TRENDS IN SOUTH DAKOTA FRUIT & VEGETABLE PRODUCTION 1997-2017

R. L. Burrows*
Department of Horticulture, Agronomy, and Plant Science
South Dakota State University
West River Research and Extension Center
Rapid City, SD 57703
*Corresponding author email: rhoda.burrows@sdstate.edu

ABSTRACT

Since 1997, according to USDA Census of Agriculture, South Dakota has experienced decreased numbers of vegetable farms producing larger amounts of single crops (notably potatoes, sweet corn, and melons) and moved towards more diversified production, with increased numbers of farms growing relatively small amounts of a range of crops. The number and proportion of small farms has increased over the past ten years: in 2017, 67% of vegetable farms were under 50 acres (20 ha) and 33% under 10 acres (8 ha), compared to 54% and 26%, respectively in 2007. About two-thirds of the vegetables were marketed directly to the consumer in 2017, a characteristic of small, diversified farms. There has also been a steady increase of vegetables and herbs being grown under "protected" culture, i.e. greenhouses or high tunnels.

The number and production of fruit farms steadily increased from 1997 to 2017, driven particularly by apples, grapes, and shrub fruit such as aronia and currants. As with vegetable production, the trend has been towards increasing numbers of small farms (71% of fruit farms were under 50 acres (20 ha) in 2017). Apple production continues to be the lead fruit in terms of acreage at 252 acres (102 ha) and farm number (80). Other tree fruit shows a pattern of steady or increasing acreage, but marked rises in numbers of farms. Over the past twenty years, grape acreage has expanded from 8 (3 ha) to 176 (71 ha), with the number of vineyards rising from 12 to 67. Aronia was not tracked separately until 2017, but now stands at 97 acres (39 ha), mostly planted in the past five years.

Keywords

Census, South Dakota, horticultural crops, vegetables, fruit

INTRODUCTION

Over the past twenty years, locally-produced food has garnered increasing attention both nationally and locally. In South Dakota, the number of farmers markets has increased from a handful, to nearly 60 across the state (South Dakota Specialty Producers Association, personal communication). Commercial

vineyards began being planted with the advent of new cold-hardy grape (*Vitis* hybrids) varieties. During this same time period, production of melons in the Forestburg area, once renown for cantaloupe (*Cucumis melo*) and watermelon (*Citrullus lanatus*), dropped precipitously. The following study was undertaken to elucidate the changing patterns of fruit and vegetable production across the state.

METHODS

Horticulture production data for South Dakota for the years 1997, 2002, 2007, 2012 and 2017 were drawn from Census of Agriculture (United State Department of Agriculture, National Agricultural Statistics Service) to determine trends of fruit and vegetable production and farm numbers in the state over the past twenty years.

The USDA Census defines a farm as an entity that produces and sells, or would have sold, at least $1000 worth of agricultural products during the year the census is conducted (https://www.nass.usda.gov/AgCensus/FAQ/2017/index.php). The Census relies on self-reporting, so despite efforts to send surveys to every farm, not all farms respond. A particular group of farms that may be under-reported are new farms and very small farms whose owners have not previously accessed USDA programs.

To account for farmers who did not participate in the census, NASS uses statistical methodology to correct for nonresponse, undercoverage, and misclassification. As part of this process, the census responses are compared to existing NASS data: "For example, in June each year NASS conducts a survey that is a sample of farms in the United States. Statistical models are developed based on matching information from this survey with information from the census. These models take into account the size of a farm (in terms of both land area and sales of agricultural products), the age of an operator, the type of farm, and a number of other features. Using these models, NASS can adjust for nonresponse, undercoverage, and misclassification to develop accurate and reliable estimates for U.S. agriculture" (https://www.nass.usda.gov/AgCensus/FAQ/2017/index.php).

RESULTS

Over the past twenty years, the number of farms in South Dakota that reported producing fruit has steadily increased, along with the value of the fruit sold (Figure 1; USDA-NASS 1997, 2002, 2007, 2012, 2017). In contrast, while the number of farms producing vegetables has also increased, reported vegetable sales are down considerably from a high in 2002, and the increase in fruit sales has not yet risen enough to replace that loss for total produce sales.

Vegetables—Vegetable production in South Dakota in the past twenty years (1997 to 2017) has shifted towards smaller, generally more diversified farms (USDA-NASS 1997, 2002, 2007, 2012, 2017), in direct contrast to the general pattern of commodity crop farm size in the state. Production has shifted away

from sweet corn (*Zea mays*) and potatoes (*Solanum tuberosum*) which are often grown in larger acreages; the acreage of melons (watermelon and cantaloupe) has also decreased drastically since 1997 (Figure 1).

In 2017, South Dakota had more land in pumpkins (*Cucurbita pepo*) (158 A; 64 ha) than any other vegetable (Figure 2). The next two highest acreage crops were sweet corn (139 A; 56 ha), and potatoes (97 A; 39 ha) (USDA-NASS 2017). Ten years earlier, in 2007, the largest acreage vegetable crop was potato at 854 A (345 ha), followed by watermelon at 255 acres (103 ha), sweet corn at 185 A (75 ha) and pumpkin at 142 A (57 ha) (USDA-NASS 2007). Twenty years ago, potatoes were the top acreage crop in South Dakota at 4,386 A (1,775 ha), with more land devoted to potatoes than all other vegetable crops combined. That acreage dropped by more than 75% between 1997 and 2002 and has continued to shrink to now being a minor crop (USDA-NASS 1997, 2002, 2007, 2012, 2017). During the same time frame, the number of potato farms has not fallen, so the average potato acreage per farm has decreased considerably.

With the exception of sweet corn and melons, over the past twenty years the trend is that increasingly more farms are growing individual vegetable crops (USDA-NASS 1997, 2002, 2007, 2012, 2017). The trend is most obvious with pumpkins and tomatoes (*Lycopersicum esculentum)*, which were the two crops grown by the greatest number of farms in 2017 (Figure 3). The number of farms producing tomatoes doubled over the past twenty years, which may be due in part to the increased use of high tunnels and other structures in South Dakota.

The production area of vegetables and herbs "under protection" (i.e., greenhouse or high tunnels) has steadily increased since 2002, along with the number of growing operations: 70 reported in 2017, a seven-fold increase since 2007 (USDA-NASS 2002, 2007, 2012, 2017). Although there is at least one large hydroponic operation contributing towards the production, the increase is also due to the proliferation of high tunnels in South Dakota in the past decade: the USDA-NRCS cost-shared over 100 high tunnels in South Dakota from 2000 to 2018 (USDA-NRCS, Huron, SD, personal communication). Since 2007, about three-fourths of growing operations under protection included tomatoes; currently tomatoes comprise over 80% of sales dollars from these operations. However, from 2012 to 2017, the overall number of greenhouse vegetable operations increased more rapidly than those with tomatoes, indicating those producers are diversifying their crop base beyond tomatoes (USDA-NASS 2007, 2012, 2017).

Fruit—The number of farms growing fruit in South Dakota has nearly quadrupled over the past twenty years, with a seven-fold increase in reported sales (Fig. 1; USDA-NASS 1997, 2002, 2007, 2012, 2017). As with vegetable production, the trend has been towards increasing numbers of very small farms (71% of fruit farms were under 50 acres (20 ha) in 2017).

Fruit crop acreage (Figure 5) has gradually increased overall, with the exception of 2007's apple acreage. Apples (*Pyrus malus*) continue to be the lead fruit in terms of acreage (252 acres; 102 ha in 2017) and farm number (80 in 2017) (USDA-NASS 1997, 2002, 2007, 2012, 2017). Other minor tree fruit crops, such as pears (*P. communis*) or cherries (*Prunus cerasus*), show a pattern of steady or increasing total acreage, but rises in numbers of farms, resulting in diffused

production (data not shown). Over the past twenty years, the number of vineyards rose from 12 to 67, expanding from 8 to 176 acres (3 to 71 ha) (Figure 4) (USDA-NASS 1997, 2002, 2007, 2012, 2017). Aronia (*Aronia melanocarpa*) was not tracked separately by Census data until 2012, but at 97 acres (39 ha), is now the 3rd largest fruit crop in South Dakota. Mostly planted in the past five years; aronia makes up the vast majority of the 2017 "Berry" acreage presented in Figure 4. Also included in this category are other small fruit such as raspberries (*Rubus idaeus*), strawberries (*Fragaria* x *ananassa*), haskaps (*Lonicera caerulea*) and currants (*Ribes nigrum* and *R. rubrum*) (USDA-NASS 1997, 2002, 2007, 2012, 2017).

Markets—Starting in 2012, the USDA began including questions on local food marketing practices, including sales directly to consumers, and in 2017 expanded the question to include sales to local and regional markets, such as retail establishments (e.g., local grocery stores and restaurants), institutions, and food hubs. In 2017 about two-thirds of farms selling vegetables (including melons) sold at least a portion of their produce directly to the consumer (Table 1) through farm stands, farmers markets, and CSA's (literally, "Community Supported Agriculture" which for a flat fee supply produce throughout the season). The proportion is only a slight increase from 2012, but because the number for farms has increased (Figures 1 and 3), represents more farms selling to consumers.

Table 1. Value of produce sold directly to consumers, retail markets, institutions, or food hubs in South Dakota, and the percent of vegetable or fruit/nut farms that direct marketed, in 2012 and 2017 (USDA-NASS, 2012, 2017).

Sales type	2012		2017	
Direct to consumers	Sales	% of farms*	Sales	% of farms*
Vegetables + Melons	$516,000	61%	n/a	67%
Fruit and Tree Nuts	$ 86,000	27%	$32,000	17%
Local/Regional**				
Vegetables + Melons			$84,000	11%
Fruit and Tree Nuts			$12,000	9%

*Percent of farms that sold that type of produce
** Local/Regional does not include direct to consumers

DISCUSSION

Over the past twenty years, vegetable production in South Dakota has shifted away from larger acreages of single crops, towards smaller, diversified farms (Figures 1 and 2). During this transition from 2002 (a record high year), farm numbers have risen 23% while total vegetable sales dropped over 50%, although a slight increase in 2017 suggests that sales have at least stabilized. In contrast,

from 1987 to 2007 (the most recent data available), acreages per farm of most vegetable crops increased nationally during the same time frame, likely indicating consolidation, specialization and mechanization on particular individual crops. The national average potato acreage per farm nearly tripled (McDonald et al. 2013), underscoring the vastly different nature of the South Dakota production.

The data show that about two-thirds of vegetable farms sell at least a portion of their crop directly to the consumer; and a smaller proportion sell to local or regional grocery stores, institutions, or to food hubs. Direct markets tend to be lower volume and higher priced, and often require a mix of products for optimal sales. Lancaster and Torres (2019) found that growers who sold produce locally and/or utilized season extension technology such as high tunnels, were more likely to have a diverse crop mix. A diversity of crops can also help manage risk of a crop failure, or market saturation of a particular item. In Indiana, an average fresh market vegetable operation consisted of 17 crops (Torres and Marshall 2017).

Figure 4 shows the steady increase of "protection" technology by South Dakota farmers; while tomatoes are a large portion of that increase, there are a number of farms that do not produce tomatoes in their greenhouses. The use of high tunnels and greenhouses helps expand the growing and thus the marketing season to help capture a larger proportion of the consumer food spending, as well as improving the financial status of the grower.

A much smaller proportion of vegetable farms (11%) reported sales in 2017 to local/regional markets, such as restaurants, institutions, grocery stores, and food hubs. This lower proportion is in contrast to local marketing nationally; in 2017, only about 20% of U.S. farms that sold locally sold directly to the consumer (Vogel and Low 2015). The consumer vs. less-direct sales percentages in South Dakota likely reflect both the rural nature of our state, as well as the relative newness of our diversified produce farms. In addition, local sales to institutions and similar outlets historically has been limited in our state. In 2016, a producer food hub was started in the southeast part of the state and is slowly expanding both its sales and its members. As growers seek to expand sales beyond what they can market directly to the consumer, more will likely turn to food hubs and other markets which often require higher volumes of produce. As they expand, they often, but not always, begin to specialize in items that are especially profitable, and may be less reliant on hand labor for crop maintenance and harvesting. However, it is unlikely that one or a few crops will dominate vegetable acreage to the extent that they did twenty years ago.

Agricultural economists across the United States are carefully watching the effects of the COVID-19 pandemic on local food buying habits (see for example https://news.ca.uky.edu/article/uk-leads-national-team-studying-pandemic%E2%80%99s-effect-local-food-systems). DakotaFresh Food Hub manager Kristianna Gehant (personal communication) reports that the trends in southeast South Dakota are similar to those observed across the nation - loss of produce sales to local restaurants and institutions - just when long-term efforts to increase those sales in South Dakota were beginning to be successful. Some producers reported increased CSA membership sales this spring, and strong sales of pre-packaged "market boxes" filled with produce and sometimes meat. Whether

these trends will continue beyond the effects of the current epidemic is at best difficult to predict. Direct markets such as CSA, produce boxes, and even online sales would tend to encourage a diversified crop mix for vegetable producers, continuing the current trend.

Fruit and vegetable sales are quite distinct in the state. Both fruit sales and number of fruit farms have increased steadily (Figure 1). If the trend continues, fruit sales may equal or eclipse vegetable sales in the state. Fruit farms in South Dakota are far less likely to sell directly to the consumer than are vegetable farms (Table 1). Much of this can be explained by sales to wineries, including almost all vineyards, as well as fruit, such as currants and aronia. Aronia is also sold to cooperatives (Stewart, personal communication) for processing. Apples are the only fruit found consistently at farmers markets across the state, and they are also sold to institutions and other regional markets or used in value-added products. Apple acreage has been uneven over the years, though it appears to be on a trend to increase. It should be noted that acreages can be deceiving, as row spacing can vary widely by farm, and newer orchard systems require much less land for higher yields per acre (Schmit et al. 2018); state yield data are not available.

Grape (*Vitis* hybrids) production rose sharply in the early 2000's, but has stabilized somewhat over the past ten years (Figure 5). Almost all the grapes are northern hybrid grapes grown for wine production; the majority of vineyards are under 10 acres (4 ha) and most are hand-harvested (Burrows, personal observation). Hail and herbicidal drift from nearby corn and soybean fields are common threats to both yield and quality, leading to the abandonment of some plantings. However, although some vineyards have been removed, that acreage has been replaced by new vineyards or expansion of current successful vineyards (Burrows, personal observation). Many vineyard owners have started their own winery to add value to their fruit, since profit margins are quite narrow for fruit production. Other fruit may prove to be more profitable, especially if grown on a large enough scale for mechanization to reduce labor costs, and to satisfy markets such as wineries and other processed products.

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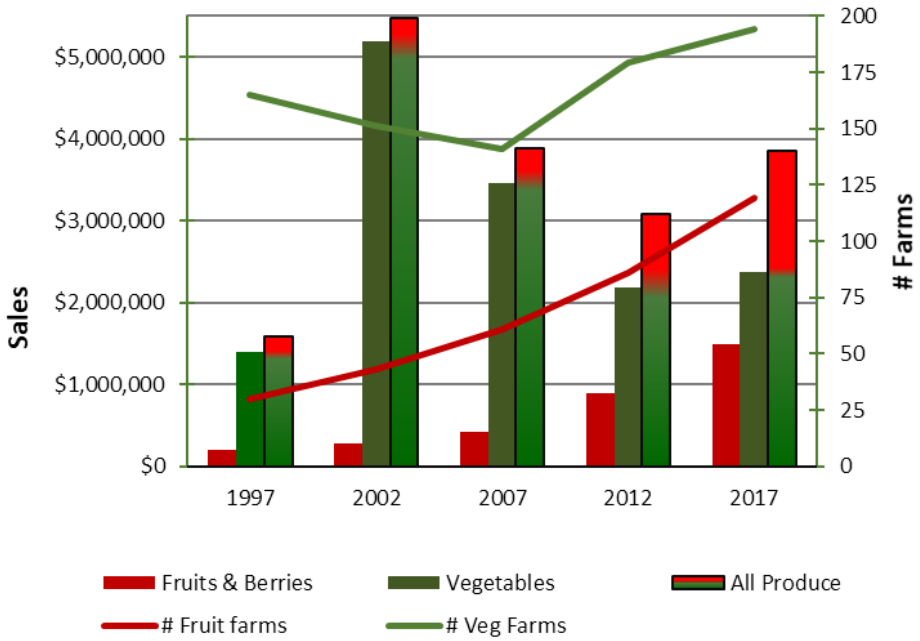

Figure 1. Number of farms selling produce, and Census year sales of fruits and vegetables in South Dakota, Based on USDA Census of Agriculture NASS 1997-2017.

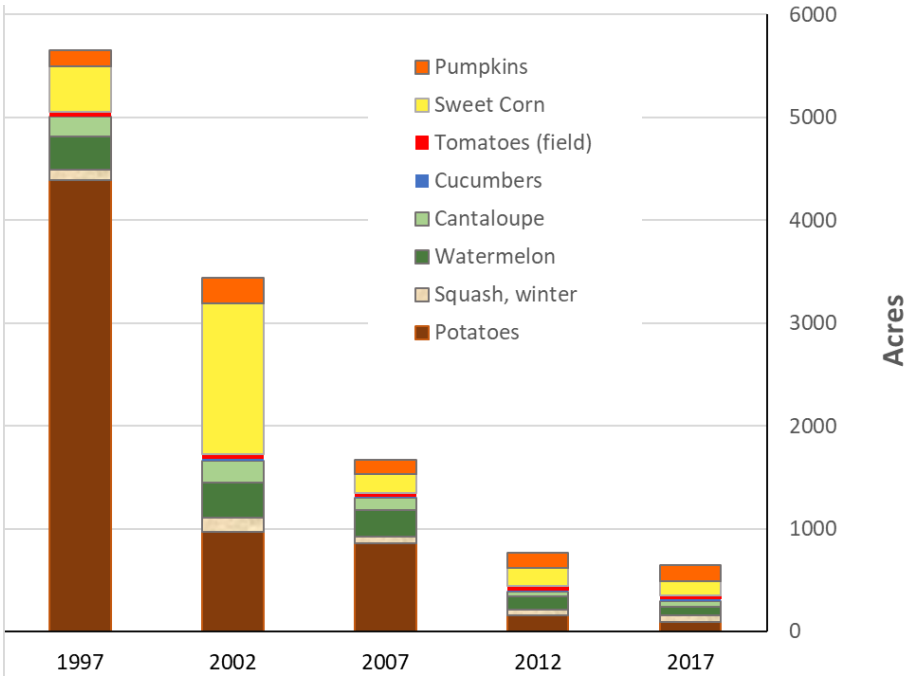

Figure 2. Total acreages of individual field-grown crops in South Dakota, in Census years from 1997-2017. Based on USDA-NASS Censuses of Agriculture, 1997-2017.

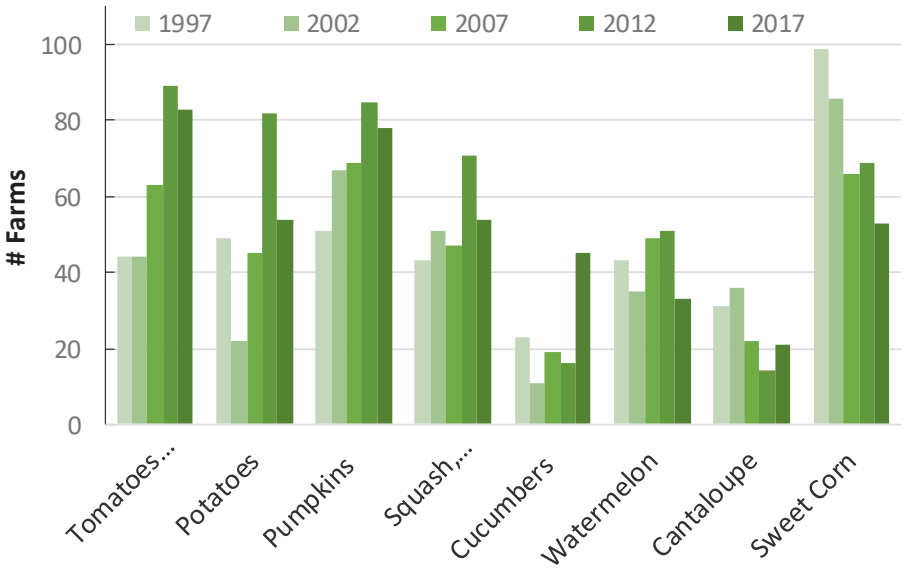

Figure 3. Number of South Dakota farms growing individual vegetable crops, in Census years from 1997-2017. Based on USDA-NASS Censuses of Agriculture, 1997-2017.

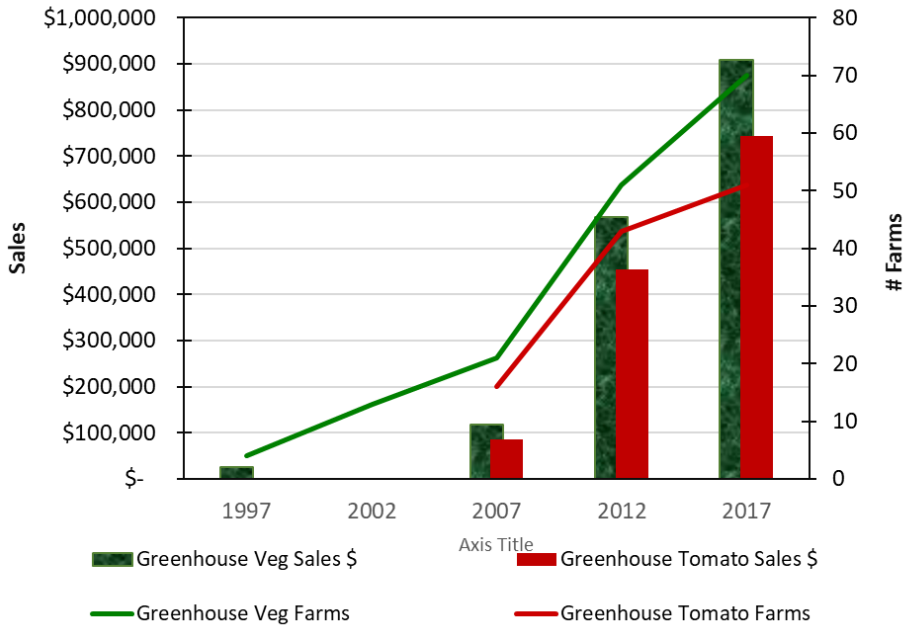

Figure 4. Sales (left axis) of greenhouse vegetables and tomatoes, and number of farms (right axis) selling greenhouse vegetables and tomatoes in South Dakota, in Census years from 1997-2017. Based on USDA-NASS Censuses of Agriculture, 1997-2017.

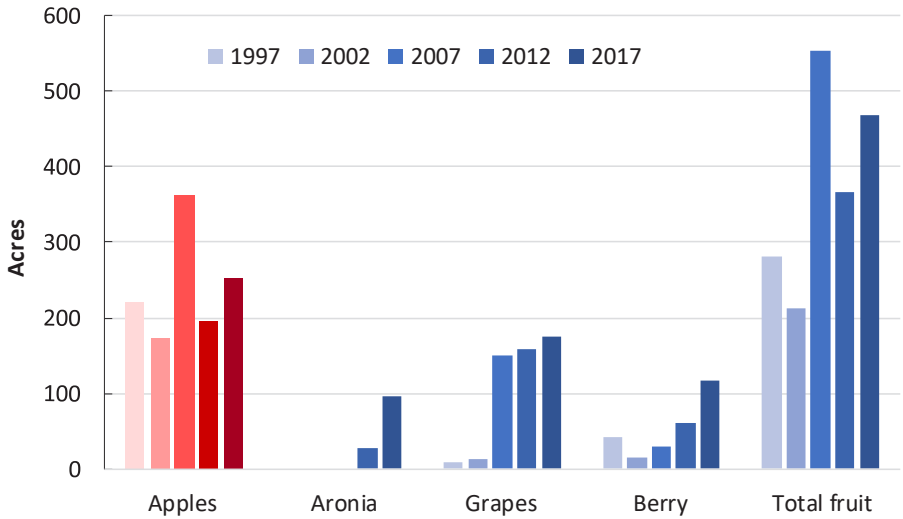

Figure 5. Acres of fruit crops in South Dakota, from 1997-2017. Based on USDA-NASS Census of Agriculture, 1997-2017.