders—local farmers, food hubs, and CBOs—in implementing and sustaining healthy food box programs.¹⁸ Although existing research highlights the benefits of these interventions in improving dietary quality and reducing food insecurity,^{11–16} limited attention has been given to the operational dynamics, satisfaction, and perceived value of these programs among the stakeholders responsible for their implementation.

AREAS OF PERCEIVED STRENGTH AND GROWTH Stakeholders were asked about the direct benefits to their stakeholder group. The top three benefits included an increased revenue stream; community support for purchasing local food at fair market value; and opportunities to provide healthy, local food to low-income participants. The main benefits to the community were characterized as healthy, local food access for the underserved; cultural diversity of food available; and new community relationships.

However, all three stakeholder groups indicated a need for more funding, both to support infrastructure and to purchase local food; specifically, funding was needed for new infrastructure improvements, such as cold storage and delivery methods. Stakeholders expressed concern that without FarmsSHARE, they would lose a vital revenue stream and a crucial source of healthy, local food for underserved communities.

Consistent with previous studies on CSA-type healthy food box interventions, this stakeholder survey confirms that these programs contribute to CBOs being able to enhance the quantity, quality, and cultural diversity of the food being distributed to households experiencing food insecurity.^{14–16} Unlike earlier studies primarily

focused on outcomes among recipients, findings from our survey suggest that FarmsSHARE is strengthening food and farm business systems by increasing revenue (by selling products at fair market value), expanding access to new markets, hiring additional staff, and fostering new partnerships. FarmsSHARE prompted food hubs to expand the diversity of their farm partners, such as reaching more farms owned by members of racial and ethnic minority populations.

Our study adds to the existing literature by demonstrating that participation in locally sourced healthy food box distributions can foster commitment to prioritize local food purchased at fair market value as a strategy to address food and nutrition insecurity.¹⁶ Notably, the program's ability to generate financial benefits for local farmers and food hubs, while simultaneously improving access to healthy food for low-income communities, highlights the strength of the FarmsSHARE model.²⁶

Future research is needed to deepen understanding of the FarmsSHARE program's impact, particularly through qualitative methods such as focus groups and in-depth interviews. Although initial findings provide valuable insights, the complexity of farmers' experiences, economic outcomes, and community relationships requires further exploration.

POLICY IMPLICATIONS Our findings emphasize the role of policy making and funding structures in amplifying the reach of federally funded programs such as LFPA.²⁰ Local leadership, including farmers, regional food hubs, and CBOs, proved critical in tailoring food boxes to meet the nutritional needs of low-income households. FarmsSHARE's ability to navigate local relationships and deploy resources effectively was pivotal in federal funding translating into positive local food system outcomes.²³

Continued investment and expansion are essential to sustaining LFPA-funded programs. The high satisfaction and perceived value of the FarmsSHARE program among grassroots community partners demonstrate its effectiveness in integrating local food into broader Food Is Medicine initiatives.^{15,16} By streamlining the distribution of locally sourced food, the program offers a replicable model for other regions looking to integrate local food within Food Is Medicine programs, such as medically tailored meals or produce prescriptions.⁹ The efficient coordination between food producers and local partners ensures that fresh, nutritious food reaches high-risk people, providing a sustainable model for integrating local food systems within health initiatives. Future research should explore the impact of local food and grassroots CBOs in Food Is Medicine models in directly reducing rates of

nutrition insecurity.

Building on the successes of FarmsSHARE, policy makers should consider prioritizing flexible, locally informed funding mechanisms and incentives to foster collaboration to address systemic barriers in food and nutrition systems.⁸ Future iterations of LFPA and similar policies can strengthen local farm and food businesses; tackle nutrition insecurity; and improve access to nutritious, local, and culturally diverse food, fostering lasting pathways toward healthier communities.^{5,6,8}

Conclusion

Our results illustrate the far-reaching impacts of North Carolina's LFPA-funded FarmsSHARE program in enhancing collaborations and strengthening local food systems.^{18,19} They also emphasize the importance of incorporating local food into Food Is Medicine nutritionally tailored food box interventions and other population-level food policies and programs to enhance satisfaction, particularly regarding the quality, nutrition, and cultural diversity of the healthy food boxes designed for low-income households.^{15,16} ■

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