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# Saskatchewan Vegetable Production – An Opportunity Awaits

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## Abstract

At 7% “in-season” self sufficiency, Saskatchewan imports about \$25,000,000 of fresh vegetables annually. To further exploit this apparent diversification opportunity a vegetable project was initiated in 1996 to demonstrate newer production technologies and to obtain data for Saskatchewan based costs of production. One half acre sized fields of pumpkin, carrots, cabbage, peppers, cucumber, broccoli, cauliflower, romaine lettuce, celery, Brussels sprouts and cantaloupe have been grown and marketed to simulate commercial production. The results have shown that acceptable yields of suitable quality produce can be grown and superior quality where proximity to market is a factor. Net returns have been positive for the most part but, since labour is such a significant component of variable costs, productivity and efficient use of labour can be critical. These initiatives have given the vegetable industry in Saskatchewan further impetus and direction. A number of new producers and a new generation cooperative, currently in the formative stages, appear poised to further diversify the agricultural landscape with **SASK GROWN** fresh vegetables.

## Introduction

Saskatchewan’s share of the total domestic unloads of fresh vegetables (excluding potatoes) originating from the prairie provinces was only 2.0% in 1999 compared to 34.6 originating from Manitoba and 63.4% originating from Alberta. Of a total 46,097,467 kilograms 933,071 kilograms originated from Saskatchewan, 15,953,885 kilograms from Manitoba and 29,210,511 kilograms from Alberta.

Based on unload data Saskatchewan is only 7% self sufficient in “in-season” fresh vegetables. That self-sufficiency compares to 33% in Alberta and 57% in Manitoba.

The 93 % of in-season fresh vegetables imported into this province represent a direct loss to Saskatchewan’s economy of about \$25,000,000 annually. About 40 to 50 % of that money goes to vegetable growers in other Canadian provinces primarily Manitoba while the remaining 50 to 60 % goes to support the economy of the United States.

In 1996 the Canada-Saskatchewan Irrigation Diversification Centre (CSIDC) initiated a vegetable project to demonstrate production and newer technologies such as drip irrigation, mulch, mini-tunnels, floating row covers and wind protection. In 1997 and 1998 the Agri-Food Innovation Fund (AFIF) provided funding to carry on the project with eleven vegetable crops.

## **Project Format / Procedures**

The vegetable crops were grown on 0.2 ha (½ acre) sized blocks to simulate a commercial operation. The resulting crops were harvested, washed, graded, packaged as appropriate and marketed to wholesale buyers to simulate commercial production. Data obtained was used to calculate a Saskatchewan based cost of production for each crop.

IRT (infrared transmissible) mulch was used alone or in combination with mini-tunnels and/or row covering where applicable for the pumpkin, cucumber, pepper and cantaloupe. To make most efficient use of the mulch, crops were planted in a double row configuration along the outer edge with the drip tape running between the two rows.

Wind protection was provided for the pumpkin, cucumber, cantaloupe and pepper by means of rye solid seeded between the mulch rows either the fall prior or early in the spring. A waterwheel planter was used to transplant cabbage, peppers, cantaloupe, broccoli, cauliflower, romaine lettuce, Brussels sprouts and celery transplants through the mulch. Pumpkin and cucumber were also seeded through the mulch with the waterwheel planter. A Stanhay precision seeder was used to direct seed pelleted carrot seed on raised beds.

Field days and tours were held to demonstrate production techniques to interested individuals. Wholesale buyers were invited to similar events to view the quality of the resulting crops and begin the process of encouraging the use of more **SASK GROWN** produce. The resulting produce was harvested, washed, graded and packed as appropriate and moved to wholesale and / or processing markets. Peppers remaining at season end were processed and marketed as a frozen diced product.

## **Results**

During the first year of the project, cumulative corn heat units were near average at 2369. 1998 saw much higher values at 2545, 1999 much lower at 2077 and 2000 near average at 2300. These are compared to the long term average of 2253 (1931-1998). The heat loving crops, pumpkin, cucumber and pepper, performed exceptionally well in 1998 while the cabbage, being a cool season crop, performed much better in 1999.

### **Pumpkin**

Pumpkin has produced the most impressive results. Yields from 87 to 143 t/ha (38.7 to 63.5 tons/ac) were achieved with an average price of \$0.319/kg (\$0.145/lb) (Table 1).

The quality of the pumpkin grown was excellent and well received. Most were completely orange in the field. Some later pollinated pumpkin required further ripening but there was very little loss due to green colour.

The net returns were positive each year ranging from a low of \$7324/ha (\$2964/ac) in the last year of the project to a high of \$21675/ha (\$8772/ac) in the second year. These results have encouraged a number of private operations to grow pumpkin. Since there is a limited market for

pumpkins and it is also very seasonal, persons interested in growing pumpkins should exercise extreme caution.

### **Carrots**

In terms of ease of production, quality, yield and market demand, carrot production was the more attractive option for further development. They are one of the few vegetable crops that can be entirely mechanized similar to potato

Bunched carrots (6 to 8 per bunch X 24 / case) returned the equivalent of 1740 cases/ha (704 cases/ac) valued at \$20613/ha (\$8342 /ac). This is for one production year of data.

Topped carrot yields ranged from a low of 19.6 t/ha (8.7 tons/ac) in 1999 to a high of 57.5 t/ha (25.5 tons/ac) in the first year of the project (Table 1). The higher yield would be more indicative of carrot production potential.

Of the total marketable crop an average of 78.3% was sold as a Canada No.1 product either in a 0.9 or 2.3 kg (2 or 5 lb) poly consumer pack while the remaining 21.7% was moved into the processing market.

The scale of this project did not lend itself to efficiencies in harvest nor in the washing, grading and packaging operation. As a consequence the actual costs did not result in a positive net return. Assuming machine harvest and a washing, grading and packaging line along with good storage, it would appear that net returns in the range of \$7412 /ha (\$3000/ac) could be achievable.

### **Cabbage**

Comparison of direct seeded cabbage to transplant production in the first two years indicated yields of 62.8 t/ha (27.9 tons/ac) for transplants and 18.3 t/ha (8.1 tons/ac) for direct seeding. Transplant production incurred extra costs of \$2000/ha (\$807/ac). At an average selling price of \$0.246/kg (\$0.112/lb) the net return for transplant production was \$11000/ha (\$4430/ac) which more than covered the additional expense. In addition transplanted cabbage was harvested about 10 days earlier than direct seeded cabbage. In spite of a reasonable spraying schedule for flea beetles, root maggots and imported cabbage worm the direct seeded cabbage appeared to suffer more than transplants further encouraging the use of transplants.

The average yield from transplants over the three years of the project was 72 t/ha (32.0 tons/ac). With an average price of \$0.246/kg (\$0.112/lb) the gross returns were \$17732/ha (\$7153/ac) (Table 1).

### **Peppers**

Pepper production is very weather dependent and as such results have been more variable than those obtained for the other crops. Total heat units not only affected yield but quality in terms of sizing and the volume of red peppers produced. Overall marketed yields ranged from 340 kg/ha

(300 lb/ac) in the last year of the project to a high of 49200 kg/ha (43667 lb/ac) in the second year (Table 1).

Peppers are sold on the basis of size and color. Those not sufficiently sized can be sold as chopper grade for restaurants and institutions while red peppers for retail command a premium price. The price ranged from a low of \$0.72 (\$0.327) for green chopper peppers to a high of \$2.60/kg (\$1.18/lb) for retail red peppers.

The option of making diced frozen peppers from produce picked immediately prior to freeze up was explored in the latter two years of the project and indicated that an acceptable product could be achieved. Efficiencies of scale and some degree of mechanization particularly with respect to the initial cutting would be required in order to make it economically viable.

### **Cucumber (slicing)**

Cucumber production is a labour intensive crop requiring careful harvest every two days during the peak picking period. Moving vines too aggressively during harvest resulted in abrasion damage to young undeveloped fruit. This later resulted in scarring. These fruit were subsequently not saleable. A solution involved leaving the vines relatively intact while searching for harvestable fruit and removing those cucumbers with the least amount of vine disturbance.

Accordingly high harvest costs resulted in this crop being the least attractive in the project on the basis of net returns. Losses from scarring and temporary surpluses on occasion resulted in losses ranging from 20 to 36% of marketed yields.

Marketed yield ranged from a low of 2400 cases/ha (968 cases/ac) (24 count/case) as a result of lower heat units in the last year of the project to a high of 5820 cases/ha (2347 cases/ac) with gross dollar return ranging from \$12500 to 31500/ha (\$5041 to \$12705/ac) (table 1).

Further mechanization in terms of picking aids and improved packaging efficiencies would significantly improve the economics of cucumber production.

### **Broccoli**

Broccoli was grown sequentially using transplants exclusively as the project progressed. The larger heads were of excellent quality and well received. Harvesting frequency was critical with earlier harvests but slower development later in the fall allowed more flexibility in harvest and marketing. Light frosts were not a problem allowing harvest to continue into early October.

The heads were field trimmed, placed in pallet bins, stored in the filacel cooler and subsequently graded, packed 14 count per case, top iced and shipped.

In 1999 a yield equivalent of 3043 cases/ha (1232 cases/ac) were marketed at an average price of \$10.39 / case for a gross return of \$31616/ha (\$12800/ac). (table 1). Average yield was lower but the 1999 results should be more indicative of potential.

## **Cauliflower**

Problem with head discoloration reduced the economics of cauliflower production in this project. The market demands a white head that is achieved through the use of self blanching varieties, adequate moisture and fertility that ensures maximum leaf growth and earlier harvest at the 12 count size to avoid any exposure of the head to sunlight. While several frosts did not damage the cauliflower it was very slow to size during latter September and early October.

Most of the cauliflower was harvested as a 12 count head, individually wrapped and sold 12 heads per case.

A total of 2383 cases/ha (965 cases equivalent /ac) were marketed at an average price of \$9.80 / case in 1999 for a total return of \$23363/ha (\$9459/ac) (Table1). Average returns over the term of the project, however, were negative. This was 80% of the population planted and is most likely indicative of potential provided problems with discoloration can be resolved.

## **Brussels Sprouts**

This is a labour intensive crop when harvested by hand. In addition the sprouts are difficult to remove and would create some distress to workers with a larger area to harvest. In 2000 the stalks were harvested and marketed with the sprouts attached. This method of harvest reduced labour cost by 3 to 4 times but did increase packing costs.

Yields of 16301 kg/ha (14520 lbs/ac) and 13326 kg/ha (11870 lbs/ac) were achieved respectively in 1999 and 2000. Gross returns of \$19962/ha (\$8082/ac) and \$23455/ha (\$9496/ac) resulted in an average net return of \$7850/ha (\$3178/ac) in the project.

The quality of the sprouts seemed acceptable but variability in size may require some mechanical means of sizing. The success of this crop will depend on the introduction of some means of mechanical harvest or consumer acceptance of stalks with sprouts attached.

## **Celery**

This is a long season crop requiring transplants started in March and field planted in early June after the temperature remains above 10C (50 F). In addition it is a crop that needs and responds well to good moisture levels throughout the growing period.

The celery was harvested commencing in early September and concluded in early October. Quality was good to excellent with very little stringiness although some plants did develop a more open stature as the season progressed. These were not marketable. Exposure to several light frosts did no serious harm but a severe frost episode to minus 9.4C in early October 2000 destroyed the remaining crop.

An average of 1491 (24 count) cases/ha (604 cases/ac) or 66% of the population planted was marketed at an average price of \$15.66 per case for a gross of \$21475/ha (\$8695/ac) (Table 1).

Celery had the highest labour to variable cost ratio in the project, however, which contributed to a break even net return. Harvest and field trimming were the most significant labour cost.

### **Romaine Lettuce**

Romaine lettuce was sequentially planted using transplants exclusively as the project progressed. The bulk of the harvest originated from the first two plantings, however, as lettuce maturing later in the mid-summer heat did not form adequate heads for harvest. The quality of this early production was excellent with good-sized heads and no tip burn.

The equivalent of 1356 cases (24 count) /ha average (549 cases/ac) was marketed at an average price of \$10.47 per case giving a gross return of \$13782/ha (\$5580/ac) (table 1). This lower than expected yield that was 60% of the population planted contributed to a break even net return. The price in 1999 at \$8.49 per case was also less than the more normal \$11 to \$12 / case.

### **Cantaloupe**

Cantaloupe was successfully grown from transplants as well as seed on IRT mulch under mini-tunnels in this project. Harvest commenced in early August and continued until all the fruit was harvested in September. Even after light frost had destroyed the vines the fruit continued to mature and was still marketable.

Consumers continue to be impressed with the quality of **Sask Grown** cantaloupe picked at or close to full slip. Sugar content of this cantaloupe was as high as 14% but more normally in the 9 to 12 % range. Imported cantaloupe harvested several days prior to full slip to accommodate shipping requirements was about half that percentage. Cantaloupe harvested at or close to full slip, however, has a more limited shelf life which will require the cooperation of the wholesale / retail sector to move produce through the system faster and perhaps an educational program to educate consumers.

Identifying locally grown cantaloupe, which is essentially identical to imported produce in appearance, and subsequently promotion will be essential to command a premium for this superior quality.

Cantaloupe is sold by count (9, 12, 15, 18 or 23 / case) with the greatest demand for 15 and 18 count. An average yield of 1919 cases/ha (777 cases/ac) was marketed at an average price of \$12.01 per case for a gross return of \$22971/ha (\$9300/ac) (Table 1). Yields based on sampling ranged as high as 3031 cases/ha (1308 cases/ac)

**Table 1.** Yields, Prices, Gross and Projected Net Returns of Eleven **Sask Grown Vegetable Crops**

<b>CROP</b>	<b>YIELDS (/ac)</b> (range)	<b>PRICE</b> (range)	<b>GROSS RETURNS/ac</b>	<b>NET RETURNS /ac</b>	<b>Projected Gross Net Return</b>
Pumpkin	<b>97744 lbs</b> (77404-126948)	<b>\$0.146 /lb</b> (0.134-0.155)	<b>\$14147</b> (11602-17012)	<b>\$6236</b> (2964-8772)	\$12000 \$6639
Carrot	<b>36159 lbs</b> (39930-51073)	<b>\$0.222 /lb</b> (0.210-0.238)	<b>\$9361</b> (8833-9888)	<b>\$1480</b> (1413-1548)	\$10000 \$3651
Cabbage	<b>64100 lbs</b> (50166-80610)	<b>\$0.112 /lb</b> (0.10-0.13)	<b>\$7153</b> (5374-8086)	<b>\$1562</b> (1065-2268)	\$9000 \$1951
Pepper	<b>22544 lbs</b> (302-43667)	<b>\$0.495 /lb</b> (0.454-0.570)	<b>\$11159</b> (139-19604)	<b>\$890</b> (-4833-5229)	\$12000 \$2193
Cucumber	<b>1864 cs 24ct</b> (968-2347)	<b>\$5.38/cs</b> (5.20-5.58)	<b>\$10028</b> (5041-12705)	<b>\$813</b> (-466-1515)	\$10000 \$1510
Broccoli	<b>558 cs 14ct</b> (104 – 1232)	<b>\$11.74/cs</b> (10.39 – 14.00)	<b>\$6223</b> (1127 –12800)	<b>\$942</b> (-1146-3870)	\$13000 \$3104
Brussels Sprouts	<b>13195 lbs</b> (11870 – 14520)	<b>\$0.68 / lb</b> (0.56 – 0.80)	<b>\$8789</b> (8082 –9496)	<b>\$3178</b> (2499-3857)	\$10000 \$4126
Celery	<b>604 cs 24 ct</b> (387 – 907)	<b>\$15.66 / cs</b> (12.00 – 22.25)	<b>\$8695</b> (6587 –10884)	<b>(\$182)</b> (-1491-1832)	\$10000 \$1409
Cauliflower	<b>693 cs 12ct</b> (363 –965)	<b>\$9.38 / cs</b> (7.50 – 10.84)	<b>\$5415</b> (2722 – 9459)	<b>(\$-1430)</b> (-2932-1147)	\$10000 \$1704
Romaine Lettuce	<b>549 cs 24 ct</b> (448 – 714)	<b>\$10.47</b> (8.49 – 11.99)	<b>\$5580</b> (5313 –6056)	<b>\$149</b> (-907 – 732)	\$9000 \$2189
Cantaloupe	<b>777 cs 9 to 23/cs</b> (582 -897)	<b>\$12.01</b> (11.10 – 12.47)	<b>\$9300</b> (7246 – 11186)	<b>\$664</b> (-1102 – 1654)	\$12000 \$3104

## Labour

The most significant cost associated with vegetable production in this project was labour. As a percentage of variable costs, labour ranged from a low of 33.2% for pumpkin to a high of 70.1% for celery. The average was 48.6%.

The development of mechanization and efficient operating systems is an essential requirement to improve the profitability for commercial operations. Secondly managing the human resource by selecting suitable employees, motivating employees and rewarding productivity is equally important to assure efficiencies.

## Cost of Production

A detailed cost of production analysis based on actual experience for each of the three years along with an average and a projection for each crop is provided. The projected cost of production for each crop reflects an estimation of what a commercial operation should reasonably expect in terms of yields, returns and costs.

## Conclusion

The results from this project have shown that acceptable yields of suitable quality produce can be grown in Saskatchewan. Where proximity to market is a factor allowing more timely harvest and



delivery then superior quality produce can be offered to the trade. Net returns have been positive for the most part. Since labour is such a significant component of variable costs, productivity and efficient use of labour can be critical.

This project has already resulted in additional private production, particularly with pumpkin, and much interest in other vegetable crops. A new generation cooperative, in the formative stages, is an attempt to further develop the vegetable industry by coordinating marketing to the wholesale / retail and processing market.

The Canada food guide recommends the consumption of five to ten servings of fruits and vegetables per day for a healthy diet. Why not make it **SASK GROWN?**