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Journal of Food Distribution Research
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Table of Contents

Research Updates:

- 1 **COVID-19 and Marketing Challenges for Food Producers in Louisiana**
Maria Bampasidou, Johannah Frelier, Marcus A. Coleman, and Carl E. Motsenbocker 1–2
- 2 **Arkansas Food Pantries and Perceived Barriers to Client-Choice Conversion**
Kathryn A. Carroll, Rachel Schichtl, and Lauren Allbritton 3–4
- 3 **Optimizing the Use of American Rescue Funds in Pork and Beef**
Keri L. Jacobs and Dermot J. Hayes 5–6
- 4 **“Growing” Sustainable Horticulture Farmers**
Marcus A. Coleman, Maria Bampasidou, and Carl E. Motsenbocker 7–8
- 5 **Cell Phone Readable Dendritic Identifiers: Applications for Secure Track and Trace in the Food Supply Chain**
Michael Kozicki, Mark Manfredo, Abolfazl Razi, and Yago Gonzales Velo 9–10

Research Reports:

- 6 **Firm Resiliency Post Economic Shock: A Case Study of Rural Wineries During the COVID-19 Pandemic**
Kynda R. Curtis and Susan L. Slocum 11–18
- 7 **What They Know and Why They Do It: Preliminary Findings of Farmer Focus Group Discussion on Value-Added Agriculture in North Carolina**
Obed Quaicoe, Roger Vorsah, Kenrett Jefferson-Moore, Jarvetta Bynum, and John Owens 19–22

8	U.S. Farmers Markets—Essential Business Survival in Disrupting Times	
	<i>Jairus Rossi, Mahla Zare, and Tim Woods</i>	23–32
9	A Gravity Model of Central American Organic Coffee Trade with the United States	
	<i>Lauren Benavidez and Tian Xia</i>	33–40
10	Impact of Remittance on Household Welfare: Evidence from the Western Region of Nepal	
	<i>Laxmi D. Adhikari and Sayed Saghaian</i>	41–50
11	Students’ Perceptions of Weight and Health Status and Factors Influencing Their Body Mass Indices	
	<i>Patricia E. McLean-Meynsse and Melissa Johnson</i>	51–58

Research Update: COVID-19 and Marketing Challenges for Food Producers in Louisiana

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Abstract

The COVID-19 pandemic disrupted the operations of many farm and food businesses across Louisiana. Producers had to adapt to changes or closures of market outlets, including farmers markets, farm-to-school programs, and restaurants. Using data collected from an online survey, this research examines pre- and post-pandemic marketing channels and challenges faced by food producers.

Keywords: food producers, local food systems, Louisiana, online survey, pandemic

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Introduction

The recent pandemic stressed local food systems. Despite the focus given to the challenges faced at each segment of the food supply chain, the pandemic allowed for re-examining strengths and weaknesses of local and regional food systems and assessing their adaptability. Shorter supply chains and economic synergies at the local and regional levels, trust between consumers and local farmers, and producer responses to challenges faced by the pandemic were some areas that received attention. Considering the variations of local food systems by locale, case studies by state or industry provide additional insight.

In Louisiana, market uncertainty and new safety protocols caused broader shocks to the local food system throughout the state. This was coupled with national seed shortages, panic buying, and reduced operations at critical processing plants. Farm operations had to adapt, with many producers relying on online platforms to sell their products, development of Community Supported Agriculture (CSA) operations, and partnerships with local institutions, food banks, and pantries.

Objective

This research examines changes in market channels pre- and post-pandemic, marketing challenges, and assistance needed by Louisiana food producers.

Methodology

An online survey was administered in October 2020, about six months into the pandemic. The 25-item questionnaire collected information on farm production, market channels, and marketing challenges. A total of 124 complete responses were collected and analyzed.

Findings

The highest response rate came from the South and Central regions of Louisiana (76%)—areas with more established local food systems and smaller farm operations focusing predominately on vegetable and fruit production. Findings reveal marketing challenges throughout the state, with 34% of the respondents requiring marketing assistance and 8% software or technology support. The top two marketing channels were direct sales and wholesale (81%, 45% responses) pre-COVID. The producers selling through direct marketing (highest value sales channel) reported mixed effects 6 months post-COVID; the ones experiencing increased sales switched to online marketing and to CSAs. Thirty-five percent saw loss in weekly sales up to \$1,000, and 15% reported no change in sales.

Research Update: Arkansas Food Pantries and Perceived Barriers to Client-Choice Conversion

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Abstract

To address food insecurity, community-based food pantries typically distribute food to area residents using a prefilled bag/box of items (traditional method), or by allowing clients to select items (client-choice method). Prior efforts have found client-choice pantries are often preferred by clients, allowing them more control and dignity over their food choices. However, limited research exists examining barriers to client-choice conversion that pantries may face.

Many pantries continue to follow the traditional model. This is especially true in Arkansas, which frequently ranks high in the nation in food-insecure households. The Arkansas Foodbank (AFB) serves as the state's largest nongovernmental provider of food aid, working with over 400 pantries. Despite efforts by the AFB to promote client-choice conversion, in 2020 only 13% of Arkansas pantries offered client-choice.

To identify perceived barriers to client-choice conversion, we conducted a mixed-methods survey sent to 366 Arkansas pantry managers during spring 2021. The survey featured questions concerning the feasibility of and potential barriers to offering the client-choice option and had a

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response rate of 36%. Following grounded theory, a thematic analysis approach was used to code and analyze responses to the open-ended, qualitative survey questions.

Preliminary results uncovered five primary themes and six sub-themes, indicating perceived barriers to client-choice conversion. These included concerns related to pantry space and location (37%), volunteer and staffing needs (35%), lack of awareness concerning client-choice options (28%), COVID-19 concerns (27%), and perceived client greed and client distrust (12%). Our preliminary findings suggest food pantry stakeholders may need additional outreach and education concerning the various ways that the client-choice method can be implemented. Our results have important implications for those involved in distributing food aid to food-insecure households.

Acknowledgment

This work was supported by the University of Central Arkansas–University Research Council under project award number 335R10.



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Research Update: Optimizing the Use of American Rescue Funds in Pork and Beef

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Abstract

The American Rescue Funds Program seeks improvements to infrastructure, capacity, and diversification in meat and poultry processing, with clear prioritization of increased competition via small- and medium-sized processing facilities.¹ The need to euthanize animals at a time when retailers were rationing meat sales was one of several examples of market failures during the COVID-19 pandemic, and the U.S. Department of Agriculture estimated the disruptions to agricultural meat, poultry, and egg production at \$15 billion based on CFAP and CFAP2 payments.² Marani et al. (2021) estimate the probability of a repeat event at 1% to 2% per year, justifying the use of these public funds to add surplus capacity and infrastructure to mitigate disruptions in case of recurrence.

Economics of scale are modest beyond slaughter of more than 125 head per hour in beef plants and 2,000 head per day in pork plants (Duewer and Nelson, 1991; Ollinger, MacDonald, and Madison, 2005). Dozens of such “medium-sized” U.S. pork and beef processing plants have survived since 2000, typically relying upon niche market connections. Given historic processing plant construction costs for medium-sized plants (Aherin, 2021) and an assumed 20% USDA grant to incentivize construction, a \$100 million expenditure on each of the beef and pork

¹<https://www.federalregister.gov/documents/2021/07/16/2021-15145/investments-and-opportunities-for-meat-and-poultry-processing-infrastructure>

² “Coronavirus Food Assistance Program 2 Cost Benefit Analysis,” September 15, 2020.
<https://www.farmers.gov/sites/default/files/documents/CFAP2-CBA-09252020.pdf>

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plants creates an opportunity to add as much as 5% additional capacity for each species, easing current capacity as the industries prepare for local and export growth.

Whether producer-ownership of capacity can generate stability and additional benefits in the supply chains is of key interest. Models of producer ownership—including cooperatives and carefully structured LLCs—allow livestock producers to capture processing margins and remove some of the price uncertainty around live animal prices to the plant and producer. It follows, too, that producer-ownership can therefore reduce the ability of existing larger plants to poach supply from medium-sized plants during the crucial startup phase and ensure that plants run at optimum capacity. A significant portion of the additional capacity added to the pork industry in the last 15 years exhibited some form of producer ownership. Anecdotally, the pork and beef sectors may be moving away from commodity production and into systems that maintain animal identity from farm to consumer. Producers have an opportunity to capitalize on this shift by collectively investing in medium-sized plants with the ability to preserve identity and be more responsive to evolving consumer preferences. An overarching concern is of the need to maintain capacity into the future and the potential of existing packers to acquire this subsidized capacity should medium-sized processing fail.

Acknowledgement

This work is supported by *Ag Market and Economic Research* (Cooperative Agreement Award 58-0111-21-018) from the USDA Office of Chief Economist and *Rapid Response to Novel Coronavirus (SARS-CoV-2) Impacts Across Food and Agricultural Systems* (Award 2020-68006-35036) from the USDA National Institute of Food and Agriculture.

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Research Update: “Growing” Sustainable Horticulture Farmers

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Various extension programs across the country offer educational and practical opportunities for new and beginning farmers. In recent years, Louisiana has experienced a boom in horticultural farm businesses managed by new and beginning farmers. Though access to land and credit are often cited as two primary challenges that new and beginning farmers face, access to market channels and business management skills are also key to building sustainable farm businesses. Moreover, strong social networks where new and beginning farmers can freely exchange ideas, network, share resources, and provide trainings are essential to the development of new and beginning farmers.

This research focuses primarily on horticulture farmers’ perceptions of business management skills and risk management. We used data collected as a part of the evaluation program for the Grow Louisiana Beginning Farmer Training Program (Grow Louisiana), an extension program offered by the Louisiana State University Agricultural Center. Grow Louisiana is a partnership of academic, cooperative extension, and nonprofit organizations to train fruit and vegetable farmers with less than 10 years of experience on small to mid-size farms in Louisiana. Focused on the southeastern region of Louisiana, the program emphasizes sustainable agricultural practices and local food systems. The year-long program offers participants training in whole-farm planning and risk management based on the following principles: (i) sustainable agriculture and business practices, (ii) resource optimization, (iii) objective decision making, and (iv) efficient work

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practices. The program trained 16 farmers per year and apart from educational training, promotes networking and mentoring among farmers across the state.

This study used a mixed methods approach to analyze program evaluation data from the 3-year program (2018-2021). The first year the program was offered in person, the second year moved to a hybrid model when measures were taken to address participant safety due to the COVID-19 pandemic, and the third year was completed mostly online. Data were collected pre- and post-program through needs assessments, interviews, and focus groups with participants. Findings add to existing literature and highlight the importance of business and marketing planning in the development and training of new and beginning farmers. Moreover, the study provides useful information for extension practices considering the variety of methods of delivery by year (i.e., in person, hybrid, online).

Keywords: business management, horticulture producers, marketing, producer perceptions, Louisiana

Acknowledgment

This research update is based upon work that is supported by the National Institute of Food and Agriculture, U.S. Department of Agriculture (Award # 2018-70017-28597).

Research Update: Cell Phone Readable Dendritic Identifiers: Applications for Secure Track and Trace in the Food Supply Chain

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This research update describes an ongoing USDA-NIFA-funded project examining the development and efficacy of cell phone readable Dendritic Identifiers for use in secure track-and-trace systems in the food supply chain. Traceability systems using distributed ledger technologies such as blockchain have been proposed to store and streamline disparate food supply chain information, ultimately aiding in identifying the location and scope of a food safety incident or case of food adulteration. The sophistication and agility of such databases means that each and every food item could be represented in the electronic ledger, coupled with information on its origin and other attributes, and electronically tracked. If this could be achieved with sufficient granularity, it could lead to rapid hyper-targeted recalls, thereby greatly reducing the economic damage and health impacts of tainted or counterfeit product. For each food item to be represented in the electronic ledger, it is necessary to have a *unique and secure physical identifier on each article*—“unique” to allow an unambiguous mapping between the tagged item and the information contained in the database, and “secure” to prevent fraudulent use of the identifier.

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Dendritic Identifiers are intricate branching patterns that cannot be replicated (similar to fingerprints or retinal images) and can serve as a secure identifier. Dendritic Identifiers can be produced inexpensively, can be incorporated with current food labeling technology, and have the potential of being placed on food items directly (without a tag). Furthermore, given Dendritic Identifiers can link to any database and are scannable via cell-phone-based technology, consumers have the opportunity to scan a Dendritic Identifier (similar to a QR code but much more secure) with a cell phone and obtain important food provenance information, such as where and when the item was picked and packed, and sustainability practices of the farm.

The multidisciplinary research team has completed tests of different substrate materials for Dendritic Identifiers that can be used in conjunction with existing food labeling technology, such as PLU stickers, as well as determined the strength of the Dendritic Identifiers to hold up in realistic use settings found in the fresh produce supply chain. The team has also advanced roll-to-roll fabrication processes that aid in potential mass manufacturing. The team is also developing an affordable and easy-to-implement cell phone reader that has the capability of scanning the Dendritic Identifiers and linking production and provenance data with blockchain databases, coupled with image identification software. Focus is also being placed on evaluating the costs and benefits of implementation, an important consideration in determining commercial viability of this technology for food safety applications.

Acknowledgement

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Research Report:
**Firm Resiliency Post-Economic Shock: A Case Study of Rural
Wineries during the COVID-19 Pandemic**

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Abstract

The COVID-19 pandemic adversely affected the wine industry in California due to mandated tasting room closures between March and May 2020, followed by restrictions on capacity through October 2020. Hence, this study examines the resiliency of wineries in minor California wine regions, including the challenges faced during the pandemic, strategies used to sustain their business, and the organizational factors that contributed to success. Results indicate that these wineries are small family-owned firms, which gives them the ability to control costs and make decisions rapidly, remain customer centered, and quickly adjust to the regulatory environment during the pandemic.

Keywords: winery, rural tourism, resiliency, economic shock

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Introduction

On March 11, 2020, the World Health Organization (WHO) declared COVID-19 a global pandemic, its director-general stating, “This is not just a public health crisis, it is a crisis that will touch every sector” (Ducharme, 2020, np). In rural areas, the tourism industry was especially impacted due to closures and travel restrictions (Cho, Lee, and Winters, 2021). In California, for example, food, drink, and other tourism providers were fully closed from mid-March to mid-May 2020. Once open, restaurants, wineries, breweries, etc., could not seat visitors indoors until October 2020. Shelter-in-place and lockdown orders in major counties in the San Francisco Bay region brought nonessential travel, including tourism to nearby California wine regions, to a halt. Thus, this study examines the resiliency of wineries in minor California wine regions during the COVID-19 pandemic and is, essentially, a case study on firm organizational factors that enhance resiliency after economic shocks.

Literature Review

The COVID-19 pandemic created an economic shock, defined as an unexpected change in the economy. Previous literature on firm-level resiliency post-economic shock provides a framework to explore the resilience of wineries in minor California wine regions. Firm or enterprise resilience is defined as the ability of an operation to return to its original state or to a new, improved state, after experiencing a disruption and, thus, avoid failure or prevent a shift to an undesirable condition (Carvalho, Duarte, and Machado, 2011).

The literature on resiliency in tourism is sparse, but there are many studies on resiliency in small businesses and family-owned firms from which to draw. For example, the elements that make an organization resilient to a crisis are the presence of social capital, training and education, adaptability, knowledge, creativity, receptiveness, and flexibility (Ahmed et al., 2004). Slocum and Kline (2014) declare that resilience should be viewed as a positive adaptive response to adversity, where actors can draw on natural, human, cultural, social, financial, built, and political capital to negotiate change. A few common factors emerge from the literature and provide a template for the organizational factors that lead to firm resiliency after an economic shock.

A short management span, specifically a small number of employees that a particular supervisor leads, is one. Sabatino (2016) finds that resilient enterprises employ a simplified structure, with an average of 8 to 10 people between top management and frontline personnel. Additionally, smaller firms often have structures that enable more effective financial management (Mzid, Kahachlouf, and Soparnot, 2019).

In times of crisis, it is no surprise that firms need to rapidly pivot their operations. Sabatino (2016) finds that enterprises that make decisions rapidly are more resilient. Firms that follow simple rules and make quick decisions are more competitive in the long term (Davis, Eisenhardt, and Bingham, 2009). Both Thomas et al. (2015) and Engeset (2020) point out that small noncomplex firms are often able to make decisions more rapidly. This allows those likely to detect changes early to possess the authority to respond quickly and proactively.

Literature on business organization states that the most resilient enterprises are those that focus on core competences (Prahalad and Hamel, 1990; Thomas, Shaw, and Page, 2011; Sabatino, 2016) and goes as far as to say that firms should make “adaptive capacity” a core competency. Adaptive capacity is built from a firm’s risk intelligence, flexibility, and readiness for change. As elements of adaptive capacity include creativity and flexibility, additional discussion follows.

The resiliency of a firm is determined by its ability to react to shocks with creativity and flexibility (Peterson, 2000). Khan, Christopher, and Creazza (2012) claim that firms need to become more impervious to disruptions and to quickly return to the previous or improved state after a disturbance. Resilient organizations encourage continuous experimentation and innovation, not just in product and service design, but in business processes and strategies (Seville, Van Opstal, and Vargo, 2015). Hence, “resilient organizations make knowledge sharing and knowledge management available on an ongoing basis” (Seville, Van Opstal, and Vargo, 2015, p. 9).

Customer centric is an organizational strategy in which a firm’s actions in marketing, product development, and operations are built according to customer priorities (Ross, 2009). Sabatino (2016) states that the most resilient enterprises are those that focus on customer needs in times of crisis or major change. Other studies conducted on the complexity of customer needs, customer centricity, innovativeness, service differentiation, and business performance confirm the authors’ findings (Gebauer, Gustafsson, and Witell, 2011).

Methods

Qualitative data were collected through structured in-person interviews conducted with five wineries in minor California wine regions, specifically the Russian River Valley and Nevada County in the Sierra Foothills. The interview questions were derived from the literature on business resiliency (Ahmed et al., 2004; Slocum and Kline, 2014; Seville, Van Opstal, and Vargo, 2015) as previously discussed. Special attention was paid to pre-COVID operations, adaptations during COVID regulatory changes, and reflections on business processes by the interviewees. All interviews were recorded and transcribed. The data were combined and hand coded into topics. These topics were then pooled to develop themes, defined as common plots or ideas running through the data (Richards and Morse, 2007).

Results

The four primary themes that emerged from the data include lifestyle business, market differentiation, direct marketing, and the effects of COVID-19.

The wineries in this study can be defined as small by the Small Business Act (1958). Wine production ranges from 1,000 bottles to 2,500 bottles annually, and the wineries employ no more than 10 people. The largest vineyard is 65 acres, but the remainder have 12 acres or less in production (see Table 1). Moreover, these wineries are operated as lifestyle businesses. Lifestyle businesses can be defined as entrepreneurial activities begun for noneconomic reasons, often accepting few, if any, profits (Ateljevic and Doorne, 2000) in favor of maintaining a personally

satisfying way of life. As Winery 1 states, “I actually moved here specifically to do what I’m doing. I wanted to raise my family in a rural farming environment. Making money really isn’t the attraction.” Winery 4 adds, “It’s about lifestyle and craft. You’re not going to be rich with this.” These wineries take pride in their trade and value the quality of life small-scale wineries offer them.

Table 1. Study Winery Characteristics

Winery Name	Year Established	Acreage Planted	Production (Cases)	Employees (Full-time Equivalent)	Varieties Produced	In-town Tasting Room
Winery 1	2000	9.5	1,800	2.5	Sauvignon Blanc, Negroamaro, Sangiovese, Primitivo, Teroldego, Barbera, Aglianico, Dolcetto, Nebbiolo	No
Winery 2	2004	3.5	1,000	4	Rkatsiteli, Pinot Blanc, Pinot Grigio, Melon de Bourgogne, Semillon, Chenin Blanc, Orange Muscat, Sangiovese, Peverella, Forastera, Barbera, Dolcetto, Sangiovese, Carmine, Refosco	Yes
Winery 3	1995	12	2,500	2	Sauvignon Blanc, Zinfandel, Cabernet Sauvignon, Barbera, Chardonnay, Cabernet Franc, Petite Syrah, Riesling, Fumé Blanc	Yes
Winery 4	2003	10	2,200	1	Grenache, Petite Syrah, Primitivo, Syrah, Varáz, Vizir, Zinfandel, Sauvignon Blanc	Yes
Winery 5	2001	64	12,500	10 (not including vineyard staff)	Pinot Noir, Chardonnay, Shiraz (Syrah), Sauvignon Blanc, Rose	Yes

About half the participants in this study started as hobbyists, realizing later that wine-making can be an expensive endeavor. For example, Winery 2 states, “I had been interested in drinking wine and decided to grow a small experimental venue. We lived there for 13 years, strictly as amateurs.” Others had a strong background in business and took a more strategic approach to their operations. Winery 4 acknowledges, “This is a business; it’s set up as a business to make money.”

One primary intention of lifestyle businesses is to keep them small and manageable (Howkins, 2002), often relying on family contributions in the overall business strategy. Winery 3 employs their son, who is a “second-level sommelier and certified wine judge.” Spousal partnerships were

common, with distinct divisions of labor, such as wine-making, financial management, or tasting room operations. There were generally only two levels of employment—the family manager and the employees. Winery 3 states further, “If you have a lot of employees, then that’s going to cost you, that’s one of the biggest expenses. So, we do a lot of it ourselves.”

One strategic competency is the ability to reject or adapt to more traditional distribution strategies, such as working with wholesalers and/or restaurants and employing local harvesting events, side stepping expensive and unreliable contractors. Winery 1 explains, “The best way to not get paid for all your work is to sell wine to a restaurant,” and Winery 3 emphasizes, “We’ve had somebody try to wholesale for us, but there wasn’t enough profit.” Some wineries used to sell in local grocery chains, but now only one winery sells to restaurants.

Customer relationships form the backbone of the wineries’ business model, as well as support the creativity and flexibility needed to maintain a craft business mindset (Ross, 2009). Because up to 70% of their business is derived from customers located within 100 miles, customers often join volunteer work parties, attend local events, and buy wine through wine clubs and internet sales. For example, Winery 1 “throws a big harvest party and we do a big banquet spread. We’ll get 50 or 60 volunteers to come out.”

Customer-centric business models allow for agility in marketing, merchandising, and operations (Ross, 2009). Winery 3 states, “Thankfully, we have a really nice wine club that keeps us going.” All the wineries offer events, as explained by Winery 2. “My wife has a relationship with some of the local artists and sometimes we’ll have an event that is devoted to displaying this person’s art.” By maintaining tight relationships with customers, the wineries are better able to adapt to changing consumer needs, retain higher profits, and remain flexible as output varies (Thomas, Shaw, and Page, 2011).

The primary mode for sales is through tasting rooms, which allow for intimate relationships to form and for continuous feedback from consumers. They also provide a visitor experience, which builds customer loyalty (Yoon and Uysal, 2005). Winery 1 reiterates, “Many of the wineries in this region are too remote, or they’re on private roads. That’s why everyone has a tasting room in town.” Winery 4 claims, “We knew we needed to get away from the winery because we just didn’t get enough traffic. The tasting room is my distribution outlet and that’s very important.” Winery 3 claims that 80% of their sales are from their tasting room.

Wine owners often remain in contact with visitors through wine clubs and social media, which, in turn, supports customer loyalty and long-term relationships, resulting in increased social capital. California and Nevada’s liberal liquor laws allow for the direct shipment of wine to households, enhancing existing e-commerce practices. Social media is used to announce new wine releases, upcoming events, discount sales, and general happenings at the wineries. It appears the goal is to provide easy access to wine while maintaining personal connections.

The primary shock from COVID-19 was complete closure resulting from mandated lockdowns. The secondary shock was the long-term cessation of in-person gatherings, including tasting rooms.

Twelve months after the start of the COVID-19 pandemic, all the wineries reported similar revenue streams to the pre-COVID year. For example, Winery 1 reported revenues up 7% from the previous year, and Winery 2 states, “We’re probably 40% or 50% down from the number of people that pass through the store, (but) we have maintained 70% of our sales.” Winery 4 sums up the general attitude: “I am only down about 20% (in revenue), but I’m open 65% less hours per week, so it’s convenient for me.”

However, the wineries have had to face changing regulations. Wineries were classified as essential businesses in California during the lockdown, meaning they could remain open to produce, bottle, and sell wine, but could not do tastings. Winery 1 explains, “We were allowed to stay open to sell wine out the door, but we weren’t able to do the things that we need to be able to do to grow the business.” Moreover, COVID-19 policy changed frequently and without much planning or communication. Winery 3 describes the chaos: “I think this is the seventh or eighth different rendition of business openings.”

Conclusions

This study shows that business models established in advance of an economic shock can have lasting impacts on the sustainability of organizations throughout a global catastrophe, such as the COVID-19 pandemic. While wine production does not appear to have been heavily impacted, the loss of tourism, specifically through restrictions on tasting rooms and small-scale events, has had an impact. This research shows that the rural wineries in this study thus far have been able to pivot operations and maintain profitability and customer loyalty, primarily due to their business model.

Obvious limitations to this study include the small sample size and the regional proximity of the wineries. Additionally, the wineries were all in California, thus this study has limited geographic scope. The cultural aspects of resiliency and the length and nature of the COVID-19 restrictions may differ in other areas, which may impact results.

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Research Report:
**What They Know and Why They Do It: Preliminary Findings of
Farmer Focus Group Discussion on Value-Added Agriculture in
North Carolina**

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Abstract

Sustaining farm profitability has been challenging for North Carolina smallholder farmers facing market failure. Small farms earning between \$10,000 or less and \$50,000 annually in net farm income need alternative practices that will make them more profitable. This study assesses North Carolina small farmers' understanding and attitudes towards value-added agriculture. We conducted farmer focus group interviews and analyzed the data using Qualitative Data Analysis Miner Lite. We found that the main drivers of value-added agriculture include improving on-farm profitability, product expansion, and market growth. High production costs and lack of government assistance are some of the factors limiting value-added participation.

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Background

The proportion of small farmers¹ in North Carolina has been declining over the years due to unsustainable farm profitability (NCDCAS, 2015; USDA-ERS, 2019; USDA-NASS, 2020). Due to low productivity and rising production cost, most small farmers are not generating enough revenue to cover production cost, especially labor cost. Research shows that farm sustainability is linked to the generation of additional income from existing farm resources (Barbieri and Mahoney, 2009). Value-added agriculture is one of the ways through which small farmers can generate additional income (Michel, Anders, and Wismer, 2011; Lu and Dudensing, 2015; Yeboah et al., 2019). Value-added agriculture includes “activities that result in the physical/nutritional alteration of an agricultural commodity” (Coltrain, Barton, and Boland, 2000, p. 5; Lu and Dudensing, 2015) with the aim of increasing farm revenue, rural jobs, and consumer market share (Michel, Anders, and Wismer, 2011; Lu and Dudensing, 2015; Yeboah et al., 2019). This study assesses North Carolina small farmers’ understanding and attitudes toward value-added agriculture.

Methodology

We conducted a virtual focus group interview with 12 farmers (6 males and 6 females). Farmers were solicited from five major metropolitan areas across North Carolina, namely, Charlotte, Raleigh/Durham, Greensboro, Wilmington, and Asheboro. Interview discussions ranged from the definition of value-added activities from farmers’ perspectives to challenges and opportunities of value-added agriculture. The focus group discussion was recorded, transcribed, and analyzed using Qualitative Data Analysis (QDA) Miner Lite software.

Results and Conclusions

The average farmer interviewed was about 60 years old with at least 8 years of farming experience and operated on an average farm size of 38 acres (Table 1). Reported farm income ranged from \$10,000 to \$200,000 per year with an average income of about \$25,000 per year (Figure 1). During the interview, farmers expressed various reasons for their willingness to participate in value-added agriculture. About 90% of the farmers interviewed were willing to engage in value addition to increase farm profitability. The remaining 10% attributed willingness to adopt to expanding consumer base through local, interstate, national, or international recognition (Figure 1). Some of the examples of value-added agricultural practices given by the farmers included diversification in crops and animals, mixed farming, and processing of agricultural raw material.

Table 1. Demographic Characteristics of Small Farmers in North Carolina

Variables	Mean Value	Minimum Value	Maximum Value
Age (years)	60	40	78
Income (\$)	25,000	10,000	200,000
Years of farming	7.5	1	15
Farm size (acreage)	37.5	5	58

¹ Small farmers are farmers who earn an annual gross farm income of \$250,000 or less (McDonald, 2021).

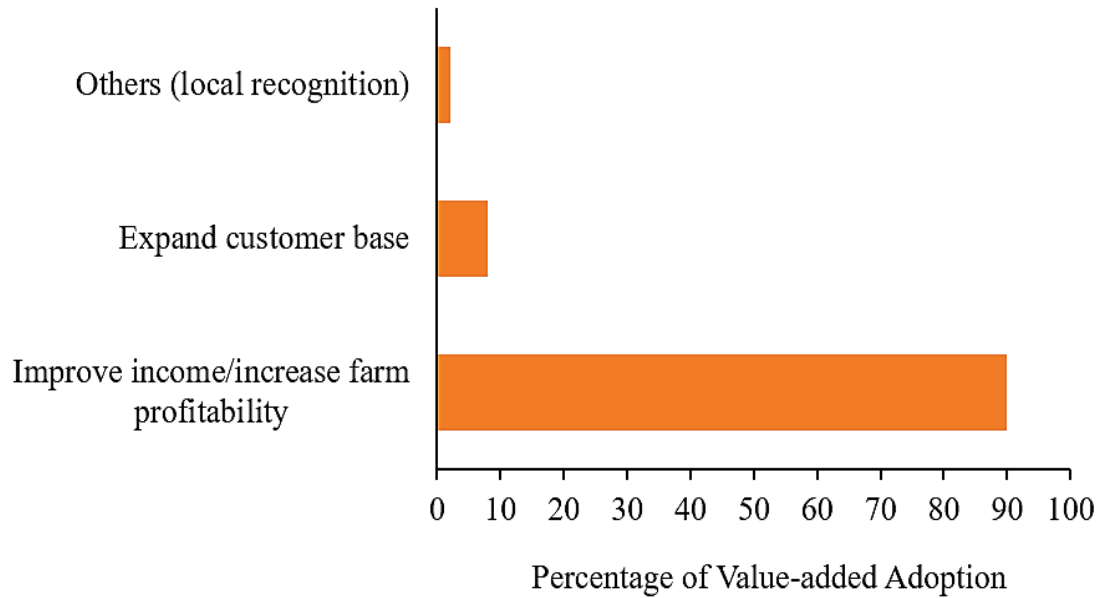


Figure 1. Reasons for Value-added Agriculture Adoption among North Carolina Farmers

Farmers also expressed some of the challenges associated with value addition: high production costs, lack of government assistance, inadequate financial support, poor extension services, and lack of processing infrastructure (Figure 2). We also asked how COVID-19 had impacted their farming operations. Farmers indicated that the lockdown and social distancing guidelines resulted in significant market disruptions resulting in both physical losses of farm produce and income. Furthermore, some farmers indicated that they had to divert resources toward their physical and/or mental well-being. Some of the farmers also indicated that COVID-19 enabled them to think about other innovative ways of marketing their products. Overall, small farmers in North Carolina acknowledged the good prospects that value-added agriculture presents, despite the associated challenges.

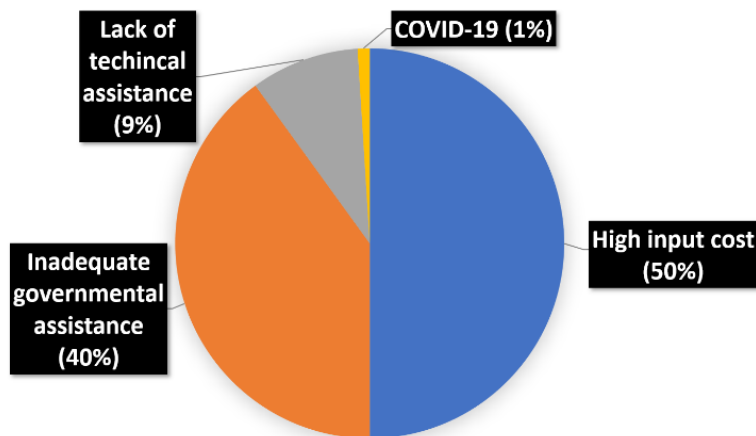


Figure 2. Constraints toward Adoption of Value-added Agriculture among North Carolina Farmers

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Research Report:
**U.S. Farmers Markets—Essential Business Survival
in Disrupting Times**

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Abstract

In this paper, we evaluate the impact of COVID-19 on farmers market (FM) sales across the United States during the 2020 operating season using survey responses from 420 market managers. Using a multinomial logit model, we evaluate how certain market characteristics are associated with increased probabilities of market organizations gaining or losing revenue in 2020. We find that SNAP sales changes, market location, and COVID-19 intensity impacted revenue outcomes. State COVID-19 policies for FM and the existence of FM assistance organizations had less of an impact.

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Introduction

The COVID-19 pandemic has had complex and long-lasting impacts on food systems. Supply chain disruptions in the conventional retail grocery business were common in the spring of 2020 (Hobbs, 2020) and continue to reappear. As a result, many consumers started developing alternative strategies for food acquisition. Local foods and direct market channels, such as farmers markets, community-supported agriculture, specialty stores, and produce auctions, were prominent in these new strategies (Ricker and Kardas-Nelson, 2020; Richards and Vassalos, 2021; Thilmany et al. 2021b).

Some farmers shifted their own strategies to take advantage of increased consumer interest in direct sales. Some found new opportunities in retail spaces to fill product gaps. Many also invested in e-commerce platforms and increasingly accepted SNAP (Thilmany et al., 2021a). These adaptations also allowed some farmers to pivot from COVID-19-affected markets, such as restaurants and institutions, while developing relationships to create a broader consumer base.

These pivots to local, direct markets were not always straightforward. Farmers markets, for instance, had to negotiate a constantly changing health policy landscape. Market managers and vendors had to meet criteria set by states and local health departments to operate (Wolnik and Broadway, 2020). Market managers introduced strategies such as structuring the flow of visitors in certain directions, increasing spacing between vendors, increasing online preordering, and reducing entrances and touchpoints. While some markets were closed or operated at a reduced vendor capacity, others experienced increased sales and foot traffic. The experience of different markets and vendors varied by local context (O'Hara et al., 2021).

In this paper, we evaluate the impact of COVID-19 on the revenues of farmers market organizations across the United States during the market season in 2020. We draw from a unique dataset of survey responses from 420 market managers in all 50 states and the District of Columbia. Survey responses were gathered by the Farmers Market Coalition—a national organization that provides technical assistance to farmers markets. We ask, “What market-specific and contextual characteristics predict whether a FM organization gained or lost revenue during the first COVID-19 market season (2020) compared to the previous year (2019)?” Since experiences of COVID-19 in early to mid-2020 were geographically varied, different local characteristics might be associated with patterns of change in FM revenues. Using a multinomial logit model (MLM), we evaluate how certain characteristics are associated with the increased likelihood of market organizations gaining or losing revenue in 2020 compared to 2019.

Methods, Project Background, Survey, and Data

This work is part of a larger Local Food Systems Response to a COVID-19 project that was established in the late spring of 2020. The goal of this project was for 17 national Communities of Practice (COPs) representing different local/regional food sectors to communicate in real time about COVID-19 adaptation strategies. A high-level overview of this project's efforts can be found at lfscovid.localfoodeconomics.com and in Thilmany et al. (2021b).

The Farmers Market Coalition (FMC)—a participating COP in this project—developed and implemented a survey of FM managers across the United States. This post-season survey measured the short-run impact of COVID-19 on markets in late 2020. Market managers were asked about market-specific characteristics, costs incurred to adapt to a new operating environment, market-level changes in revenue as a result of COVID-19, changes in SNAP sales, and changes in market participation by vendors. Survey participants included 420 market managers who completed the survey on behalf of their 8,000 vendors.

The FMC shared the survey with the research team to determine what lessons could be drawn from these initial experiences. Our specific focus is to understand which characteristics of a market organization are associated with gains or losses in market revenue. Because FM organizations rely on vendor sales and consumer participation for operating revenues, their gains and losses act as a proxy for overall market sales. We next describe the multinomial logit model we used to determine how certain market characteristics affect the likelihood of FM revenue changes.

Model

The multinomial logit model is a binary logistic regression that predicts probabilities of possible outcomes conditional on values of explanatory variables (Clark et al., 2019; De España, 2020).

MLM is defined as follows:

$$P(Y = j | X_1, X_2, \dots, X_k) = P(Y = j | K); j=0,1,\dots,J \tag{1}$$

where X_i is the matrix of independent variables of the market j , and β_j is the parameter vector for each outcome. P_{jk} is Prob ($Y = j | K$), and is response probabilities, which is estimated as below in equations (2) and (3) by method of maximum likelihood:

$$P(Y = j | X) = \left(\frac{\exp(x_k \beta_j)}{1 + \sum_{h=1}^J \exp(x_k \beta_h)} \right) = p_j(X, \beta); j=0,1,\dots,J \tag{2}$$

$$P(Y = 0 | X) = \left(\frac{1}{1 + \sum_{h=1}^J \exp(x_k \beta_h)} \right) = p_0(X, \beta) \tag{3}$$

MLM estimates the odds of each category relative to a baseline category as a function of covariates. This method relaxes the assumption of confounder effects when testing for the equality of coefficients (Fujimoto, 2005). In this study, we used a MLM to evaluate what market characteristics predict the likelihood of overall revenue at market j decreasing (0) or increasing (2) compared to our base outcome of staying the same (1) using the following model:

$$F(j, k) = \beta_{0,j} + \beta_{1,j} X_{1,k} + \beta_{2,j} X_{2,k} + \dots + \beta_{H,j} X_{H,k} \tag{4}$$

where $\beta_{H,j}$ is a regression coefficient associated with the h^{th} explanatory variable and the j^{th} outcome. We describe the independent variables used in the next section.

Variables

In the MLM, we chose independent variables that we expected to impact markets' revenue streams. Table 1 describes and provides summary statistics for each variable.

Table 1. Variables Used in the Multinomial Logit Model¹

Variable	Description and Coding	N	%
Outcomes			
Revenue	Market org. revenue decreased (0)	282	67.1
June-August 2020 compared to 2019	Market org. revenue unchanged (1)	39	9.3
	Market org. revenue increased (2)	99	23.6
Independent Variables			
Urban	Urban (1); Rural/suburban (0)	324/96	77.1/22.9
State policy (SP)	State organization developed Covid guidelines for FMs: (1)Yes; (0)No	234/186	55.7/44.3
Formal state association (FSA)	Does a State have an organization dedicated to FM technical assistance? (1) Yes; (0) No	194/226	46.2/53.8
SNAP sales	Market SNAP sales changes from 2020 decreased (0-base); stayed same (1); increased (2)	157/65/ 177	39.4/16.3/ 44.3
VegShare	% of market vendors selling fruits/veg (0) 0%;	101/119/	24/28/
	(1) 1%-25%; (2) 26%-40%; (3) > 40%	110 /90	26/22
		Mean	Std Dev
CovJune	COVID incidence rate for June 2020	7.1	3.9
CovJuly	COVID Incidence rate for July 2020	14.9	10.6
CovAugust	COVID Incidence rate for Aug. 2020	13.9	7.3
Years	# years of market operation	20.2	23.9

Results

First, we discuss some of the descriptive statistics from the survey and other data from the FMC to give context for broader trends in FM during COVID-19. When considering vendor-level data, sales changes from 2019 to 2020 were related to the type of product the vendor was offering. Vendors who predominantly sold produce (58%) and meat and dairy (64%) saw increases in sales (Table 2). Those who sold nonfood or processed products more often had decreases in sales. Thus, product type seems to matter in understanding revenue changes, but other contextual characteristics are important (O'Hara et al., 2021). It is possible that food-oriented markets were

¹ Source: 2020 Farmers Market Coalition Market Manager Survey

more likely to receive the “essential” business designation than markets that were more focused on cultural products and entertainment.

Table 2. Individual Farmers Market Vendor Sales Changes in 2020 Compared to 2019²

	Vendors reporting decreased sales	Vendors reporting increased sales
Fruit and vegetable	1,035	1,433
Meat and dairy	444	786
Value-added products	1,218	797
Flowers	467	342
Artisanal products/crafts	1,409	430

Moving to the market level, managers reported that two-thirds of the farmers markets’ revenue decreased overall compared to 2019 (Table 1). In spite of the general sales slowdown in most markets, there were substantial increases in SNAP sales by market (Table 3). Nearly 40% of markets increased their SNAP sales compared to 2019. Additionally, 28% of the markets used SNAP for the first time during the pandemic. This rise in sales, participation, and markets accepting SNAP may be related to programming specific to the pandemic (Jones, 2021). With a sharp rise in unemployment and closures of in-person schooling, programs such as the Pandemic EBT were implemented to help families meet their food needs (Jablonski et al., 2021). It is worth considering the extent to which farmers markets provided vulnerable populations with an important food outlet during a time of crisis. Using an MLM, we next evaluate how specific market conditions, such as SNAP sales, predict revenue changes for market organizations.

Table 3. SNAP Redemption Changes by Market Organization in 2020 Compared to 2019

	Frequency	Percent
Increased	182	39.5%
Decreased	66	14.3%
Stayed the same	29	6.3%
First year with SNAP	116	27.6%
Did not know	14	3.3%
Did not offer SNAP	21	5.0%

Market Revenue Changes as Predicted by Multinomial Logit Model

Our MLM was designed to determine which market characteristics predict the likelihood of a market experiencing one of three outcomes in revenue. We set the base outcome for our analysis to be “stayed the same” to see whether increases or decreases were comparatively more likely given certain criteria. In the first two results columns, we present the coefficients for each

² Source: 2020 Farmers Market Coalition Market Manager Survey

independent variable and their level of significance. If a variable is significant with a positive coefficient, it is more likely to predict revenue changes corresponding to that outcome. Negative coefficients make the outcome less likely. If a variable is not significant, then it has lower predictive power in either direction (i.e., more or less likely). For instance, the COVID-19 incidence rate in June is significant but negative for the outcome “increased revenue.” We interpret this as meaning markets in states with higher rates of COVID-19 in June were less likely to increase revenue in 2020 than in 2019 when compared to the base outcome of no changes in revenue. To augment this analysis, we also present variables’ marginal effects for each outcome. These marginal effects estimate the extent to which each variable predicts a particular outcome and is calculated across all outcomes.

Table 4. Revenue Changes Predicted by Market-Specific Conditions in a MLM

	MLM Coefficients		Marginal Effects		
	Decreased Revenue (0)	Increased Revenue (2)	Decreased Revenue (0)	No Change (1)	Increased Revenue (2)
CovJune	-0.122	-0.202**	0.005	0.010*	-0.015*
CovJuly	0.087*	0.148***	-0.005	-0.007**	0.012**
CovAugust	-0.100*	-0.146***	0.002	0.008**	-0.010*
State policy	-0.710	-1.045**	0.012	0.057*	-0.069
FSA	0.321	0.318	0.018	-0.023	0.005
SNAP same	-0.027	1.327**	-0.185***	-0.018	0.203***
SNAP Inc.	-0.012	1.025*	-0.127**	-0.013	0.140***
Urban	1.177	0.410	0.183***	-0.073**	-0.111**
Years	0.012	-0.006	0.004**	0.000	-0.003*
VegShare	0.485***	0.518***	0.022	-0.036***	0.014
Constant	1.560	0.898			

Note: Single, double, and triple asterisks (*, **, ***) indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

We begin by considering the temporality of COVID-19. Higher rates in the months chosen for the analysis are predictive of both revenue gains and losses compared to 2019. But the directionality is complex (Table 4). Higher rates in June predict that markets are less likely to increase revenues during the full 2020 market season, according to coefficients. Marginal effects also suggest a higher likelihood of revenues staying the same as the previous year. Higher rates in July, however, predict both positive and negative effects on revenue, likely due to other place-specific contextual factors. For each integer increase in COVID-19 rates (i.e., cases per 100,000 people), the model predicts a 1% increase in the likelihood of a market experiencing revenue increases.

What would explain higher COVID-19 rates predicting revenue increases in July, but no change in June? June rates may have impacted when and how a market could open, but by July, some markets may have already opened and enacted reasonable safety and protocols. These markets may have attracted consumers who were new to FM, possibly because they felt these businesses were safer than retail. Another possibility is that they were tied to increased funding for incentive programs such as P-EBT and SNAP Double Dollars. Finally, lower rates in earlier months may

have also led to less consumer fear for attending markets, especially if markets were perceived to be conscious about safety. Whatever the reason, higher incidence rates during peak market season seemed to predict increased revenue for markets.

Higher COVID-19 rates in August point to a “no change” outcome. This is a similar effect to what was seen in the June incidence rates. Perhaps at this point in the season, new consumers who initially felt uncomfortable at retail stores started shopping at grocery stores more frequently. There could have been a desire to return to a feeling of normalcy or at least being more accepting of “the new normal” and its associated risks. What is noticeable is that the marginal effects for all three market months do not indicate that higher COVID-19 rates were predictive of decreased revenue.

The next set of variables is related to policies and programs. The first variable includes any state policies or recommendations for how FMs could open and operate. Examples of state policies would be capacity limits, social distancing guidelines, and other safety precautions. The existence of state policies was only weakly predictive of decreased likelihood of increasing revenues in the MLM. The marginal effects suggest that the existence of state policy is related to a 5% increase in the likelihood of no change in revenue. These data suggest that formal state policies for market operation did not have much impact on revenue changes. Similarly, the existence of formal state associations for FMs did not predict losses or gains. Formal state associations are organizations dedicated to providing technical assistance, resources, and support to FMs, the existence of which we thought might improve revenue outcomes for FMs.

What could explain the minimal impact of formal state policies and state policies on revenue changes? Perhaps localities and individual markets developed operating standards that were more influential than state-level directives. Market managers know their local market landscapes in greater detail than entities operating at the state level. Another factor may be that local health departments were given more responsibility for enacting standards. At the same time, the relative lack of change in revenue is not a negative outcome. Formal state policies and state policies may have created the conditions for markets to operate efficiently in an extremely adverse crisis to the point where revenue could rise to a similar revenue level as the previous year. Additionally, as we are only measuring markets that opened during the 2020 season, we cannot account for the impact of strict standards that limited the opening of markets. For FMs that did open, state guidelines and formal associations had little impact on predicting revenue gains or losses.

SNAP sales is another policy/program variable of interest given the expansion of benefits during COVID-19. In the MLM, markets with no change or increases in SNAP sales predicted an increased likelihood of overall revenue increases compared to markets with decreased SNAP sales. The marginal effects reinforce this perspective to a greater extent. Here, markets with no change or increases in SNAP sales were 20% and 14% more likely to have an increase in overall revenue, respectively. In short, SNAP sales had an impact on the overall revenue of markets.

The final variables we consider are specific market attributes. Markets in urban locales had an increased likelihood of falling into a decreased revenue category by 18%. This result was expected,

because densely populated locales experienced higher levels of COVID-19 during the summer of 2020, potentially more stringent local regulations for opening, and more spatial challenges to enacting social distancing measures. Next, markets with more years of operation seem to be more likely to experience decreased revenue, suggesting that markets with well-established operating protocols and structures faced different challenges in adapting to COVID-19 compared to newer markets. Finally, markets with a higher percentage of vendors that focus on fruit and vegetable sales were more likely to experience either increases or decreases in revenue. This bifurcated result indicates again the complexity of markets' experiences of COVID-19.

Discussion and Conclusions

COVID-19 had a complicated impact on how markets could operate and who was able to persist in a drastically altered market environment. Despite many markets (i) receiving an essential business designation, (ii) offering an important outlet for SNAP recipients, and (iii) creating a safer food purchasing experience than retail, two-thirds of markets surveyed reported revenue decreases. To say that COVID-19 was impactful to the fortunes of farmers markets would be an understatement.

However, some markets saw revenue increases. From our analysis, these increases are be associated with certain contextual and market characteristics. In particular, increased SNAP sales were significant to the overall revenue of a market. While the increase in available funds and beneficiaries might be temporary, markets benefited when they were able to meet food access needs to some degree. With increases in SNAP redemption and beneficiaries during COVID-19, many individuals became market patrons for the first time.

This finding mirrors another broader trend with consumers' increasing willingness to experiment with businesses in local market channels (Thilmany et al., 2021b). The influx of new consumers presents alternative considerations to vendors, but it also emphasizes the importance of markets and other local businesses as food suppliers. Knowing how these new consumers perceive of and interact with FMs is critical to understanding FMs' long-term evolution, and area where state and national market organizations can support markets. By providing valuable technical assistance on emerging market trends and how to best serve new market patrons, formal state associations can facilitate changes that make markets increasingly flexible.

Another takeaway from our data is that specific COVID-19 rates are less important than the mere existence of COVID-19. The pandemic impacted the structure of farmers markets as well as the consumers who attend. For some producers, farmers markets are a complimentary channel to their broader business strategy. In cases where institutional and restaurant sales disappeared, farmers may have used FMs to find new customers. Additionally, while not considered here, many farmers adopted e-commerce strategies to promote their farm brand, facilitate ordering, and achieve social connection while distancing (Thilmany et al., 2021a; O'Hara et al., 2021). Other coping mechanisms, such as online preorders, curbside delivery, pre-boxing, and other distribution logistics may be preferred by some consumers but are very challenging and costly to vendors (Wolnik and Broadaway, 2020). Nevertheless, many farmers adopted these innovations and

integrated them into their FM strategies. Thus, the concept of the farmers market is altered by these shifts. Finally, the impact of COVID-19 on people's fortunes is extremely varied. Some individuals, groups, and sectors disproportionately bore the burden of COVID-19 in food systems (Thilmann et al., 2021b). More exploration of specific characteristics of market vendors and how their position in the food system impacted their ability to adapt to COVID-19 is more critical than ever.

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Research Report: A Gravity Model of Central American Organic Coffee Trade with the United States

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Abstract

This research analyzes the effects of economic and regulatory factors on the trade volume of organic Arabica green coffee from Central America to the United States. A gravity model with a panel data set is estimated using data from 2011 to 2020. We found that the major factors affecting the organic coffee trade were the organic price paid to exporters, U.S. per capita GDP, and the number of organic certified USDA-NOP organizations in the exporting countries. Central America can continue diversifying its production by adopting more organic certification schemes and expanding its market share in international markets.

Keywords: coffee, gravity model, organic certification, trade

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Introduction

Green coffee is among the top five exported agricultural products of Central America (CA): Guatemala, Nicaragua, Honduras, Costa Rica, El Salvador, and Panama, and the United States was the principal market for the 2019-2020 season. In 2020, 34.41% of total U.S. imports of organic Arabica green coffee came from Central America, and 40.93% of U.S. imports came from South America (U.S. Department of Agriculture, Global Agricultural Trade System, 2021).

Coffee is the most imported organic product by the United States. U.S. organic product sales have been increasing in the past several years and their value reached \$55.1 billion in 2019 (Organic Trade Association (OTA), 2020). Furthermore, 82% of U.S. households had experience buying organic products in 2016 (OTA, 2016).

Coffee farmers in Central America have been slowly adapting operations and transitioning to an organic-certified production to receive better prices. Mendez et al. (2010) found that farmers selling organic-certified products were more likely to sell 100% of their products at the certified prices, while farmers selling fair-trade-certified products sold only 60% at the certified prices.

Given the importance of organic coffee trade to CA producers and the U.S. markets, this paper uses a gravity trade model to estimate the effects of economic and regulatory factors on the trade of organic Arabica green coffee between Central America and the United States.

Literature Review

Gravity models were first proposed by Linnemann (1967), who created a model for trade flow of goods with variables that affect trade. In the first version of the model, the trade flow from country i to country j (X) is specified as a function of gross domestic product (GDP) of both nations (Y), population (N), distance (D), and preferential trade factors (P):

$$X_{ij} = \sigma_0 Y_i^{\alpha_1} N_i^{-\alpha_2} Y_j^{-\alpha_4} D_{ij}^{-\alpha_5} P_{ij}^{\alpha_6} . \quad (1)$$

Gravity models include the incomes/GDPs of importing and exporting countries. This type of model can also include variables such as distance, exchange rates, adjacency, and GDP deflators (Bergstrand, 1985). Researchers have adapted gravity models accordingly to fit their main objectives or opted for other types of models (Egger and Nigai, 2015).

There have been debates on applying random (Cardoso et al, 2016; Zhou, Li, and Lei, 2018) or fixed effects (Gopinath and Echeverria, 2004; Tamini, Doyon, and Simon, 2016; Osabuohien et al., 2019) in a gravity model. Osabuohien et al. (2019) applied a Hausman test to choose between a random effects model and a fixed effects model for the study. A fixed effects model was chosen. However, as proven by Zhou, Li, and Lei (2018), the fixed effects approach eliminates time-invariant variables such as the distance variable in gravity models.

Some research has been done on coffee trade and organic standards. Cardoso et al. (2016) estimated gravity models with GLS random effects to measure the most influential factors in coffee trade between Italy and 11 trading partners. Canavari and Cantore (2010) used gravity models to evaluate the equivalence of organic standards among Italy and its trading partners.

Methods

In the gravity model for the organic coffee trade between Central America and the United States, we include regulatory variables of organic certification and adoption, in addition to macroeconomic variables (Cardoso et al., 2016) and market determinants (Koo, Karemera, and Taylor, 1994).

The volume (Q_{jt}) of U.S. imports of organic Arabica green coffee from a Central American country j at time t is specified as:

$$Q_{jt} = f(OP_{jt}, CP_{jt}, GDPUS_t, GDPCA_{jt}, OrgC_{jt}, FC_t, Dist_j), \quad (2)$$

where OP_{jt} and CP_{jt} are the prices paid to the organic and conventional coffee exporters (US\$/Kg), respectively; $GDPUS_t$ and $GDPCA_{jt}$ are the per capita gross domestic product in U.S. dollars in the United States and Central America country j , respectively; $OrgC_{jt}$ is the quantity of organic certified organizations in the exporting country j ; FC_t is the quantity of fraudulent organic certificates reported by the USDA; and $Dist_j$ is the physical distance between the exporting country j and the United States. The organic (OP_{jt}) and conventional (CP_{jt}) coffee prices are expected to have a negative and positive effect, respectively, on the trade volume. Conventional coffee is considered as a substitute for organic coffee in this study. Both GDP variables are expected to have positive effects on the quantity traded. More organic certified organizations ($OrgC_{jt}$) should result in larger trade volume. The number of fraudulent organic certificates (FC_t) can reduce U.S. import demand for organic coffee. A longer distance ($Dist_j$) is expected to decrease the trade volume.

Data was grouped by country and by year in a panel-type database with 60 observations (10 years for six Central American countries). A log transformation was applied to the data for quantity, prices, and per capita GDP. The final econometric equation is

$$\ln Q_{jt} = \beta_0 + \beta_1 \ln OP_{jt} + \beta_2 \ln CP_{jt} + \beta_3 \ln GDPUS_t + \beta_4 \ln GDPCA_{jt} + \beta_5 OrgC_{jt} + \beta_6 FC_t + \beta_7 Dist_j + \varepsilon_{jt}. \quad (3)$$

The model was estimated as a panel regression with random effects using the software STATA.

The data of quantity, organic, and conventional coffee prices were collected from the Global Agricultural Trade System of the USDA (USDA-GATS, 2021).¹ Per capita GDP data were obtained from the International Monetary Fund (IMF, 2021), and the data of distance between the

¹ Values of Panama organic coffee exports for 2018 and 2019 were missing, an average from 2017 and 2020 data was used for both observations on quantity and price.

exporting countries and the United States were obtained from Mayer and Zignago (2011). Data from organic certified organizations and fraudulent organic certificates were obtained through the USDA's Organic Integrity database (USDA, 2021a, b). Around 40% of organic certified operations produce coffee, making coffee one of the most important organic crops produced in Central America.

Results

Table 1 displays the estimation results of the gravity model in equation (2). All the coefficient estimates have the expected sign except the ones for *GDPUS* and *GDPCA*.² The coefficient estimates of three major explanatory variables are statistically significant. The effects in percentage of regulatory variables (*OrgC* and *FC*) on trade are presented in Table 2.³ In the following subsections, we discuss the major results of the estimation in detail.

Table 1. Estimation Results of the Gravity Model

Coefficients	Estimate	Std. Error	Z
Intercept	121.891**	26.43	4.61
<i>LnOP</i>	-1.899*	0.85	-2.23
<i>LnCP</i>	0.602	1.38	0.44
<i>LnGDPCA</i>	-0.242	0.43	-0.57
<i>LnGDPUS</i>	-8.932**	2.41	-3.71
<i>OrgC</i>	0.024**	0.003	7.45
<i>FC</i>	-0.013	0.01	-0.96
<i>Dist</i>	-0.002	0.002	-1.03
$R^2 = 0.2504$ (within) 0.8915 (between) 0.7567 (overall)			
Observations = 60			

Notes: Double and single asterisk (**, *) indicate significance at the 5% and 10% levels, respectively.

Table 2. The Effects in Percentage of Regulatory Variables

Variable	Coefficient	Effects in Percentage
<i>OrgC</i>	0.024	2.429%
<i>FC</i>	-0.013	-1.292%

Organic Coffee Price (*OP*)

The green organic coffee import price has a negative impact on the import volume, as expected. For a 1% increase in the import price, the import quantity would be reduced by 1.899%. It can be

² The coefficient estimate of *GDPCA* was not statistically significant from zero. The coefficient estimate for *GDPUS* is significant and negative, which implies that increases in *GDPUS* will cause a smaller trade flow (Jaenicke and Demko, 2015). Possible implications on the negative relationship between *GDPUS* and coffee trade will be discussed further in a subsequent subsection of the paper.

³ The data of the regulatory variables are, by their nature, in levels, while other trade variables in the model are in logarithm to facilitate estimation and analysis. Thus, the effects in percentage of the regulatory variables on trade were calculated using their coefficient estimates and included in Table 2 to facilitate an easier discussion of their trade effects.

inferred by economic reasoning that organic coffee has an elastic import demand by the United States. This result is consistent with other findings in literature on the demand for organic products. In previous research on the organic fresh fruits demand in the U.S. markets, both conventional and organic products were analyzed, and findings showed negative coefficients on the own-price elasticities in all cases. Based on those findings, researchers concluded that consumers of organic products were more likely to switch to conventional products if the organic prices increased (Lin et al., 2009).

Organic Fraudulent Certificates (FC)

As expected, the variable measuring the quantity of fraudulent organic certificates in the USDA organic database has a negative coefficient estimate, which implies that a 1% increase in the number of fraudulent organic certificates will lead to a 1.292% reduction in U.S. import volume. This shows that trust reduction on organic certificates does cause an adverse effect for the trade of organic products.

GDP Per Capita in the United States (GDPUS)

This coefficient estimate of *GDPUS* shows a somewhat surprising result of the impact of U.S. per capita GDP. When U.S. per capita GDP increased by 1%, the import volume of organic green coffee from Central America declined by 8.93%. Jaenicke and Demko (2015) assumed that GDP is proportional to trade so that it leads to a positive impact, as was expected. However, opposite results can be justified by analyzing the specific product demand and its purchasing behavior. By evaluating coffee demand in the United States and customer quality perception by product origin, Houston, Santillan, and Marlowe (2003) analyzed the effects of income, consumption habits, prices, and trade agreements on mild coffee trade. They found that higher U.S. income leads to more imports of mild coffee from Kenya, Tanzania, and Colombia.

Other research measured the effect of country-of-origin labeling on coffee prices using hedonic models. The research found that Latin American coffee prices ranged between \$9-\$10 per pound (retail level), whereas East African and Indonesian coffees ranged at higher levels, \$11-\$12 per pound (Teuber, 2010). It can be inferred that with an increase in per capita GDP, U.S. consumers could switch to perceived high-quality coffee, such as East African and Indonesian coffees, so organic coffee imports from Central American countries may be reduced.

Organic Certified Organizations (OrgC)

Finally, the variable for the number of USDA organic-certified organizations in Central America has a positive coefficient estimate, indicating that when there is a 1% increase in the number of organic-certified organization, U.S. imports will be 2.429% larger. As the adoption of organic agriculture in a Central American country increases, the number of suppliers of organic products becomes larger, and the organic certifier entities and agricultural organic techniques used are more trusted. As a result, U.S. demand for this Central American country's organic products will increase.

Conclusions

The findings in this paper have important contributions to the economic literature on the organic coffee trade, especially regarding regulatory factors. It is essential to note that as Central American countries adopt more organic agricultural practices, the volume of the organic coffee trade will be higher. An increase in U.S. per capita GDP may cause U.S. consumers to switch to higher-quality coffee products, causing a decrease in organic coffee imports from Central America.

Previous research has focused primarily on the trade of conventional coffee in other regions (Cardoso et al., 2016; Abafita and Tadesse, 2021). This research has built on those studies by highlighting the importance of certifications and organic coffee in international trade. The findings in this study improve the understanding on organic coffee trade between the United States and Central America and provide essential information for producers on the benefits of entering the international markets, as well as on the importance of transitioning to organic-certified production.

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Research Report: Impact of Remittance on Household Welfare: Evidence from the Western Region of Nepal

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Abstract

This study examines the impact of remittance on household welfare measured by consumption expenditures in the western region of Nepal. We used regional-level microeconomic data obtained from the Nepal Living Standards Survey (2010/2011) and employed Propensity Score Matching (PSM). Our results show that remittance-receiving households spend 34% and 20.33%, respectively, more per capita on agriculture and education than non-remittance-receiving households. However, there is no effect of remittance per capita on food expenditures. The findings of this study will be helpful to the federal-level policy makers in the western region of Nepal in deciding on scaling up migration-related programs.

Keywords: Nepal, PSM, remittance, western region

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Introduction

Nepal's labor market has experienced a remarkable shift in foreign labor migration in the last two decades. According to the Central Bureau of Statistics (CBS) Nepal, it is estimated that in 2001, migration was 3.2%, whereas in 2011 migration increased to 7.3%. The same report shows that more than 520,000 labor permits were issued to Nepalis planning to work abroad in the fiscal year 2014 (CBS, 2014). Sluggish economic growth and political instability with weak infrastructure development, such as education, electricity, lack of access to jobs, and opportunities, force the young and active generations to pursue international migration in the effort to find employment. The outmigration has further proliferated decade-long internal conflicts. Malaysia is the number one destination country for Nepali migrants (40.9%), followed by Saudi Arabia (22.9%), Qatar (20.3%), United Arab Emirates (11.2%), and Kuwait (2.1%) (International Organization for Migration, 2019).

A few past studies on the impact of remittance on household welfare were carried out, considering all parts of Nepal (Thapa and Acharya, 2017; Wagle and Devkota, 2018). Findings from these studies are national and recommendations are general. Previous research argues that migration has a heterogeneous effect on different places. In other words, migration has a more positive effect in some areas and a positive or negative effect in other areas, so the impact of migration is region specific (de Haas, 2006). In this context, an important question arises: Does this general recommendation apply to a specific region in the country that has many regional disparities? The answer to this question demands region-specific research that helps in understanding the household spending behaviors of remittance receivers and non-remittance receivers. Therefore, using regional-level microeconomic data obtained from the Nepal Living Standards Survey (NLSS) (2010/2011), our research focuses on the western region of Nepal. The region-wide policy is important for the western region of Nepal for two reasons. First, Nepal has adopted a new federal-state structure following the promulgation of the Constitution of Nepal in 2015 (Dahal, 2020). This change from a unitary to a federal system facilitates an inclusive and responsive system of governance and promotes an effective and efficient service delivery system to the people (Acharya, 2018). Second, the western region of Nepal had the highest rates of poverty with a poverty gap in the range of 4.27 to 10.74 in 2011 (Asian Development Bank, 2013). In this context, the major objective of this research was to understand the impact of remittance on household welfare, which is measured in terms of food expenditures, agricultural expenditures, and educational expenditures.

This study employed Propensity Score Matching (PSM) to estimate the causal impact of remittance on consumption expenditures. Our results show that remittance-receiving households spend almost 34% and 20.33%, respectively, more per capita on agriculture and education than non-remittance-receiving households. The findings of this study will be helpful to the federal-level policymakers in the western region of Nepal in developing strategies that can help people benefit more from the migration that is taking place.

The remainder of the paper is organized as follows. The next section provides a background and literature review of the impact of remittance, while the subsequent section describes data, variable

definitions, and pre-outcome analysis. The following section describes the model. The next section presents the results, while the final section contains the conclusion, policy implications, and limitations of this research.

Background and Literature Review

Literature on welfare suggests that consumption expenditure is the better measure of household welfare in developing countries because consumption indicates what people get, and it remains almost the same throughout the year (Skoufias, Davis, and Behrman, 1999). Therefore, we measure welfare in terms of food expenditures, agricultural expenditures, and educational expenditures. Findings of the previous literature on these three welfare indicators follow.

Starting with remittance and food expenditures, Andersson (2014) found that remittance-receiving households in Ethiopia spend almost 50% of remittance income on food. However, using the National Sample Survey data from India, Parida and Mohanty (2013) concluded that food expenditures of remittance-receiving households was 2% less at the margin compared to the non-remittance-receiving households. Similarly, Thapa and Acharya (2017), using the Nepal Living Standards Survey data, noted that remittance-receiving households tend to spend less on food. Adams and Cuecuecha (2013), using the data of Ghana Living Standards Survey (GLSS), found no significant difference in spending behaviors on food among remittance-receiving and non-remittance-receiving households. Thus, reviewing the results of previous literature to this point suggests mixed findings of remittance's effect on household food expenditures.

Regarding remittance and agricultural expenditures, a study conducted by Castaldo and Reilly (2015) asserted that remittance income is used by many households to reduce their workload by hiring outside labor, thereby increasing the leisure time of household members. Singh, Singh, and Jha (2012) studied the effect of migration on agricultural productivity in Bihar, India, and concluded that remittance-receiving households spend remittance on adopting modern agricultural technologies and improved seeds of rice, causing higher agricultural production. Similarly, Mendola (2008), using the cross-sectional household survey data from Bangladesh, noted the positive role of remittance on the adoption of new agricultural technology, which has a positive effect on agricultural expenditures, leading to improved agricultural production. Thus, findings of previous studies indicate a positive association between remittance and agricultural expenditures.

Finally, regarding remittance and educational expenditures, Thapa and Acharya (2017) studied the impact of remittance using the NLSS data of 2010/2011 and concluded that remittance-receiving households in Nepal tend to spend more on educational attainment. Parida and Mohanty (2013), using large-scale household survey data, studied the role of remittance on household expenditure patterns in India. They found that marginal spending behaviors of the remittance receiver in education were 12% higher than the non-receiver. Based on these results, the authors concluded that remittance has a positive effect on human capital investment. Another study by Calero, Bedi, and Sparrow (2009), using the National Living Standards Survey (NLSS) data from Ecuador, found that remittance has a positive effect on educational attainment and reduces child labor.

Hence, reviewing research findings inside and outside Nepal show the positive impact of remittance on education.

Data, Variable Descriptions, and Pre-Outcome Analysis

Data for this study came from the Nepal Living Standards Survey (NLSS) provided by the Central Bureau of Statistics, Nepal. Until now there have been three waves of data collected by CBS: 1995/1996, 2004/2005, and 2010/2011. We are using the third wave of data from 2010/2011. Data have been collected using various socioeconomic questionnaires, including demographics, consumption, remittance, assets, access to facilities, housing condition, education status of the family members, and employment status. The total sample size was 2,436 households. Variable definition and pre-outcome analyses in Table 1 show that remittance-receiving households and non-remittance-receiving households are significantly different in certain observed characteristics. In other words, two groups are different, and two groups are required to make a comparable on all observed characteristics for the causal inference of remittance on household welfare.

Table 1. Variable Definition and Pre-Outcome Analysis

Variable	Definition	Remittance Receiver (mean)	Remittance Non-Receiver (mean)	P-Value
Gender	Gender of household head	0.617	0.707	0.000
Age	Age of the household head in years	45.047	46.069	0.092
HH size	Total number of members in the household	4.464	4.767	0.000
Dependent young members	Dependent 0-4 years of age	0.467	0.565	0.002
Mid-age members	Age 15-29	1.252	1.225	0.598
Adult age members	Age 30-60	1.346	1.454	0.004
HH job code	Household head job in 6 sectors: Service, Technical, Teaching, Wage earning, Agriculture and Other	4.410	4.469	0.280
Education	Years of schooling of the household head	15.403	15.852	0.003
Total land	Total land size of a household in hectares	0.151	0.176	0.011
Per capita educational expenditure	Total annual education expenditure divided by household size	1541.117	1320.08	0.008
Per capita agricultural expenditure	Total annual agriculture expenditure divided by household size	4664.421	3324.506	0.001
Per capita food expenditure	Total monthly food purchase divided by household size	2579.198	2423.939	0.046
Sample size		869	1,567	

Model

We use the Propensity Score Matching (PSM) proposed by Rosenbaum and Rubin (1983) to estimate the causal effect of remittance on food expenditures, agricultural expenditures, and educational expenditures. Because remittance is not randomly assigned, remittance-receiving households and non-remittance-receiving households are different in certain characteristics, which we already observed from the pre-outcome analysis in Table 1. Thus, we cannot compare these two groups without making them comparable. In the case of observational data, PSM is one of the approaches to compare two groups. PSM was also applied by Clement (2011) and Thapa and Acharya (2017) to study the impact of remittance. We implement PSM in following three steps;

Estimating the Propensity Score Using Logit Model

$$D_i = \widehat{\beta}_0 + \widehat{\beta}_1 X_{1i} + \widehat{\beta}_2 X_{2i} + \widehat{\varepsilon}_i \quad (1)$$

Where, i is a household, D is an indicator variable for remittance-receiving households and is treated as 1 if a household is receiving remittance and zero otherwise; ε is the error term; and β is the coefficient. The vectors X_1 and X_2 represent household characteristics and farm characteristics, respectively. Examples of household characteristics include gender of the household head, age of the household head, household size, number of dependent members, middle-aged and adult-aged members in a household, occupation of the household head, and education of the household head. Similarly, an example of farm characteristics is total land size.

Choosing Matching Algorithm

We use the Nearest Neighbor matching because Rubin (1973) argues that it is one of the most common and easiest to implement matching method. In Nearest Neighbor matching, the treated household is matched with the nearest control household having similar propensity scores.

Assessing the Matching Quality

We assess the matching quality by comparing the means of observed characteristics (covariates) in treated and control groups. After matching, no significance difference between means of observed characteristics indicates a good matching quality. Additionally, visual analysis of similar covariates distribution in treated and control group confirms that two groups are similar in observed characteristics.

Estimating Average Treatment Effect on the Treated

Average treatment effect on the treated (ATT) gives the impact of remittance on remittance-receiving households. ATT is estimated as;

$$\widehat{\tau}_{ATT} = E[Y_i(1)|D_i = 1] - E[Y_i(0)|D_i = 1] \quad (2)$$

Where $E[Y_i(1)|D_i = 1]$ is an average outcome if they have received remittance, and $E[Y_i(0)|D_i = 1]$ is an average outcome had they not received remittance denoting counterfactual.

Results

Propensity Score Matching

A logit model is used to estimate the propensity scores of remittance receivers and non-remittance receivers. The results from the logit model and the variables used in the matching procedures are reported in Table 2. Our results show that a household headed by a male who is older reduces the likelihood of receiving remittance. Similarly, having a higher number of children below 4 years of age reduces the likelihood of receiving remittance. This finding implies that a household having dependent young children cannot receive remittance because the parents must take care of them. In addition, a wage-earning head of household's major occupation also reduces the likelihood of receiving remittance.

Table 2. Propensity Score Matching

Dependent Variable-Remittance	Coefficient	Standard Error	P-Value
Gender_HH	-.256**	.126	0.043
AgeHH	-.056**	.028	0.044
AgeHH_sq	.000**	.000	0.048
HH size	.032	.042	0.442
Dep_young(0-4 yrs)	-.299***	.088	0.001
Mid-age members (15-29 years)	.043	.060	0.472
Adult age members (30-60 years)	-.040	.099	0.684
Technical skill	.702	.509	0.167
Teaching	-.001	.314	0.996
Wage earning	-.481*	.274	0.079
Agriculture	-.189	.223	0.395
Other	-.202	.316	0.522
Education of HH head(years)	-.015	.017	0.369
Total land	-.191	.569	0.737
Total land_sq	-.311	.504	0.537
Constant	1.333	.652	0.041

Note: Single, double, and triple asterisks (*, **, ***) denote significance at the 10%, 5%, and 1% levels, respectively.

Assessing the Matching Quality

We assess the matching quality by plotting the distributions of all explanatory variables before and after matching. Distributions of all variables after matching are similar in both remittance receivers and non-remittance receivers. For the sake of brevity, we have presented the distribution of the variable age of the head of household in Figure 1. Distribution is almost similar in both groups after matching. A similar distribution of variables in two groups increases the likelihood that the

two groups are similar in all observed characteristics, and any difference in outcome indicator is due to remittance. This lends credence to the validity of our experimental design for determining the causal impact of remittance on household food, agriculture, and educational expenditures.

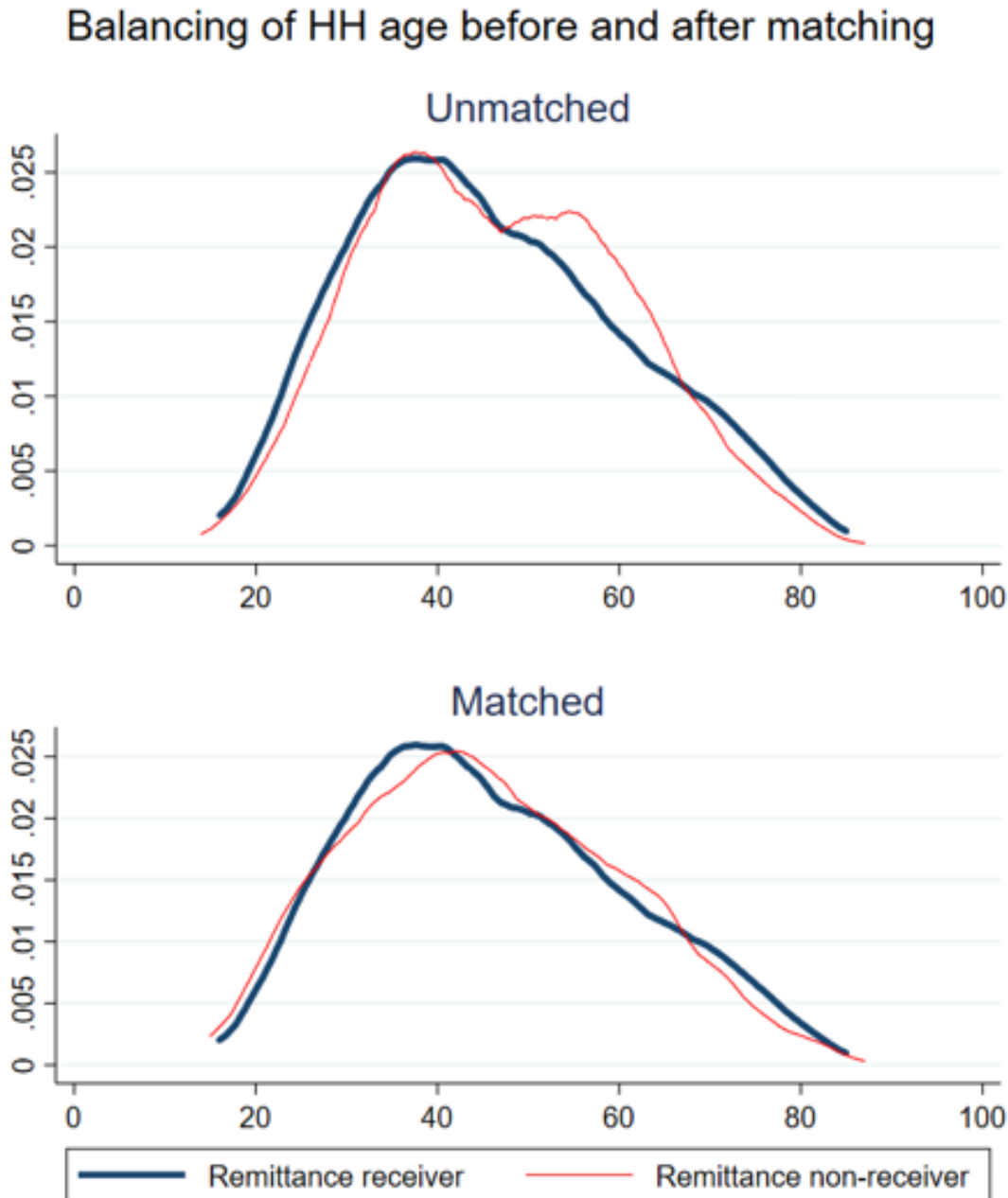


Figure 1. Assessing the Matching Quality in Age of the Household Head

Estimation of Remittance Effects on Household Welfare

Our results using the Nearest Neighbor matching in Table 3 show that there is no significant effect of remittance on food expenditures. Similar results have been found by Randazzo and Piracha (2014) and Castaldo and Reilly (2015). They reported that international transfer reduces food expenditures, whereas domestic transfer shows no effect on household expenditure decisions. However, our results show that remittance-receiving households spend 34% more per capita on agriculture. This result is consistent with the result from de Haas (2006) using data from Morocco, where the author found that remittance income is primarily invested in housing and agriculture. Because the remittance-receiving households are substantially more likely to spend on agriculture, these results are highly suggestive of the role of remittance on the improvement of agriculture development in the western region of Nepal. Similarly, our results show that remittance-receiving households spend 20.33% more per capita on education compared to non-remittance-receiving households. This finding is consistent with the previous results from Bansak and Chezum (2009) and Bohra-Mishra (2011), where the authors found the positive impact of remittance on educational expenditures in Nepal. In conclusion, remittance-receiving households spend more on agriculture and education than the non-remittance-receiving households.

Table 3. Nearest Neighbor Matching

Outcome Variable	Remittance-Receiving Household	Non-Remittance-Receiving Household	ATT
Per capita food expenditure	9.021	9.046	-.025(-0.72)
Per capita agricultural expenditure	9.217	8.877	.340*** (3.60)
Per capita educational expenditure	8.306	8.103	.203** (2.07)

Note: *t*-statistics in parentheses. Double and triple asterisks (**, ***) denote significance at the 5% and 1% levels, respectively.

Conclusions

Using the western region-level microeconomic data obtained from the Nepal Living Standards Survey in 2010/2011 and employing propensity score matching, we found evidence that remittance-receiving households spend 34% and 20.33%, respectively, more per capita on agriculture and education than non-remittance-receiving households. However, there is no impact of remittance on food expenditures.

The findings of this study can be used by federal-level policy makers in the western region of Nepal. The policy-level implication of positive and significant impacts of remittance on agriculture is important for necessary federal-level policy considerations for improving the agricultural sector in the western region of Nepal. The federal government can work on developing proper infrastructure and modern agricultural technology to create an environment conducive to

remittance receivers investing more in agriculture. Similarly, at the household level, higher spending on education among remittance-receiving households can help build human capital in the western region. The focus of this study on poverty and income disparity in the western region provides an important perspective on the impact of remittance. Finally, our results should be interpreted with the following caveats in mind. First, we consider remittance as money sent by absentees, so remittance can be both national and international. Second, the western region used in our study includes the western development region, the mid-western development region, and the far-western development region in Nepal. Third, the data we use is ten years old and things might have changed during this time. Thus, a household's expenditure pattern ten years ago could be significantly different from current expenditure.

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Research Report: Students’ Perceptions of Weight and Health Status and Factors Influencing Their Body Mass Indices

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Abstract

The results of this study suggested that there were no statistically significant differences between how two selected groups of students perceived their overall health and weight status. However, when perception levels were paired with four body mass indices (underweight, normal weight, overweight, and obese), the results were statistically significant. Despite some divergences among perceptions and body mass indices, students who assessed their weight as “about right” and their health as “excellent” were more likely to fall in the normal weight classification than in other classifications. Age, household size, gender, resident status, fruit consumption, and perceptions of health status influenced students’ body mass indices.

Keywords: weight and health status, body mass indices, students, fruit and vegetable consumption, fast food, obesity

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Introduction

The United States has been battling rising levels of overweight adults and obesity for several decades without much success. For example, from 2017–2018, 42.4% of adults aged 20 and over were obese compared to 30.5% from 1999–2000. Severe obesity rates increased from 4.7% in 1999–2000 to 9.2% in 2017–2018. Among adults aged 20–39, the current obesity rate is about 40%, and the rate for severely obese adults is about 9.2% higher among women compared to men and among non-Hispanic black adults compared to other races (Hales et al., 2020). Rising obesity rates have always been a concern given the health risks associated with being obese and the costs of treating obesity-related illnesses. In fact, researchers have identified several diseases directly or indirectly linked to obesity and to rising healthcare costs. Among the diseases are hypertension, high LDL cholesterol, low HDL cholesterol, type 2 diabetes, coronary heart disease, strokes, gallbladder disease, osteoarthritis, sleep apnea, and breathing problems, among others (Centers for Disease Control and Prevention, 2021a).

Researchers have long held the view that the quality of a person's life is linked to physical, psychological, cultural, genetic, sociodemographic, and environmental factors, among others, and that many of these factors contribute to rising overweight and obesity rates both domestically and globally (Choi, 2020). Food preferences are developed at an early age but can diverge in college, when financial and other stress factors often worsen students' dietary habits and reduce physical activity, resulting in weight gains and obesity (Sogari et al., 2018; Caso et al., 2020; Nho and Chae, 2021; Wongprawmas et al., 2021).

Embarking on a new endeavor, such as enrolling in a university, can be a stressful event and is compounded when academic stress is combined with worrying about money. These stressors often result in unhealthy eating habits and weight gains among many students. Consequently, considerable amount of research is being done at the college and university levels to help students make healthier food choices to lower the exploding overweight and obesity rates and related costs of treating diet-related illnesses (Abraham et al., 2018). Nelson et al. (2007), for example, observed that overweight and obesity levels rose in the two groups of students they studied and that the levels were higher among males, African Americans, and students of lower socioeconomic status, but were lower among Asians. They also noted that television viewing and inactivity were associated with obesity. Nho and Chae (2021) found significant differences in health-promoting behavior, psychological distress, body weight, and other factors among participants in their study of overweight or obese female college students in Korea.

Overweight and obesity rates among young adults in Louisiana and across the United States have increased rapidly over the past 25 years. In 2020, Louisiana's adult obesity rate was 38.1%, and the rate among non-Hispanic black adults was 45.2%. The data also indicated that Louisiana residents between the ages of 18–24 were becoming obese at the fastest rate. The student population we studied is primarily non-Hispanic black adults, which gives us an excellent opportunity to study students' perceptions about diet and health and to address any misconceptions they may have on these issues.

Objectives

The study's overall objective is to examine students' perceptions of their weight and health status and their eating habits over two survey periods. The specific objectives are (i) to compare weight and health perceptions and body mass indices (BMI) for two randomly selected groups of students and (ii) to examine whether students' BMI are associated with selected socioeconomic and behavioral factors, such as age (Age), resident status (Live), household size (Hsize), marital status (Single), household income (Income), race (Race), gender (Female), fruit consumption (Fruit), vegetable consumption (Veget), fast-food consumption (Fastfood), and health perceptions (Health) during the two survey periods.

Methods and Procedures

Researchers in the Agricultural Economics Program have been conducting campuswide student surveys at 5-year intervals for more than 25 years. The surveys are based on each project's objectives and are funded by the U.S. Department of Agriculture. In the 2010–2014 survey, the researchers surveyed 402 students and collected data on nutritional knowledge, eating habits, and perceptions of health and weight status, among others. Based on a 5% margin of error and a 95% level of confidence, the 2020–2024 survey will contain at least 367 respondents and will capture data on students' levels of financial literacy and financial stress, eating habits, and perceptions of health and weight status, among others. The multistage sampling method has been used in all cases to obtain the samples.

The study's data were compiled from two random samples, each-containing 132 students from the 2010–2014 and 2020 surveys. The specific questions analyzed were as follows: (i) "Would you say that, in general, your health is poor, fair, good, very good, or excellent?" (ii) "Do you consider yourself to be overweight, underweight, or about right?" (iii) "About how much do you weigh (in pounds) without shoes?" (iv) "About how tall are you (in feet and inches) without shoes?" (v) "In general, how many times per day would you say that you eat fresh fruits?" (vi) "In general, how many times per day would you say that you eat fresh vegetables?" and (vii) "In general, how many times per day would you say that you eat fast food meals?" Data were also collected on age, academic classification, household size, marital status, family's total annual household income, race, and gender. BMI were determined using the formula (weight in pounds \div height in inches²) \times 703. We used the following BMI classifications in the study: underweight (BMI \leq 18.5); normal weight (18.5 \leq BMI \leq 24.9); overweight (25 \leq BMI \leq 29.9); obese (BMI \geq 30) (Centers for Disease Control and Prevention, 2021b). The data were analyzed using descriptive statistics, *t*-tests, chi-square tests for independence, and linear regression. The linear regression model used to estimate relationships between BMI and the selected independent variables for the two time periods is shown in Equation 1. The variables and their definitions are shown in Table 1.

$$\text{BMI} = \beta_0 + \beta_1\text{Age} + \beta_2\text{Live} + \beta_3\text{Hsize} + \beta_4\text{Single} + \beta_5\text{Income} + \beta_6\text{Race} + \beta_7\text{Female} + \beta_8\text{Fruit} + \beta_9\text{Veget} + \beta_{10}\text{Fastfood} + \beta_{11}\text{Health} + \varepsilon$$

Table 1. Variables and Definitions

Variables	Definitions
Independent Variables	
Age	Participants' age in years
Live	Lives on campus = 1; Lives off campus = 0
Hsize	Number of persons living at participant's permanent address
Single	Single = 1; Otherwise = 0
Income	Family's total household income: < \$15,000; \$15,000-\$24,999; \$25,000-\$34,999; \$35,000-\$49,999; \$50,000-\$74,999; \$75,000 and over
Race	African American = 1; Otherwise = 0
Female	Female = 1; Male = 0
Fruit	Fruit consumption (times/day): = 0, = 1, or ≥ 2
Veget	Vegetable consumption (times/day): = 0, = 1, or ≥ 2
Fastfood	Fast food consumption (times/day): = 0, = 1, or ≥ 2
Health	Poor/fair = 0; good/very good/excellent = 1
Dependent Variable	
BMI	Body Mass Indices

Empirical Results and Discussion

Tables 2–4 show the two-period comparisons between students' perceptions of their weight and health status and the computed BMI for both periods. The results suggest that there are no statistically significant differences in students' perceptions of their weight and health status and the computed BMI for the periods studied. However, when weight perceptions are compared to the computed BMI, statistically significant differences emerge. In both survey periods, students continued to place themselves in the wrong weight category (see Table 5). For example, in the 2010–2014 survey, 26% thought their weight was about right when in fact, they were overweight, and 16% of the students were actually obese. Additionally, 57% who viewed themselves as overweight were obese, and 67% who perceived themselves as underweight fell in the normal weight category. The pattern is similar in the 2020 survey. The results in Table 6 also indicate some misperceptions about health status and the computed BMI. A large percentage of students who thought they were in good, very good, or excellent health were overweight or obese. However, 42% and 36% of the students in the two periods correctly linked their health status (poor/fair) with their BMI category: obese. The statistically significant χ^2 coefficients in Tables 5 and 6 imply that the null hypotheses that the response categories are independent are rejected at the 10% and 1% levels of probability, respectively.

Table 2. Students' Weight Perceptions by Time Periods (%)

Responses	2010–2014	2020	t-Value	p-Value
About right	53	54		
Overweight	40	35		
Underweight	7	11	-0.307	0.760

Table 3. Students’ Health Perceptions by Time Periods (%)

Responses	2010-2014	2020	t-Value	p-Value
Poor	6	6		
Fair	20	21		
Good	36	42		
Very good	29	23		
Excellent	9	8	0.758	0.450

Table 4. Computed Body Mass Indices by Time Periods (%)

Responses	2010-2014	2020	t-Value	p-Value
Underweight	4	4		
Normal weight	39	44		
Overweight	26	24		
Obese	31	28	0.571	0.569

Table 5. BMI and Weight Perceptions by Time Periods (%)

Categories	Underweight	Normal Weight	Overweight	Obese	χ ²	p-Value
2010–2014						
About Right	4	54	26	16		
Overweight	0	13	30	57		
Underweight	33	67	0	0	55.924***	0.000
Total	4	39	26	31		
2020						
About Right	1	63	28	8		
Overweight	0	13	20	67		
Underweight	29	50	21	0	81.440***	0.000
Total	4	44	24	28		

Note: ***indicates statistical significance at the 1% level of probability.

In time period 1, resident status, gender, fruit consumption, and perceptions of health influenced BMI. Thus, students who lived off campus, male students, those who consumed fruits, and those who perceived their health as being good, very good, or excellent had lower BMI levels than their corresponding counterparts (see Table 7). BMI levels in time period 2 were influenced by age, household size, and health perceptions. These findings imply that the younger students, those from larger households, and those who ranked their health as being good, very good, or excellent had lower BMI than their corresponding counterparts (see Table 8). Given that the sample responses have the same variances, we can conclude that there were no variabilities in students’ responses from the two surveys. Therefore, the university can continue to offer the health and wellness courses currently in place but instructors must intensify their efforts in encouraging students to adopt healthier eating habits and to learn their correct weight classification.

Table 7. Estimated Results for the BMI Model for Time Period 1

Variables	Estimated Coefficients	Std. Error	t-Value	p-Value
Constant	31.030***	6.595	4.705	0.000
Age	0.161	0.138	1.166	0.246
Live	-2.685**	1.196	-2.245	0.027
Size	-0.314	0.922	-0.340	0.734
Single	-2.476	2.801	-0.884	0.378
Income	0.283	0.533	0.532	0.596
Race	2.639	1.845	1.430	0.155
Gender	-3.926***	1.286	-3.054	0.003
Fruit	-1.187*	0.694	-1.711	0.090
Veget	0.147	0.672	0.219	0.827
Fastfood	-0.205	0.467	-0.438	0.662
Health	-3.621***	1.177	-3.075	0.003
F-Value	2.967***			0.002
\bar{R}^2	0.142			

Note: Single, double, and triple asterisks (*, **, ***) indicate statistical significance at the 10%, 5%, and 1% levels.

Table 8. Estimated Results for the BMI Model for Time Period 2

Variables	Estimated Coefficients	Std. Error	t-Value	p-Value
Constant	36.314***	5.018	7.237	0.000
Age	0.114*	0.064	1.785	0.077
Live	-1.108	1.312	-0.845	0.400
Size	-2.597**	1.233	-2.107	0.037
Single	-1.988	2.269	-0.876	0.383
Income	-0.013	0.618	-0.021	0.983
Race	-2.179	1.958	-1.113	0.268
Gender	-1.062	1.468	0.723	0.471
Fruit	-1.115	1.093	-1.020	0.310
Veget	0.037	1.026	0.036	0.971
Fastfood	-0.559	0.984	-0.568	0.571
Health	-3.359**	1.370	-2.451	0.016
F-Value	2.074**			0.027
\bar{R}^2	0.083			

Note: Single, double, and triple asterisks (*, **, ***) indicate statistical significance at the 10%, 5%, and 1% levels.

Summary and Conclusions

Louisiana's obesity rates have risen steadily over the past 25 years, with most of the growth occurring in the 18–24 age group and among African Americans. The majority of the students at our university are between 18–24 years old and are African Americans. Therefore, the university is an excellent venue for studying weight and health perceptions and eating habits. The homogeneity between the two samples suggests that the student body has not changed significantly over the two survey periods. Therefore, our nutritional strategies are still appropriate for the current

student body. Nevertheless, because students continue to place themselves in the wrong weight categories, we must target our efforts in this area and help students to learn about BMI classifications and how to make healthier food choices and lifestyle changes that will put or keep them in the normal weight category.

The United States is facing a severe health crisis because of the rising numbers of overweight and obese residents. Healthcare costs for treating diet-related illnesses are approaching unsustainable levels. Thus, there is an ongoing need for efforts such as those at our institution to educate young adults on how to improve their dietary habits and lifestyles so as to lessen the strain on the healthcare system. The pandemic uncovered several cracks in the U.S. healthcare system and also highlighted the negative health outcomes that obese and severely obese persons can face from the COVID-19 virus.

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