

**SUSTAINING THOSE WHO SUSTAIN US:  
VALUING LABOR INPUTS IN SMALL-SCALE AGRICULTURE**

by

**RACHEL J. WEIL**

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## ABSTRACT

Although diversified cropping strategies benefit many ecological measures of sustainability, vegetable farms with highly diversified crop portfolios often struggle to maintain profitable businesses that generate sufficient income to support their livelihoods and the livelihoods of their farmworkers. As influential organizations such as the United Nations and United States Department of Agriculture (USDA) promote local and regional food systems with goals of environmental and economic sustainability, they must develop resources (including policy, research and production guidelines) to assist diversified vegetable farmers in the management of the complex production and marketing aspects of these farming operations. Understanding the economic, labor, and production consequences for various managerial decisions on small-scale farms, such as mechanization adoption and “scaling up”, can contribute to the continued success and sustainability of these operations, and the concurrent growth of local and regional food systems. To understand labor costs, we employed time and technique studies to investigate the impacts of management variables (farm size, level of mechanization, grower presence and crew experience) on labor productivity for five crops and three discrete production activities. We found that farm size and mechanization had the most impacts across crops and activities. Mechanized processes that significantly increased labor productivity on a per person basis included waterwheel transplanters, carrot harvesters, and barrel washers. We also found that the intermediate scale farms in our study had lower labor productivity for harvest activities, which was perhaps due to the difficulty and lack of resources to help farmers in scaling up labor management efforts. Increasing support and resources for a permanent, trained and appropriately compensated labor force is an essential aspect to the long term viability of diversified vegetable farms, strengthening the industry while supporting associated ecological and social benefits.

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*“What better books can there be than the book of humanity?” – Cesar Chavez*

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## INTRODUCTION

### *A paradox in the renaissance of local and regional food systems*

According to the United States Department of Agriculture (USDA), ‘local and regional food systems’ are defined as “place-specific clusters of agricultural producers, including farmers, ranchers, fishers, along with consumers and institutions engaged in producing, processing, distributing, and selling foods” (USDA, 2015). The numbers of markets, businesses and farms operating within the local and regional system scale have grown substantially, with many of these operations maturing into flourishing enterprises. Values collected by USDA illustrate the important role of these systems nationally, estimating local food sales totals of \$12 billion, an increase from \$5 billion in 2008 (USDA, 2016). Food hubs, which serve as regional product aggregators, have increased in number by 288 percent since 2007 (USDA, 2015). In 2015, 8,476 active farmers markets could be found throughout the U.S, a 180 percent increase since 2006 (USDA, 2015). While these increases are significant, the sales from local foods remains a fraction of a percent of overall US food sales (USDA, 2015). In response to this data, policy makers in the United States are increasingly recognizing the role of local and regional food systems in fostering greater consumer connection with food and farmers while improving food security.

To amplify the potential impacts of these systems, federal, state, regional and local governments have made substantial investments to increase their capacity, including the development of programs and investments of funds for research and support for further expansion. Federally, the Agricultural Act of 2014 (“The Farm Bill”) provides support for several new and expanded programs. The Farm Bill expands the Farmers’ Market Promotion

Program, administered by the USDA, to include the Local Food Promotion, receiving a three-fold increase in funding to \$30 million per year. Other expanded programs within USDA's portfolio include the Specialty Crop Block Grant, the Value-Added Producer Grant, and the Supplemental Nutrition Assistance Program (SNAP). With these strategies, the USDA has invested over \$1 billion in more than 40,000 local food businesses and infrastructure since 2009 (USDA, 2016). Additionally, in 2015, the USDA announced a further \$97 million would be available to local food projects through expanded USDA grants: "Increasing market opportunities for local food producers is a sound investment in America's rural economies, while also increasing access to healthy food for our nation's families," (Secretary Vilsack, Quoted at the 2015 National Farmers Union Convention). In tandem with federal initiatives, state and local governments have developed additional efforts reflecting these trends.

Vegetable farms comprise an important sector of regional food markets, representing almost a third of local food sales (USDA, 2015). Despite the growth of local and regional food systems, many small-scale vegetable farms are struggling financially. According to the 2012 agricultural census, of the 163,675 'local food farms,' or farms selling into local markets, 85 percent had a gross cash farm income below \$75,000, and only five percent had a gross cash farm income above \$350,000. While a lower gross income may not be reflective of the overall financial status of these farms, other evidence demonstrates that many farmers do not adequately account for their labor as operators when estimating operating expenses, with their product pricing insufficient to allow themselves a living wage (Oberholtzer, 2004; Ostrom 2007; Schreck et al., 2005; Tegtmeier and Duffy 2005). The wide range of farmworker hourly wages, including some as low as \$3.60/hour on diversified vegetable farms, also reflect the lack of an established industry standard in lieu of regulation (Berkey, 2015; Galt, 2015; Weil, 2016). Farm owner's

wages are also variable, and calculated on an hourly basis can result in a wage of under \$3 per hour (Hendrickson, 2005).

Crop diversification is often promoted by scientists and policy makers as a way to improve sustainability and reduce risk for agricultural enterprises (Navarrete et al., 2015). However, while diverse systems provide environmental and agronomic benefits, they also require complex management regimes that may challenge their potential to be implemented widely within the operational limitations of working farms. This is particularly evident in the case of small to mid-sized vegetable operations, which, in addition to their highly diverse crop portfolios, are also highly diverse in their marketing strategies (Silva et al., 2011). New farmers entering into small-scale diversified vegetable farming and engaging in local markets particularly struggle with this complexity of determining the costs of production, creating additional downward pressure on prices throughout a region.

The complex nature of the management of diversified farming systems is not only due to the wide knowledge and skill base in the production and marketing of many crops, but also the requirement for larger labor crews which can be more challenging to efficiently and effectively manage (Buck et al. 1997, Escalante and Santos 2010, Hendrickson, 2005; Navarrete et al., 2015, Pates and Artz, 2014). In their study of southern French farms, Navarrete et al. (2015) investigated the synergies between sustainability criteria (agronomic, environmental economic, social) in diversified farming systems in contrast to farms that were more specialized. In this study, higher levels of diversification required more labor due to the increased production factors associated with each additional crop, which could total to 30 crops for a single field season. However, this did not impact the farmers' perceptions of quality of life, as they cited that the increased labor and management associated with diverse cropping systems was more fulfilling

and less monotonous than the work on specialized crop farms. In his study of Midwestern vegetable farms, Hendrickson (2005) found that farmers had difficulty navigating the dynamic between the level of mechanization, equipment expenses and hired labor, especially during the scaling-up process. Prices are more complex to calculate, given the mix of different crops and equipment. Consequently, labor costs are consistently underestimated and undervalued (Ostrom, 2008).

#### Accounting for production costs

Understanding the economic, labor-related, and production consequences for various farm managerial decisions, such as mechanization adoption and scaling-up, can contribute to long-term success and sustainability of diversified vegetable operations. Enterprise budgets have become a standard approach to evaluate production costs on farms and serve as economic decision-making tools for farmers (Connor and Rangaran, 2009). These budgets assist farmers in the management of risk by estimating the costs and returns associated with the production of a single commodity, and guiding decisions on land, labor and machinery resource allocation to pricing (Conner and Rangaran, 2009). While enterprise budgets are commonly available for many conventionally-produced commodity crops, fewer enterprise budgets for diversified vegetable farms exist, in part due to the high variability in production approaches as well as shared processes and inputs across crops.

Generalized enterprise budgets may not be the most appropriate approach, however, to evaluate the costs of production associated with the highly diversified and complex cropping approaches characteristic of the smaller farms selling into local markets. Instead, farm-specific cost of production evaluations may offer more appropriate and accurate information to guide the financial assessment of these operations. The need for the development of this type of approach

to determine costs of production on diversified vegetable farms is heavily documented in recent scholarship and has also been cited by many farmers (Bozoglu & Ceyhan, 2007; Conner and Rangaran, 2009; Jacobsen et al., 2010; Hendrickson, 2005; Silva et al., 2013).

A number of industries measure labor productivity using time studies, which are used to estimate cycles of work. The studies can inform enterprises in pursuit of improving overall productivity and profit, while also providing support for ergonomic interventions or other modes of assistance for the workers. The Department of Labor uses them in investigations of workplace compliance with labor laws. While no literature exists on using time studies in agricultural labor, methodology has been developed by the Department of Labor. The methodology involves breaking the cycles of work into elemental components, and requires consistency in the start and end time.

Published studies on costs of production of diversified vegetable farms have found that labor accounts for a significant proportion of the operational costs, comprising 65-75 percent of production costs on diversified vegetable farms versus 42 percent of production expenses on specialized vegetable farms (Calvin and Martin, 2010; Chase, 2012; Hendrickson, 2005). In his study, Hendrickson (2005) found that labor hours ranged from 462 to 2,994 labor hours per acre, where 17- 98 percent of those hours were grower's labor input. Labor costs vary depending on a range of factors, including production and marketing approaches, farm size and level of mechanization. Harvest activities have been found to be very labor intensive compared to other production activities (Connor and Rangaran, 2009; LeRoux, 2010). Furthermore, labor needs can additionally vary by market channel (LeRoux et al. (2010). Based on their market channel assessment tool, used for four New York diversified vegetable farms, LeRoux et al. (2010) found that for wholesale markets, harvest and processing and packing were more-labor intensive than

direct-marketing due to the requirements of consistency in size and quality, creating a higher labor need involved in washing, culling, grading and packaging. Across all activities, the CSA channel was the least labor intensive, and U-pick and farmer's markets were the most labor intensive marketing channels (LeRoux et al., 2010). Taking into account a number of additional costs and risks, the CSA channel garnered the best performance rating. However, the study emphasized that optimizing profit requires nimbleness in combining marketing channels (LeRoux et al., 2010).

In addition to differing by activity and market, labor needs on diversified vegetable farms vary widely by farm size. In general, total labor needs are higher on farms with more land, more capital equipment, and a higher share of land in harvested acres (Navarrete et al. 2015, Pates and Artz, 2014; USDA, 2012). Smaller farms, under some circumstances, have been documented to have increased labor efficiency (Bozoglu and Ceyhan, 2007) and higher entry-level wages (Harrison and Getz, 2014), than larger farms. Large farms have some advantages in terms of economy of scale, including greater ability to mechanize, as well as some indicators of labor quality which may be due to greater availability of insurance and other benefits that are more affordable at larger crew sizes and operations (Harrison and Getz, 2014).

Labor needs on diversified vegetable farms are further impacted by the farm's integration of mechanization into farming operations. Mechanization tends to be correlated with farms with more specialized (rather than diverse) crop portfolios (Pates and Artz, 2014). Only a few studies have been conducted to date on the relationship between mechanization and overall farm management for small-scale diversified vegetable farms. Righi et al. (2011) divided vegetable farms (n=2373) in southern Uruguay into seven categories based on eight key variables: total area, irrigated area, vegetable cultivation area, greenhouse area, family labor, permanent hired

labor, temporary hired labor, and mechanization level. They found that the level of mechanization on these farms strongly impacted other production decisions and outcomes, such as crop choice, cultivable area, productivity and income were the availability of off-farm labor, and irrigation. In their study of Midwestern vegetable farms, Pates and Artz (2014) found that an increased level of mechanization was concurrent to an overall increase in farm size (2014). Farmers in this study cited decreased cost, reduced effort, improved timeliness of operations, savings in costs of labor, and mitigation of lack of viable hand labor alternatives as important factors in the decision to mechanize. Mechanization did not completely eliminate the need for labor, especially in harvest, nor did it always have significant labor or cost savings.

Mechanization tends to be less frequent on fresh market vegetable farms, as the risk of potential damage of the crop, decreasing the quality of the product and the amount of salable product, outweighs gains in labor efficiency (Calvin and Martin, 2010; Glancey, 2005). Growers often prefer manual harvesting of fields, as it allows for more careful handling resulting in less culling of damaged product, increasing overall marketable yield (Calvin and Martin, 2010; Pates and Artz, 2014). Further expansion of mechanization on diversified vegetable farms would require significant changes in the farm's operational approaches to mitigate any potential detrimental impacts while still maintaining efficiency gains, such as the use of cultivars adapted to mechanized harvest and cultural practices that facilitate the mechanized system (Glancey et al. 2005; Huffman, 2012).

#### *Laborers on diversified vegetable farms*

Despite the importance of labor on small-scale diversified farms, research and support from broader sustainable agricultural organizations on the welfare of laborers on these farms is

also only recently emerging. As rural sociologist Fred Buttel noted thirty years ago, “the full-time agricultural labor force in nonindustrial farming settings has been almost totally ignored” (Buttel, 1983). At a 2015 Midwest CSA conference, hosted by the Wisconsin Farmer’s Union, farmers spoke out for the need to address offering better job opportunities and living wages for workers. This need is fundamentally linked to promoting diversified vegetable farming a viable economic alternative with a stable, trained workforce.

Given the importance of labor in the expansion of small scale diversified farming systems, it would seem reasonable that the sustainable agriculture movement include forums for farmworker voice in its manifestations. However, the lack of a forum for farmworker voice amongst these organizations is noteworthy, and has not gone unnoticed (Ekers et. al, 2015; Gray, 2014; Minkoff-Zern, 2014; Sbicca, 2015; Weiler et al. 2016). An exemplary group of sustainable agriculture organizations, the member organizations of National Sustainable Agriculture Coalition (NSAC), are “united in their values and commitment to promoting a healthier, more vibrant food and farming system” (NSAC website). Of these 106 member organizations, very few have a farmworker component in their mission or operation. Assuming this to be a representative sample of the sustainable agriculture movement, this absence demonstrates that the connection between labor and the movement is underdeveloped. Historically, workers’ rights have not been prioritized in these organizations. This is not because of disregard for these issues, but because the people initially engaged in these organizations came to the table with different priorities in mind. Engagement of farmworkers has been a more recent effort of NSAC and other similar organizations, and hopefully will yield fruitful partnerships for both parties.

Sustainable agriculture is sometimes assumed to include fair labor practices. However, little research exists to either confirm or deny these expectations (Guthman, 2004). In fact,

studies have shown ambivalence from farmers about including labor protections and fair working conditions under the banner of sustainable or organic agriculture (Berkey, 2015; Shreck et al., 2006). While this study does not seek to evaluate the validity of the connection between labor protection and sustainable farming, it decries the lack of protection offered by federal and state labor law, and investigates remedies to cover workers within sustainable agriculture.

Valuing labor inputs by guaranteeing worker protections and fair wages translates into gains for farmers and farmworkers. Farmers gain a trained workforce they can depend on to cultivate the evolving local and regional food system. From a farmworkers perspective, valuation of their inputs could help them experience a more stable livelihood, from receiving higher wages, improved benefits, and an increased professionalism attached to their career (Glancey, 2005, LeRoux, 2010). The successful improvement of farmworker's lives via the efforts of progressive policies such as those propelled by Los Angeles' Food Policy Council's Good Food Policy Program, Farm Labor Organizing Committee (FLOC), and The Coalition of Immokalee Workers' Fair Food Program have demonstrated that these are victories that span across the food chain. Indeed, valuing labor inputs is integral to the holistic, value-based core of the sustainable agriculture movement, whose success ultimately rests on the labor of farmworkers.

As the literature on labor inputs on small-scale diversified vegetable farms is limited, more research is needed to support and sustain diversified vegetable farming systems. This paper seeks to advance the scholarship on labor in small-scale diversified vegetable farming in two ways. First, the paper will present the results of an on-farm time and technique study that investigated labor as a cost of production, and measured efficiencies on diversified vegetable farms in relation to the level mechanization, farm size, and other managerial factors. The second section of this paper investigates options for protecting farmworkers on small-scale diversified

farms against the backdrop of agricultural exceptionalism. Through the consideration of these two different yet complementary perspectives on labor inputs, researchers, extension agents, policymakers and farmers themselves can help sustain the work that continues to cultivate our local and regional food systems.

## **CHAPTER 1**

### **Effects on labor productivity in time and technique studies on diversified vegetable farms in southern Wisconsin**

#### **METHODS**

Labor data were collected on ten certified organic diversified vegetable farms in southern Wisconsin throughout two production seasons, 2014 and 2015<sup>1</sup>. The farms were selected to reflect a range of production scales, levels of mechanization, and management approaches representative of upper Midwestern organic farms. All farms had a Community Supported Agriculture (CSA) component to their operation, but varied in the other market avenues in which they engaged.

#### ***Data Collection***

Production labor time and technique studies focused on three specific activities: transplanting, harvest, and post-harvest handling (washing/packing). These activities were observed for five different crops: broccoli, head lettuce, carrots, bell peppers, and summer squash. Time required for the packing of CSA boxes was also measured. The observations for each activity by crop are enumerated in Table 3. The crops varied in terms peak labor needs throughout the season, and the activities represented tasks with large hired labor needs within a growing season. Farmers communicated with the research team to schedule data collection visits for key events related to different activities. Timing of data collection was limited to fair weather conditions, i.e. no storms or extraordinary heat in order to avoid the effects of extreme weather on labor efficiency.

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<sup>1</sup> For specific farm visit dates with corresponding activities, see Appendix 1.

Data was recorded in ‘pulses’, with a pulse defined as one discreet activity for one crop (i.e. transplanting a bed of lettuce or harvesting 400 pounds of carrots). Time to complete each activity was recorded for every crop<sup>2</sup>, plus CSA box packing, making a grand total of 15 ‘pulses’ that were observed in this study. Data collection occurred annually for at least one of each pulse per farm each season.<sup>3</sup>

This study utilizes a cyclical measurement component, similar to the methodology used in the Department of Labor time studies. For each pulse, total time required to complete the entire pulse was recorded, as well as the time to complete shorter subsections of the pulse. Timing of the activity was started as the workers started the task and did not include driving to the field or idle time. Information was recorded on data sheets (Appendix 2).

In addition to the time for completion of task, other production metrics were recorded, including appropriate unit of vegetable yield handled in a pulse (and in each individual trial): number of transplants and row feet for transplanting; pound of vegetable harvested for harvest<sup>4</sup>; pound of vegetable washed and packed for post-harvest; and number of boxes packed for CSA packing. Other descriptive information on the method (hand or machine) and technique employed was also collected. Quantitative and qualitative characteristics with respect to the work force included crew size, experience (in seasons), presence of crew leaders, presence of volunteers or worker-shares, presence of farmer-owner, and the division of labor. Additional variables, including environmental conditions, market channels, were also noted. A complete list of data categories can be found in Table 1.

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<sup>2</sup> With the exception of transplanting for carrots, as carrots are typically direct seeded. Direct seeding was not included in this study.

<sup>3</sup> However, scheduling logistics and the dynamic nature of farming (and participatory research) prevented the complete collection of all of these data points.

<sup>4</sup> Except for lettuce, which was measured in heads of lettuce for both harvest and post-harvest pulses.

Interviews with the participating farmers provided supplemental information on farm management, farmer experience, crew experience, employment, wages, market channels and pricing (see Appendix 3). Summary information is found in Table 2. This information was used to provide more context for each farm when interpreting efficiencies and differences between operations.

### Data Analysis

Data recorded on printed forms was then entered into a database. Outcomes calculated reflected four measures of labor productivity: time per output, time per output per person and output per hour per person. The first two measures (time per output and time per output per person) contain the same information as the last two measures (output per hour and output per hour per person), since the measures are simply reciprocals of one another. The participating growers desired data summaries in the form of time per output and time per output per person, but the remainder of this analysis uses output per hour and output per hour per person, which are more conventional measures of labor productivity (BLS, 2012).

For transplanting activities, time per 100 row feet transplanted, time per 100 row feet transplanted per person, transplants per hour, and transplants per hour per person were calculated. For harvest activities, time per pound of vegetable harvested, time per pound of vegetable harvested per person, pounds of vegetable harvested per hour, and pounds of vegetable harvested per hour per person were calculated<sup>5</sup>. For post-harvest activities, time per pound of vegetable packed, time per pound of vegetable packed per person, pounds of vegetable packed per hour, and pounds of vegetable packed per hour per person were calculated. For CSA box

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<sup>5</sup> Except for lettuce, which was calculated in heads harvested or packed instead of pounds.

packing, time per box packed, time per box packed per person, boxes packed per hour, and boxes packed per hour per person were calculated.

Data was analyzed using JMP Pro software (SAS Institute, 2011). Variables analyzed included level of mechanization, farm size, grower presence, new employee presence, and worker-share or volunteer presence. Level of mechanization was operationalized from the variable “Method.” Usually, a binary was employed (hand v. machine), but with a few of the pulses, there was more variety in the type of machine used, so multiple categories summarized the range of machinery employed. Farm size was operationalized from the number of acres in vegetable production on each farm. There were three small farms ranging from 0 to 3 acres, four medium farms ranging from 4 to 10 acres, and three large farms ranging from 10 to 50 acres. Grower presence was noted by a ‘yes’ or ‘no’ to whether the grower was present for the timed activity. New employee presence was noted as ‘yes’ or ‘no’ to whether an employee was being trained on the activity and were participating in the activity for the first time. Worker-share or volunteer presence was noted as ‘yes’ or ‘no’ to whether a worker-share or volunteer or other non-paid workers were participating in the activity.

### Statistical analysis

One-way ANOVAs were conducted on all fifteen pulses for each of the five different variables and for two labor productivity outcomes (output/hour and output/hour/person), for a total of 10 analyses per pulse. For each variable, significant differences were identified using a 5% and 10% significance level. A 10% level was used to determine statistical significance unless otherwise noted. Tukey’s HSD tests were conducted to test the significant differences between

each pair of categorizations within a variable. While the test assumes equal variance, the high level of variance in each pulse satisfies this assumption.

## **RESULTS**

The ten farms included in the study varied by size of operation, as measured by acres in vegetable production. Three farms were designated as “small” (0 to 3 acres), four farms as “medium” (4 to 10 acres), and three farms as “large” (10 to 50 acres). Within each of the three farm size categories, differences in crew sizes, divisions of labor, income levels, and general management styles were observed.

Levels of mechanization varied among the farms. For most activities, only one type of machine was used, resulting in a binary comparison. Transplanting machines consisted of waterwheel and carousel transplanters. Harvesting machines were only observed for carrots. Mechanized harvest conveyor belts (suspended off of a flatbed trailer hooked up to a tractor) were observed to assist with harvest efficiency; these belts allowed the workers to harvest onto the belt, reducing the amount of stooping and the required time for crating. Post-harvest washing and packing equipment included barrel washers and brush washers.

Labor productivity outcomes for this study are operationalized as average output per hour per person, and will be referred to as such throughout this study. These outcomes are summarized by activity for each crop in Table 4 organized by level of mechanization and farm size. The statistical analyses of the variables are also presented by crop and activity in Table 4.

### Transplanting

For the task of transplanting, thirty-one data pulses were collected representing range of equipment used across crops. Waterwheel transplanters (n=14) and carousel transplanters (n=2) attached to tractors were the mechanized forms of transplanting observed. Non-mechanized hand-scale tools used included Hatfield transplanters (n=1), rolling dibblers (n=2) and hand dibblers (n=3). Most farms used trays of soil plugs, requiring the dislodging of each seedling from the trays, resulting in increased time to complete the pulse. This task was usually done before the rest of the transplanting was started, often utilizing the whole crew. Fewer farms (n=4) used soil blocks, requiring less labor during the transplant, but noted to be labor intensive to prepare at the initial seeding of transplants. Some farms incorporated fertilizer into the transplanting, either in the waterwheel transplanter or by hand into dibbled holes created for the transplants. Crew sizes ranged across crops, and were generally higher for the mechanized processes.

Across all crops, labor productivity for transplanting by non-mechanized labor (n=15) ranged from 60.9 to 485.4 transplants per hour person with an average value of 175.7. Average crew size for hand transplanting activities was 3.3 people. Comparing non-mechanized labor productivity averages across all crops, broccoli transplanting was completed at a higher rate of labor productivity, and squash transplanting at a lower labor productivity rate.

Labor productivity for mechanized transplants (n=16) ranged from 212.4 to 1108.1 transplants per hour per person, with an average value of 526.2. Average crew size for mechanized transplanting activities was 4.6 people. When comparing mechanized averages across all crops, labor productivity was highest for lettuce transplanting, while broccoli

transplanting demonstrated the lowest labor productivity. The carousel transplanter was more efficient than most waterwheel transplanters observed, although not statistically significant. In the majority of observations, the task of mechanical transplanting required an additional crew member to replant any plants not fully incorporated into the soil.

Farm size impacted the labor productivity of transplanting activities. For lettuce, peppers and squash, larger farms demonstrated higher labor productivity than small farms. Large farms observed for these crops used mechanized transplanters<sup>6</sup>, while small and medium farms used mostly hand-scale tools. For broccoli, labor productivity for transplanting did not vary across farm sizes.

Of all the variables analyzed, mechanization had the most impact on labor productivity for transplanting activities, with significant differences observed in the completion of transplanting task for lettuce, pepper and squash. Labor productivity for lettuce transplanting was significantly impacted by farm size, new employees being trained and worker share presence.

### Harvest

Harvest activities (n=93) varied less by mechanization intensity and more by labor management strategy. Carrot harvesters (n=4) and undercutters (n=6) were used on several of the farms in this study. Carrot harvesters can increase labor productivity, but require an average crew size of seven. Undercutting requires hand labor in addition to the use of mechanized equipment, with a tractor driver dislodging the roots and the crew manually removing them from the soil. Harvest conveyor belts were observed on one farm, allowing these workers to place roots onto the belt, reducing the amount of stooping and the required time for crating. They require a large

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<sup>6</sup> Except for one exception, where a transplanter was used only to mark holes.

crew of eight to ten people. Harvest belts also were found to demonstrate significant labor productivity on a total pounds harvested per hour basis, but not on a per person basis. Hand labor for harvesting differed from farm to farm in terms of division of labor. Farms with some division of labor (i.e. one person digs and another pulls) generally had higher labor productivity than farms with all crew members doing the same task.

Across all crops except for lettuce, labor productivity for non-mechanized harvest (n=78) ranged from 17.4 to 303.8 pounds harvested per hour person, with an average of 94.2 and crew size averaging 2.7 people. Yield of lettuce was measured in heads and labor productivity ranged from 37.3 to 380.0 heads harvested per hour per person. Comparing labor productivity for non-mechanized labor harvests averaged across all crops, broccoli and lettuce hand harvests produced the highest rate of labor productivity, and carrot hand harvests generated the lowest efficiencies. There was significant variation throughout the crops.

Labor productivity for machine harvests (n=13) for carrots (n=10) was higher for carrot harvesters than those for undercutters. Labor productivity using the undercutter (n=6) ranged from 26.3 to 341.1 pounds per hour per person, with an average of 122.4 and a crew size of five. Labor productivity using mechanized carrot harvesters (n=4) ranged from 449.1 to 1278.9 pounds per hour per person, with an average of 816.4 and a crew size of seven. The use of harvest belts (n=3) for broccoli and squash were observed at one farm, with resulting harvest rates ranging from 92.7 to 121.3 pounds per hour per person, with an average of 105.4 for squash (n=2), and 121.33 for broccoli (n=1). Crew size for harvests with harvest belts averaged 8.3 people.

Labor productivity for carrot harvest was significantly impacted by mechanization. On a per person average, harvests using the carrot harvester were eight times more efficient than harvests using either the undercutter or hand tools (e.g. digging forks or shovels). The use of harvest belts for broccoli and squash resulting in higher labor productivity as calculated by overall pounds harvested per hour, but on a per person basis was not significantly higher.

Farm size affected labor productivity for most crops except for broccoli. Overall, large farms had higher labor productivity than small and medium farms, but not always significant for every crop measured. For carrot harvests, large farms had significantly higher labor productivity than small and medium farms. For lettuce harvests, both large and small farm harvests had significantly higher labor productivity than medium farm harvests. For pepper harvests, large farms had significantly higher labor productivity than medium farms. Grower presence, new employee presence, worker share presence had no significant impacts on harvest activities, across all crops.

### Post-harvest

Time and technique studies for post-harvest activities (n= 74) were limited to the observation of washing and packing, and tasks within those activities. The impact of the use of brush washers was measured for peppers and squash, and barrel washers for carrots. Washing and packing for broccoli and lettuce mostly involved submerging produce in tanks of water or evaporative pre-cooling. Aside from the brush washing, squash post-harvest washing and packing was often minimal.

Across all crops, labor productivity for hand labor post-harvest activities (n=57) ranged from 18.3 to 583.8 pounds washed and packed per hour person, with an average of 220.5. Crew

size averaged two people for all processes, performed by hand or machine. Labor productivity for mechanized post-harvest tasks (n=17), either using a brush-washer or barrel washer, ranged from 80.6 to 1350.0 pounds washed and packed per hour person. For activities involving brush washers (n=7), labor productivity ranged from 108.3 to 1350.0, with an average of 438.7 for peppers and 277.4 for squash. With barrel washers for carrots (n=10), labor productivity for post-harvest activities ranged from 80.6 to 882.8, with an average of 386.9.

Several variables impacted post-harvest activities. Integration of mechanized techniques into carrots, peppers and squash postharvest activities resulted in higher labor productivity as compared to hand washing and packing, but the use of barrel washing for post-harvest activities of carrots created a significant result. Brush washing of peppers and squash had higher labor productivity for washing and packing activities, although not statistically significant.

Larger farms were generally demonstrated higher labor productivity for post-harvest washing and packing activities, with the exception of carrot post-harvest. Farm size significantly impacted labor productivity for washing and packing lettuce and squash. For lettuce, large farms showed significantly higher labor productivity than medium and small farms. For squash, large farms had significantly higher labor productivity than medium farms, but not small farms. For broccoli, measured labor productivity for large farms were found at an overall pounds washed and packed per hour level, but not on a per person level.

Crew experience resulted in significant differences with respect to labor productivity in post-harvest events for several crops. New employee presence significantly lowered the labor productivity for lettuce post-harvest activities. Worker share presence also lowered the labor

productivity for complete lettuce postharvest activities. Grower presence had no significant impact on labor productivity for post-harvest activities measured in this study.

### CSA box pack

Of all the observed activities, packing the CSA share boxes (n=21) demonstrated the least amount of variation across farms. All farms' CSA box packing was non-mechanized. Variation existed with respect to division of labor (e.g., assignment of tasks to specific individuals) and crew composition. The majority of farms assigned each person on the pack line on to three produce items to place in each box, with other individuals additionally assigned to prepare and close the boxes. Individuals on the pack line pushed the boxes forward on the roller table, with each person packing their assigned items into the box. A few farms, with smaller crew sizes and fewer CSA members, would have one or two crew members packing the boxes, filling each box with every share item before moving on to the next box. Many farms used worker-shares to pack CSA boxes, as training requirements were minimal. The number of boxes packed per hour person ranged from 9.9 to 52.0, and averaged 29.7 across all farms. The average crew size for CSA box packs was six.

Worker share presence and farm size significantly impacted labor productivity for CSA box packing. The presence of worker shares increased labor productivity, in number of boxes packed per hour person. In terms of farm size, the small farms on average had higher labor productivity than large and medium farms, but this difference was only statistically significant between small and large farms.

Economic characteristics: pricing, wages, employment

To put the labor productivity and efficiencies into economic context, the team collected information on prices for the study crops in a few different market channels. Farmer's market prices were found to be generally higher than wholesale market prices. On the farms surveyed, broccoli was sold for \$1.60 to \$2.00 per pound for wholesale markets and restaurant, and \$2.00 to \$4.00 per pound at farmer's markets. Carrots were sold for \$1.13 to \$1.60 per pound for wholesale markets, and \$1.25 to \$3.00 per pound at farmer's markets. Lettuce was sold for \$1.25 to \$1.50 per head for wholesale, and \$1.00 to \$3.00 per head at farmer's markets. Peppers were sold for \$1.50 to \$2.50 per pound for wholesale markets, \$2.00 to \$4.00 per pound at farmer's markets. Squash was sold for \$1.50 per pound for wholesale markets, \$1.50 to \$2.00 per pound, or \$1.00 for 2.00 squash at farmer's markets.

Information on participating farms' wages and employment provided context for valuing labor inputs (Table 5). Starting wages for new employees ranged from \$7.00 to \$10.50 per hour, with an overall average of \$9.00 per hour. Starting wages for managers or experienced employees ranged from \$10.00 to \$15.00 with an overall average of \$11.00 per hour. As characterized by farm size, small farms averaged \$9.00 per hour for new employees and \$10.00 per hour for managers or experienced employees, medium farms averaged \$8 per hour for new employees and \$11.00 per hour for managers or experienced employees, and large farms averaged \$9.75 per hour for new employees and \$12.75 per hour for managers or experienced employees per hour.

Full time employees, excluding owners, ranged from 0 to 15 across all ten participating farms. Part time crew members ranged from 1 to 12. Employee retention ranged from 0 to 80

percent. To summarize by farm size, small farms averaged 0 full time employees and 3 part time employees. Medium farms averaged 3 full time employees and 5 part time employees. Large farms averaged 11.3 full time employees and 7 part time employees.

## **DISCUSSION**

In a previous study conducted by the authors, high coefficients of variation were observed in annual labor hours needed to complete production, harvest, and packing activities on organic diversified vegetable farms throughout the upper Midwestern U.S. (Silva et al., 2014). The goal of this study was to further understand the role of farm size and production, harvest, and packing approaches in the labor productivity of a specific task to better understand sources of this variability. With the approach outlined in the work outlined in this paper, a tremendous degree of farm-to-farm variation exists in labor productivity.

The high level of variability in labor productivity across crops and activities reflects the diversity of approaches to production and management, even within farm size classification and level of mechanization. For example, with the use of a specific tool (e.g., a barrel washer used in carrot post-harvest activities), techniques for tool usage and division of labor employed varied widely. While the statistical analysis is limited to the five variables selected, the results are a starting point to allow farmers to evaluate labor efficiency and production costs on their farms.

Data from this current study illustrated a decline in the labor productivity on medium-sized farms (Hendrickson, 2005; Silva et al. 2014). For lettuce harvests, both large and small farm harvests had significantly higher labor than medium farm harvests. For pepper harvests, large farm size harvests had significantly higher labor productivity than medium farm size

harvests. Grower presence, new employee presence, worker share presence had no significant impacts on labor productivity for harvest activities, across all crops.

On-farm research restricts the amount of control a research team has over a study. There is a limited ability to test for all variables, because of time constraints and operationalization of some variables, and other issues. However, many variables influence labor efficiency.

In addition, the small sample size and relatively small geography of the farms makes the conclusions from this study perhaps less apt to apply to a wide range of farms. This is a limitation found throughout participatory research looking at labor on farms (Jacobsen et al, 2010; LeRoux et al, 2010). Also noteworthy but not quantified was the lack of demographic diversity in the farmers and farmworkers studied. No migrant workers were observed, although some participating farms reported contracting short-term crews for tasks like weeding or strawberry harvests.

Among the variables examined, mechanization and farm size impacted the most crops and activities. However, these relationships are not absolute across all crops and activities, nor do they entirely explain labor productivity. Yet, they explain what sets some farms apart, and indicate crops or activities that can benefit from adoption of machinery or are more suitable for a larger scale. Considerations such as crew size, farm size (i.e. in acres) and worker welfare are important in assessing the advantages to each mechanized process.

### Impacts of mechanization

Mechanization resulted in significantly higher labor productivity for all transplanting activities<sup>7</sup>, and carrot harvest and post-harvest activities. Transplanting by hand is very labor-intensive across all crops, and mechanized transplanting has the potential to increase labor productivity up to tenfold<sup>8</sup>. Crew size is important to consider, as mechanized transplanters require four to five crew members on average. For this reason, farms with fewer crew members might not be able to support the use of a waterwheel or carousel transplanter. Economic and logistical concerns about space and turning radii must also be factored into the consideration of mechanization adoption.

Both activities associated with carrots were significantly impacted by mechanization. Even the observation with the lowest labor productivity for carrot harvesters was more than twice as productive as the most efficient harvest by shovels or digging forks. These machines can have enormous impacts, but average crew size for harvesters was 7. Undercutters require fewer crew members, but also resulted in far lower labor productivity. Still, incorporating ergonomic and worker welfare concerns can add to the advantages of these machines. Barrel washers also greatly increased labor productivity, and did not require an increase in crew size. Many farmers particularly praised the benefits of switching to a barrel washer instead of spending hours washing by hand. Barrel washers are one of the more farm scale-flexible mechanized tools available.

Activities for which the mechanized process did not show significantly higher labor productivity than the non-mechanized process were usually attributable to a major difference in

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<sup>7</sup> Except for broccoli. \*\*add how we don't know why?

<sup>8</sup> Measured from minimum of range for hand labor, and maximum of range for machine labor.

crew size or the equipment being new. Crew size affected labor productivity calculations for the harvest belts. The average crew size was 8.33, which decreased the labor productivity (calculated per person) and also makes their use less widely attainable. How employees interface with the machines and the ergonomics also matter, so these must be considered in the benefits for harvest belts.

The use of brush washers showed some increased labor productivity that was not significant, but still noticeable. Labor productivity for pepper post-harvest washing and packing was greater than that of squash. The lack of significance could be attributable to small sample size (n=11 for peppers, 16 for squash), or the fact that the machine was a new purchase for some of the farms and employees had recently been trained (though they were not being trained at the time of observation).

This relationship speaks to the capital- labor dynamic central to economic analysis, but does not follow a simple fixed ratio where more capital translate to less labor needed to complete a task. Tractor-pulled transplanters and carrot harvesters are effective, but their crew size requirements make them less widely adopted diversified vegetable farms. With crew sizes smaller than five, the barrel washer for carrots is the only scale-appropriate machine than had significant effects on labor productivity observed in this study. Few hand-scale tools were observed that improved labor productivity, except the rolling dibbler for transplanting. The dichotomies and absence of machinery in many of the small and medium farms underlines for the need for scale appropriate, inexpensive machinery.

*Impacts of farm size*

Farm size had more nuanced effects across the crops and activities observed at the participating farms. Transplanting for lettuce; harvests for carrots, lettuce, peppers; post-harvest for lettuce and squash, and CSA box-packing were all significantly impacted by farm size. Harvest activities are the most affected, with increases in labor productivity for large farms up to threefold for peppers, lettuce and squash. Higher labor productivity for carrot harvest is partially explained by the presence of machine carrot harvesters at large farms. Harvests on these large farms were generally more systematized, which could account for why higher labor productivity was observed on larger farms. Labor productivity observed for post-harvest washing and packing on large farms may have more to do with an economy of scale effect: efficient processes may exist that only make a difference for larger volumes of produce. Management of quality or hygiene might also play a role. In addition, some labor productivity on large farms was found significant at overall units per hour measures, but was not significant when calculated per person.

Estimating labor needs is an important part of increasing farm size, and a few studies have shown the difficulty in negotiating these needs at an intermediate scale. Lower labor productivity rates were observed for some crops and activities on medium farms, as compared to large and small farms, a trend found in a few studies mentioned earlier (Hendrickson, 2005; Silva et al., 2014). In his study of nineteen Midwestern farms, Hendrickson (2005) found that the midscale farm was a system that is harder to maintain than other scales of diversified vegetable farms. This was observed in various aspects of our study as well. The midscale farms, labeled market gardens and ranging from three to twelve acres had the lowest three-year average annual gross sales of the three scales of farm, at \$11,121 per acre. The midscale farms had notably higher hours per acre than large scale farms, labeled vegetable farms at 12 or more acres and the highest percentage of labor hours performed by owner than either small scale 'market gardens'

or the large scale farms. Together, the three of these factors, the dip in average gross sales, higher labor hours per acre and higher owner labor hours, indicate the nuance of calculating labor costs at the intermediate scale of diversified vegetable farming.

In our study, this pattern was observed most often in harvest activities, for all crops except for squash. Some of the differences were significant. Some of this is attributable to one of the medium farms' focus on education and recruitment of a large pool of 'interns.' Other speculations on the source of this decrease in efficiency suggest that medium farms are scaling-up from an operation primarily run and staffed by the farmer(s) themselves, to an operation where a multi-person crew is necessary. This shift requires management skills, which take time to attain, and a change in processes to accommodate a crew. This speaks to the paucity in medium-scale tools, as discussed before. Also noteworthy is the dearth of federal programs and resources for farmers who are not considered 'beginning farmers' (by the USDA definition) anymore, but are still small in size and perhaps still renting land.

The effect of farm size on wages and employment practices is an interesting complement to labor productivity comparisons. Starting wages for new employees on medium farms on average was less than that of larger and smaller farms. This is in line with the notion of the difficulty in adjusting to managing payment in a scaled-up system. The concern over the impact of farm size on jobs has been cited widely in literature on conventional agriculture, it has not been widely studied in sustainable, small-scale agriculture, and not at all in diversified vegetable farming. The few studies on job quality in sustainable agriculture show mixed results in regards to the relationship between job quality and farm size (Fan and Chan, 2005; Guthman, 2004; Harrison and Getz, 2014) Larger farms sometimes benefit from economies of scale effects, where they can provide more benefits or trainings to their crew due to group discounts, while at

the same time, smaller farms generally have higher starting wages (Harrison and Getz, 2014).

While this study did not look at job quality specifically, the variation in wages, sizable presence of unpaid labor, and general pressure to keep wages low suggests more attention should be paid to this aspect of sustainable agriculture.

#### *Impacts of crew experience and grower presence*

Crew experience had few discernable patterns on labor productivity and minimal impacts compared to mechanization and farm size. New employee presence significantly lowered labor productivity for lettuce transplanting and post-harvest activities. Worker-share presence significantly lowered labor productivity for lettuce transplanting and post-harvest activities carrots (almost tenfold), while it significantly increased labor productivity for CSA box packing. Lettuce transplanting was one of the few transplanting activities where new employees or worker shares were present, so perhaps crew experience would have had a bigger impact had more transplants with new employees or worker-shares been observed. Carrot post-harvest activities with worker-shares were correlated with hand washing, which significantly lowered labor productivity as compared to barrel washing. The fact that worker-share presence increased labor productivity during CSA box packing supports the many farmers who argue for this staffing arrangement for this activity.

Grower presence did not significantly affect any activity or crop. One explanation could be that the pressure to perform from the grower's presence was replaced by the pressure from the presence of researcher. However, even when the activity was performed by the grower themselves, this did not seem to make a significant difference on labor productivity.

### Management

These five variables do not explain all comparisons of labor productivity. Management styles are an important component of the equation, but also more complex to measure and incorporate into a quantitative model for labor productivity. I would argue that the variation left over after analyzing the discrete variables is principally attributable to management. From interviews and observations, we found some anecdotal evidence of managerial prowess on various farms, such as managers who gave periodic trainings to the crew or checked in with the crew twice daily to reorganize, assess crew welfare and set priorities for the day. Managerial skills often improve with grower experience, but they are not always correlated. In his study, Hendrickson (2005) found that the combination of managing an efficient work crew and effective tools was crucial to achieving economic success for the owners, across farm sizes. There is no singular correct way to manage, but farmers and managers who appreciated the strengths of the crew and appreciated crew members as assets rather than liabilities generally had a happier place to work, which sometimes translated to labor productivity.

### **CONCLUSION**

Despite this study's limitations and small sample size, there are many questions in agriculture that could be answered through time and technique studies, and this study has just begun to show that potential. To that end, more time studies of this nature should occur. More data that addresses more variables would help decipher further causes of efficiency. A larger sample size would increase the robustness of the study, and include more of a diversity of

farmers and farmworkers. Time studies could contribute to collective resources and tools for regional organizations of sustainable agriculture.

This study produced benchmark labor productivity metrics for transplanting, harvesting and post-harvest washing and packing for five different crops, and analyzed the effects of five different variables on these pulses. The study found that farm size and mechanization were important variables that affected labor productivity in various ways. Mechanizing transplanting and carrot harvests and post-harvests were advantageous to farmers. Scaling-up farm size significantly impacted harvest activities. Worker-shares presence in CSA box increased labor productivity, while it decreased labor productivity in other activities. These strategies for increasing labor productivity and managing costs of production on small-scale farms can help farmers value labor inputs and ultimately, help sustain local and regional food systems.

This study aims to help farmers measure their own economic sustainability, and will contribute to the body of work that helps farmers find equilibrium between various constraints, such as crop diversification, labor inputs, and marketing channels (Navarrete et al., 2015). Policy should support efforts that provide resources to help small-scale sustainable farmers strategically make decisions, such as mechanization adoption or scaling-up. Additionally, policy should support research and business endeavors that develop mid-scale tools for vegetable farms, and incentive programs to make them affordable.

This study could help other researchers develop more comprehensive measures of sustainability, based on labor inputs as well as environmental inputs. We were not able to evaluate economic consequences of these partial measures of labor productivity, as a full labor productivity rate would include output per hour per worker for all processes involved in the

production of a widget (or vegetable, in this case), and we did not collect full financial information from each farm. However, understanding labor productivity by activity can help farmers better manage their workforce. Furthermore, analysis of the wages in context of the labor efficiencies could contribute to the discussion of living wages emerging within other sectors of the food supply chain. This study provides a platform to explore many different aspects of labor costs on small-scale vegetable farms.

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## CHAPTER 2

### **Agricultural Exceptionalism and Strategic Partnerships to Protect Workers on Small-Scale Farms**

#### INTRODUCTION

At a recent conference of Midwestern diversified vegetable farmers, one panelist decried the lack of a trained workforce for small-scale sustainable agriculture. He noted the high turnover in labor on farms, and attributed this to the lack of managerial positions and living wages. The movement was built on underpaid labor and internships, he proclaimed. He emphasized that sustainable, community-based farming should be viewed as an employment system, supported by ongoing, well-paying jobs. This call to create a fairly-paid, trained and dignified workforce of farm laborers is hardly new, but has not taken priority in sustainable agriculture.

Supporting hired labor on small-scale diversified vegetable farms by providing a fair day's pay for a fair day's work and proper worker protection is necessary for the long-term sustainability of the sector. Under federal labor law, small-scale farms are exempt from many of the worker protections applicable to the rest of the national workforce. This complicates farm jobs and livelihoods, and makes for a patchwork of state and local regulation that provide unequal coverage to workers on these farms. Worker protections have not been on the forefront of small-scale sustainable agriculture discussions, as they have to a greater extent in large-scale industrial agriculture. Federal programs for supporting beginning farmers have arisen in the past decade. However, as an increasing number of producers, retailers, consumers, purchasing institutions and policy makers are supporting local and regional food systems based in sustainable small-scale agriculture, nurturing a labor force of paid, trained farmworkers will be the key to growing the industry to its full potential.

### Hired labor on small-scale diversified vegetable farms

Hired labor on small-scale diversified vegetable farms is not enumerated in the National Census of Agriculture. In the 2014 US National Organic Census of Agriculture, which accounts for a wide range of organic farms (including dairy and livestock farms, e.g.), the USDA reports that about 60 percent of the nation's certified and exempt<sup>9</sup> organic farms reported hired labor, including contract labor, as one of their production expenses (USDA Census, 2014). While organic farms accounts for a much wider variety of farms that are not necessarily representative of the labor needs of small scale diversified vegetable farms, the presence of hired labor is commonplace on sustainable farms.

To put things in the context of small-scale diversified farms, findings from a recent survey of Wisconsin diversified vegetable farms with a Community Supported Agriculture (CSA) component, disseminated by the FairShare CSA Coalition reflect the importance of hired labor. The survey found that 83 percent of survey respondents (n=50) had paid workers of some kind. Of these 50 farms with paid workers, 22 percent of farms had hired managers, 62 percent had full-time workers, 86 percent had part-time workers, and 18 percent had interns or apprentices (FairShare, 2015b). The majority of all these employees were paid hourly. The diversity and varied prevalence of wages and benefits for hired labor on sustainable farms indicates the lack of uniform standards or norms across the sector.

### A proactive approach to protecting small-scale agricultural workers

Investing in developing a work crew on a small-scale sustainable farm requires training for a diversified set of activities, and a significant amount of time spent by the farmer. However, many small-scale farms experience high rates of turnover for their work crew (Oberholtzer, 2004). In her study, Berkey found that a third of respondents had a workforce comprised of more than 40 percent new

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<sup>9</sup> According to the USDA, farms can be exempt from certification if they made less than \$5,000 in annual sales. Such farms are noted as 'exempt' but still included in the Census.

employees. In the Veggie Compass study, farms were asked about employee turnover (i.e. the converse metric), and the average of the farms in the study was 40 percent. One farmer in the study by Shreck et al. (2006) said that treating workers with respect and paying them above minimum wage saves her money on training (up to \$30,000) as the crew returns each year. In this way, “the farm becomes a center not only of production, but of training and cooperation with the community” (Henderson, 2016).

A critique of the concern over labor in sustainable agriculture might be the relative lack of formal complaints of wage theft or human rights violations that are cited in large-scale agriculture, where laborers are primarily migrant workers and immigrants. Immigration policy makes the already vulnerable position of the farmworker even more precarious, leading to all sorts of exploitation and tolerance of terrible working conditions by migrant workers. Enforcement of these serious human rights and labor violations is paramount to the welfare of these workers. In small-scale sustainable agriculture, these violations are notably absent, but the underpayment and lack of worker protection merits a proactive approach as the sector grows. Employing the broken windows theory to argue for a shift in the climate in which worker voice is exercised in agriculture merits consideration (Weil, 2014). The theory advocates a shift from reactive response towards proactive intervention, in order to prevent more serious violations and crimes. Extending this application to sustainable farmworkers, a proactive approach to expand worker protections could function to prevent crimes such as wage theft or exploitation.

Considering this broken windows rationale, advocates of sustainable agriculture and local and regional food systems should address the patchwork coverage of farmworkers under labor laws, which is especially sparse on small-scale farms. In the next section, I explore the legal protections afforded to small-scale agricultural workers, in conjunction with the economic realities of being a worker in this field. I then explore innovative mechanisms for addressing this lack of coverage, and address future research questions.

## **Legal exemptions for small-scale agriculture from labor law**

Agricultural exceptionalism exempts farmworkers from a panoply of federal and state protections, both in labor law and occupational health and safety law. Even fewer protections exist for farmworkers on small farms. These laws include the Fair Labor Standards Act's (FLSA) provisions on minimum wage and overtime; state laws on worker's compensation and collective bargaining, and Occupational Safety and Health Administration protections.

This exceptionalism is hardly new; it stems from a set of out-of-date perspectives and prejudices encapsulated in policy due to a compromise between urban and rural Congressional representatives. In the 1917 ruling of *White* 243 U.S. 188, the U.S. Supreme Court stated that the "risks inherent [in farming] are exceptionally patent, simple, and familiar" (Ebinger, 2008). Earlier rationalizations of these exemptions included a bevy of misguided perceptions of farming. Lawmakers cited a lower risk of injury, in comparison to factories; and an inability of farmers to raise prices to pay for worker's compensation, therefore passing the cost to consumers. Along with these misconceptions of risk in farming, a historic prejudice pervaded the New Deal legislation that sought to guarantee rights for workers. As agricultural workers were predominantly non-white, exemptions arose to bar these workers from protections (Schell, 2007). Due to political factors and the increasing complexity of the agricultural workforce, these exemptions persist today, largely untouched from their original forms.

### *Exemptions for pay under the Fair Labor Standards Act and state statutes*

The most flagrant exemptions for agricultural workers lie in the Fair Labor Standards Act (FLSA). The FLSA, first enacted in 1938, establishes the national minimum wage, overtime pay, recordkeeping, and youth employment standards, affecting employees in the private sector and in Federal, State, and local governments. The definition of agricultural workers under FLSA is broad and exempts an expansive range of employees:

“Agriculture includes farming in all its branches and among other things includes the cultivation and tillage of the soil, dairying, the production, cultivation, growing, and harvesting of any agricultural or horticultural commodities (including commodities defined as agricultural commodities in section 1141j(g) of Title 12), the raising of livestock, bees, fur-bearing animals, or poultry, and any practices (including any forestry or lumbering operations) performed by a farmer or on a farm as an incident to or in conjunction with such farming operations, including preparation for market, delivery to storage or to market or to carriers for transportation to market. (Fair Labor Standards Act, Sec. 203(f))

Accordingly, any employee employed in agriculture is exempted from the regulation on minimum wage if the farm employs six full-time employees or fewer or on a farm which used less than 500 man-days of labor (Fair Labor Standards Act, § 213 5&6A). 500 man-days of labor is roughly equivalent to 7-8 employees working full-time in a calendar quarter. Additionally, all immediate family members of the farmer, including children, are exempt from minimum wage and child labor protections.

Many states have sought to provide a minimum wage for agricultural workers. Wisconsin’s agricultural minimum wage is equal to the federal minimum wage of \$7.25 an hour (WI DWD, 2009). In New York, the agricultural minimum wage is set at \$8.75 an hour, which is on par with the state minimum wage (NYDOL, 2015). In California, agricultural minimum wage is also equivalent to the state minimum wage of \$8.00 an hour (La Cooperativa, 2015).

As a result of this patchwork, wages for hired agricultural workers on small-scale diversified vegetable farms vary tremendously. Real hourly earnings for farmworkers across all farms averaged \$10.80 (in 2012 prices), which is not substantially different from small-scale diversified vegetable farms (USDA, 2012). Through studies of small-scale diversified vegetable farms across the country, wages range from \$3.60 an hour to \$15 an hour for new employees, and \$9 to \$22 per hour for managers (Berkey, 2014; Galt, 2015; FairShare CSA, 2015b; Weil, 2016). On average, these studies reflect \$9 per hour as a starting wage for new employees, and around \$11 as a starting wage for experienced employees or managers. Internships posted on the National Center for Appropriate Technology (NCAT) database list stipends that range from \$300 to \$1000 per month (NCAT, 2015). The range for starting wages in conjunction with the widespread use of community labor on small scale diversified vegetable farms

across the country suggest a great variability in pay for workers, including underpayment. This range is not addressed through the FLSA.

Similar to minimum wage, most agricultural workers are exempt from the overtime protections of the FLSA. Although states have the ability to provide their own coverage of overtime, many choose to exempt farmworkers, or provide a threshold above 40 hours a week that is considered overtime. Wisconsin, for example, exempts farmworkers from overtime coverage. In Maryland and California, overtime does not apply until after a farmworker has worked 60 hours per week (Schreck et al., 2006).

Work hours vary, as different points in the season reflect different labor needs. Internship postings for sustainable farms in the National Center for Appropriate Technology (NCAT) database suggest workers often work 50 to 60 hours a week. Most start in February or March, and extend through the growing season. Again, there is no scholarship on average weekly hours for farmworkers specifically on small-scale diversified vegetable farms, but due to the labor intensiveness of this type of farming and the weather-dependent decision-making on farms, working longer days is somewhat of a norm during peak season. Additionally, Berkey's study found that of the third of participating farms in her study that had 'benefits-eligible' employees,<sup>10</sup> only 19 percent offered overtime pay (Berkey, 2015). However, underemployment persists during the off-season, as the majority of US farmworkers spend less than half the year on a farm (Oxfam, 2004).

Enforcement of FLSA relies on records kept by farmers, which must include information for each employee including: name, address, occupation, dates of employment, time began and ended work each day, meal break, rate of pay (and if work is on piece rate, quantity). This record-keeping would allow farmers and the government to better quantify the efforts of farmworkers on small-scale farms, and broadly understand and appreciate their contribution to sustainable agriculture. The exemptions from the

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<sup>10</sup> Benefits-eligible workers are defined by the federal government as employees who have worked for a covered employer for at least 12 months, have 1,250 hours of service in the previous 12 months, and if at least 50 employees are employed by the employer within 75 miles. (from the "Employee Rights and Responsibilities Under the Family and Medical Leave Act." 2013)

minimum wage and overtime protections also preclude farmworkers on small farms from benefitting from the impacts of this type of recordkeeping. While the coverage under minimum wage provisions is wider than overtime protections, and the Department of Labor strives to protect agricultural workers through child labor restrictions and the requirement of recordkeeping, many FLSA protections against exploitation are not available to small-scale diversified vegetable workers (DoL WHD, 2008).

Workers' compensation requires businesses to provide wage replacement and medical benefits to a worker injured in the workplace. Workers' compensation is a state-determined mandate, but has similarly been denied for workers on small-scale farms in most states. In Wisconsin's worker's compensation law, Wis. Stat. Ann. § 102, the minimum requirement for applicability of a farm is the employment of six or more employees on any 20 days in a calendar year (WI Worker's Compensation, 102.05(3)). These six individuals do not have to work in the same location, and the 20 days do not have to be consecutive. Additionally, the six individuals do not have to be full time employees (i.e. if 6 employees work only one hour on Fridays for 20 weeks, the threshold is met). To confound things further, spouses, children, parents, siblings and in-laws are not counted as employees of farmers. In contrast, non-agricultural businesses must provide workers' compensation if they have one employee (Ebinger, 2008). If a farm does not carry workers' compensation, either because of state exemption, and an employee is injured, they may sue farm under tort law or file a negligence claim. To put the use of this protection in perspective, 18 percent of CSA farms surveyed nationwide carried workers' compensation insurance (Johnson et al., 2013).

#### *Coverage and exemptions under Migrant and Seasonal Agricultural Worker Protection Act*

The Migrant and Seasonal Agricultural Worker Protection Act (MSPA) protects migrant and seasonal agricultural workers by establishing employment standards related to wages, housing, transportation, disclosures and recordkeeping (MSPA, 1986). Employers are required to meet minimum standards for heating, cleanliness, living spaces, sanitation, and other very basic requirements of employer

provided housing. There are also basic requirements for safety of vehicles used to transport workers to and from the fields if provided by the employer. While MSPA offers some coverage previously denied to many farmworkers, the small business exemption has the same 500 man-days of labor threshold as FLSA (MSPA, § 4.2).

*Exemptions from collective bargaining under National Labor Relations Act*

The National Labor Relations Act (NLRA) exempts farmworkers from another worker protection: collective bargaining. However, some states recognize farmworkers right to organize. The California Agricultural Labor Relations Act (CALRA) was enacted in 1975, and seeks to “ensure peace in the agricultural fields by guaranteeing justice for all agricultural workers and stability in labor relations” (Cal Lab. Code § 1140). Otherwise, agricultural workers have little legal protection to bargain for their rights. Greg Schell’s analysis reveals another layer of complexity to the right to organize: “oversupply of labor has led to stagnant wage levels and discouraged collective action by disgruntled workers” (Schell, 2002). On top of the lack of agency granted by NLRA for farmworkers to organize, economic conditions allow for the easy dismissal by employers, especially given the immigration of many farmworkers. Small-scale diversified farms may not share the same pool of workers as large-scale commodity farms, but the ability to act collectively for better employment conditions should be available to all workers, no matter the scale.

*Exemptions from safety protections under the Occupational Safety and Health Act*

Lastly, Occupational Safety and Health Administration's (OSHA) worker safety protections do not extend to workers on small-scale farms. OSHA’s mission, as set by the Occupational Safety and Health Act of 1970 is “to ensure so far as possible every working man and woman in the Nation safe and healthful working conditions...” (OSHA, 1970). The applicability of OSHA regulations is limited in operations with less than eleven workers (OSHA, 1970). Furthermore, funding appropriation bills have prohibited OSHA from spending funds on enforcement against small farms with fewer than 11 employees

who have not had a temporary labor camp (i.e. housing for seasonal workers) in the previous year (Armstrong, 2014). OSHA Field Sanitation Standards, which seek to ensure minimum standards in field sanitation and labor camps, also only apply to agricultural operations with eleven or more employees working in the fields in a day (DoL WHD, 2013).

Cumulatively, these exemptions deny agricultural workers on small-scale farms the basic protections provided to the rest of the U.S. workforce, which undermines the socioeconomic position of these workers. Indeed, the multitude of exemptions for workers on small farms from laws intended to protect all workers creates a complicated and seemingly ambivalent legal territory for CSA farms to navigate. The sustainable agriculture movement must advocate for solutions that place farmworkers employed on farms of all scales under protections on par with the rest of the workforce.

### **MECHANISMS FOR VALUING LABOR INPUTS**

Intuitively, the most comprehensive solution proposed to address the limited worker protections for farmworkers is to end farmworker exceptionalism in labor law, by abolishing the exemptions and thus including all agricultural workers through amendments to the original Acts. In his article “Ending farmworker exceptionalism,” Greg Schell (2007) argues that advocates have campaigned for laws to protect farmworkers, such as the Migrant Seasonal Protection Act, rather than removing the exemptions that deny them the basic rights granted to the rest of the workforce. He argues that this ‘strategy of amelioration’ is bound to fall short as farmworkers become subject to the same political forces that first created agricultural exceptionalism. For these reasons, ending the exceptionalism by getting at the root of the problem and including agricultural workers on all scales and types of farms in the coverage provided by these laws is the only path towards meaningful systemic change, according to Schell.

These exemptions are rooted in New Deal-era policy and Jim Crow prejudices that have been semantically reframed as protection of the ‘family farm,’ and are incredibly difficult to detangle from the

web of protections allowed to agriculture based on the political power of the industry in Washington. State-level efforts, such as the proposed New York Farmworker Fair Labor Practices Act from the 2013-2014 legislative session, have arisen to allow farmworkers these protections, but none have successfully afforded farmworkers the full coverage denied them by federal law. In the meantime, labor advocates and the sustainable agriculture movement should work together to build allegiances and coalitions with other food workers to work on strategies that neither minimally ameliorate profound injustices nor expect to end exceptionalism, but instead seek innovative solutions where all parties benefit.

These kinds of solutions range from existing mechanisms for addressing worker welfare, such as unionization and fair trade labeling, to fusions of existing models with emerging policy vehicles. Existing solutions have made some progress in tackling the lack of coverage, but may hinge on outdated assumptions about economic systems as well as mixed research results. This paper explores these existing models, as well as the potential of applying models of worker protection from large scale agriculture, such as the Fair Food Program. I ultimately recommend tailoring these models to the scale and markets in small-scale sustainable agriculture, and employing regional and federal policy vehicles that are emerging in the face of growing public support for sustainable food systems.

### Unionization

Historically, farmworker unions have leveraged manpower in the face of oppressive working conditions and egregious human rights violations. United Farm Workers (UFW) under leader Cesar Chavez found significant strength in numbers in the grape vineyards of California, and successfully executed boycotts and campaigns that led growers to sign contracts to provide their workers with better pay, benefits, and protections (UFW website). Farm Labor Organizing Committee (FLOC) and the Coalition of Immokalee Workers (CIW) are other successful examples of unionized farmworkers who have successfully achieved better working conditions and coverage, addressing the exemptions from payment and collective bargaining protections, through contracts with growers and corporate buyers.

Each of these efforts has built upon the victories set by the preceding iterations of farmworker union organizing, and have vastly improved the lives of farmworkers across the country, in addition to its own members. In the 1960s and 70s, UFW brought together exploited farmworkers of Mexican and Filipino descent, cast their plight into the eye of the American public, and effectively organized with local community, religious and cultural groups to gain a seat at the table (Barger and Reza, 1994). Building on that success, FLOC's legacy granted farmworkers the power to decide what they demand and what they concede at the bargaining table (Barger and Reza, 1994). Through that empowered seat at the table, the CIW has effectively pushed for fair food standards and the end of exploitation across the food system, engaging large national corporations (CIW website). The system changes through these efforts, as "each achievement establishes new standards for farmworker rights and benefits and opens the way for other agricultural industries" (Barger and Reza, 1994).

The aforementioned unions overcame the NLRA exemption and brought on the passage of CALRA, and through that protection, were able to bargain for better wages and living conditions. However, the economic structure of small-scale operations based on direct marketing may not be as conducive to farmworkers' unionizing as large-scale agriculture. Formation of unions can be threatening to employers. To continue the community-centric message of local and regional food systems, this perceived antagonism might endanger that dynamic.

Additionally, economic factors such as stagnant wage levels due to oversupply of labor have discouraged collective action by discontented workers (Schell, 2002). Furthermore, the agricultural workforce as a whole is moving beyond traditional unionization, as evidenced by the proliferation of worker centers and other organizational alternatives (Fine, 2006). In fact, the AFL-CIO recently made it policy to promote the worker center model of organizing (AFL-CIO, 2013). From this changing channel of organization, farmworkers may benefit from the higher wages and standards afforded unionized workers as well as an evolved dynamic in the workforce.

Market-based solution: fair trade certification

An ongoing market-based effort to value the labor in the sustainable agriculture movement is the Domestic Fair Trade (DFT) certification initiative. The concept of DFT is modeled after international Fair Trade programs, which are standards aimed to help producers in developing countries achieve more advantageous trading conditions and promote social, environmental and economic sustainability (Fair Trade USA website). Under international Fair Trade certification regimes, producers in developing nations, often comprised of companies that contract with many individual smallholder growers, receive a minimum price, to protect against market fluctuations, as well as a premium, paid separately, that workers and farmers can invest in environmental, educational or infrastructure projects (Sherman, 2012). The Fair Trade Resource Network estimates that more than 1.4 million producers in more than 70 countries directly participate in fair trade projects (Sherman, 2012).

Proponents and supporters of this concept include champion of the CSA movement, Elizabeth Henderson. Henderson sits on the board of the Agricultural Justice Project, which is a stakeholder-driven certifier that collaborates with numerous farmworker nonprofits to grant “Food Justice Certified” labels. They have a standards committee that meets every five years to update their standards. Currently, their standards address: workers’ rights to freedom of association and collective bargaining, fair wages and benefits for workers, fair and equitable contracts for farmers and buyers, fair pricing for farmers, clear conflict resolution policies for farmers or food business owners/managers and workers, the rights of indigenous peoples, workplace health and safety, farmworker housing, interns and apprentices and children on farms (AJP website).

To that end, the North American-based Domestic Fair Trade Association (DFTA) was organized in 2005 to explore “the converging interests of family farmers, farm workers, organic advocates and Fair Trade Organizations in domestic agriculture” (Brown and Getz, 2008). The DFTA serves as an evaluator of certifiers, and conducted its first round of evaluations in 2013. Their evaluation is based on twelve

principles, hinging on full participation, fair wages, freedom from workplace toxins and freedom to organize (DFT website). The project has evaluated seven certifiers, only granting four stars to one certifier (indicating satisfaction of 3 or more of the 12 principles).

While this approach may push these certification companies to further consideration of farmworker justice within their certification schemes, the efficacy is not clear as seen through several studies (Brown and Getz, 2008; Gitter et al., 2012). Fair trade certification has shown mixed results in regards to improvements for workers. In their study of the impacts of fair trade certification on coffee growers in Central America, Gitter et al. (2012) found that price premiums from Fair Trade certification played a smaller role in household incomes than education, which can lead to yield improvements or the ability for a household member to work outside the coffee industry. Additionally, Brown and Getz (2008) suggest that there are significant dangers with applying the term “Fair Trade,” with its basis in an international movement, to the local food movement, which derives value from its smaller geographic dimension. Furthermore, differences in market sectors among the growers involved as well as the more striking lack of farmworker voice in the process tilted the DFTA towards farmer-oriented resolutions (Brown and Getz, 2008). Another strand of criticism of certification centers around reinforcing neoliberal power asymmetries, which argues that label standards are weakened through their use by transnational corporations (Guthman, 2004).

Lastly, a study by Schreck et al. (2006), surveyed organic farmers in California about their perceptions and beliefs about social sustainability as a component of organic certification. They found that only 12 percent of these farmers agreed that organic agriculture was more socially sustainable than conventional agriculture. Furthermore, they found that more than half of the surveyed population was opposed to incorporating criteria on working conditions in organic certification. Opposition was correlated with farms that had hired labor. An earlier study by Guthman (2004) found that farms with higher wages and more benefits tended to be all-organic (versus partially organic in acreage), highly diversified, larger farms that tended to use more direct marketing channels. Each of these criticisms

demonstrate that certification alone does not have the power to provide standards that set a precedent to improve farmworker livelihoods.

*Collaborative standard-setting partnerships*

Within the broader agricultural labor context, there have been several successful and innovative collaborative supply-chain partnerships that have improved the welfare of migrant farmworkers. The contexts of these partnerships are different from the context of small-scale agricultural labor, primarily in the existence of egregious wage violations and the backdrop of immigration policy. However, the multi-stakeholder approach based on farmworker voice has proven to be a lasting, effective strategy for protecting workers and enhancing worker welfare with cross-contextual potential that merits consideration.

One of the most successful efforts in formalizing farmworker voice is the work of FLOC, the labor union described previously. FLOC represents farmworkers in the tomato and pickle industries of Ohio and Michigan and North Carolina (FLOC website). In 1986, after two decades of strikes and targeted campaigns against Campbell Soup (the food processing corporation that controlled the tomato farm labor contracts) FLOC brought Campbell Soup to the bargaining table, along with the Campbell Soup growers. The collective bargaining mechanism was unique in its creation for including all three parties. The resulting contractual arrangement was a 3-year contract covering 800 farmworkers. Its provisions included set wages, benefits and holidays, housing for workers, and experimental health insurance. Improved record keeping requirements assured the union that farmworkers would have a written report of earnings and expenses. Growers were assured that they would receive prices to keep them financially viable. FLOC also received the assistance of the Dunlop Commission, a private labor relations board that had the power to review, arbitrate, and resolve worker complaints. The enforcement support from the Commission for this legally-binding contract solidified the voice of the farmworker in setting wages and benefits (Barger and Reza, 1994).

Agreements with Vlasic, Heinz, Green Bay, and Aunt Jane corporation and their pickle growers in Ohio and Michigan followed the Campbell Soup contract, expanding coverage to 7,000 farmworkers, and increasing wages by 25 percent. Further contracts expanded on the rights guaranteed in the original contract, and classified farmworkers as proper employees, thus solidifying some of their rights under labor law. More recently, in 2004, FLOC and the North Carolina Growers' Association agreed to a collective bargaining agreement and the coverage of H-2A guest workers. This agreement now covers 120 growers, and 6,500 workers in North Carolina, Illinois and Ohio (Weil, 2014). The impact on farmers' lives is a testimony to FLOC's approach to including farmworker voice at the bargaining table in this collaborative arrangement.

Another successful campaign started by farmworkers is the Fair Food Program (FFP), initiated by the CIW, a worker-based human rights group, in 2010. This watershed multi-stakeholder agreement enabled a powerful farmworker voice in the Florida tomato industry, which was rife with wage theft and slavery violations. After many years of CIW campaigns linking the poor working conditions to the grocery brands that controlled the supply-chain, the agreement engaged farmworkers, Florida tomato growers, and participating retail buyers in an effective partnership. This partnership requires lead companies to pay a small premium to production volumes for produce through an industry fund administered by CIW that provides wage supplements for workers covered by agreement (CIW website). The program garnered \$20 million in premiums between its initiation in January 2011 and October 2015.

In the legally-binding Fair Food Agreements, buyers commit to purchasing tomatoes only from growers in 'good standing' under the FFP. In this way, the standards are enforced through market consequences. The FFP engages workers and a third-party monitor in holding the retail buyers accountable for compliance with the program. To that end, the CIW holds worker-to-worker education sessions on the labor standards set in the agreement. The Fair Food Standards Council serves as the third-party monitor that ensures compliance in FFP. Through these mechanisms, the FFP is able to present benefits to all parties involved: protection of human rights and higher wages for workers, risk

management and workforce stability for growers, and meaningful social responsibility and brand protection for retailers (CIW; Asbed and Sellers, 2014).

The FFP has gained numerous accolades from labor leaders, human rights groups, the U.S. State Department, and the United Nations. As of 2012, ten retail food corporations have signed binding agreements to participate in the Fair Food Program, including McDonalds, Subway, Burger King, Sodexo, Aramark, Compass Group, Whole Foods, and Trader Joe's (Asbed and Benitez, 2012). The innovative FFP is a model for human rights and enabling farmworker voice to better shape their present and future.

Both the FLOC and FFP programs engage farmworkers, growers, and retail buyers in negotiations which have created social and economic benefits for all parties involved. The involvement of a third party monitoring mechanism ensures the compliance of the growers and buyers with the standards put forth in the contracts, giving the agreements legal teeth. Each agreement guarantees compliance with labor laws, going above the federal floors for wages and benefits, and addresses health and safety externalities involved in agricultural work (Weil, 2014). The agreements tackle the tension underlying the fissured decision-making in the supply chain, and address the root systemic causes that deny workers at the bottom of these chains their rights.

#### *Tailoring the model to small-scale diversified vegetable farming*

Tailoring these models to small-scale sustainable agricultural labor requires considerations of market, economic scale, and cultural contexts. However, the labor standards and multi-stakeholder approach involved in each agreement are applicable, as are the targeted outcomes, due to the shared lack of protection from federal law. Coupling these economically beneficial, human rights-centric, legally binding contracts with farmer-based, regional sustainable agriculture organizations, emergent federal farm bill programs for diversified farms, and municipal governmental purchasing programs could forge new paths for including a voice for farmworkers in the sustainable agriculture paradigm.

Because the structure of the supply-chain is fundamentally different in small-scale diversified vegetable farming, some of the structural facets of the FLOC and FFP models do not entirely translate. Small-scale diversified vegetable farming often involves a mostly direct marketing strategy, rather than the three-tiered supply-chain. In contrast to the tiered supply chain, the direct marketing strategy is usually more capable of incorporating values of fairness and transparency (Day-Farnsworth and Morales, 2011). However, besides the producers themselves, price-makers are not clearly delineated, unlike the grocers and food corporations in the context of large-scale agriculture. The price-maker role could include the aggregate bloc of regional farmer's market shoppers, institutions or the smaller retailers that source produce from these small-scale farms. This suggests that the solutions may be best scaled at the regional or local level, in lieu of lassoing the involvement of large corporate buyers. No private national (or transnational) entities would be appropriate. The economic pressure may not be as easy to connect directly, but as the sustainable agriculture sector grows, more price makers and standard setters are developing, such as the regional coalitions discussed later.

The human rights violations seen in migrant worker-dominated large-scale agriculture have not arisen in CSA farming as of yet, nor are the pressures of immigration policy present. The historical prevalence of migrant labor in agriculture has unfortunately been characterized by severe mistreatment of workers in the United States (Barger and Reza, 1994; Luna 2014; Schell, 2007). Low wages and lack of overtime only begin to describe the struggles of migrant workers, who make up a majority of the agricultural labor in the US. Human rights violations such as dilapidated and unsafe housing, child labor, sexual assault, and many other issues that tragically are less likely to be reported due to the looming threat of deportation. The prevalence of these issues is staggering, and has important implications for standards and any policy solutions that truly seek to improve the lives of these workers. This context is largely absent from small-scale agriculture, as seen in the few available surveys of small-scale sustainable farms in the US (Berkey, 2015, Schreck et al. 2006). However, forging partnerships with industries that employ largely migrant labor could advance the protections that should be afforded all agricultural laborers.

Considering the composite of these contexts for large scale agricultural workers, tailoring the worker protections to small scale sustainable agriculture must seek appropriate protections and vehicles for these protections. Because currently these protections are granted ad hoc, or on more of a farm-by-farm basis on small scale sustainable farms, protections should address the variety of farms and farm crews that populate this industry.

### *The Protections*

Deciding which protections to include in such a standard should be up to the collaboration of farmworkers, growers and the standard-setting organizations. Protections in FLOC and FPP included collective bargaining rights, set wages, benefits and holidays, housing, health insurance; and training for workers to know their rights and understand how to file complaints. They have continued to build on their base of protections over the years. In their analysis of social certification in organic agriculture, Schreck et al. (2006) included collective bargaining rights, a living wage, health insurance, paid sick leave, paid vacation. Of these five requirements, surveyed organic farmers responded most favorably to a living wage, with a little under half of the responding farmers agreeing with the idea that certified farmers should provide a living wage to farmworkers. One of the biggest obstacles they encountered in regards to farmers' attitude towards social certification was that many farmers cannot (and do not) even pay themselves a living wage.

The most basic and perhaps most urgent requirement is setting a minimum wage in these standards. Discussions at the Midwest CSA conference, in NOFA in the Northeast United States, and a recent article by Elizabeth Henderson have revolved around how and why sustainable agriculture should address not only a minimum wage, but a living wage. The momentum from the Fight for \$15 campaign of fast food workers is encouraging. Joining workers across the food chain in this endeavor could build cross-chain solidarity, put more pressure on corporate buyers and yield positive results for all (Ferdman,

2015). Overtime, worker's compensation, and benefits should also be part of the standards, due to the absence of these protections, longer peak season hours, and propensity for injury in the farm environment.

Direct representation and farmworker-specific forums would be a powerful manifestation of valuing farmworker voice in bolstering these protections. As seen in the FLOC and FFP models, the meaningful involvement of farmworkers in negotiation and decision-making can create a more stabilized workforce in an otherwise relatively transient worker population. Organization of these voices could be achieved through unionization, though the limitations discussed earlier present some obstacles, or empowered working groups associated with existing regional sustainable agriculture organizations. Indeed, due to the small-scale nature of these crews and the geographic dispersion, building off of the still-emerging regional organizations as a platform to organize seems most appropriate. Farmworker forums could also give rise to any previously unvoiced issues specific to farmworkers.

### Vehicles

An alternate vehicle for carrying these worker standards forward in small-scale sustainable agriculture must be investigated. Vehicles examined in the next section include: a federal policy for diversified farms, a regionally-based contract, and a municipal purchasing policy program. Each has its strengths and limitations, but both hold potential for propelling these protections forward.

#### Prospective federal policy vehicle: Whole Farm Revenue Protection

A federal vehicle for housing multi-stakeholder standard setting is the Whole Farm Revenue Protection program (WFRP) from the 2014 Farm Bill ("The Act"). The 2014 Act authorized the RMA to develop WFRP, which is "crop-neutral" revenue insurance that grew out of the AGR-lite insurance program (NSAC, WFRP). This insurance offers a premium subsidy of up to 80 percent when at least two crops are grown, and a premium discount for increased diversification, along with coverage for replanting and some processing activities. As the National Sustainable Agriculture Coalition (NSAC) describes it, WFRP "recognizes and rewards the inherent risk management benefits of on-farm diversification"

(NSAC WFRP). This insurance option was first available in FY2015 and 1046 farms in 45 states signed up in the initial year. While its effectiveness is still being tested, this program provides more federal funding to support and grow sustainable agriculture, and invites interesting opportunities for incorporating compliance requirements into a highly-valued insurance policy.

Including requirements for worker welfare in this program could set a standard for all farms across the country, similar to the labor standards being proposed for the Trans-Pacific Partnership (USTR, 2015). As this program grants coveted crop insurance to diversified farming operations which otherwise lack any sort of coverage, the adoption of this program is forecast to grow. Subsequently, attaching standards to this policy could have huge implications for farmworker welfare. The Farm Bill also authorized the requirement of conservation compliance for general revenue protection programs. Requiring farms that want to adopt WFRP to comply with farmworker welfare standards seems like an incredible opportunity for fusing the goals of sustainable agriculture with labor concerns.

However, this emergent and long anticipated addition to a federal program may be cumbersome to amend and onerous to bolster sufficient support. Political maneuvering of support for any labor standards would be very tricky, given the relative lack of support for worker voice in Congress, and to an even lesser extent, farmworker voice. Additionally, the requirements for this revenue protection are already somewhat restrictive, as it has a minimum of three to five years of experience for each applicable farm (NCAT WFRP, 2015). Farmers may be less willing to apply for the insurance given labor provisions. However, this is a unique opportunity in the otherwise limited realm of federal programs that should be fully considered as a vehicle for change in sustainable agriculture. A strategy of voluntary adherence, perhaps by state, could increase the political palatability of this approach.

*Prospective regional vehicle: Regional CSA coalitions*

As noted earlier, many sustainable agriculture organizations lack a forum for farmworker voice, and do not focus on farmworker welfare. As argued, this is vital for the longevity of local and regional

food systems based on small-scale farms, as they continue to grow and influence food consumption and policy. Sustainable agriculture farmer coalitions serve important roles in the local and regional food system. Through these organizations, farmers can tap into knowledge and equipment sharing, coordinate outreach and build public awareness, develop resources and address the needs of low-income and special needs families (Ostrom 1997b). These organizations can connect the consumer to the producer, and therefore have a level of economic and regulatory influence (Jerde, 2015).

Fair Share CSA in Madison, Wisconsin is a prime example of an organization built to propel and support small-scale diversified vegetable farming that could benefit from incorporating farmworker protection into their objectives. FairShare's mission is to "bridge the gap between area farmers and folks who are longing for a deeper connection to food and community" (FairShare CSA website). For consumers, FairShare CSA hosts CSA open houses, provides resources for interested consumers and provides financial assistance to low-income families interested in receiving a CSA share through its Partner Shares program. FairShare CSA has endorsed over 50 farms in the Madison, Milwaukee, Dubuque, and Twin Cities area through a peer-reviewed application and interview process. These applications include the following requirements: 1. Secure land and adequate infrastructure; 2. Farm production and management experience, 3. Utilize organic and sustainable farming practices; 4. Provide quality marketing and membership experience; 5. Understanding of CSA and CSA experience; 6. Agreement to participate in the FairShare CSA Coalition (FairShare CSA 2015a). Labor welfare and protections are notably absent from this otherwise progressive list of considerations.

Under the auspices of an organization like FairShare, which sets criteria for farms eager to tap into the growing market for CSA shares, farmworkers could gain a powerful seat at a regional sustainable agriculture table with a measure of influence in the regional market through direct representation in crafting these criteria as well as active participation in decision-making boards. Inviting representative farmworkers from the endorsed farms to the board of FairShare CSA to develop the criteria could propel standards on wages, hours and benefits. The strength of the FairShare CSA Coalition and its

endorsements has grown in the past few years, and this addition could have powerful reverberations around the region.

*Prospective vehicle: Los Angeles Food Policy Council's (LAFPC) Good Food Purchasing Program*

Los Angeles Food Policy Council's (LAFPC) Good Food Purchasing Program (GFPP) takes the partnership approach to regional institutional level. The LAFPC GFPP involved stakeholders from labor, environment, animal welfare and public health organizations in the development, including Food Chain Workers Alliance (Lo and Delwiche, 2016). The GFPP encourages regional institutions (i.e. school districts) to procure local, sustainable, fair and humanely produced foods through a scoring system with five required components, including "a valued workforce." The labor standards that are part of this evaluation system include compliance with state and federal laws and the core standards of the International Labor Organization (ILO), and averaging 5% of annual total cost of food purchases from a combination of farms with union contracts, worker-owned cooperatives, Fair Trade certified products; and farms with social responsibility policies (LAFPC website).

This program has expanded greatly since its initiation in 2012, and its potential for change and replication is remarkable. While it does not include the full coverage needed to protect farmworkers, it is a potential regional governmental vehicle to address the exemptions. Bolstering the 'valued workforce' requirements to specifically address farmworkers' minimum wage, overtime, worker's compensation, and collective bargaining rights could set an impressive precedent for farmworker protection, especially stemming from its importance in California. Extending that provision to small-scale farms would be a particularly strong statement of support for cohesive, just local and regional food systems.

Limitations of this program are the bureaucracy inherent in municipal government and lack of teeth of regional organizations. However, if other cities and regions begin adopting similar policies, the impacts could be substantial and create a Domino effect across industries in regions propelling these policies.

### Third party enforcement

The third-party enforcement could take form through an existing body, like the Domestic Fair Trade Association (DFTA), or a regional public economic development entity. The DFTA are established as program evaluators, and themselves have multi-stakeholder roots. Enacting a legally-binding relationship might be less difficult with an existing entity like the DFTA, who are active nationwide. A regional governmental organization that promotes economic development could be a powerful way to promote these labor standards within other industries in the region. The third party would need to navigate preserving the trust and community links with the farmers while holding them accountable to these standards.

This multi-stakeholder partnership would be most effective in organizations with influence on the local or regional economy. Indeed, due in part to the weakness of federal protection, the history of the farmworker voice has always been a decentralized one with many different regional models (Schell, 2007). While FairShare CSA Coalition has the potential to effectively influence regional agriculture to an extent, they are a unique organization in an especially bountiful region. Due to this unique power FairShare CSA Coalition holds in the community, this model may not be readily reproducible across the country. However, other regional organizations are emerging, such as Community Alliance for Family Farmers in California, Northeastern Organic Farmers Association (NOFA), Western Michigan Growers' Group, and Duluth, Minnesota-based CSA Guild. FairShare CSA Coalition is currently working on creating guidebooks for similar CSA networks, and they could include a resource on standards for worker protection based on this model in this cross-coalitional capacity building.

Other challenges this regional approach may face is possible farmer disillusionment or perhaps even perceived antagonism from the regional agricultural organization with increased wages or requirements for labor management. Many small-scale CSA farmers already feel economic pressure and

are resistant to more requirements being placed on their already resource-limited operations. However, any dialogue that could arise would serve the purpose of bringing awareness on the issue of farmworker welfare in the sustainable agriculture community would be valuable on a broader movement scale.

Regional organizations have power and buy-in that federal agencies might not. In her study of northeastern organic farms, Berkey concluded: “the possibility of change exists at a regional scale, as demonstrated by the [farmers’] recognition of NOFA as a resource and their own voices in shaping the organization itself as well.” She reflects the need for more farmer trainings about farmworker protection and justice issues, where they might not be fully aware of the issues. Consequently, more widespread awareness and understanding of the issues will likely increase farmer buy-in to including these protections through these organizations of which they are members.

The LAFPC GFPP has the advantages of effecting change on a regional scale involving numerous large institutional stakeholders. This model is promising and merits further research to judge its efficacy in terms of the protections afforded farmworkers.

#### Further research

Critiques of raising wages cite the subsequent increase in costs for employers, which in the agricultural sector could be partially (but certainly not entirely) passed on through pricing for food. Under that perspective, a parallel effort to account for this increase in costs must be investigated. This effort could be housed under the push to better account for the externalities of our food system, by incorporating labor costs in the price of food. However, this could increase the discrepancy between conventionally produced and sustainably produced food prices, which would be hard to argue for as a component of a more just food system.

A farmer in the study by Schreck (2006) responded to the discussion of worker protections: “get rid of imports, allow prices to reflect actual costs and I believe most family farms would absolutely support benefits.” A consumer push for more locally and regionally produced food may also allow for a

better market for these small scale growers, and thus allow for benefits. The role for consumers in pushing for prices include labor costs cannot be understated, and has played a central part in the rise of organic and sustainable food products. Efforts from all economic players are necessary for effective change. As discussed in the Veggie Compass time and technique study, farmers accounting for their labor costs through benchmarking and time management is a crucial part of this effort to value labor inputs. Additionally, solidarity from workers across the food chain to increase wages may help offset some of the price discrepancies and put more pressure on the top of the chain.

### Classification of workers

One more layer of complication involves the classification of workers in the small-scale agricultural model. The community labor aspect of small-scale diversified vegetable farms with a CSA component involves interns, volunteers, and worker-shares that get paid 'in-kind' with a weekly share of vegetables in return for their labor. Reliance on informal workers or family members is commonplace on small-scale farms. In her study of organic farms in eight Northeastern states, Dr. Becca Berkey (2015) found that 43 percent of farms used hired work, while 74 percent relied on family members, and many relied on some form of unpaid, informal labor.

While there are many differences in the roles and responsibilities of unpaid labor from farm to farm, their status under employment law is unclear. Under the direction of the Department of Labor, there are six requirements to fulfill to be considered an intern, rather than an employee who may be subject to minimum wage law (depending on state application of FLSA and farm size):

1. The internship, even though it includes actual operation of the facilities of the employer, is similar to training which would be given in an educational environment;
2. The internship experience is for the benefit of the intern;
3. The intern does not displace regular employees, but works under close supervision of existing staff;
4. The employer that provides the training derives no immediate advantage from the activities of the intern; and on occasion its operations may actually be impeded;

5. The intern is not necessarily entitled to a job at the conclusion of the internship; and
6. The employer and the intern understand that the intern is not entitled to wages for the time spent in the internship

(DoL WHD Factsheet #71)

These six tests for applicability of FLSA protections are each legally complex in their own right, but proving the employer gains no advantage or economic benefit is thought to be the most difficult (Endres and Armstrong, 2014). Encouraging the legal profession to reconsider the notion of community labor, Endres and Armstrong (2014) argue that community labor builds a fundamental base of support in the community and fulfills the farm's social mission, and should therefore not be evaluated in the courts based solely on their economic relationship. They propose that a new legal paradigm should support the democratization of the workplace to include community labor. It is imperative, however, that an innovative approach to community labor include valid worker protections. The flexibility proposed could yield further vagueness in terms of the rights and employment status of workers on many of these sustainable farms.

Organizing the employment practices of a small-scale CSA farm to better protect land and nonfarm assets from liability risk while keeping the community-oriented foundation of CSA model has many CSA farmers conflicted. Small-scale CSA farmers are often unaware of all the applicable labor laws, and many do not understand the risks of internships, worker shares without strong contractual agreements. Johnson et al. (2013) underline this legal grey area of community labor on CSA farms, and emphasize the important role for attorneys and policymakers in this emerging arena. Further research is needed to explore different possibilities for supporting protected community labor while ensuring a fair day's pay for a fair day's work.

## CONCLUSIONS

As the sustainable agriculture movement strives towards an agriculture that is truly sustainable for all, it must better protect the farmworkers that are the foundation for the industry. This sentiment is echoed by Guadalupe Luna in her paper "The Dominion of Agricultural Sustainability," in which she posits that the "jurisprudence that dominates agricultural law and laborers will promote neither healthy agricultural economics nor integrated sustainable practices" (Luna, 2014). Fusing the growing sustainable agricultural movement and the increasing concern for worker welfare should be a priority for advocates of both issues. As small-scale sustainable farms seek more market power and economic longevity and sustainability in local and regional food systems, the movement should better protect farmworkers, and incorporate the farmworker voice into decision-making.

Labor law has long-standing exemptions for farm labor, with even less applicability on small farms. The remaining legal protections have scared farmers and have gained criticism for not recognizing the contributions of 'community labor' and the nuances of small farm operations (Endres et al. 2010). While abolishing farm labor exemptions would be ideal, the prospects for this are currently dim, due to the pressures and obstacles resulting from a political system bonded to an agricultural industry dependent on an underpaid labor base. However, engendering a dialogue for farmworker voice would bring the value of labor into the equation for agricultural decision-making, and, coupled with consumer demand, could shift the potential for these changes.

Protecting farmworkers and engaging farmworker voice in decision-making through economically strategic partnerships in sustainable agriculture would build on the success of existing farmworker campaigns, forging alliances between these workforces. Small-scale diversified vegetable farms, which espouse social and environmental values, could be a beacon for the rest of the local and regional food system paradigm in the inclusion of this voice. Indeed, valuing labor inputs would support the community-building center of local and regional food systems, "reestablishing the connections and

responsibilities that extend beyond self-interest and define community and create commonwealth” (DeLind, 2003). Adding professionalism and dignity to the profession of a sustainable agriculture farmworker by furthering protections and valuing labor inputs holds tremendous promise in advancing a just, truly sustainable local and regional food system.

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## OVERALL CONCLUSIONS

Labor inputs are an undervalued asset and cost to small-scale diversified vegetable farms, and appreciation of these inputs advances the cause of both farmer and farmworker. The complementary lenses represented through the two chapters of this thesis demonstrate the multi-faceted rationale and potential strategies for valuing the labor that makes sustainable agriculture possible.

Through the lens of the participating farmers in the time and technique study, understanding the labor that goes into production at an activity-specific level helps them more accurately calculate costs and profit margins. Understanding what makes an activity more efficient in terms of higher labor productivity can result in enterprise growth. The time and technique studies demonstrate that there are significant impacts on labor productivity in mechanizing transplanting activities, carrot harvest and post-harvest washing and packing activities. Significantly higher labor productivity rates were observed during harvest activities for larger farms, and with worker-share labor for CSA box packing. Declines in labor productivity for some activities at the mid-scale farms echoed patterns in other studies (Silva et al. 2013; Hendrickson, 2005). As they make decisions like equipment purchases, farmers can apply the efficiencies from labor productivity and the benchmark values from this study to their own operations.

Through the policy lens, addressing the exemptions from labor protections will strengthen the small-scale sustainable agricultural workforce and also strengthen connections between labor and alternative agriculture. Employing partnership models seen in large-scale agriculture through emerging regional or federal vehicles could merit meaningful coverage currently denied farmworkers. These efforts could also forge new partnerships with other food worker efforts, bolstering worker solidarity across the food chain.

The synergies between these two approaches speak to the interconnected success of the alternative agriculture movement and its workers. To truly promote local and regional food systems, we must endeavor to empower the farms and farmworkers with the tools and protections to cultivate environmental, economic, and social sustainability.

Table 1. Information collected for each observation in time and technique studies, categorized by activity.

	<b>Transplant</b>	<b>Harvest</b>	<b>Post-Harvest</b>	<b>CSA Box Packing</b>
<b>Environmental conditions:</b> <i>Temperature, wind, precipitation, Soil conditions</i>				
<b>Bed conditions:</b> <i>number of beds, bed length, plastic mulch or bare ground, soil preparation (method and date)</i>				
<b>Was the grower (farm owner/manager) Present?</b>				
<b>Crew description:</b> <i>size, experience of crew members, presence of crew leader, information on the division of labor, rotation of tasks, if new members were being trained, if the crew included worker-shares</i>				
<b>Description of activity</b>	Method: hand or machine	Method: hand or machine	Method: hand or machine	
	Equipment used	Equipment used	Equipment used	Equipment used
	Bed length	Selective harvest or complete harvest	What is being done	Total # and list of crops being packed
	Soil preparation (method and date)	Weed pressure level	Packaging Used	Packaging used
	Additional time spent watering/ setting up irrigation	Post-harvest handling in the field		
	Technique description	Technique description	Technique description	Technique description
<b>Trial specific information</b>	Crew number	Crew number	Crew number	Crew number
	Time per bed	Time per trial	Time per trial	Time per trial
	Rows per bed	Rows per bed	Amount accomplished	Type of share (half, full)
	In-row spacing	Bed length	Units	Number of boxes packed
	Transplants per bed	Yield: in pounds and units, when feasible	Market destination	Total number of shares
	Were transplants watered?	Market destination		
	Total time	Total time	Total time	Total time

Table 2. Characterization of ten certified organic diversified vegetable farms in southern Wisconsin, studied for 2014 and 2015 seasons.

<b>Farm</b>	<b>Farm size</b>	<b>Acres in vegetables</b>	<b>Farmer gender(s)</b>	<b>Age range</b>	<b>Years farming</b>	<b>CSA shares</b>
<b>A</b>	Medium	7.0	male	50+	20+	n/a
<b>B</b>	Medium	4.0	male	40-49	10-20	450
<b>C</b>	Large	20.0	male & female	30-39	10-20	350
<b>D</b>	Small	1.5	male & female	20-29	6-10	36
<b>E</b>	Large	48.0	male	30-39	10-20	440
<b>F</b>	Large	45.0	male & female	50+	20+	478
<b>G</b>	Medium	5.5	male	30-39	6-10	168
<b>H</b>	Small	4.0	female	50+	20+	33
<b>I</b>	Small	2.5	male	20-29	>5	112
<b>J</b>	Medium	5.5	male	20-29	6-10	195

Table 3.1. Transplanting observations by crop, characterized by mechanization and farm size on ten Wisconsin diversified vegetable farms for 2014 and 2015 seasons.

	<b>Broccoli</b>	<b>Carrots</b>	<b>Lettuce</b>	<b>Peppers</b>	<b>Squash</b>
<i>Mechanization</i>					
<b>hand</b>	5	n/a	5	3	2
<b>machine</b>	4	n/a	5	3	4
<i>Farm size</i>					
<b>small</b>	3	n/a	3	2	1
<b>medium</b>	4	n/a	3	n/a	1
<b>large</b>	2	n/a	4	4	4
<b>Total</b>	<b>9</b>	<b>n/a</b>	<b>10</b>	<b>6</b>	<b>6</b>

Table 3.2. Harvesting observations by crop, characterized by mechanization and farm size on ten Wisconsin diversified vegetable farms for 2014 and 2015 seasons.

	<b>Broccoli</b>	<b>Carrots</b>	<b>Lettuce</b>	<b>Peppers</b>	<b>Squash</b>
<i>Mechanization</i>					
<b>hand</b>	12	11	20	13	22
<b>machine</b>	1	10	n/a	n/a	2
<i>Farm size</i>					
<b>small</b>	n/a	6	2	3	7
<b>medium</b>	9	9	9	5	9
<b>large</b>	4	6	8	5	8
<b>Total</b>	<b>13</b>	<b>21</b>	<b>20</b>	<b>13</b>	<b>24</b>

Table 3.3. Post-harvesting (washing & packing) observations by crop, characterized by mechanization and farm size on ten Wisconsin diversified vegetable farms for 2014 and 2015 seasons.

	<b>Broccoli</b>	<b>Carrots</b>	<b>Lettuce</b>	<b>Peppers</b>	<b>Squash</b>	<b>CSA</b>
<i>Mechanization</i>						
<b>hand</b>	9	13	15	6	14	30
<b>machine</b>	0	10	n/a	5	2	n/a
<i>Farm size</i>						
<b>small</b>	n/a	7	1	2	7	6
<b>medium</b>	8	9	9	5	7	7
<b>large</b>	1	7	5	4	2	8
<b>Total</b>	<b>9</b>	<b>23</b>	<b>15</b>	<b>11</b>	<b>16</b>	<b>21</b>

Table 4.1. Transplanting labor productivity means characterized by mechanization and farm size and effects of five variables on labor productivity for ten certified organic diversified vegetable farms in Wisconsin for seasons 2014 and 2015.

	<b>Broccoli</b>	<b>Carrots</b>	<b>Lettuce</b>	<b>Peppers</b>	<b>Squash</b>
-----Transplants (no.) per hour per person-----					
<i>Mechanization</i>					
<b>hand</b>	313.0	n/a	149.6	113.0	89.0
<b>machine</b>	421.0	n/a	683.5	438.0	492.0
<i>Farm size</i>					
<b>small</b>	387.6	n/a	877.7	<b>n/a</b>	103.9
<b>medium</b>	339.9	n/a	163.9	365.5	492.1
<b>large</b>	313.0	n/a	232.2	113.0	89.0
----- <b>P &gt; f</b> -----					
<b>Farm size</b>	-	n/a	**m	-	-
<b>Mechanization</b>	-	n/a	**m	*	**
<b>Grower presence</b>	-	n/a	-	-	-
<b>New employee?</b>	-	n/a	**	-	-
<b>Worker shares/ Volunteers?</b>	-	n/a	**	-	-

\*Significant at the 0.10 probability level.

\*\* Significant at the 0.05 probability level.

- Not significant at the 0.10 probability level.

m indicates multiple significant differences within variable

Table 4.2. Harvest labor productivity means characterized by mechanization and farm size and effects of five variables on labor productivity for ten certified organic diversified vegetable farms in Wisconsin for seasons 2014 and 2015.

	<b>Broccoli</b>	<b>Carrots</b>	<b>Lettuce<sup>1</sup></b>	<b>Peppers</b>	<b>Squash</b>
----- Pounds harvested per hour per person-----					
<i>Mechanization</i>					
<b>hand</b>	162.2	90.8	170.6	75.4	86.3
<b>machine</b>	121.3	400.0	n/a	n/a	105.4
<i>Farm size</i>					
<b>small</b>	n/a	112.2	229ab	78ab	68a
<b>medium</b>	144.1	93.4	114b	36b	81a
<b>large</b>	179.1	580.8	219a	112a	112a
----- <b>P &gt; f</b> -----					

<b>Farm size</b>	-	**m	*	**	-
<b>Mechanization</b>	-	**m	n/a	n/a	-
<b>Grower presence</b>	-	-	-	-	-
<b>New employee?</b>	-	-	-	-	-
<b>Worker shares/ Volunteers?</b>	-	-	-	-	-

\*Significant at the 0.10 probability level.

\*\* Significant at the 0.05 probability level.

- Not significant at the 0.10 probability level.

m indicates multiple significant differences within variable

<sup>1</sup> Lettuce harvest measured in heads harvested per hour per person

Table 4.3. Post harvest (washing & packing) labor productivity means characterized by mechanization and farm size and effects of five variables on labor productivity for ten certified organic diversified vegetable farms in Wisconsin for seasons 2014 and 2015.

	<b>Broccoli</b>	<b>Carrots</b>	<b>Lettuce<sup>1</sup></b>	<b>Peppers</b>	<b>Squash</b>	<b>CSA<sup>2</sup></b>
----- Pounds washed and packed per hour per person-----						
<i>Mechanization</i>						
<b>hand</b>	211.9	158.0	202.9	198.0	187.0	29.70
<b>machine</b>	n/a	387.0	n/a	439.0	278.0	n/a
<i>Farm size</i>						
<b>small</b>	n/a	306.3	99ab	296.2	215.7	36.52b
<b>medium</b>	189.0	209.7	65b	141.2	118.9	30.60ab
<b>large</b>	396.0	270.5	471a	520.9	417.7	23.83b
----- <b>P &gt; f</b> -----						
<b>Farm size</b>	-	-	**m	-	**m	*
<b>Mechanization</b>	n/a	**	n/a	-	-	n/a
<b>Grower presence</b>	-	-	-	-	-	-
<b>New employee?</b>	-	*	**	-	-	-
<b>Worker shares/ Volunteers?</b>	-	**	-	-	-	*

\*Significant at the 0.10 probability level.

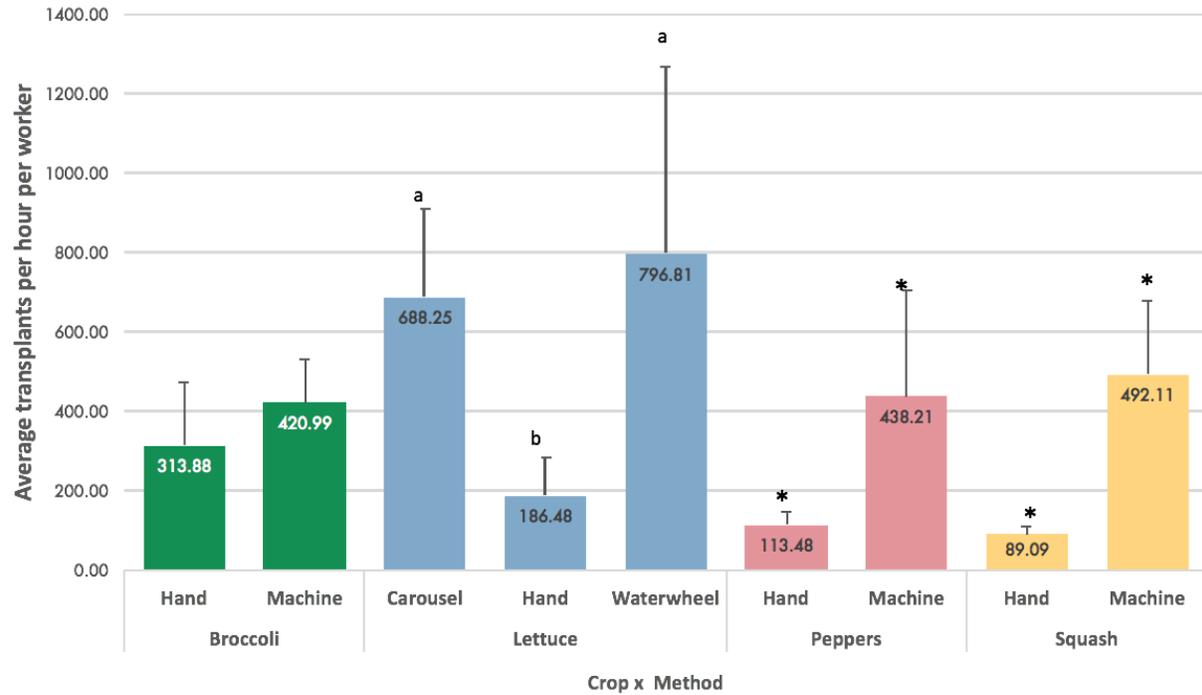
\*\* Significant at the 0.05 probability level.

- Not significant at the 0.10 probability level.

m indicates multiple significant differences within variable

<sup>1</sup> Lettuce post-harvest measured in heads packed per hour per person

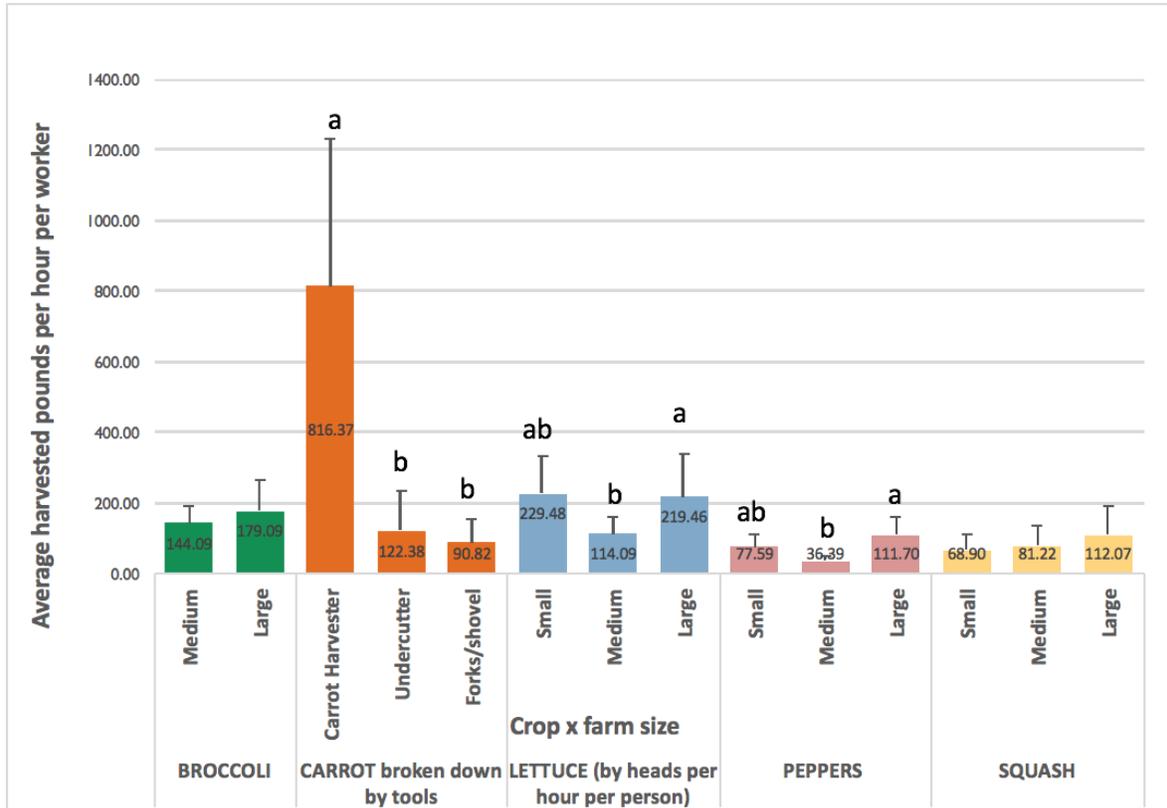
<sup>2</sup> CSA box packing measured in boxes packed per hour per person



\*indicates significant differences

Letters indicate multiple significant differences within variable

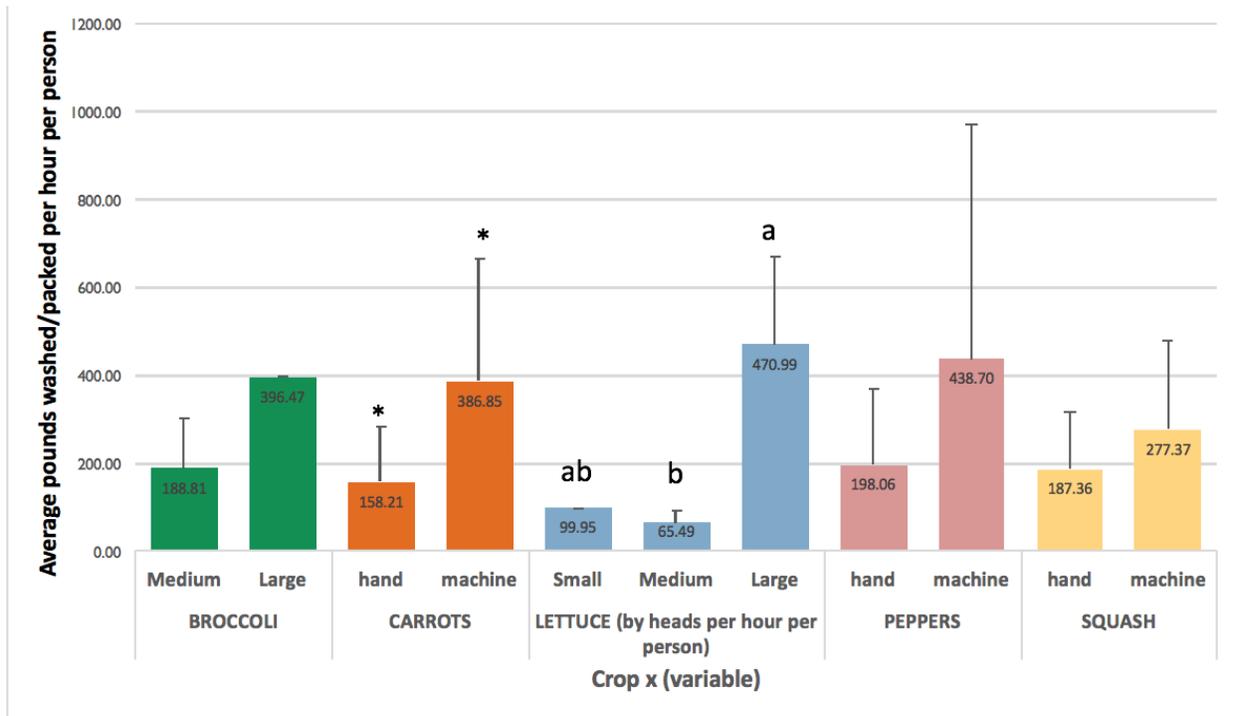
Figure 1. Transplanting labor productivity means characterized by mechanization for ten certified organic diversified vegetable farms in Wisconsin for seasons 2014 and 2015.



\*indicates significant differences

Letters indicate multiple significant differences within variable

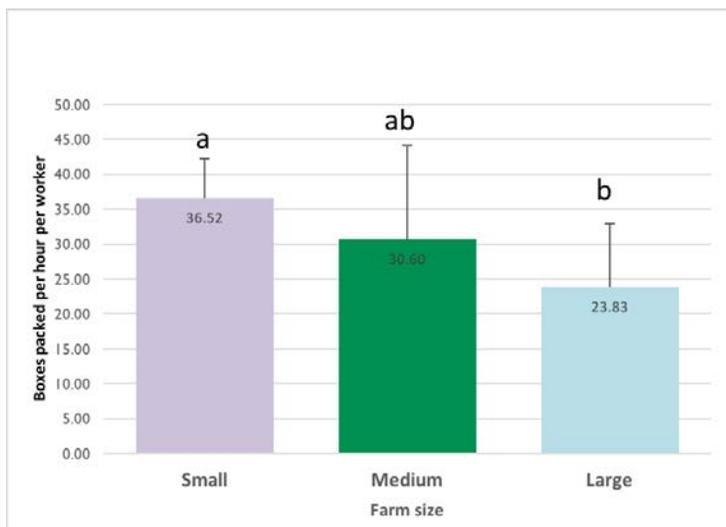
Figure 2. Harvest labor productivity means characterized by mechanization and farm size for ten certified organic diversified vegetable farms in Wisconsin for seasons 2014 and 2015.



\*indicates significant differences

Letters indicate multiple significant differences within variable

Figure 3. Post-harvest labor productivity means characterized by mechanization and farm size for ten certified organic diversified vegetable farms in Wisconsin for seasons 2014 and 2015.



\*indicates significant differences

Letters indicate multiple significant differences within variable

Figure 4. CSA box packing labor productivity means characterized by farm size for ten certified organic diversified vegetable farms in Wisconsin for seasons 2014 and 2015.

Table 5. Wage and employment characteristics on participating farms.

<i>Farm</i>	<i>Starting wage: new employee</i>	<i>Starting wage: manager or experienced employee</i>	<i>Number of full time employees</i>	<i>Number of part time employees</i>	<i>Employee retention (2014 to 2015)</i>
<b>A</b>	\$8	\$9	2	2	n/a
<b>B</b>	\$8	\$11.50	5	3	0.5
<b>C</b>	\$10.50	\$13.50	5	5	0.4
<b>D</b>	\$9	\$11	0	1	0
<b>E</b>	\$9	\$12	14	6	n/a
<b>F</b>	n/a	n/a	15	10	n/a
<b>G</b>	\$7	\$11	3	12	0.33
<b>H</b>	\$7.50	\$10	0	5	0.8
<b>I</b>	\$10	\$10	1	3	0.33
<b>J</b>	\$9	\$12	3	2	0.4
<b>Mean</b>	<b>\$9</b>	<b>\$11</b>	<b>5</b>	<b>4</b>	

APPENDIX 1: Dates of farm visits by crop and activity

<b>Date</b>	<b>Task</b>	<b>Crop</b>
5/16/2014	Transplant	Summer squash
5/17/2014	Transplant	Lettuce
5/17/2014	Transplant	Peppers
5/23/2014	Transplant	Peppers
5/26/2014	Transplant	Peppers
5/26/2014	Transplant	Summer squash
5/29/2014	Transplant	Broccoli
5/29/2014	Weed Cultivation	Broccoli
5/29/2014	Weed Cultivation	Carrots
5/29/2014	Transplant	Lettuce
5/29/2014	Weed Cultivation	Lettuce
5/30/2014	Transplant	Broccoli
5/30/2014	Transplant	Broccoli
6/3/2014	Transplant	Lettuce
6/4/2014	Harvest	Broccoli
6/4/2014	Post Harvest	Broccoli
6/4/2014	Weed Cultivation	Carrots
6/4/2014	Harvest	Lettuce
6/4/2014	Post Harvest	Lettuce
6/10/2014	Transplant	Broccoli
6/10/2014	Weed Cultivation	Carrots
6/10/2014	Harvest	Summer squash
6/10/2014	Transplant	Summer squash
6/11/2014	Harvest	Lettuce
6/11/2014	Post Harvest	Lettuce
6/12/2014	Weed Cultivation	Broccoli/Lettuce (intercrop)
6/12/2014	Post Harvest	CSA box
6/16/2014	Harvest	Lettuce
6/16/2014	Post Harvest	Lettuce
6/16/2014	Weed Cultivation	Squash
6/20/2014	Transplant	Lettuce
6/20/2014	Harvest	Squash
6/23/2014	Harvest	Squash
6/23/2014	Post Harvest	Squash
6/23/2014	Harvest	Lettuce
6/23/2014	Post Harvest	Lettuce
6/23/2014	Harvest	Squash
6/23/2014	Post Harvest	Squash
6/25/2014	Harvest	Broccoli

APPENDIX 1: Dates of farm visits by crop and activity

6/25/2014	Post Harvest	CSA box
6/25/2014	Harvest	Squash
6/26/2014	Harvest	Broccoli
6/26/2014	Post Harvest	Broccoli
6/26/2014	Harvest	Carrots
6/26/2014	Post Harvest	Carrots
6/26/2014	Harvest	Lettuce
6/26/2014	Post Harvest	Lettuce
6/26/2014	Harvest	Squash
6/27/2014	Harvest	Lettuce
6/27/2014	Post Harvest	Lettuce
7/2/2014	Harvest	Squash
7/2/2014	Post Harvest	CSA box
7/2/2014	Harvest	Squash
7/3/2014	Post Harvest	CSA box
7/3/2014	Harvest	Squash
7/3/2014	Post Harvest	Squash
7/3/2014	Harvest	Squash
7/3/2014	Post Harvest	Squash
7/9/2014	Harvest	Broccoli
7/9/2014	Post Harvest	Broccoli
7/9/2014	Harvest	Squash
7/9/2014	Post Harvest	CSA box
7/10/2014	Harvest	Lettuce
7/10/2014	Post Harvest	CSA box
7/10/2014	Transplant	Squash
7/15/2014	Post Harvest	Broccoli
7/15/2014	Post Harvest	Carrots
7/16/2014	Harvest	Lettuce
7/16/2014	Post Harvest	Lettuce
7/16/2014	Harvest	Broccoli
7/16/2014	Post Harvest	Broccoli
7/16/2014	Weed Cultivation	Carrots
7/16/2014	Harvest	Squash
7/16/2014	Post Harvest	Squash
7/17/2014	Harvest	Broccoli
7/17/2014	Harvest	Squash
7/17/2014	Post Harvest	Squash
7/17/2014	Weed Cultivation	Carrots
7/17/2014	Harvest	Squash
7/17/2014	Post Harvest	Squash

APPENDIX 1: Dates of farm visits by crop and activity

<b>7/18/2014</b>	Weed Cultivation	Squash
<b>7/18/2014</b>	Harvest	Squash
<b>7/18/2014</b>	Post Harvest	Squash
<b>7/18/2014</b>	Post Harvest	CSA box
<b>7/22/2014</b>	Harvest	Broccoli
<b>7/22/2014</b>	Post Harvest	Broccoli
<b>7/22/2014</b>	Weed Cultivation	Peppers
<b>7/22/2014</b>	Post Harvest	Carrots
<b>7/23/2014</b>	Transplant	Lettuce
<b>7/28/2014</b>	Transplant	Lettuce
<b>7/28/2014</b>	Transplant	Broccoli
<b>7/28/2014</b>	Harvest	Carrots
<b>7/28/2014</b>	Post Harvest	Carrots
<b>7/28/2014</b>	Harvest	Carrots
<b>7/28/2014</b>	Post Harvest	Carrots
<b>7/29/2014</b>	Weed Cultivation	Lettuce
<b>7/29/2014</b>	Weed Cultivation	Broccoli
<b>7/29/2014</b>	Harvest	Lettuce
<b>7/29/2014</b>	Post Harvest	Lettuce
<b>7/29/2014</b>	Harvest	Peppers
<b>7/29/2014</b>	Post Harvest	Peppers
<b>7/29/2014</b>	Harvest	Carrots
<b>7/29/2014</b>	Post Harvest	Carrots
<b>7/31/2014</b>	Harvest	Peppers
<b>7/23/2014</b>	Transplant	Broccoli
<b>7/31/2014</b>	Harvest	Summer squash
<b>7/31/2014</b>	Post Harvest	Summer squash
<b>7/31/2014</b>	Post Harvest	Peppers
<b>7/31/2014</b>	Post Harvest	Lettuce
<b>7/31/2014</b>	Harvest	Lettuce
<b>8/4/2014</b>	Harvest	Summer squash
<b>8/4/2014</b>	Harvest	Squash
<b>8/4/2014</b>	Post Harvest	Squash
<b>8/4/2014</b>	Harvest	Peppers
<b>8/5/2014</b>	Harvest	Carrots
<b>8/5/2014</b>	Post Harvest	Carrots

APPENDIX 1: Dates of farm visits by crop and activity

<b>Date</b>	<b>Task</b>	<b>Crop</b>
5/13/2015	Transplant	Broccoli
5/13/2015	Transplant	Peppers
5/18/2015	Transplant	Peppers
5/19/2015	Transplant	Broccoli
5/19/2015	Transplant	Lettuce
5/20/2015	Transplant	Broccoli
5/22/2015	Transplant	Peppers
5/29/2015	Transplant	Peppers
6/05/2015	Transplant	Lettuce
6/08/2015	Transplant	Broccoli
6/08/2015	Transplant	Lettuce
6/09/2015	Transplant	Peppers
6/10/2015	Transplant	Squash
6/11/2015	Harvest	Lettuce
6/11/2015	Post Harvest	Lettuce
6/17/2015	Transplant	Squash
6/18/2015	Harvest	Lettuce
6/18/2015	Post Harvest	Lettuce
6/22/2015	Harvest	Lettuce
6/22/2015	Harvest	Broccoli
6/24/2015	Harvest	Lettuce
6/24/2015	Harvest	Broccoli
6/24/2015	Harvest	Squash
6/24/2015	Post Harvest	Lettuce
6/24/2015	post Harvest	Broccoli
6/24/2015	post Harvest	Squash
6/25/2015	CSA pack	CSA pack
6/30/2015	CSA pack	CSA pack
7/01/2015	Harvest	Squash
7/02/2015	CSA pack	CSA pack
7/08/2015	Harvest	Broccoli
7/08/2015	Harvest	Squash
7/08/2015	Post Harvest	Broccoli
7/08/2015	CSA pack	CSA pack
7/08/2015	Post Harvest	Squash
7/09/2015	Post Harvest	Lettuce
7/10/2015	CSA pack	CSA pack
7/2015/2015	Harvest	Broccoli
7/2015/2015	Harvest	Carrots

APPENDIX 1: Dates of farm visits by crop and activity

7/2015/2015	Post Harvest	Broccoli
7/2015/2015	Post Harvest	Carrots
7/17/2015	Transplant	Lettuce
7/20/2015	Harvest	Lettuce
7/20/2015	Harvest	Squash
7/20/2015	Harvest	Peppers
7/20/2015	Post Harvest	Lettuce
7/20/2015	Post Harvest	Peppers
7/22/2015	Transplant	Lettuce
7/22/2015	Harvest	Lettuce
7/22/2015	Harvest	Squash
7/22/2015	Post Harvest	Lettuce
7/22/2015	Post Harvest	Squash
7/23/2015	Harvest	Squash
7/23/2015	Post Harvest	Squash
7/23/2015	CSA pack	CSA pack
7/24/2015	CSA pack	CSA pack
7/27/2015	Harvest	Squash
7/27/2015	Post Harvest	Squash
7/27/2015	Harvest	Peppers
7/27/2015	Post Harvest	Peppers
7/28/2015	Harvest	Carrots
7/28/2015	Post Harvest	Carrots
7/30/2015	Harvest	Broccoli
7/30/2015	Post Harvest	Broccoli
8/05/2015	Harvest	Squash
8/05/2015	Post Harvest	Squash
8/05/2015	CSA pack	CSA pack
8/06/2015	Post Harvest	Carrots
8/06/2015	Harvest	Peppers
8/06/2015	Post Harvest	Peppers
8/10/2015	Harvest	Carrots
8/10/2015	Post Harvest	Carrots
8/10/2015	Transplant	Lettuce
8/11/2015	Harvest	Carrots
8/11/2015	Harvest	Lettuce
8/11/2015	Harvest	Squash
8/11/2015	Post Harvest	Carrots
8/11/2015	Post Harvest	Squash
8/11/2015	Post Harvest	Lettuce
8/12/2015	Harvest	Carrots

APPENDIX 1: Dates of farm visits by crop and activity

8/12/2015	Post Harvest	Carrots
8/13/2015	Harvest	Peppers
8/13/2015	Post Harvest	Peppers
8/19/2015	Harvest	Carrots
8/19/2015	Post Harvest	Carrots
8/19/2015	Harvest	Peppers
8/19/2015	Harvest	Peppers
8/19/2015	Post Harvest	Peppers
8/21/2015	Harvest	Squash
8/25/2015	Harvest	Peppers
8/25/2015	Post Harvest	Peppers
8/27/2015	Harvest	Peppers
8/27/2015	Post Harvest	Peppers
8/31/2015	Harvest	Squash
8/31/2015	Post Harvest	Squash
8/31/2015	Harvest	Peppers
8/31/2015	Post Harvest	Peppers
9/03/2015	Harvest	Broccoli
9/03/2015	Post Harvest	Broccoli
9/22/2015	Harvest	broccoli
9/22/2015	Post Harvest	Broccoli
9/23/2015	Harvest	Peppers
9/23/2015	Post Harvest	Peppers
10/12/2015	Harvest	Carrots
10/12/2015	Post Harvest	Carrots
10/13/2015	Harvest	Carrots
10/13/2015	Harvest	Carrots
10/13/2015	Harvest	Carrots
10/13/2015	Post Harvest	Carrots
10/13/2015	Harvest	Broccoli
10/13/2015	Post Harvest	Broccoli
10/14/2015	Harvest	Carrots
10/14/2015	Post Harvest	Carrots
10/20/2015	Harvest	Carrots
11/4/2015	Harvest	Carrots
11/5/2015	Harvest	Carrots
11/5/2015	Post Harvest	Carrots
11/6/2015	Post Harvest	Carrots

<b>TRANSPLANT</b>	<b>Crop:</b>	<input type="text"/>	<b>Farm:</b>	<input type="text"/>	<input type="text"/>
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**Conditions and Situation**

<b>Date:</b>	<input type="text"/>	<b>Temperature:</b>	<input type="text"/>	<b>Precipitation:</b>	<input type="text"/>
<b>Farm size</b>	<input type="text"/>	<b>Wind:</b>	<input type="text"/>	<b>Notes:</b>	<input type="text"/>
<b>Soil Conditions:</b>	<input type="text"/>		<b># of beds</b>	<input type="text"/>	<b>Plastic / Bare?</b> <input type="text"/>
	<small>(Soil texture, Level of debris, dryness, drainage)</small>				
<b>Soil Prep:</b>	<input type="text"/>				
	<small>(Equipment used, Approximate time involved, Etc.)</small>				
<b>Crew Numbers:</b>	<input type="text"/>	<b>Crew Leader?</b>	<input type="text"/>	<input type="text"/>	<input type="text"/>
<b>Grower Present?</b>	<input type="text"/>	<b>Crew Notes:</b>	<input type="text"/>		
			<small>(Division of labor? Rotation of tasks? New workers being trained?)</small>		

**Method and Data**

<b>Method:</b>	<input type="text"/>	<b>Equipment:</b>	<input type="text"/>			
	<small>(Hand/machine)</small>					
<b>Technique Description</b>	<input type="text"/>					
	<small>(Include info on set-up/prep time, marking systems, watering in, etc.)</small>					
<b>Trial Number</b>	<b>Bed Length</b>	<b>Rows / Bed</b>	<b>In-row Spacing</b>	<b># Plants / Bed</b>	<b>Time / Bed</b>	<b>Watered?</b>
1	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
2	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
3	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
4	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
5	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
6	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

**Notes and Comments** (Including: ask farmer and crew if they went faster than normal and by how much?)

<input type="text"/>					
<input type="text"/>					

<b>HARVEST</b>	<b>Crop:</b>		<b>Farm:</b>			
<b>Conditions and Situation</b>						
<b>Date:</b>		<b>Temperature:</b>		<b>Precipitation:</b>		
<b>AM/PM</b>		<b>Wind:</b>		<b>Notes:</b>		
<b>Soil Conditions:</b>			<b>Beds?</b>		<b>Plastic/Bare?</b>	
	(Soil texture, Level of debris, Etc.)					
<b>Crew Numbers:</b>		<b>Experience:</b>		<b>Crew Leader?</b>		
<b>Grower Present?</b>		<b>Crew Notes:</b>				
			(Division of labor? Rotation of tasks? New workers being trained)			
<b>Method and Data</b>						
<b>Method:</b>		<b>Equipment:</b>				
			<b>Selective Harvest/Harvest all</b>			
	(Hand / machine)					
<b>Weed pressure level</b>			<b>Describe any post-harvest handling in field</b>			
<b>Technique Description</b>						
	(Include info on set-up/prep time, collection containers, marking systems, etc.)					
<b>Trial Number</b>	<b>Crew #</b>	<b>Bed Length</b>	<b>Rows / Bed</b>	<b>Time / Bed</b>	<b>Yield (lbs)</b>	<b>Yield (unit)</b>
1						
2						
3						
4						
<b>Market destination of this harvest:</b>						
<b>Notes and Comments</b> (Including: ask farmer and crew if they went faster than normal and by how much?)						

<b>POST HARVEST</b>	<b>Crop:</b>	<input type="text"/>	<b>Farm:</b>	<input type="text"/>
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**Conditions and Situation**

<b>Date:</b>	<input type="text"/>	<b>Temperature:</b>	<input type="text"/>	<b>Precipitation:</b>	<input type="text"/>
		<b>Wind:</b>	<input type="text"/>	<b>Notes:</b>	<input type="text"/>
<b>Crew Numbers:</b>	<input type="text"/>	<b>Experience:</b>	<input type="text"/>	<b>Crew Leader?</b>	<input type="text"/>
<b>Grower Present?</b>	<input type="text"/>	<b>Crew Notes:</b>	<input style="width: 100%; height: 40px;" type="text"/>		
(Division of labor? Rotation of tasks? New workers being trained?)					

**Method and Data**

<b>Method:</b>	<input type="text"/>	<b>Equipment:</b>	<input type="text"/>		
	(Hand / machine)				
<b>What is being done?</b>	<input style="width: 100%; height: 30px;" type="text"/>			<b>Packaging:</b>	<input type="text"/>
<b>Technique Description</b>	<input style="width: 100%; height: 80px;" type="text"/>				
(Include info on packing area, set-up/prep time, weighing etc.)					

Trial Number	Time	Amount	Units
1	<input type="text"/>	<input type="text"/>	<input type="text"/>
2	<input type="text"/>	<input type="text"/>	<input type="text"/>
3	<input type="text"/>	<input type="text"/>	<input type="text"/>
4	<input type="text"/>	<input type="text"/>	<input type="text"/>

<b>Market channel destination:</b>	<input style="width: 100%;" type="text"/>
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**Notes and Comments** (Including: ask farmer and crew if they went faster than normal and by how much?)

<b>CSA BOX</b>			<b>Farm:</b>	
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**Conditions and Situation**

<b>Date:</b>		<b>Inside?</b>		<b>If no - temp</b>	
		<b>Wind/Precip</b>		<b>Notes:</b>	
<b>Crew Numbers:</b>		<b>Experience:</b>		<b>Crew Leader?</b>	
<b>Grower Present?</b>		<b>Crew Notes:</b>			
<small>(Division of labor? Rotation of tasks? New workers being trained)</small>					

**Method and Data**

<b>Method:</b>		<b>Equipment:</b>			
	<small>(Hand / machine)</small>				
<b>Total # and list of crops</b>			<b>Packaging:</b>		
<b>Technique Description</b>					
<small>(Include info on packing area, set-up/prep time, weighing etc.)</small>					

<b>Trial Number</b>	<b>Type of share</b>	<b>Time</b>	<b># boxes</b>
1			
2			
3			
4			

<b>Total number of shares:</b>	
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**Notes and Comments** (Including: ask farmer and crew if they went faster than normal and by how much?)

<b>Farm Name:</b>		
<b>ENVIRONMENT</b>		
Total farm acres:	Acres in vegetables:	
Topography (% slope):	Soil name/type (texture class):	
<b>MANAGEMENT:</b> Describe the management system (farmer/owner only or also hired managers? Training systems? Division of labor?) and strategies for efficiency and oversight (planning, organizational systems, meetings, whiteboard, tools ready) and % owner hours on organization/management		
<b>HEAD GROWER/OWNER PROFILE</b>		
Head grower(s) name(s):	Age:	Gender:
Years farming (total):	Years on current farm:	
<b>LABOR PROFILE</b>		
Crew size:	# Volunteers:	
# Full time:	# Part time:	
Crew make-up: (interns, hourly, salaried):		
Age range (decades):	Main season crew size:	
Spring crew size:	Fall season crew size:	
<b>MECHANIZATION, INFRASTRUCTURE AND EQUIPMENT</b>		
Primary tillage system:	Total tractors:	Cultivating tractors:
Standard bed width:	Bed/field length:	
Greenhouses:	Cold storage:	
Harvest/pack shed:	# Hoop houses:	
Post-harvest methods (hand or machine):		
<b>MARKETS</b>		
CSA:	Direct Wholesale:	
Farmer's market:	Other:	
Wholesale Distributor:	Certified organic?	