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Existing and Potential Market Conditions for Farm-to-School Programs in Western North Carolina

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Farm-to-school (F2S) programs intend to connect schools with local farms with the objectives of improving student nutrition, providing health and nutrition education opportunities, and supporting local small farmers. Initially developed in the 1990s, the interest in F2S programs in the United States continues to grow. For example, in the last six years the number of schools serving food produced by local farms increased from 400 to 2,061, and the number of states with F2S programs increased from 22 to 41 (CFJ 2009; Vallianatos, Gottlieb, and Haase 2004). The last two U.S. Farm Bills (2002 and 2008) have also included language requiring the Secretary of Agriculture to encourage schools to purchase from local farmers. In addition, the 2008 Farm Bill allows the incorporation of geographic preference in the procurement of unprocessed agricultural products.

Over the past decade a body of literature has also emerged on F2S programs (Vogt and Kaiser 2008; Joshi and Azuma 2009). Three groups of studies are found within this literature. The first group corresponds to *ex-ante* studies assessing the feasibility and potential of F2S programs in a region. The second group of studies deals with *ex-post* studies evaluating the performance of the programs (Joshi and Azuma 2009). Finally, there are numerous publications dealing with practical aspects of implementing a F2S program (e.g., McKelvey, Hendrickson, and Parcell 2007).

Regarding the F2S evaluation literature, it should be noted that out of the more than 2,000 F2S programs in the country, only a small number have been assessed. A recent report reviewing the literature on F2S program evaluation found that only 23 of these programs had been evaluated (Joshi and Azuma 2009). Moreover, even though F2S programs intend to benefit both farms and schools, Joshi and Azuma's report show that most of the evaluation work has focused only on the impact of

the programs on schools. A final conclusion of this report is that "data on monetary and other benefits to farmers is scarce."

The present study focuses on the farm side of F2S programs. We evaluate the current situation and potential of an F2S program as a market for the products produced in local farms. The study therefore can be seen as both an evaluation of currently active F2S programs and also as a feasibility study for the expansion of the programs from the farmers' perspective. Three F2S programs located in Western North Carolina are analyzed. These F2S programs are county-wide programs corresponding to Madison, Mitchell, and Yancey counties.

Farm-to-School Programs in Western North Carolina

In Western North Carolina, F2S program efforts began in 2003 when a farmer located in Yancey County started selling lettuce to the county school system (ASAP 2006). By 2005, F2S projects had expanded to at least five counties in the region including Madison, Mitchell, and Yancey Counties. The growth of F2S programs in the region has been attributed to sustained collaborative efforts between the Appalachian Sustainable Agriculture Project (ASAP), Schools Child Nutrition Directors (CNDs), farmers, Cooperative Extension, County Health Departments, and Blue Ridge Food Ventures (ASAP 2006).

With respect to farmers participating in Farm to School programs in the region, most of the farms selling to schools are associated with Madison Farms, a non-profit organization that helps producers with their marketing efforts. During 2006, approximately 25 farmers sold their products to schools and other institutional markets (hospitals, colleges, etc.) through Madison Farms. By 2009, 40 farmers were reported participating in the program.

For purposes of this study, F2S programs are seen as a market with both a supply and a demand component. Schools are considered as consumers

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demanding the products, and farmers are the suppliers of the goods. The remaining sections of the paper are organized as follows. We first present two sections looking at both the demand and supply sides of the F2S programs in the region. Each section contains a summary of the methods used for the analysis followed by the presentation and discussion of the results. The final section summarizes the findings and provides some policy implications and recommendations for future work.

Schools' Demand for Locally Grown Products

This section assesses the current and potential demand for locally grown fresh fruits and vegetables by the three school districts. The demand assessment entailed the following steps: First, we collected expenditure data from the Child Nutrition Directors of the three school systems under study (Academic Year 2006–2007); second, we analyzed the expenditure data in order to identify the fruits and vegetables with the highest demand by the schools; and finally, we identified the crops that can be produced in the region and estimated the potential demand for local products by the school districts.

Table 1 presents a summary of the expenditures on fruits and vegetables products by the three school districts, classified by source of origin of the products (local versus traditional food-service provider) and the type of products (fresh and processed). Regarding the source of origin of the products, the majority of fruits and vegetable products consumed in the schools were purchased from traditional food-service providers, which in most cases buy the food from sources outside the region. Moreover, only fresh fruits and vegetables were purchased from local sources. In relation to the type of products being purchased, most of the expenditures on fruits and vegetables were on processed products.

Table 1 also shows that during the 2006–07 school year, Madison had the highest share of expenditures on locally grown produce compared with total expenditures on produce (26.4 percent), compared with Mitchell (5.2 percent) and Yancey (10.9 percent). Hence, on average, expenditures on local fruits and vegetables in the three counties accounted for 18 percent of the expenditures on fresh produce. Madison also reported the highest number of fresh fruit and vegetable products purchased from local sources (14 products) compared to Yancey (7 products) and Mitchell (1 product). Finally, most of the

Table 1. Madison, Mitchell, and Yancey County Public Schools Expenditures (in dollars) on Fresh and Processed Fruits and Vegetables, 2006–07.

Product	Madison	percent ^a	Mitchell	percent	Yancey	percent
Fresh fruits and vegetables	38,441.25	40.7	12,119.78	28.3	17,276.96	28.9
Traditional food-service provider (TFP)	28,310.00	30.0	11,485.78	26.8	15,388.46	25.8
Locally grown	10,131.25	10.7	634.00	1.5	1,888.50	3.2
Processed fruits and vegetables (TFP)	55,999.11	59.3	30,649.87	71.7	42,448.12	71.1
Total	94,440.36	100.0	42,769.65	100.0	59,725.08	100.0
Expenditure per student in fruits and vegetables	36.18		19.51		23.60	
Total nutrition expenditures per student	525.55		421.17		506.65	

^aPercentages do not add up to 100 because grocery supply and locally grown are both part of produce.

expenditures on locally grown products in the three counties was concentrated on a very few products. In fact, only four products—apples, Bibb lettuce, tomatoes, and potatoes—accounted for 73 percent of the expenditures on locally grown produce.

Based on the expenditure data, a total of 17 crops were selected to estimate the potential demand for locally grown produce (Table 2). The 17 crops include 15 crops that were purchased from local farmers during the 2006–2007 school period

and 2 crops that were not purchased locally that season but that could be produced in the region. In other words, the total expenditures on locally grown products and the corresponding total quantity demanded represent measures of the current demand for locally grown products. On the other hand, expenditures and quantities of products that are grown locally but that are purchased from the food-service providers can be seen as measures of the maximum additional potential demand for lo-

Table 2. Madison, Mitchell, and Yancey School Districts Current and Potential Demanded for Locally Grown Produce.

Commodity	Expenditure (in dollars)			Quantity demanded (cwt)		
	Locally grown ^a	Traditional food service provider ^b	Total	Locally grown	Traditional food service provider	Total
Apples	3,500	7,737	11,237	58.80	97.20	156.00
Bell peppers	201	466	667	1.60	2.40	4.00
Blueberries	360	0	360	1.95	0.00	1.95
Broccoli	511	2,525	3,036	2.80	27.04	29.84
Cabbage	329	1,645	1,974	11.80	76.40	88.20
Cantaloupe	470	1,573	2,044	4.18	23.45	27.63
Cauliflower	17	1,150	1,167	0.18	8.22	8.40
Cherry tomatoes	380	72	452	3.04	0.64	3.68
Cucumbers	310	820	1,129	2.60	5.60	8.20
Green beans	0	1,428	1,428	0.00	18.20	18.20
Lettuce, Bibb	2,751	0	2,751	9.30	0.00	9.30
Lettuce, iceberg	0	7,229	7,229	0.00	65.60	65.60
Potatoes	1,475	5,114	6,589	42.00	143.00	185.00
Sweet potatoes	462	0	462	10.50	0.00	10.50
Tomatoes	1,471	5,037	6,508	20.97	49.66	70.63
Watermelons	345	632	977	16.80	20.00	36.80
Yellow squash	72	49	121	0.90	0.60	1.50
Total	12,654	35,477	48,130	187	538	725
Percentage in relation to total expenditures in that category	100%	64%	71%			

^a The locally grown columns represent current demand for locally grown products in the region (2006–2007).

^b Traditional service provider columns represent the potential additional demand for locally grown products.

cally grown products. In practice, seasonality of production and the need to provide students with a more diverse selection of fruits and vegetables throughout the year limit a complete substitution of out-of-state products with locally grown products. Based on the previous assumptions it is estimated that expenditures on local fruits and vegetables could account for up to 71 percent of the current expenditures in fresh produce, well above the current 18 percent average level in the region.

Supply of Locally Grown Foods

This section explores the supply side of the farm to school program in Western North Carolina and focuses on two main objectives. The first objective is to calculate the amount of land that is required to satisfy the demand for produce by the school districts. The second objective is to assess the profitability of farmers' participation in F2S programs.

Land Required to Satisfy the Demand for Produce in the Three School Districts

The assessment of the total amount of land needed to satisfy the current and potential demand for fresh fruits and vegetables required two important pieces of information. The first is an estimate of the schools' demand for locally grown products (obtained from the previous section). The second component is data on yields per acre for the selected crops (Table 3).

As shown in Table 3, it is estimated that 1.2 acres of land in the region (about seven ft² per student) were needed to produce all the products purchased locally by the three school districts during the academic period 2006–2007. Some additional 3.8 acres will be required to produce locally the fruits and vegetables currently purchased from the traditional foodservice providers. Therefore the total land area required to satisfy the current and potential demand for fruits and vegetables by the Madison, Mitchell and Yancey school districts is approximately five acres (30 ft² per student).

Profitability of Farmers' Participation in F2S Programs

To evaluate the profitability of farmers' participation in the F2S programs in the region we conducted a

phone survey of farmers involved in the programs. The survey focused on farmers' perceptions concerning the difference in prices received from the school districts compared to the prices received from conventional wholesale markets, as well as the difference on the costs of marketing the products to these two marketing outlets. Survey participants included a *convenience sample* of nine farmers (out of 40) selling their products to schools through Madison Farms.

Most of the farmers surveyed (seven of nine) considered that the costs of selling their products to the schools were lower than the costs of selling to conventional wholesale markets. The remaining two farmers thought that the costs were equal. Regarding the difference between prices received, five considered that the prices received from schools were higher, one that prices were equal, two that prices were lower, and one farmer was uncertain about the difference.

When looking at both the costs and prices together, it can be concluded that most of the farmers (six out of nine) consider that selling their products through the schools districts is either more profitable (five producers) or as profitable (one producer) as selling their products to conventional markets. On the other hand, only one of the farmers considers that the profitability in the F2S market is lower than in the conventional markets (no explanation was given as to why they sell to schools). Regarding the other two farmers, the information provided does not allow us to make a final conclusion regarding the profitability of their participation in the F2S programs.

Summary and Final Remarks

This study analyzes the demand and supply of locally grown products for F2S programs in Madison, Mitchell, and Yancey counties in North Carolina. The demand analysis is conducted using the amount and value of produce and processed fruits and vegetables purchased by these three schools districts. For the supply analysis, we calculate the amount of land that is required to satisfy the current and potential demand for produce by the three school districts and assess the profitability of farmers' participation in F2S programs.

Results of the analysis indicate that current demand and use of produce in general, and lo-

Table 3. Yield per Acre and Land Area Needed to Meet the Demand for Locally Grown Fruits and Vegetables from the Madison, Mitchell, and Yancey Scholar Districts.

Commodity	Yield (cwt/acre)	Area (acres)		
		Locally grown	Traditional food service provider	Total
Apples	177.7 ^b	0.33	0.55	0.88
Bell peppers	118.1 ^b	0.01	0.02	0.03
Blueberries	48.4 ^b	0.04	0.00	0.04
Broccoli	84.0 ^a	0.03	0.32	0.36
Cabbage	209.4 ^b	0.06	0.36	0.42
Cantaloupe	120.0 ^a	0.03	0.20	0.23
Cauliflower	140.0 ^a	0.00	0.06	0.06
Cherry tomatoes	660.0 ^c	0.005	0.001	0.01
Cucumbers	112.5 ^b	0.02	0.05	0.07
Green beans	49.4 ^b	0.00	0.37	0.37
Lettuce, Bibb	40.0 ^a	0.23	0.00	0.23
Lettuce, iceberg	80.0 ^a	0.00	0.82	0.82
Potatoes	190.1 ^b	0.22	0.75	0.97
Sweet potatoes	155.0 ^b	0.07	0.00	0.07
Tomatoes	315.0 ^b	0.07	0.16	0.22
Watermelons	166.3 ^b	0.10	0.12	0.22
Yellow squash	97.5 ^b	0.01	0.01	0.02
Total		1.24	3.78	5.02
Land area/pupil (ft ²)		7.27	22.24	29.51

^a NCSU Horticulture Extension;

^b USDA, NC average from 2000-2007;

^c University of California Cooperative Extension, 2005.

cally grown products in particular, by the school districts is relatively small and concentrated on a very few fresh fruits and vegetables. This finding is important for two reasons. First, because it reflects potential for growth, but more importantly because it suggests that schools interested in supporting local farmers can allocate a relatively high share of total expenditures on fresh fruits and vegetables to buying local products by focusing on those few products with the highest demand.

Out of the three school districts being analyzed, the Madison school district had in the academic

year 2006–2007 the highest share of expenditures on fresh fruits and vegetables on locally grown products (26 percent), followed by the Yancey and Mitchell school districts, whose share of expenditures on locally grown products was 11 percent and 5 percent, respectively. Our review of the literature identified only one previous study that reports a similar figure. Feenstra and Jeri (2006) report that purchases from local farmers in a farm-to-school program in Yolo County, California accounted for an average 51 percent of total salad purchases during the 2000–2005 period. The maximum and

minimum total salad purchases from local farmers ranged from 31 percent to 100 percent.

Based on the expenditure data it is estimated that expenditures on local produce could increase to 71 percent (about \$6.6/student per year, and a total of \$48,000 for the three school districts) of the current expenditures on fresh produce, well above the current 18 percent level in the region (which is about \$1.7/student per year, or a total of \$13,000 for the three school districts). Even though these figures are estimated using data from only three counties, they can be used to estimate the potential of F2S programs as a market for agricultural products at the state and national levels.

Results of the supply analysis suggest that the amount of land required to grow local fruits and vegetables is relatively small. About seven ft² of farmland were required to produce the local fresh and fruits and vegetables used to feed each student in the Madison, Mitchell, and Yancey school districts during the 2006–2007 school year. If all the fruits and vegetables that can be produced in the region were procured locally, a total of almost 30 ft² per student, or a total of five acres, would be required to satisfy the entire demand.

The profitability analysis based on a small survey of farmers participating in F2S programs in the region suggests that most farmers consider that selling to schools is more profitable than selling their products to traditional wholesale markets. However, more research is needed to evaluate the profitability of the F2S programs compared to other markets with a bigger sample, and also to accurately quantify the profitability differences.

Even though we present some information regarding the demand for processed foods, the focus of this study is on the demand and supply of fresh fruits and vegetables. More work is needed to evaluate the schools' demand for processed fruits and vegetables. Processed fruits and vegetables purchased by schools are also "value-added" opportunities that can be considered by farmers or local entrepreneurs. The use of processed foods in

schools can also be tied to the educational experiences for students, parents, and teachers in the same way that agricultural production has been linked to the use of fresh fruits and vegetables.

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