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Measuring community power: A scale to measure collective self-determination, Embodied Earth Care and Connection, and Ubuntu among urban farmers and gardeners

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Abstract

Participation in community farming and gardening increases and improves social support, collective agency, care, and resistance in many historically exploited communities. Black- and Brown-led food justice organizations have expressed the need for an instrument that captures what is most important to them: information on how their programs impact land-based knowledge, spirituality, collective agency, resistance, and mental health. This study used a survey instrument to develop a scale using exploratory factor analysis. Participants were recruited with the help of key partners and influencers from U.S.-based agricultural networks. The final analyzable sample contained 363 respondents. The scree plot, parallel test, and eigenvalues all supported a five-factor structure as most appropriate for the data. These five inter-related factors explain a concept called "Agricultural Community Power" and refer to Collective Self-determination, BodyMind Community Care, Land-based Spiritual Wellbeing, Embodied Earth Care and Connection, and Ubuntu/Interdependence. This model had adequate internal consistency reliability (Cron-

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bach's alpha = 0.93). The Agriculture Community Power Scale (AgCPS) is a tool that (1) can be used for program evaluation and (2) is better aligned with the values, priorities, and impacts of many community-rooted environmental organizations. AgCPS moves food justice evaluation away from standard metrics (such as BMI and fruit and vegetable consumption) and toward metrics of community care, collective agency, land-based spirituality, and community power.

Keywords
agriculture, community gardens, urban farming, self-determination, community power, spirituality, ecospirituality, wellbeing, scale development, Ubuntu

Introduction

Community farming and gardening have consistently been associated with positive and improved health outcomes for both the consumers of the food and the people who participate in growing. These agricultural activities have been shown to improve depression, anxiety, stress, and physical health (Fang et al., 2021; Gregis et al., 2021; Lampert et al., 2021; Soga et al., 2017). Participation in community farming and gardening has also led to increases and improvements in social support, collective agency, care and wellbeing, and resistance in many historically exploited communities and organizations (Gripper, 2023). Among these groups and organizations, Black-led and Black-serving urban agriculture organizations have highlighted racial disparities in philanthropic funding (Reynolds, 2015), since U.S.-based white-led and white-serving organizations tend to receive much of the funding available for environmental education and stewardship (Ghose & Pettygrove, 2014).

Black-led organizations have expressed the need for an instrument that captures what is most important to them: information on how their program impacts land-based knowledge, spirituality, collective agency, resistance, and mental health (Bartram's Garden, n.d.; Gardening The Community, n.d.; Soil Generation, n.d.; The Urban Farming Institute, n.d.). Many Black people do not grow as a hobby or to partake in trends, but as resistance for healing and self-determination (Gripper, 2020). The health benefits and ecosystem services of Black agrarianism and urban agriculture extend beyond physical health. However, urban agriculture organizations have repeatedly shared that their funders often measure the success of their programming based on the amount of produce grown, changes in body mass index (BMI) of participants, and/or average fruit and vegetable consumption (Daftary-Steel et al., 2015). These evaluation metrics are not only misaligned with what organizations want to show, but they are also often in direct opposition to programmatic missions and goals (Bartram's Garden, n.d.; Cohen & Reynolds, 2015; Soil Generation, n.d.; Soul Fire Farm, n.d.). Since a widely accepted, validated, and established tool does not exist to capture what is most important to many urban growers, there is a need for one to be developed.

There are existing scales that measure individual agency, social capital, and community mobilization generally (Cavazzoni et al., 2022; Saito et al., 2017; Tapal et al., 2017). There is also an instrument measuring social and dietary outcomes in relation to community garden participation (Burt & Delgado, 2020). However, no single scale exists to measure "community power," nor does an instrument exist to measure community power as it manifests for Black agricultural communities in the U.S. (Gripper, 2023). Measuring these latent constructs may help Black-led agricultural organizations better assess their project and programmatic impacts and secure funding to expand their work. The goal of this study was to develop a new scale that measures community power among urban farmers, gardeners, and growers and that can be used by urban agriculture organizations in the U.S. to assess their programming; the scale allows it to be used in national studies as well. This concept of community power encompasses latent constructs such as collective agency, care and relationship-building, interdependence, and what I am calling "Embodied Earth Care and Connection."

Methods

Scale development has unavoidable bias (Andersen et al., n.d.). The lack of transparency and awareness around our different internal biases and lack of cultural understanding is in part why there are issues

with how scales have been developed (Kayes & McPherson, 2010). Before choosing and using scales, researchers should ask: What demographic of people were these scales created for? What populations were considered as scales were designed and developed? On what populations were the established scales initially validated? These questions and considerations were prioritized throughout the development of this study's aims, instrument, and scale.

Many epidemiologists and social scientists treat scales as one-size-fits-all, thinking that they will operate similarly across racially, culturally, ethnically, and economically diverse populations. Morgado et al. highlighted the need for "more diverse views to be considered to reflect more comprehensive perspectives of human knowledge-creating behaviors to strengthen the validity of developed scales" (p. 14). If researchers are designing scales for a specific community, then research should start with engaging that community.

Scale Development Methodology

I[1] began the process of item and scale development by hosting focus groups with Black and white urban growers in Philadelphia (Gripper, 2023). During these focus groups, I asked about their experiences with growing food and the self-determined impacts on their health and communities. During these focus groups, I also provided participants with an opportunity to share any agriculture-related topics that they think should be further investigated and uplifted in research settings. The qualitative data gained from these focus groups informed, influenced, and shaped the content and development of the present scale (Gripper, 2023).

I also conducted informal interviews and intentional conversations with Black agrarian communities across the U.S. and the Caribbean. During these conversations, people emphasized the benefits of urban agriculture for spirituality, collective agency, mental health, and community-building and organizing. While there are validated instruments to measure spirituality, most of these tools focus on spirituality in the context of religion. To date, there are few, if any, instruments that capture land-based, holistic spiritual wellbeing. I use land-based spirituality to refer to spiritual practices originating in African indigenous cultures that emphasize the divinity of and reverence for ancestors, nature, and God (p'Bitek, 2011; Somé, 1994, 1999). Such a tool could be useful as an alternative impact measure for grassroots organizations and community-rooted groups whose work centers collective care and agency, as well as the cultures, foods, and spiritual practices of the African diaspora.

There are scales that aim to measure community capacity-building, which is related to the concept of community care and relationship-building (Gripper, 2023), but with some key differences. Community capacity is the "combined influence of a community's commitment, resources, and skills that can be deployed to build on community strengths and address community problems and opportunities" (Deaton, 2022, "What is capacity," para. 1). This concept focuses on the resources, skills, and commitments that move through a community. "Community care and relationship-building," as outlined in Gripper (2023), places its focus and emphasis on the care and wellbeing of the people who make up a community, not necessarily the resources or skills that flow between people.

Using collective agency and community resilience (CACR) as a guiding framework (White, 2017), I draw from my experiences as a Black urban farmer, subject matter expertise, informal interviews with urban growers, and focus group data (Gripper, 2023) to determine the items and factors included in the instrument. This study sought to build on qualitative findings from earlier studies by developing a scale to measure community care, collective agency, and resistance, as well as the various concepts that are captured within them. Embedded in these concepts are the following themes: political education, resource sharing, economic autonomy, collective decision-making, environmental health literacy, spiritual wellbeing and practice, health, and interdependence.

[1] Throughout this manuscript, both first and second person point of views are incorporated. When "I" is used, it refers to the first author. "We" is used in the context of the study's coding and analysis which, at times, was conducted by the authors collaboratively.

Survey Administration

This study used a survey instrument to develop a scale using exploratory factor analysis. Surveys were administered online and collected anonymously through Qualtrics. Institutional review board (IRB) approval for this study came from the Office of Regulatory Affairs and Research Compliance at the Harvard T.H. Chan School of Public Health. I recruited participants with the help of key partners and influencers in agricultural communities in the U.S. through a variety of approaches. The survey link and recruitment materials were shared with community partners and comrades. People then shared the survey link and/or recruitment emails with their networks and listservs. Urban agriculture organizations also discussed the study with their members via word of mouth. The survey link, accompanied by a description of the research, was also shared on several online mailing lists, newsletters, and social media pages, such as Philadelphia Urban Farmers Network (PUFN), Northeast Sustainable Agriculture Working Group (NESAWG), Northeast Farmers of Color (NEFOC), and others.

Participants included urban farmers and gardeners from across the U.S., with an emphasis and targeted outreach for the following cities: Atlanta, Baltimore, Boston, Chicago, Cleveland, Detroit, Houston, Minneapolis, Philadelphia, Portland, San Francisco Bay Area, and Seattle. These areas were chosen to increase regional and geographic variability. They were also selected because they have an urban agriculture presence and/or movements and are not as well studied as some other major urban areas. To be eligible to participate in this study, individuals had to (1) garden or farm outdoors with other people, (2) be at least 18 years of age, (3) grow produce or herbs, and (4) grow in an urban context.

The survey was initially open to participants for three weeks. On day three of data collection, Qualtrics' built-in software detected bots and duplicate responses. To limit additional bots from completing the survey, I added a reCAPTCHA question and made the race/ethnicity text entry fields mandatory. Prior to the third day of the survey, race/ethnicity text entry fields were suggested but optional. After the survey closed, consideration was given to re-opening it based on interest and feedback from potential participants. The survey was reopened for four additional days.

I collected demographic information on race, ethnicity, gender, age, occupation, education, type of growing project, and length of time farming. I also collected data on the respondent's mental health, physical health, and spiritual wellbeing. Participants were able to opt into a raffle for a US $50 gift card at the completion of the survey.

Bot Detection

I imported data into Excel to be cleaned and managed. Qualtrics contains built-in "unsophisticated" bot-detection, fraud detection, and duplicate detection software (Simone, 2019; Storozuk et al., 2020). This software determined that a small portion of respondents were likely bots and/or duplicate responses. In order to filter out low-quality and fraudulent responses, I exported the remaining responses into Excel. After initial bot detection measures were implemented, I then searched for and filtered out ineligible respondents and sophisticated bots (Simone, 2019; Storozuk et al., 2020) before reaching a sample that included all eligible and analyzable responses. Sophisticated bots are robots that use the survey's language to create responses to text entry questions (Simone, 2019; Storozuk et al., 2020). To detect these bots, I looked for nonsensical answers to straightforward questions such as "what is your occupation" and "what is your ethnicity." Coupling this knowledge with information in the email address fields, I discovered that bots, hackers, and duplicate responders tend to send consecutive survey responses that contain the same email address structure (Simone, 2019; Storozuk et al., 2020). To identify bots, I also looked at fraud and duplicate scores. These scores are calculated through Qualtrics' reCAPTCHA software. I evaluated all this information concurrently to determine which responses were definitely bots and which respondents were legitimate. These bots also register from different IP addresses and latitudes and longitudes. This makes bot responses seem more realistic and difficult to differentiate from legitimate responses. Sophisticated bots with a CAPTCHA-determined fraud score of greater than or equal to 20, i.e., manual bot detection, were

excluded. Table 1 outlines the data cleaning process and exclusions. After filtering out Qualtrics-detected bots and duplicate responses, there were 690 respondents. Further analysis of the data revealed an additional 128 "sophisticated" bots that had completed the survey.

Factor Analysis

All analyses were performed in R. I considered results from the scree plot, parallel test, and eigenvalues to get a sense of how many potential factors to extract. Reverse coded items were recoded to be on the same scale as other items. We then performed an exploratory factor analysis (EFA) extracting one, three, four, five, and eight factors, and examined factor loadings and item correlations of each model (DeVellis, 2017). I assessed internal consistency reliability, content validity, and discriminant validity (DeVellis, 2017). Single-rated mental health, single-rated physical health, and single-rated spirituality items were included in the scale to provide additional context and understanding around the health of urban growers. Content validity of the scale was evaluated by experts in Black agricultural studies, survey design, and scale development (DeVellis, 2017).

I selected EFA because traditional regression techniques are insufficient for scale development and assessing latent variables (McCoy, 2019a). In the EFA model, we included an oblique rotation since the underlying latent constructs are likely correlated with one another (DeVellis, 2017). Within urban agriculture and Black agricultural communities, it is very likely that the concept of community care is also related to collective agency and community resistance.

I chose to retain items with factor loadings >0.3 and evaluated cross-loadings (Boateng et al., 2018; Tavakol & Wetzel, 2020). If there were cross-loadings, an item was assigned to the factor on which it had the largest loading. This analysis did not rely heavily on model fit statistics because this is an exploratory factor analysis and not a confirmatory factor analysis (McCoy, 2019b). I did, however, observe and note reliability statistics for the overall model. For the final scale, I dropped items with factor loadings <0.3 from the model and scale. After dropping items with low loadings, we re-ran the exploratory factor analysis and evaluated internal consistency reliability and model fit statistics. Analyses of item-scale correlations, Cronbach's alpha for reliability, and factor correlations helped determine which items to retain (DeVellis, 2017).

Results

The final analyzable sample contained 363 respondents. Black people composed 19% of the sample. Native American, Asian, and mixed-race respondents made up 15% of the sample. Many respondents were in Philadelphia (26%), Boston (14%), Baltimore (10%), Chicago (9%), and the San Francisco Bay Area (7%). Participants' ages ranged from 21 to 83. Most participants had completed at least some college (95%).

Table 2 lists health indicator statistics by race. About 94% of people who completed the survey rated their physical health as good, very good, or excellent. Among Black people, 94% of participants rated their physical health as good, very good, or excellent. Roughly 83% of all respondents rated their mental health as good, very good, or excellent, while 17% rated their mental health as fair or poor. Most growers indicated that

Table 1. Bot Detection and Final Sample Size

Step	Reason Excluded	*n* Excluded	*n* Remaining After Exclusion
1	1 - Preview	4	913
2	2 - Bot: Qualtrics	223	690
3	3 - Bot: Manual Detection	128	562
4	4A - Not Eligible (Q7): Does not grow w other people	63	499
	4B - Not Eligible (Q7): missing grow w other people	57	442
	4C - Not Eligible (Q4): Fish/Animals or Fruit Trees Alone	19	423
	4D - Not Eligible (Q5): In Water or Indoors Alone	4	419
5	5 - Incomplete	56	363

they think about their spiritual wellbeing (85.7%). This was slightly higher among Black growers: about 94% of Black growers said they think about their spiritual wellbeing. Of all racial groups, Black people had the highest engagement in spiritual practices (85.5%). When asked to rate their spiritual wellbeing and/or practices, 70.2% of all survey respondents said their spiritual wellbeing is good, very good, or excellent. About 19% of all respondents said their spiritual wellbeing was fair or poor and about 11% of respondents said that this question was not applicable to them.

The scree plot, parallel test, and eigenvalues all suggested that a four or five-factor structure is most appropriate for the data. Model fit statistics were examined but not used to determine how many factors to retain. Model fit statistics were adequate and minimally adequate, respectively, using RMSEA >0.07 cut-off value (RMSEA = 0.07, TLI = 0.7).

Five factors were extracted, which means that there are five underlying constructs that compose this scale. Table 3 shows which items or statements load onto specific factors. The exploratory factor analysis with an oblique rotation yielded very few cross loadings. There were five items that did not load onto any factors based on a cut-off of <0.3 (Q22, Q30, Q31, Q41, Q47). I used item-scale correlations to determine which items to keep in the model and which items to remove from the model

Table 2. Health Indicators by Race

		Black (*N* = 6)	Native American / Alaska Native (*N* = 4)	Asian (*N* = 20)	White (*N* = 241)	Mixed race (*N* = 29)	Total (*N* = 363)
Self-rated physical health	Excellent	10 (14.5%)	N/A*	1 (5%)	43 (17.8%)	6 (20.7%)	60 (16.5%)
	Very good	26 (37.7%)	N/A*	10 (50%)	116 (48.1%)	13 (44.8%)	168 (46.3%)
	Good	29 (42%)	N/A*	8 (40%)	69 (28.6%)	7 (24.1%)	114 (31.4%)
	Fair	4 (5.8%)	N/A*	1 (5%)	12 (5%)	1 (3.4%)	18 (5.0%)
	Poor	0 (0%)	N/A*	0 (0%)	1 (0.4%)	2 (6.9%)	3 (0.8%)
Self-rated mental health	Excellent	10 (14.5%)	N/A*	0 (0%)	30 (12.4%)	5 (17.2%)	45 (12.4%)
	Very good	25 (36.2%)	N/A*	4 (20%)	80 (33.2%)	6 (20.7%)	117 (32.2%)
	Good	21 (30.4%)	N/A*	10 (50%)	96 (39.8%)	10 (34.5%)	139 (38.3%)
	Fair	12 (17.4%)	N/A*	6 (30%)	30 (12.4%)	8 (27.6%)	56 (15.4%)
	Poor	1 (1.4%)	N/A*	0	5 (2.1%)	0	6 (1.7%)
Consideration of spiritual wellbeing	Yes	65 (94.2%)	N/A*	15 (75%)	204 (84.6%)	24 (82.8%)	311 (85.7%)
	No	4 (5.8%)	N/A*	2 (10%)	25 (10.4%)	3 (10.3%)	35 (9.6%)
	Unsure	0 (0%)	N/A*	3 (15%)	12 (5%)	2 (6.9%)	17 (4.7%)
Engagement in spiritual practices	Yes	59 (85.5%)	N/A*	11 (55%)	149 (61.8%)	19 (65.6%)	241 (66.4%)
	No	6 (8.7%)	N/A*	6 (30%)	64 (26.6%)	5 (17.2%)	82 (22.6%)
	N/A	4 (5.8%)	N/A*	3 (15%)	28 (11.6%)	5 (17.2%)	40 (11.0%)
Self-rated spiritual wellbeing	Excellent	14 (20.3%)	N/A*	0 (0%)	16 (6.6%)	2 (6.9%)	33 (9.1%)
	Very good	22 (31.9%)	N/A*	5 (25%)	48 (19.9%)	7 (24.1%)	84 (23.1%)
	Good	23 (33.3%)	N/A*	6 (30%)	95 (39.4%)	13 (44.8%)	138 (38.0%)
	Fair	8 (11.6%)	N/A*	6 (30%)	45 (18.7%)	1 (3.4%)	60 (16.5%)
	Poor	1 (1.4%)	N/A*	0 (7.1%)	6 (2.5%)	2 (6.9%)	9 (2.5%)
	N/A	1 (1.4%)	N/A*	3 (15%)	31 (12.9%)	4 (13.8%)	39 (10.7%)

* *N* is too small to report per ethical standards.

(DeVellis, 2017). One item was removed from its corresponding factor to allow for a clearer interpretation (Q34). Other items with slight cross loadings were assigned to the factor under which they made

Table 3. Agricultural Community Power Scale Factor Loadings

Factor	Load	Item	Item Question
ML 3	0.697	Q39	My community is determined to work through challenges together
	0.628	Q40	My community works together to develop shared practices or values
	0.562	Q29	I am aware of opportunities to become more involved in community matters
	0.557	Q25	My community openly shares our goods and resources with one another
	0.547	Q27	I have access to material support or resources through my community
	0.450	Q26	When money is tight, I can depend on my community for financial support
	0.370	Q64	If someone in my community is in need, we can depend on each other for support
	0.369	Q33	My community is currently practicing or plans to practice cooperative economics
	0.357	Q23	I am aware of community spaces where I can speak openly with others about politics
	0.332	*Q54	If I get sick, I can count on my community to help me through it
	0.328	Q36	I work with others to strengthen our collective economic power
	0.310	Q24	When my community works together, we have strong political will and power
	–0.597	Q37	My community works together to make decisions on how to use or consume our shared resources
	–0.699	Q38	When my community is threatened, we work together to come up with a solution
ML 4	0.671	Q53	Because of my experience gardening and/or farming, I feel a deeper responsibility to care for the Earth
	0.619	Q50	Gardening and/or farming have helped me feel more connected to the Earth
	0.549	Q43	I share what I know about the environment and health with my friends, family, or colleagues
	0.540	Q45	I am more knowledgeable about the foods that I eat than I was before I started gardening/farming
	0.513	Q46	I think about the distance food has traveled when I shop at the supermarket or grocery store
	0.512	Q32	I give time, money, or labor to help support or improve my community
	0.456	Q63	I think about how my actions will impact my community
	0.425	Q59	I feel less anxious when I garden and/or farm
	0.390	Q60	I feel less depressed when I garden and/or farm
	0.386	Q61	Gardening and/or farming has helped me improve my physical health
	0.380	Q35	My community has more power when we pool financial resources
	0.336	Q44	When purchasing produce, I prefer to buy pesticide-free products
	0.323	*Q52	Growing food has helped me to feel or be more connected to my ancestors
	0.305	*Q51	Gardening and/or farming have helped me develop deeper spiritual practices
ML 1	0.865	Q56	Knowledge from my community has improved my physical health
	0.780	Q55	Knowledge from my community has influenced my physical health and/or activities
	0.679	Q58	My mental health has improved because of the knowledge or care I have received from my community
	0.584	Q57	My mental health has been influenced by the knowledge I received from my community
	0.361	*Q54	If I get sick, I can count on my community to help me through it
	0.356	Q42	I have gained knowledge from my community about the ways the environment impacts my health
ML 5	0.841	Q49	My spiritual wellbeing or practice has been improved by knowledge or care I received from my community
	0.841	Q48	My spiritual wellbeing or practice has been influenced by knowledge I received from my community
	0.650	*Q51	Gardening and/or farming have helped me develop deeper spiritual practices
	0.377	*Q52	Growing food has helped me to feel or be more connected to my ancestors
	0.372	Q34	I am exploring economic alternatives to capitalism by myself or with my community
ML 2	0.887	Q66	My wellbeing is connected to other people's wellbeing
	0.833	Q65	My humanity is connected to other people's humanity
	0.492	Q67	I make decisions about my actions based on how they might impact other people
	–0.449	Q62	My actions do not affect other people; I should be able to do what I want

* Denotes cross-loaded item

the most sense (Q51, Q52, Q54). The five factors were moderately correlated with one another, supporting the choice of a single scale with five interdependent subscales. This model had adequate internal consistency reliability (Cronbach's alpha = 0.93).

Discussion

The primary goal of this study was to develop a valid and reliable scale that measures the impact of grassroots and community-based urban agriculture projects.

Factor and Construct Interpretation

Based on the factor loadings, item groupings, and my subject-matter expertise, the five factors represented in the scale refer to Collective Self-determination, BodyMind Community Care, Land-based Spiritual Wellbeing, Embodied Earth Care and Connection, and Ubuntu/Interdependence, described in detail below. Together, these factors and constructs form the Agricultural Community Power Scale (AgCPS; see Table A in the Appendix) and measure community power as it manifests among urban farmers and gardeners.

Collective Self-determination

Each of the items that loaded onto the Collective Self-determination factor contained the word "community." These items focused on concepts like economic autonomy, political education, resource and information sharing, and collective decision-making. Together, they explain processes of how people think, decide, and act together to determine what is best for the community as a whole. The collection of items that loaded onto this factor almost entirely capture the following strategies of resistance outlined in *Freedom Farmers: Agricultural Resistance and the Black Freedom Movement*: Commons as Praxis, Prefigurative Politics, and Economic Autonomy (White, 2018). For example, item 25 says, "my community openly shares our goods and resources with one another." This statement is one of several consistent with Commons as Praxis, which "refers to the resource commons and includes collective decision making, collective action, and fair allocation of shared resources" (Gripper, 2023, p. 4). Overall, Collective Self-determination had the most items loaded onto it of any factor, and loadings ranged from moderate to strong.

Embodied Earth Care and Connection

The 17 Environmental Justice Principles from the First National People of Color Environmental Leadership Summit call for deep-rooted care of Earth and articulate alternative ways to engage with communities that have perpetually experienced environmental exploitation and injustices (The First National People of Color Environmental Leadership Summit, 1991). Embodied Earth Care and Connection demonstrates the ways that participation in community agriculture has helped people to realize their connections to Earth as well as their responsibility to care for Earth. The items that loaded onto the Embodied Earth Care and Connection factor refer to knowledge, understandings, and perceptions that people have gained from participating in agricultural activities, specifically related to food and harmful environmental exposures. It also includes the ways Earth has cared for and facilitated healing for people. One example of this is item 59, which says, "I feel less anxious when I garden and/or farm." The items that loaded onto Embodied Earth Care and Connection also captured participants' experiences with agriculture, that is, the feelings and sense of responsibility that participating in agricultural activities initiated in people. Examples of items that loaded onto this factor include item 43, "I share what I know about the environment and health with my friends, family, or colleagues," and item 53, "because of my experience gardening and/or farming, I feel a deeper responsibility to care for the Earth." Loadings on this factor were moderate (0.31–0.65).

BodyMind Community Care

These items refer to ways that one's community has shaped, influenced, or improved their health. It includes people's perceptions of how their community cares for them when they experience mental or physical illness. The focus of this factor is the health-related care that communities provide through sharing information and mutual aid. Examples of items that loaded onto this factor include item 56, "knowledge from my community

has improved my physical health" and item 54, "if I get sick, I can count on my community to help me through it." These items loaded moderately to strongly onto the BodyMind Community Care factor.

Land-based Spiritual Wellbeing

All items that loaded strongly onto this factor are related to agriculture and how participation in an agricultural community impacts spirituality. These items relate to how community gardening and farming facilitates spiritual wellbeing, deepening of spiritual practices, and connection to ancestors. Spirituality in this context is facilitated through connection to Earth, land, and agriculture. Items that loaded strongly onto this factor include but are not limited to item 49, "my spiritual wellbeing or practice has been improved by knowledge or care I received from my community," and item 51, "gardening and/or farming have helped me develop deeper spiritual practices."

Ubuntu and Interdependence

Ubuntu is a South African principle from the Zulu tribe (Foundation, 2017). It is often defined and described as "I am because we are" or "I am a person through you." Ubuntu is about the interdependence and interconnection of all humanity and Earth. The items that loaded onto this factor are about understanding one's own positionality in relation to other people. For instance, one item says, "I think about how my actions will affect other people." Another item was reverse coded and says, "My actions do not affect other people. I should be able to do what I want." The remaining items that loaded onto this factor mentioned the interconnections of humanity, collective wellbeing, and decision-making. These loadings were strong.

Sensitivity Analyses

We performed several sensitivity analyses. We repeated the exploratory factor analysis using data that included potential bots. This analysis yielded similar findings to the main analysis of the data that excluded bots. We also performed a sensitivity analysis restricted to participants who were Black, Native American, Asian, and mixed-race. This analysis was not sufficiently powered; however, it did yield similar results. One notable difference was the emergence of an additional factor that was not explicitly captured in the initial scale. This factor included items 23, 24, 29, and 35, and encompasses some of the ways that activism and resistance manifest through community gardening and farming. In the qualitative research that preceded this study, there were subtle and obvious differences between Black and white focus groups in their discussions about activism and resistance (Gripper, 2023). The excerpt below highlights some of those differences and offers a potential explanation for why the factor analysis for this sensitivity analysis included an additional factor.

> "Activism and resistance" was one of several subthemes that made up the larger theme "growing food as a demonstration of agency and power." … White participants engaged with concepts of resistance, activism, and justice from social positions that differed from Black participants. While people across racial groups talked about topics related to agency and power, Black participants discussed them more frequently. There was also a difference in the emphasis people placed on specific topics. For instance, in one of the Black focus groups, participants dedicated most of the allotted time to talking about activism and resistance. While White participants also named resistance as an impact of urban agriculture, the conversations around resistance were shorter, less emphatic, and did not contain the same sense of urgency as in the Black focus groups. (Gripper, 2023, pp. 14, 15–16)

Lastly, we compared characteristics of respondents who took the survey before the initial close date and those who took the survey after the initial close date. Seventeen people completed the survey after it reopened. People who took the survey after it reopened were more likely to identify as Black, Asian, or mixed-race ($N = 14$).

Strengths and Limitations

The AgCPS is a tool that can be used for program evaluation for environmental organizations working toward BodyMind Community Care, agency

and self-determination, spirituality, environmental stewardship, and justice. While no measurement tool can definitively determine the extent of a person or group's spiritual connections, the AgCPS offers a measure of land-based spiritual wellbeing that can serve as an alternative impact measure for grassroots organizations and community-rooted groups. The content of this scale is more closely aligned with the values, priorities, and impacts of many of these groups as compared to the scales often used to measure impact (Bartram's Garden, n.d.; Detroit Black Community Food Security Network, n.d.; Neighborhood Land and Power Project, n.d.; Soil Generation, n.d.; The Urban Farming Institute, n.d.; Wozniacka, 2019). This scale moves food justice evaluation metrics away from standard metrics such as changes in BMI or consumption of fruits and vegetables, and toward metrics of collective agency, wellbeing, spirituality, and community power.

While there were many white respondents, all survey questions and statements were primarily designed by drawing on information, wisdom, and experiences from Black growers. Compared to the racial distribution of the U.S. population, this survey had a greater response rate from Black, Native American, Asian, and mixed-race urban growers than expected. Though validated in urban agriculture communities, it is also likely that this scale is transferable to Black rural farming and other justice-centered communities such as abolitionist, spiritual or faith-based, and social movement groups. Future iterations of this work will validate the instrument with different demographics and occupations in order to measure Community Power among other groups.

Another strength of this study was the development of bot-identification and analysis strategies. A small number of bots and duplicate respondents infiltrated the survey early in the data collection process. I realized this issue very quickly and implemented additional security and bot detection measures. I put forth an extensive effort to identify "sophisticated" bots during the data cleaning stage. While the probability of excluding valid responses is very low, it is possible that some bots were included in the final sample. Bots are likely to have responded to survey questions at random, as confirmed through our sensitivity analyses, so there is no reason to think they would differentially bias this study's findings.

This study had several constraints that will be considered in the continuation of this research. The survey was only open for a total of four weeks, which means the number of responses collected was limited. This was due to timeline constraints and was the maximum amount of time it could be open. The survey window was from January 2022 to February 2022 because this time of year is when most U.S.-based farmers and gardeners have paused their "in-the-field" activities. It was important for the data collection to take place during these months so that this research was not adding undue burden to growers during the busiest time of the growing season (spring, summer, and fall). In future studies, surveys should remain open for 6–8 weeks to allow enough time for outreach to different populations.

Another limitation of this study was the inability to pay each respondent for their time and contribution to the research. It is important to value people's time and energy. One of the most tangible and effective ways to do this is through monetary compensation. Due to extreme funding limitations, I was not able to pay each respondent individually for their contribution; instead, they were able to opt in to a raffle for a US$50 gift card at the completion of the survey. Future iterations of this research will include compensation for all people who complete surveys.

Conclusion

In this paper, I introduce a statistically reliable scale to measure "Agricultural Community Power," and describe its development and validation. This 41-item scale is made up of five subdomains: Collective Self-determination, Embodied Earth Care and Connection, BodyMind Community Care, Land-based Spiritual Wellbeing, and Ubuntu. It was developed based on what I and others (White, 2018) heard from Black and Brown urban growers in our communities. The Agricultural Community Power Scale (AgCPS) is one of few instruments to describe Embodied Earth Care and Connection, Land-based Spiritual Wellbeing, Ubuntu/Interdependence, and Collective Self-determination. It

is also one of the only scales designed specifically by, for, and with guidance from Black urban farmers, thus meeting a need that community organizations have expressed for decades.

The Agricultural Community Power Scale is deeply rooted in community-generated questions, knowledge, and wisdom, and likely has utility across different disciplines and fields, including public health, sociology, and psychology. In addition to introducing the AgCPS scale, the approach and methods used throughout this research process offer an alternative way of engaging in community-based and community-rooted research methods. It may serve as a guide for others on how to produce community-engaged scholarship, where qualitative research influences quantitative studies, using an environmental justice approach. In future research projects, researchers should consider utilizing their skills, knowledge, and technical expertise to develop tools that communities have explicitly stated will be useful for them. It can lead to greater impact.

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Appendix

Table A. Agricultural Community Power Scale

Collective Self-determination	23. I am aware of community spaces where I can speak openly with others about politics
	24. When my community works together, we have strong political will and power
	25. My community openly shares our goods and resources with one another.
	26. When money is tight, I can depend on my community for financial support.
	27. I have access to material support or resources through my community.
	29. I am aware of opportunities to become more involved in community matters.
	33. My community is currently practicing or plans to practice cooperative economics
	36. I work with others to strengthen our collective economic power
	37. My community works together to make decisions on how to use or consume our shared resources.
	38. When my community is threatened, we work together to come up with a solution.
	39. My community is determined to work through challenges together.
	40. My community works together to develop shared practices or values.
	64. If someone in my community is in need, we can depend on each other for support.
Embodied Earth Care and Connection	32. I give time, money, or labor to help support or improve my community.
	35. My community has more power when we pool financial resources
	43. I share what I know about the environment and health with my friends, family, or colleagues.
	44. When purchasing produce, I prefer to buy pesticide-free products
	45. I am more knowledgeable about the foods that I eat than I was before I started gardening/farming.
	46. I think about the distance food has traveled when I shop at the supermarket or grocery store.
	50. Gardening and/or farming have helped me feel more connected to the Earth.
	53. Because of my experience gardening and/or farming, I feel a deeper responsibility to care for the Earth.
	59. I feel less anxious when I garden and/or farm.
	60. I feel less depressed when I garden and/or farm
	61. Gardening and/or farming has helped me improve my physical health
	63. I think about how my actions will impact my community.
BodyMind Community Care	42. I have gained knowledge from my community about the ways the environment impacts my health.
	54. If I get sick, I can count on my community to help me through it.
	55. Knowledge from my community has influenced my physical health and/or activities.
	56. Knowledge from my community has improved my physical health.
	57. My mental health has been influenced by the knowledge I received from my community.
	58. My mental health has improved because of the knowledge or care I have received from my community.
Land-based Spiritual Wellbeing	48. My spiritual wellbeing or practice has been influenced by knowledge I received from my community.
	49. My spiritual wellbeing or practice has been improved by knowledge or care I received from my community.
	51. Gardening and/or farming have helped me develop deeper spiritual practices.
	52. Growing food has helped me to feel or be more connected to my ancestors.
Ubuntu / Interdependence	62. My actions do not affect other people. I should be able to do what I want.
	65. My humanity is connected to other people's humanity.
	66. My wellbeing is connected to other people's wellbeing.
	67. I make decisions about my actions based on how they might impact other people.