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Land-Grant Extension: Defining Public Good and Identifying Pitfalls in Evaluation

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Abstract

Land-grant extension is an ongoing example of higher education outreach and community engagement. Population, food, climate, and geographic isolation all factor into the importance of producing and facilitating agricultural knowledge. This qualitative study took place in a geographically isolated region with potential food security issues to highlight the function and role of agricultural extension as a provider of public good. A key component of the study includes the limitation of evaluation methods in documenting extension as a public good.

Introduction

The flow of knowledge between researchers and practitioners is an essential component of higher education's contribution to society. Researchers learn from practitioners, develop new forms of knowledge and innovation, and then extend the knowledge back into the practitioner community. Although knowledge extension occurs in many forms, agricultural extension represents the first type of extension utilized in U.S. higher education. The study for this article took place in the setting of agricultural extension work, which is a very broad category that includes a robust number of programs and topics. As a result, the terms extension, agricultural extension, and cooperative extension are used interchangeably. They are all meant to identify the work of connecting university-based research and service with the surrounding community. Land-grant agricultural extension is a crucial element in providing education for the agricultural sector, both formally and informally, and connecting research-based developments to farmers. Through agricultural extension, the development of land-grant institutions eroded the elitism of the ivory tower. With this erosion, universities were connected to food-producing communities in new and innovative ways and were recognized as providing broad public benefits.

For several decades, critical theorists have maintained an argument for the centrality of the university as a producer of public good through the performance of research and the exchange of critical perspectives *(Marginson, 2007; Pusser, 2006; Slaughter & Rhoades, 2004)*.

Public good is generally defined as the well-being of society or a benefit thereunto. Articulating the centrality of the public good mission proves to be an easier task than understanding the degree to which the mission is being fulfilled. According to Bowen *(1977)*,

> The outcomes from research and public service cannot be measured with any precision, and so conclusions will inevitably be subjective and judgmental. It is possible, however, to describe these activities in some detail. Indeed, a mere recital of them strongly suggests they yield important benefits. *(p. 291)*

The results of this study reflect three guiding questions: (1) What is the perception among extension faculty and community partners regarding the purpose, function, and potential for public good of agricultural extension? (2) What role does evaluation and assessment play in a sector that was developed for broad public benefits (a notoriously difficult mission to measure)? (3) How is value understood and described as it relates to the impact of extension programs? The findings of the study include an in-depth description of the function, value, and perception of land-grant extension and the role it plays in producing public benefits. Furthermore, this article demonstrates the pressure to assess and evaluate the most crucial component of extension (public good), which is in fact difficult or even impossible to measure with precision.

Due to the difficulty of measuring public good, it is a challenge to frame higher education's social impact in broad terms that validate collaboration and partnerships with other institutions and individuals. It is also a challenge for higher education institutions to act in accordance with a mission to serve society. Wider recognition of a narrative reflecting higher education's support of public good has the potential to increase retrenchment in public support with implications for financial, political, educational, and civic sectors of higher education and society *(Kezar, Chambers, & Burkhardt, 2005)*.

The agriculture sector, universities, and many other operations are faced with pressure to do more with less. Growing populations (which increase the need for food production) and increasingly scarce water resources have led to the phrase "produce more crop with less drop." Funding reductions from state and federal sources are placing budgetary pressures on public land-grant universities. At the same time, all aspects of the university, including all forms of extension, are being asked to produce evidence to demonstrate

their value. The assessment movement is a reality for all aspects of the university, and especially for units with diverse sources of funding, like grants and guaranteed federal funds. This study considers the intersection of the public good mission and the pressure to evaluate and substantiate value.

Qualitative methods were used to examine the role and impact of agricultural extension as a public good in a state with high levels of food imports and to understand how partners in the community (typically farmers) and university faculty perceive the work of extension. Hawai'i presents a potentially significant food security scenario, as 90% of the food in the state is imported. This situation makes Hawai'i a good location for studying the intersection of land-grant extension, public good, and the ability to evaluate or measure public good.

The design of the study involved 52 individual interviews as well as 24 site visits to farms, extension offices, field days at demonstration farms, and other relevant locations. In an era of austerity, this study investigated whether evaluation methods effectively determine and communicate the broadest and deepest benefits of this historical mode of education. Although the parameters of this study focus on a particular model of extension, the findings may be useful for multiple modes of extension and university outreach that are focused on providing public benefits. Findings from the study are organized around the following themes: the perception and function of extension, evaluation, understanding value, and the future of extension. Collectively, these categories highlight the challenges facing extension as a component of the public land-grant university.

Literature Review

Public Good

The notion of public good(s) or contributions are contested and considered problematic, as the notion shares space with common good and public interests *(Mansbridge, 1998; Pusser, 2002)*. Marginson *(2012)* distinguished between public goods (plural), public good (singular), and the public sphere. Public and private goods are objectivist economic terms, distinguished in character by Samuelson *(1954)*. Whereas private goods are benefits accruing to an individual, public goods are free of exclusion and rivalry, which means they can be consumed by an infinite number of people without being depleted (e.g., clean air or comprehension

of a mathematical theory). Information and knowledge are public goods produced in higher education, the latter of which has been identified as an almost pure public form *(Stiglitz, 1999)*. The notion of public goods is more closely associated with social rates of return *(McMahon, 2009)*. For example, Plastina and Fulginiti *(2012)* estimated a 27% rate of return on public agricultural research in the 48 continental United States. The percentage is a return on investment in the form of publicly available goods.

Public good (singular) is more normative and collective in emphasis, a wide-ranging concept that is covered and maintained by various literatures *(Calhoun, 1998)*. The singular public good is often linked to higher education as a process of democratization and human development *(Marginson, 2012)*. For example, if higher education plays a role in promoting public good, it ought to be open, equal, and purposed for a larger community beyond colleges and universities. In the case of land-grant extension, a primary purpose is to serve the agriculture sector and the broader population that ultimately receives food from that sector.

Habermas *(1989)* located the public sphere as a forum and space for civil discourses—spaces where people meet, communicate, and form opinions on contemporary issues. Higher education has served as a medium for public transformation and a space for debate and contention (see broadly *Rhoads, 1998*). Pusser *(2002, 2006)* argued for continued attention to the preservation of the university as a public sphere, especially in the wake of political and economic forces that shape higher education. Increasingly restricted space for dialogue and open exchange of ideas are symptoms of deeper problems that undermine the potential social and cultural contributions of the university *(Rhoads, 2011)*.

With limited ability to measure public good, the value of and any consensus around higher education as a public good occur in public perception, policy, and debate. Various conditions affect the degree to which public good and goods emerge in higher education *(Marginson, 2012)*. Pusser *(2002)* identified the land-grant movement as an often-cited condition that promotes public good through public investment in higher education. Land-grant institutions widened the scope of university disciplines to perform research and apply its results, which led to a social contract for research *(Feller, 2000; Pusser, 2006)*. With resources and a broad sanction from the federal government, a set of institutions began producing research for the common good and trained teachers, civil servants, engineers, and agronomists. However, the evaluation and perception of university connections to public good present a problematic nexus

and a central issue for the study of land-grant extension. Franz *(2011, 2014)* wrote extensively about the history and function of public good and the need to articulate its value. Although accountability, evaluation, and the political process are essential to public good, they constitute an imperfect apparatus for recognition. The difficulty associated with recognizing the collective benefits created in higher education (e.g., agricultural extension) can render them "invisible, undefended, and underfunded" *(Marginson, 2012, p. 16)*.

Higher education institutions need a "larger purpose that underpins their existence" *(Marginson, 2012, p. 8).* Publicly owned institutions are more open to democratic policy involvement and are more likely to practice a collective approach *(Marginson, 2007)*. Given that hierarchy and market competition tend to produce private goods and that public goods can be appropriated to private goods, the public nature of higher education is in question. There is an ongoing need to measure public benefits and to communicate the macro historical impact of higher education that has eluded a clear definition. Today, assessment and evaluation are the accepted approaches to measurement.

Land-Grant Extension

The Morrill Act of 1862 granted federal support to states in order to develop college curricula that included agricultural instruction. Over time, the state land-grant colleges and universities evolved into new types of universities. These institutions developed the ability to deliver practical instruction and services as promoted by populist and egalitarian advocates in the nation. A second Morrill Act was passed in 1890 to provide additional support and to include previously excluded populations.

The land-grant idea is connected to a shift in access from the privileged to the working class, a transformation in the curriculum from the liberal to the useful, and a reorientation in purpose from theoretical knowledge to applied knowledge. However, land-grant institutions have also produced unequal benefits along racial and rurally segregated lines. Funding inequities for Historically Black Colleges and Universities (HBCUs) have been extensively chronicled and criticized as the antithesis of the purpose of land-grant institutions *(Berry, 1977; Collins, 2012; Hightower, 1973; McDowell, 2001)*.

The land-grant model flourished with its tripartite emphasis on instruction, research, and extension: the idea of making the production of knowledge created through research available to the

surrounding community. In 1914, the Smith-Lever Act created the Cooperative Extension Service. The act did not invent the idea of extension, as institutions that were given land grants in the 1862 and 1890 Morrill Acts began extension work soon after they were established. According to Hightower *(1973)*, the extension movement was a reflection of a need to

> [t]ake the teachings of the college and the research of the experiment stations directly into the rural areas for the benefit of the people there… to go to people where they were, to help them solve problems they were facing in their work, in their homes and in their communities. *(p. 13–14)*

In the field of agriculture, this movement consisted of applying the scientific approach to farming. Bogue and Aper *(2000)* noted that this new connection resulted in increased agricultural productivity. Extension implemented appropriately is an effective way to engage the community and fight rural poverty *(Mayes, 1992).*

Berry *(1977)* described the purpose of the land-grant institutions as one that combines agriculture and education to preserve the land and the people. There is a growing perception that land-grant institutions have abandoned their initial role of providing education to the working classes and connecting research and service to rural communities to instead serve the interests of agribusiness *(Hightower, 1973; Young, 2001)*. Institutions that try to mirror elite research institutions and focus less on the diffusion of knowledge or cater to large businesses that provide significant funding are susceptible to critique. Even amid criticism and mission threats, the land-grant extension function is incredibly unique in the history of higher education and maintains the highest levels of knowledge diffusion and outreach of any college type in existence today.

The role of the land-grant institution is deeply connected to the ways in which postsecondary institutions can contribute to society. Marginson *(2012)* asked: What greater good would be lost if higher education ceased to exist? The answer lies in the connection to public purpose. Public good should tie universities into a larger process of democratization and human development and avoid "empty self-marketing claims about the social benefits of education or research with no attempts to define, identify, or measure the alleged benefits" *(Marginson, 2012, p. 9)*.

According to McMahon *(2009)*, the largest and most important social benefit of higher education emerges from the creation and

dissemination of new knowledge. Often, research results and new knowledge cannot be absorbed, utilized, or implemented without specific and extensive training. The impact of agricultural extension is a key component of the land-grant contribution to public good. However, this benefit is most often captured in macrolevel studies as opposed to program evaluation, as demonstrated in the following section, which also explores the centrality of extension.

Evaluation and Assessment

Agriculture is an avenue in which land-grant institutions promote economic growth. As a vocational sector, agriculture is the primary source of income for roughly 2.5 billion people in the developing world *(FAO, 2003)*. The poorest half of the population benefits more from agricultural growth than any other economic sector *(UN, 2008; World Bank, 2007)*. Despite macrolevel evidence for the impact of agriculture, there has been a decline in public spending on agriculture since 1980 *(Akroyd & Smith, 2007)*.

Agricultural extension can positively contribute to the welfare of farmers and other people living in rural areas *(Alston, Wyatt, Pardey, Marra, & Chan-Kang, 2000)*. Anderson *(2007)* noted that agricultural extension is a set of organizations and activities working to support engagement in agricultural production to "solve problems" and harness information and skill so that people can "improve their livelihoods" *(p. 6)*. The central focus is to increase farmers' productivity and income. Extension can increase the pace of knowledge and technology transfers and assist in improving farm management practices *(Feder, Murgai, & Quizon, 2004)*. In addition, extension services are crucial components in the two-way information flow between farmers and scientists *(Anderson, 2007)*.

The current economic condition in the United States, competing government bodies, increased privatization, and a negative political climate all present serious threats to the future of extension *(Hoag, 2005; King & Boehlje, 2000)*, despite its impressive returns. For example, agricultural productivity increased about 2% per year in the latter half of the 20th century. Even without increasing inputs, output increased by 150% over this 50-year period *(Hoag, 2005)*. Although this productivity was financed with tax revenue, the recognition of such high returns is sparse and disconnected from the assessment and evaluation movement.

Waddington, Snilstveit, White, and Anderson *(2010)* noted that rigorous impact evaluations of agricultural extension programs are infrequent. This infrequency is due to the complexity

of assessing interventions that include a wide range of factors that impact agricultural outcomes (e.g., climate/weather patterns, input and supply costs, market trends, and farmer aptitude). Alston et al. *(2000)* compiled a comprehensive review of the economic returns to agricultural research and development. Results of the analysis demonstrated an average rate of return of 47% for research and extension investments, with a higher rate for extension-only investments (80%). As with many extensive reviews, the methodology of the studies is wide-ranging, highlighting the difficulty of assessing influence for interventions with no comprehensive, collaborative framework or method.

In comparison to extensive rate of return analysis and meta-analysis, the institutional level of evaluation and assessment presents a more microlevel view of extension. Program-level evaluation is a determination of the extent to which programs achieve their goals and objectives. Program evaluation is also used to assess merit or worth. The idea of merit includes providing stakeholders (e.g., politicians, government officials, university officials, and community members) information that will contribute to evidence-based decisions about extension's present and future status *(Worthen, Sanders, & Fitzpatrick, 2004).* In practice, Douglah *(1998)* noted that it is important for extension professionals to recognize the importance and complexity of program evaluation in a way that moves beyond postactivity surveys, but also involves asking questions about program design, how information is delivered to its intended audiences, and the extent to which the program is producing desired results. Given the attention placed on validating investments, public officials, donors, and administrators are expecting more formal program evaluations. Douglah *(1998)* noted, "The more resources (time, energy, money) you invest, and the more critical thinking processes you employ, the more formal, and consequently more credible, your evaluation will be" *(p. 3).*

The extension logic model includes the following components: (1) inputs: staff, money, and partners; (2) outputs: activities and participation; (3) outcomes: short-, medium-, and long-term changes in behavior or action that produce a change in results *(Taylor-Powell, Jones, & Henert, 2003)*. The highest standard for assessment and evaluation is to be outcome-centered. The highest level of achievement for assessment and evaluation is to be outcomes-centered, as opposed to inputs- or outputs-centered. This standard, however, is the most difficult aspect of any evaluation, as it involves demonstrating a causal relationship between a program and a result.

Although the evaluations noted in the preceding paragraphs focus on extension, a variety of internal and external pressures are calling for evidence to "prove" the impact of investments in higher education programs. Legislatures and government agencies are increasingly observing institutional practices and then becoming involved in institutional decision making. This shift is true not only for extension, but in many programs and departments at higher education institutions. The larger issue at stake for extension is the distance between measurement tools and recognition of a contribution to public good.

Methodology

This qualitative study used qualitative tools to better understand the role and value of extension. Case studies are typically explored within specific parameters and help elucidate details of the site that may be applicable to other settings *(Yin, 2003).* This case is about agricultural extension in Hawai'i, an isolated state that imports 90% of all food. Given Hawai'i's potential food security risk, the value of knowledge produced for the agricultural community is extremely relevant, making the island state an ideal setting for the study. In this setting, agricultural extension agents at the University of Hawai'i at Mānoa (UHM) and farmers played the largest role in the knowledge exchange and were the primary participants in the study. On a global level, Hawai'i may be a microcosm for examining the role of agricultural extension in places that are highly dependent on imports and therefore vulnerable to the adverse impact of natural disasters and economic instability of food prices. The methodological emphasis is on the voice of the participants, and the primary intent is for their words, descriptions, and frameworks to build a perspective on the role of extension, evaluation, and the essence of public good.

Given that perception and understanding are key elements of realized public good, the research questions are as follows: (1) What is the perception among extension faculty and community partners regarding the purpose, function, and potential for public good of agricultural extension? (2) What role does evaluation and assessment play in a sector that was developed for broad public benefits? (3) How is value understood and described as it relates to the impact of extension programs? Given the first research question, the relationship between the university and the community through the role of extension in the life of farmers and growers was a large focus of this study. As a result, the participants in this study include both faculty and farmers. University faculty included

instructors, researchers, specialists, and extension agents. Each farmer quoted in the study has been involved in some way with extension services. This study was approved by the Institutional Review Board.

Data Collection

Using qualitative methods, a variety of sources of evidence were used (e.g., direct and participant observation, interviews, and document analysis). Over the course of 7 months, a total of 52 interviews were conducted at multiple locations. Thirty-six interviews were conducted with university faculty (agents, specialists, researchers, and instructors). All participants were asked open-ended questions about the nature of their work and the value of extension. Interviews were recorded (with permission) and transcribed verbatim. These interviews coincided with 14 visits to extension offices, field experiment stations, demonstration farms, and other relevant locations in every county of the state. Field activities included 10 farm visits, interviews with 16 growers, and conversations with another 10 growers at field day events at demonstration farms. Two of the farmer interviews were recorded (with permission) and transcribed verbatim. Recording was not feasible for the other interviews due to their settings. For example, speaking with many of the growers required on-the-farm activities like cleaning onions, pulling cabbage, or walking through fields. These farm visits were also considered participant observation. During the visits, handwritten notes and memos constituted the data collection method. Multiple visits to farms helped to establish rapport, and careful attention was given to respecting the busy lives of farmers. To better understand how participants construct reality and think about the topics presented, each interview was flexible in format. Each participant was assigned a coded designation (e.g., A1) to maintain anonymity.

Analysis and Trustworthiness

The data analysis procedure used in this study was cyclical in nature, as it was "organized chronologically, reviewed repeatedly, and continually coded" *(Creswell, 2003, p. 203)*. Pattern analysis was utilized to identify major patterns within the findings and match them with predicted patterns *(Yin, 2003)* based on the frameworks mentioned in the literature review. These frameworks centered around the concept of public good as it relates to the role of extension and evaluation. All interview transcripts, field notes, and

memos were uploaded to a qualitative coding program (Atlas TI) to apply the consecutive rounds of coding and to organize the emergent patterns. The analysis involved "sorting out the structures of signification" *(Geertz, 1973, p. 9)*.

Throughout the data collection and analysis process, various measures were used to ensure the trustworthiness of the findings from the perspective of the researcher as well as the perspectives of the participants. The first measure, triangulation, is evidenced in the multiple vantage points within the case study. Triangulation is the use of multiple theories, data sources, and methods to evaluate a phenomenon *(Denzin, 1970)*. Denzin identified three types of data triangulation (time, space, and person), all of which were applied in this study. The central focus of the study was evaluated at different points in time, with participants holding different roles and perspectives, and in various geographic locations.

Finally, discrepant findings running counter to the themes are presented as part of the inductive analysis strategy. Faculty and farmers from various backgrounds typically provide perspectives that do not necessarily coalesce. The analysis included a search for discrepant responses. The presentation and discussion of contrary information adds an element of authenticity to this investigation and allows a better reflection of the complex reality of different perspectives.

Findings

Four dominant themes that are relevant to the research questions emerged in the interviews. The following sections cover the perspectives on the role and function of extension, evaluation/assessment, value, and the major challenges for agriculture and extension. Each theme represents the sentiments of faculty at UHM and farmers around the state. Thick, descriptive quotations are used to highlight each theme in the findings.

The Role and Function of Extension

Although university extension has a long and notable history (largely due to the land-grant legislation), the role of extension is often unclear. This absence of clarity exists not only in the public's perception, but also within university communities. Public land-grant institutions' connections with their original mission range from strong to vague, with the latter reflecting a focus more on the historical record than current institutional identity. Given that public good relies upon recognition, the lack of clarity about this

historical sector is a foundational issue for conveying a primary benefit of extension. One university extension employee noted:

> I'm an extension agent. And [people] ask, do you teach classes? Are you a professor? No, I'm not a professor.… Although I do a guest lecture now and then, I'm not a lecturer. I kind of do research but it's hard to describe what extension is. People ask, what is extension? I love it, though, because I have one foot in the academic world here and one foot in the real world, I guess, out of the ivory tower, and kind of go back and forth between the two.

The role of a university is typically perceived as an environment where students obtain a degree that leads to more income and a better life (an individual return on investment). However, extension has such a strong community connection that it often exists outside the typical conception of the role of a university. When the role of extension is considered minor or is overlooked, the gap between the "academic world" and the "real world" is larger.

Extension agents and specialists characterized extension as a unique space that connects academic knowledge with practical purposes. One extension agent noted:

> The whole idea of extension is that there's always information here at the university that people out there need. However, with so much information out there, people don't always know what they want or need. So they have somebody that comes along and can actually just spell out for them or be able to analyze their problem.… I like it because it's taking all of that research and actually putting it to good use.

Another agent said, "We translate scientific information into usable information for the general public and that's a fairly unique service provided by cooperative extension.… Other state agencies do have people out in the field but they tend to be regulatory" (A1). Extension is a university-based service, funded by the public through tax revenue. However, as noted by the agent in the preceding quote, there is an important distinction between university extension and state agencies that have a regulatory function. Several farmers in this study noted how the extension agents actually helped them deal with what they described as "overbearing"

regulatory challenges that threatened their ability to function in a way of life that has very small financial margins. This benefit is yet another one that may be difficult to capture or categorize.

In terms of public good, both the generation and diffusion of knowledge are key claims for higher education *(Marginson, 2012)*. Many universities are focused on harnessing knowledge for patenting and profit *(Slaughter & Rhoades, 2004).* Several of the faculty with extension duties noted that research products from public universities "should be in the public domain." One extension agent observed, "We don't sell knowledge—we are not crop consultants." This approach fits within the notion that knowledge creation at public universities should be used for public good, as advocated by Marginson *(2012)* and Pusser, Kempner, Marginson, and Ordorika *(2012)*. Slaughter and Rhoades *(2004)* described a public regime that stands in opposition to the academic capitalist regime. In the case of extension, funding is increasingly scarce for many projects and staff hiring. In the academic capitalist regime, diversifying revenue through patenting and privatizing is a rational response. However, given the history of diffusing knowledge from public universities, one extension agent explained:

> I know we've been under pressure a lot to patent stuff. My own philosophy is I'm not going to patent anything. It is government money and my role has always been to transfer that information.… If it [patenting] becomes the job—I just can't see myself doing it.

Another faculty member noted:

> Every database we've ever produced, we have made available on the web for free.… I don't care if they say it's from us. It's out there. It's yours. That's why we put it up on the website. It's not hidden from anybody.

This sentiment reflects the majority response from faculty, demonstrating their opinion that the university operates within the public good framework. One discrepant response to the general public good regime approach of diffusing knowledge was the previous patenting of new conventionally developed varieties of taro, a meaningful crop to the native population. Following the patenting, farmers and natives protested until the patents were relinquished and any revenues were returned to the growers.

Food producers (including farmers, ranchers, and fishers) have to fulfill many roles in their line of work. One vegetable grower noted, "A farmer has to be an entomologist, know soils, and be a mechanic, plumber, marketer, an expert on land and water rights—a jack of all trades." This need to be a "jack of all trades" was attributed to the small financial margins in food production and the inability to hire someone to complete a specialized task. Accordingly, the more farmers have to do, the more areas extension agents serve. One agent explained that what "a lot of people don't realize is that we don't specialize in one particular thing." Although many have an emphasis on fruits, vegetables, landscape, or livestock, according to the same agent, "that is just where your emphasis is—you have to know how to do all the other stuff, be multifaceted and able to answer all of the questions, not just in one particular crop or another." Field visits included accompanying agents for a day's work, allowing observations of many of these multifaceted requirements. On one particular day, an agent visited a farmer's home to consult about new crops to plant, then drove out to the farm for some observation, picked up items from an agricultural supply store that had been requested by participants in a beginning farmers program, evaluated pest damage on another farm, and collected soil samples from another farm. These experiences provided a brief but important insight into the varied work required of the agents and the connection to their constituents—an essential element in the overall description of the role of extension in public good (as indicated in the quote from *Bowen, 1977* in the Introduction).

Limitations in Evaluation and Assessment

As noted in the literature review, evaluation and assessment is a key component of publicly funded programs—especially in education. When asking extension agents if and how they are required to measure their outcomes and evaluate their impact, they all said yes and affirmed the difficulty of executing this task. For example, one agent responded, "It's really hard, because the growers also forget quickly. You solve their problems and they're happy and then they have another one, right? Even if I solved that one, they are always spreading fires."

Other agents noted that the complicated nature of evaluation is an ongoing issue and that as their personnel numbers are decreasing, the pressure to evaluate is increasing. Time spent evaluating also equates to time spent away from the field. Expertise in evaluation was also noted as an issue because *outputs* are often

being measured as opposed to *outcomes*: "'How many journal articles did you produce? How many people did you contact? How many workshops did you put on? How many people showed up?' Only now are we, relatively speaking, starting to measure impact." Ultimately, frustration or even confusion was evident. The descriptions from growers, community stakeholders, and extension personnel strongly indicated a diligent work ethic, transfers of knowledge, and receptive partners in the agricultural community. However, ultimately, there are shortcomings in finding ways to evaluate systems to prove what was happening:

> The last three years have been difficult trying to qualify major deliverables.… The challenge is figuring out how many people adapted the technology. For example, I did a workshop Saturday for teachers who wanted to benefit from incorporating aquaponics in school gardens. So I gave a presentation to 50 teachers. I don't know how many are going to adopt or utilize what information I gave them. I know how many people contact me. I do site visits. I gave the information to 50 people, but I don't know how many people are going use it.

More methods of evaluation are becoming available, as evidenced by logic models and an increasing number of conferences to train evaluators and share ideas. A key point made by the extension agents (and noted in the literature) is that assessment requires both time and resources. There may be a law of diminishing returns in terms of how much expertise in evaluation should be required for programs that are already functioning in financially austere environments.

Evidence from the literature demonstrates that when adding a new technique, technology, or piece of knowledge to the growing environment, better practices should yield better results. The complications of attributing a growth in production, change in health benefits, or increase in income are extensive. An agent explained the difficulty in these terms:

> It's really hard because the growers aren't willing to disclose financial information. It is hard to track even a change in knowledge. If you see them adopting some of the things that you're recommending… I think I'd take that as a sign. If they didn't see value in what we were doing they wouldn't show up and they wouldn't modify

> the things that they're currently doing unless there's some increase in production or there's some benefits to them that makes sense.

A change in behavior is a key sign of impact on outcomes, but formally documenting such a change remains difficult.

The issue of cause and effect further complicates measurements of change. Even if growers alter behavior, other third-party factors like farmer ingenuity and knowledge are not typically accounted for in evaluation logic models. In addition, there are considerations of immediate and long-term impacts. The longer the outcome is measured, the more difficult it is to capture and isolate cause and effect. An agent at UHM expressed confidence in extension's influence and noted:

> We believe we have no way of proving this; it has to do with the readiness of our clientele. People have the skills, so here is an anecdote. You might be 25 years old, a mother of three or four kids, single parent and in a domestic violence situation, you come to our class, our group sessions, and you do very well but you don't use it but until five or six years down the line when you're ready. If you have those skills, you can start budgeting and purchasing.

One purpose in evaluation is to be able to make evidence-based decisions and to avoid mistakes and repeat successes. However, the general feeling from those participating in the study is that the call to evaluate is complex, difficult, and may not actually capture the best aspects of extension services. This challenge is further explored in the next section on the theme of *value*. One discrepant response from the aversion to the requirement to evaluate was a small group of agents and one farmer who advocated that there must be some way to know what programs and forms of outreach are effective. Although crude, standard evaluation and logic models were considered by the minority of participants to be an imperfect but necessary tool.

Value and Impact as Public Good Descriptors

The question of value in terms of agricultural extension moves beyond the methods of evaluation. All food producers in the region deal with different challenges with respect to weather conditions, elevation, pests, and resource levels. Furthermore, farmers vary in

their experience levels and prior knowledge. When there is a new pest or problem, a new farmer, or a new technology or product to be introduced, extension has the largest impact. For example, one medium-sized aquaponic fruit producer noted that when they first started the project, they killed all of the crop twice and the fish once.

> The plants were dying… I thought it was too hot in here [the greenhouse]. He [the extension agent] took samples and did tests and came back and said it was pythium and we were kind of like, "What the hell is that?" It is a root fungus that comes with the plants. If it is in the soil it is minor, but when it hit the water it just goes everywhere, so it was killing everything. So we were pulling our hair out. We killed the plants twice and he says you can put potassium silicate in it. We tried it and instantaneously there was no longer a problem.

This particular farmer was producing high-quality fruit, expanding to a third large greenhouse, and selling everything he grew. The farmer noted, "I do not know what we would have done without the extension services."

A tea grower noted that tea is a relatively new crop for the region, and working with extension was a very collaborative "two-directional process" with lots of information sharing between extension and the farmers. Given the newness of tea, the transfer of knowledge was key when trying to generate an entirely new industry. The demonstration farm with tea, central location to coordinate the facilitation of knowledge, and increased collaboration created a new industry with greater ability to process and sell. A well-known medium-sized lettuce grower commented at length about how his view of extension changed as he saw the value emerge:

> I have been farming all of my life and have been aware of the extension service for 35 years. There is a general feeling from other farmers that the extension service is not all that important. This is a negative feeling toward extension asking, "How do they know anything? After all, they don't farm themselves." I had this feeling at points in my life as well. The key to success is "learning after you think you have learned everything." Today, my feeling about extension is very different; I now think it is

> very essential to the success of agriculture. My negative feelings were because of the academic versus practical division. How could they help a practical farmer when the two worlds cannot mesh? I am a product of a new generation and see how critical extension is to offer an academic perspective, especially for farmers who did not get that kind of education or background. Extension is important as science advances.

The researchers asked the same grower how extension might be better, and he mentioned that it "depends on the client base" and expanded more on the valuable role agents play in the life of a farmer:

> Utilizing extension services can help tackle a problem more quickly with more people working on it. Those who do not are missing out on a valuable resource—for whatever reason they are handicapping themselves. The labs, entomologists, and other things are a problem-solving department that enhances efficiency exponentially.… There are so many products now, if we can shorten the learning curve, that equals money. I hope others can see the value and importance of the future. When we have to produce more food on less ground with rising costs, it will be a challenge, and we need every advantage, which includes extension services.

This farmer's extensive commentary highlights the role of perception among stakeholders as it relates to recognizing the value in extension services.

Many more examples of the value of extension emerged in this study, including the implementation of aquaponics programs in prisons and hospitals to engage prisoners and patients in a healthy and prosocial activity that created more sustainability for the institutions. There were multiple examples of extension agents demonstrating how a $25 soil test saved farmers a great deal of money by reducing fertilizer purchases. A demonstration at an experiment station addressed a new issue for tomatoes in the state. An extension agent described the purpose of the event:

> New viruses and new diseases come in and we had to team up with some other researchers at UH and the specialists and come up with a plan 'cause growers weren't

> able to produce tomatoes like they were I guess before the virus came in. So, there's a team that works together on this tomato leaf curl virus and we contacted seed companies. We were able to bring in some seeds from the mainland, put a few trials in, and then turn around very quickly to have a field day so that growers were able to see that there were resistant varieties available and that they could modify their operations to combat this virus with some other resistant varieties in addition to their commercial type of operations. So, it's a good partnership between the extension guys, the research guys, and then we also keep in communication with the statewide agent so that they know what we're doing and so they can spread the word to their growers.

Tomato growers in attendance expressed their appreciation for the event and left with information and samples to take back to their farms. Other examples with high degrees of value where extension reached out to the community included health and diet promotions, home gardening programs, and other diverse services.

One discrepant response came from a farmer working on one of the larger organic farms in the region. The grower noted that too many extension agents exclusively work with large, conventional farms. In response to requests for assistance, the farmer indicated that a grant would need to be secured to initiate a project on his farm. This grower said, "How many times do we have to pay for this service? We pay for the institution through state taxes, the land-grant work through federal taxes, and now in order to do an experiment on my farm, there needs to be another source of funding?" Despite the complaint, the farmer worked very closely with and was supportive of an extension agent who dedicated his time to organic methods.

The value of extension is deeply connected to the idea of higher education as a public good that provides social benefits. For example, one extension specialist contrasted the nature of the public versus private model in relation to value:

> [In] private models, you go get your own money, work on patents, and the focus on universities is to generate patents and generate products to run on.… The role of public institutions is to produce public research and address those questions that are going to impact the public life, quality of life, and things that private

> industry is not going to address because there is not an immediate return on investment.… That is the role of public institution, public research, that's why we exist. We're supposed to do stuff that is potentially high impact with potentially low short-term returns, that's what we're here for.

Considering the function of agricultural extension to represent and contribute to public good, the specialist's comparison to the role of the private sector is poignant. Perhaps the most valuable aspect of land-grant extension lies in its ability to provide something that other institutions will not provide.

Challenges and the Future of Extension

The previous theme leads into two related challenges: food security in the state and reductions in resources for the extension program. Food security for an isolated and heavily populated chain of islands is a tangible issue. According to food experts at UHM, 90% of the food in the state is imported. In the event of a crisis that prevented the importing of food, the state has only a 7-day food supply. As a result, the agriculture sector plays a major role in the balance of locally produced versus imported food. Extension agents work promoting new approaches for attracting more people to agriculture, especially in the midst of attrition among farmers:

> Things keep changing as a farmer. There's always these new pests, new chemicals to deal with the pests, new techniques, the laws change. All of these things, for a small farm in Hawai'i, are overwhelming.… If you lose one or two crops in a season, that could be the end. The margins are too small and it makes it harder to survive as the costs of fuel and fertilizer go up and the profit margins go down.

Food production and security have much to do with economy of scale, according to one faculty member. Whenever it is less expensive to produce food somewhere else and ship it to the islands than it is to grow locally, consumers will favor the import. Until this cost difference shifts or a major crisis occurs, it is unlikely that the import balance will be altered. Nevertheless, extension personnel closely monitor the agricultural production capacity of the state and the potential challenges around food security, and food production is promoted. It is difficult to estimate the impact of a

service in light of a hypothetical crisis. However, the more pressing the issues of food security and local production become, the greater extension's potential usefulness.

For extension to support these immense challenges, investment and resources are necessary. As noted in UHM annual reports and in interviews with faculty and farmers, with the reduction in funding, the number of personnel in the state has gone down. One faculty member noted:

> The place of extension is something that has been especially called into question in the last few years. It's one of these areas that when there are serious budget cuts, extension is kind of pushed to the forefront.… We've lost a lot of extension faculty and it has had some pretty dramatic effects on how we operate.… We are struggling to figure how to continue to serve clients who have come to depend on us in the past and reach out to new clientele, with changing demographics in the state and changing needs.

Six of the farmers in the study made note of the reduction in extension personnel. The farmers were able to cite how many people were working in the field 5 years ago, compared to how many are available now. Retirements have left unfilled positions, and faculty have taken on additional duties. Many specialists divide their duties between research, extension, and instruction. One specialist echoed the response of several others: "My duties are 65% research, 15% extension, and 20% instruction, but in reality, it is chaos because extension requires 100% of my time."

The last facet of the challenges presented involves the perception of extension by various constituencies, including university officials:

> I would say a majority of the university does not know or understand extension very well, and sadly that includes many of our upper administrators. I think that's probably a common complaint in most land-grants with a larger mission. Let's face it, most people and most colleges here [UHM] do research in addition to instruction and then have some kind of service component as expectations of their faculty, but really nothing quite like extension.

Beyond the boundaries of the university, the recognition of the role, function, and value of extension is crucial. The social benefits that emerge from the land-grant mission and the university role in public good are fully realized only when public perception exists. This challenge is major—extension is a facet of the university that provides some of the highest returns on investment but is often underappreciated and faces major funding reductions.

Discussion

In response to the research questions, the collective responses from extension faculty and farmers indicate that there is a nexus among the issues of perception, purpose, and public good. Assessment and the notion of value further complicate the state of land-grant extension in public higher education. There is a conceptual mismatch between the original mission of extension and the highly prescribed evaluation methods that attempt to measure the impact and value of this long-standing public good function. Measuring a function with a limited tool can produce detrimental results for universities and their programs. Consider the narrowly focused rates of return analysis used by the World Bank to measure higher education in developing countries *(Collins, 2011)* and the subsequent acknowledgment of its failure to capture the impact of broader benefits *(TFHES, 2000).* Funds had already been cut, and universities were saddled with massive challenges by the time policy makers acknowledged and reversed the economically uninformed analysis.

The extension agents' observations about the perception and understanding of extension demonstrate a problem in the recognition of this public-oriented university service. The pressure to evaluate extension programs with narrow tools may exacerbate this problem and contribute to a greater disconnect from realized public good. The pressure was also reflected in comments from extension agents. However, most of the farmers involved with extension described, in detail, the ways in which they value and have benefited from agricultural extension. In turn, they are able to continue with local food production in a state that imports a vast majority of food. As opposed to a mere recital of the significant benefits, this analysis demonstrates an important disconnect for an increasingly pressed aspect of higher education. Decreased funding, staffing, and programs, and increased pressure to evaluate and assess impact with tools that ultimately do not capture the greatest public good is likely a looming quagmire for the progress of this historic university offering.

One hazard in the requirement to assess and evaluate is the time it takes away from performing extension and service work. Evaluation at its best can lead to smart investments of time and energy. It can help identify techniques, approaches, and areas that are most effective and others that are not working. At worst, evaluation can take significant time away from completing extension work, to the extent that the pool of evidence to evaluate decreases. The law of diminishing returns applies to extension and evaluation. Complexities in this regard can provide some caution against quickly implementing extensive evaluation systems. However, the push to evaluate is often related to funding. Threats to funding increase the pressure to adopt evaluation methods, even in the absence of evidence that such methods produce reliable results. For example, if evaluation does not adequately assess the monetary benefits achieved (as ultimately intended) or becomes another financial burden, then funding may decrease. Decreases in funding will push departments to seek funding from other places, notably the private sector. Increased influence from the private sector can drive the focus of extension away from the public benefits of higher education. The primary pitfall in evaluation is the inability to capture the public good component of extension, which is likely the most valuable aspect of the service. The degree to which evaluation should be considered useful in the future should reflect its ability to capture the public good components of extension.

Conclusion and Future Research

The history of extension demonstrates how land-grant institutions transformed the nature of higher education. The mission-based focus on breaking down the ivory tower and connecting research with practical application situates the university as a promoter of public good. Previous studies demonstrated that extension can indeed contribute to poverty reduction by diffusing new knowledge into communities that can benefit from new technology and techniques *(Collins, 2011, 2012)*. Others have found that extension services contribute both public and social benefits *(Alston et al., 2000)*. This study qualitatively demonstrated the impact and value of extension with several meaningful examples. Although food producers use extension at different levels and find the services to have varying degrees of utility, study participants indicated that knowledge diffusion enhanced the viability of food production. Its positive effect on food production capacity is exemplified by the accounts of assistance to new farmers with startup advice, solutions for dealing with pests and disease, and collaborative work

to produce knowledge about new crops for the region. In addition, faculty with extension-related duties demonstrated a strong dedication to the food-producing community and the public nature of knowledge produced at a public university. These narratives illustrate extension's high value and contribution to the community. Although direct clientele are aware of this value, the degree to which the larger university community and the public are aware is questionable. Both the growers who place a great value on the service and the extension agents who are facing dwindling resources and support described their concern with this lack of awareness. On a global level, issues of food security highlight the state of Hawai'i as an applicable case study for the importance of agricultural investment. If a natural disaster, an act of terrorism, or an economic crisis halted food imports, the state would have only a 7-day food supply. Investment in agriculture is critical to long-term food security, and the ability to prevent or alleviate a food crisis is at the core of public good. For universities, this investment should be at the forefront of the public engagement agenda.

Many of the educational and service units that are increasingly required to demonstrate their benefit or outcomes under the global assessment movement are overwhelmed with their core duties and are now faced with finding the time to assess. The role of assessment is important, but the transaction costs are high, and the validity of results is unknown. Future research could focus on the transaction costs of assessment and evaluation as well as the degree to which it captures the holistic value of the operation. Conducting a study on the public perception of higher education outreach and the degree to which public investments are seen as palatable would also make a significant contribution to the literature. Although studies have documented the difficulty in producing scholarship about public engagement *(Peters et al., 2011),* the most prominent barrier is legitimacy. Increased awareness and prevalence of publicly engaged scholarship and evaluation will aid in the substantiation of linking public good to the most prominent forms of educational outreach.

In the larger view of higher education, this particular case highlights issues that may also exist for other modes of extension (e.g., health care, sea grant, or space grant). The core of extension is related to the diffusion of knowledge for public good. In order to secure the support to offer such functions, outcomes must be documented. There is an inherent tension between the demand for accountability and the absence of reliable methods to demonstrate impact for public good. The gap between the intent and the ability to measure found in this case might be relevant to other programs

that exist to tie the university to public good. In theory, evaluation and assessment can be designed to capture information about any outcome articulated by the program; however, it is not simple to measure public good. Public good is not, and may never be, easily quantified and, according to some, can be assessed only by public opinion *(Gutmann, 1987; Heyneman, 2012).* The threat to sustained resources and funding in the absence of a recognized method of producing evidence about public benefits is the largest potential pitfall in the evaluation of university programs aimed at the public good. Potential reductions to higher education programs that generate the greatest social benefits are a threat to the public mission of universities and a misapplication of underdeveloped evaluation methods.

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