Estimation of Potential Economic Losses for the Alberta Beekeeping Industry Due to Winter Losses in 2007

Prepared for the Industry Development Sector

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Executive Summary

With approximately 250,000 bee colonies, Alberta is the largest honey-producing province in Canada, accounting for 40 per cent of the country's annual production. In Alberta, farm cash receipts from honey production vary. During the last six years receipts have ranged from a low of $24.3 million in 2006 to a high of $57.5 million in 2003.

In the spring of 2007, Alberta beekeepers reported higher than average winterkill losses in over-wintered bee colonies. A survey conducted by Agriculture and Food revealed that, on the average, 30 per cent of Alberta bees were killed during the 2006 / 2007 winter season – twice the long term average in the province. The percentage, however, is in line with average reported winterkill losses across Canada during the same period.

This economic survey reveals that, based on estimates and survey information, the Alberta Beekeeping Industry could potentially experience losses between $16.733 and $24.655 million because of this higher than average winterkill rate**.**

Actual industry loses will not be known until beekeepers process and sell their honey for the 2007 year.

Economic Analysis in View of Winter Bee Losses

In 2007, an estimated 240,000 beehives were registered in Alberta, 72,000 were impacted due to winterkill. This is twice the average amount usually experienced by Alberta beekeepers. A further 36,000, or 15 per cent, of colonies were weakened (less than 3 frames per colony) due to winterkill.

This economic analysis, therefore, is based on the above average amount of winterkill and weak colonies in 2007 – 72,000 colonies (36,000 above average winterkill + 36,000 above average weakened colonies). Analysis has been done based on three potential honey production scenarios per colony and per pound of honey:

1) **Below Average**. *115 pounds per hive at $0.95 per pound.*
Estimates:

- Rental income from pollination: $140 per hive
- Loss in rental income from pollination (weakened colonies): $30 per hive
- Decrease in honey production from pollinating hives: 10 pounds
- Cost of replacement of dead hives[1]: $120
- Cost of strengthening and medicating weak hives is $55

2) **Average.** *130 pounds per hive at $1.10 per pound.*
Estimates:

- Rental income from pollination: $150 per hive
- Loss in rental income from pollination (weakened colonies): $35 per hive
- Decrease in honey production from pollinating hives: 15 pounds
- Cost of replacement of dead hives: $130
- Cost of strengthening and medicating weak hives is $60

3) **Above Average**. *145 pounds per hive at $1.25 per pound.*
Estimates:

- Rental income from pollination: $160 per hive
- Loss in rental income from pollination (weakened colonies): $40 per hive
- Decrease in honey production from pollinating hives: 20 pounds
- Cost of replacement of dead hives: $140
- Cost of strengthening and medicating weak hives is $65

(A) Potential Loss in Income from Honey Production in 2007

Based on the above assumptions and survey information, estimated loss in potential income from honey production in commercial operations with 400 hives or more per operation ranges from $7.866 million to $13.05 million (Table 1, A13).

(B) Potential Loss in Income for Pollinating Hives

The number of hives used for pollination in 2007 was estimated at 65,000.

This year potential rental income from hives for pollinating hybrid canola was expected to have ranged from $140 to 160 per hive for full strength hives with 16 frames of bees.

[1] Using package bees, Nucs (4-5 frames of bees with queen) or bee hives

However, due to decrease in number of frames in hives rented for pollination, rental rate was decreased by $30 to$40 per hive.

Based on the above assumptions and survey information, estimated loss in potential rental income from pollinating hives ranges from $1.95 million to $2.60 million (Table 1, B17).

In addition to the above loss, beekeepers renting hives for pollination also lost income due to decrease in honey production. Loss in honey production has been estimated at 10 to 20 pounds per hive for the three scenarios.

Based on the above assumptions and survey information, estimated loss in honey income from pollinating hives because of lower bee strength and lower honey production ranges from $617,500 to $1.625 million (Table 1, B21). Estimated loss in potential income resulting from pollinating hives (rental and honey production) ranges from $2.567 million to $4.225 million (Table 1, B22).

(C) Loss in Potential Income Due to Decrease in Honey Production and Pollination
When losses in income due to decrease in honey production and from pollination are combined, estimated loss in potential income amounts ranges from $10.433 million to $17.275 million. This translates into an estimated loss of income per hive between $43.47 and $71.98 (Table 1, C23).

(D) Additional Cost of Replacement of Dead and Strengthening Weak Colonies
Replacement of Dead Colonies
In order to stay competitive, beekeepers will need to replace colonies affected by winterkill – using imported package bees and Nucs to fill beehives. The estimated average cost of replacement of killed colonies ranges from $120-$140 per unit.

Based on the number of colonies affected by winterkill, the estimated cost of replacement ranges from $4.320 million to $ 5.040 million (Table 1, D27).

Strengthening Weak Colonies
Affected colonies that survived with less than three frames of bees are considered weak, non-producing colonies. In an attempt to save these colonies, beekeepers must add frames of bees and brood to strengthen them. It is recommended that producers also use additional medication to treat suspected diseases and to improve bee health.

The estimated cost of strengthening colonies ranged $55 to $65 per unit. The total estimated cost of strengthening colonies ranges from $1.980 million to $2.340 million (Table 1, D30).

Total Estimated Loss of Potential Income for Replacement and Strengthening Colonies

Based on the above assumptions and survey information, the estimated cost to replenish bee colony numbers back to 2006 levels, ranged from $6.3 million to $7.38 million (Table 1, D31).

(E) Summary of Loss in Potential Income in 2007

Based on the above assumptions and survey information, estimated:

- Combined potential income loss from all of above ranges from $16.733 million to $24.655 million (Table 1, E32);
- Total loss in potential income per hive ranges from $69.72 to $102.73 (Table 1, E33); and,
- Total loss in potential income per hive ranges from $232.41 to $342.43 (Table 1, E34).

Projected Honey Production Costs and Returns Based on Average Winter Mortality, 2007

Information provided in Table 2 is based on assumptions regarding honey production and price as described above. Wax/pollen and other sales have been estimated based on data obtained from beekeepers in an earlier survey. Estimate of value of production for honey and wax and other materials is calculated based on below average, an average and above average scenarios (Table 2, A3).

Estimate of honey production expenses has been updated to 2007 using selected farm input indexes to the data collected in 2005. The assumption has been made that cash expenses will remain unchanged for the three scenarios irrespective of changes in honey yield per hive.

Based on these assumptions:

- Total cash costs have been estimated to be $102.32 per hive for all three scenarios (Table 2, B10); and,
- Return over cash costs per hive has been estimated at ranging from $14.93 to $88.93 per hive (Table 2, B11).

Conclusion:

The beekeeping industry in Alberta has experienced higher than average losses in 2007. Based on the above assumptions and survey information, these total estimated potential losses range from $16.733 million to $24.655 million for the industry.

Actual industry loses will not be known until beekeepers process and sell their honey for the 2007 year.

Table 1

Estimation of Economic Losses for the Alberta Beekeeping Industry Due to Winter Losses in 2007

			Below	Above
A.	**Loss of Income for Honey Producing Hives**	**Average**	**Average**	**Average**
1	Total number of Hives in Alberta in 2007	240,000	240,000	240,000
2	Estimate of Winter Losses	30%	30%	30%
3	Number of Hives Lost During Winter 2007	72,000	72,000	72,000
4	Average Winter Loss	15%	15%	15%
5	Number of Hives Lost Above Average Loss, 2007	36,000	36,000	36,000
6	Weak Colonies due to Winter Loss	15%	15%	15%
7	Number of Weak Hives Due to Winter Loss, 2007	36,000	36,000	36,000
8	Total Percentage of Hives Impacted in 2007	45%	45%	45%
9	Total Number of Hives Impacted in 2007 (5+7)	**72,000**	**72,000**	**72,000**
10	Average Honey Production per Hive (lbs)	130	115	145
11	**Loss in Honey Production (9x10) - lbs., 2007**	**9,360,000**	**8,280,000**	**10,440,000**
12	Expected Price per Pound in 2007 - $	1.10	0.95	1.25
13	**Loss in Honey Income (11x12) - $**	**10,296,000**	**7,866,000**	**13,050,000**
B.	**Loss of Income for Pollinating Hives**			
14	Number of Hive Used for Pollination in 2007	65,000	65,000	65,000
15	Rental Income per Hive from Pollination in 2007	150	140	160
16	Loss in Income - Decrease in Number of Frames - $	35	30	40
17	**Loss in Rental Income from Pollinating Hives - $**	**2,275,000**	**1,950,000**	**2,600,000**
18	Decerease in Honey Production per Pollinating Hive (lbs)	15	10	20
19	Honey Production from Pollinating Hives (lbs)	975,000	650,000	1,300,000
20	Expected Price per Pound in 2007 - $	1.10	0.95	1.25
21	**Loss in Honey Income from Pollinating Hives - $**	**1,072,500**	**617,500**	**1,625,000**
22	**Loss in Pollination Income (17+21) - $**	**3,347,500**	**2,567,500**	**4,225,000**
C.	**Loss in Income Due to Decrease in Honey Production & Pollination**			
23	**Loss in Income for Honey & Pollination in 2007 - (13+22) - $**	**13,643,500**	**10,433,500**	**17,275,000**
24	**Loss in Income Per Hive Based on 240,000 Hives - $**	**56.85**	**43.47**	**71.98**

Table 1 continues . . . .

D.	**Replacement of Dead and Strengthning Weak Colonies**			
	Replacement of Dead Colonies			
25	Number of Hives Lost Above Average Loss, 2007	36,000	36,000	36,000
26	Package bees, Nucs, or Bee Hives an Average Cost per unit*	130	120	140
27	**Cost of Replacement of Dead Colonies - $**	**4,680,000**	**4,320,000**	**5,040,000**
	Strengthening Weak Colonies			
28	Number of Weak Hives Due to Winter Loss, 2007	36,000	36,000	36,000
29	Cost of Adding Frames of Bees and Medications - $ per Hive	60	55	65
30	**Cost of Adding Frames of Bees and Medication - $**	**2,160,000**	**1,980,000**	**2,340,000**
31	**Loss in Income for Replacing Dead and Weak Hives - $**	**6,840,000**	**6,300,000**	**7,380,000**
E.	**SUMMARY OF LOSS IN INCOME IN 2007**			
32	**TOTAL LOSS IN GROSS INCOME in 2007(23+31) - $**	**20,483,500**	**16,733,500**	**24,655,000**
33	**TOTAL LOSS IN INCOME PER HIVE BASED ON 240,000 Hives - $**	**85.35**	**69.72**	**102.73**
34	**TOTAL LOSS IN INCOME PER HIVE BASED ON 72,000 Hives - $**	**284.49**	**232.41**	**342.43**

Notes:

Re Item No. 2: Based on survey of beekeepers in Alberta. Winter losses in 2007 ranged from 15 to 60%.

Re Item No. 26: Beekeepers use packaged bees, nucs or bee hives to replace dead colonies. Costs for packaged bees are estimated at $140; nucs at $110 and bee hives at $225 based on availability.

Table 2

Projected Honey Production Costs and Returns Based on Average Winter Mortality, 2007

		Average	Below Average	Above Average
		..... $ per Hive		
A.	Production per Hive - lbs	130	115	145
	Estimate of Honey Price in 2007 - $ per lb.	1.10	0.95	1.25
1	Bulk Honey Sales - $	143.00	109.25	181.25
2	Wax/Pollen/Other Sales - $	9.00	8.00	10.00
3	**Estimate of Value of Production - $**	**152.00**	**117.25**	**191.25**
B.	Estimate of Honey Production Expenses			
1	Bees & Queens Purchases	13.20	13.20	13.20
2	Feed - Sugar	15.75	15.75	15.75
3	Medicinal Sugar / Bee Repellent	3.30	3.30	3.30
4	Fuel	11.02	11.02	11.02
5	Utilities & Heating Fuel	9.25	9.25	9.25
6	Assoc. Dues, Prof'l Fees, Travel	4.30	4.30	4.30
7	Operating Interest	3.60	3.60	3.60
8	Paid Labour & Benefits	35.40	35.40	35.40
9	Taxes, License & General Insurance	6.50	6.50	6.50
10	**TOTAL Cash Costs - $**	**102.32**	**102.32**	**102.32**
11	**Return Over Cash Costs per Hive (A-B) - $**	**49.68**	**14.93**	**88.93**

Note 1: Data updated to 2007 using farm input indices. Assuming no change in costs for the three scenarios.

Note 2: Price for 2007 honey has been estimated at $1.10 per pound. However, indications are that it can be well over $1.10 when all production is sold.