Quantification of Agricultural Losses

IFA 2903 Research Paper

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Introduction

Agriculture is a large part of Ontario's economy with one in 46 people living on a farm[1]. With the reliance on agriculture as a source of income, many farms and greenhouses enter into business interruption insurance and stock loss contracts. These contracts typically cover the profits that the farm or greenhouse would have made had an insured event not occurred and the loss of stock as a result of the event. Insured events typically must include some form of damage to the farm or greenhouse unless contingent or civil authority business interruption insurance is in place.

A business interruption loss can arise in cases where all or a portion of the farm animals are destroyed, farming equipment is destroyed, or the farm / production facility itself suffers damage. Losses occurring in this industry require a special understanding as to how farming operations work, which this paper will address.

The objective of this research paper is to address the approach that should be utilized when quantifying business interruption losses in the agriculture industry, and unique issues that arise in these losses. This paper will also examine different types of farms and how business interruption losses should be calculated for each.

Executive Summary

Although the basic theory behind business interruption and stock losses applies to agricultural losses, agricultural losses have many unique intricacies that if ignored can significantly impact the accuracy of the calculation.

[1] Index, Farm Issues, [Online], Available: http://www.farmissues.com/index.php, [May 15, 2013].

This paper endeavors to educate the reader in the intricacies of the following most common areas of agriculture in Ontario:

- Dairy Cows
- Beef Cows
- Hogs
- Chickens
- Greenhouses
- Grain Commodities

Dairy Cows

Common Terms

The following are common terms that one needs to understand in order to quantify a dairy farm loss:

- Milking Cows – Producers of milk
- Dry Cows – Used to produce milk, but have ceased, until bred and calve again
- Calves – Newborn cows
- Heifers – A cow that has not given birth
- Bulls – Male cow, main purpose is reproduction
- DFO – Dairy Farmers of Ontario (Milk Marketing Board)
- Closed Herd – A herd in which no animals can be brought into the herd, the replacement of animals must come from breeding within the existing herd. The

implication being that the lost milking cows cannot be replaced with purchased milking cows as the herd must be bred and raised from within[23].

Dairy Farm Quota

The role of the DFO is to market milk produced by Ontario dairy farmers, to the processing industry[4]. Milk available for sale to the DFO is limited to the amount of quota held by the dairy farm and quotas are purchased, sold and controlled through the DFO. Quota is measured in kilograms of butterfat, a component of the milk that is produced. The DFO, at its discretion can increase or decrease quota to all farmers to meet demand. This is done on a percentage of quota held basis[5].

As the market for quota is tightly controlled by the DFO, it is important to be aware that if a farm loses its quota, it may not be able to purchase new quota at a future time when operations resume. Similarly, farms wishing to purchase quota in the course of normal operations may not be free to do so, as all purchases are contingent on market availability.

[2] Farm Food Care Ontario, Dairy Cows, [Online], Available:http://www.farmfoodcare.org/images/pdfs/Dairy%20Cows.pdf, [May 16, 2013]
[3] Discussions with Dairy Farmers during the course of an engagement.
[4] Dairy Farmers of Ontario, Our Role, [Online], Available: https://www.milk.org/corporate/view.aspx?content=AboutUs/OurRole,[May 15, 2013]
[5] Dairy Farmers of Ontario, DFO Policy Handbook, [Online], Available: https://www.milk.org/Corporate/pdf/Publications-DFOPolicyBook.pdf, [May 15, 2013]

In the event of a loss, the DFO will permit a farm to put its quota on hold for a period of up to one year.

Incentive Days

If the DFO expects a short-term shortage of milk or increase in demand, it will offer incentive days which are an extra allowance of quota expressed in days quota. For example, if a farmer has quota of 50kg, this implies the farmer can produce 50kg of butterfat a day without penalty. The DFO sets out how many days are in a month and if incentive days are offered, the DFO will add the incentive days to the total number of days. Using the above example, if a month has 30 days, the farmer can produce 1,500kg of butterfat during the month. If 2 incentive days are offered the farmer would be allowed to produce a further 100kg of butterfat without penalty. Incentive days are announced by the DFO in advance of the month they relate to and are reported on the DFO website[6].

Over/Under Credits

The DFO also acknowledges that due to the nature of the business it cannot be expected that cows will produce milk on an even and constant daily basis. To address this, the DFO offers over and under credits. Over credits are equal to 10 days of quota

[6] Dairy Farmers of Ontario, DFO Policy Handbook, [Online], Available: https://www.milk.org/Corporate/pdf/Publications-DFOPolicyBook.pdf, [May 15, 2013]

and under credits are equal to 20 days of quota. These allowances provide the farmer with some leeway to produce over/under quota to the maximum number of days without penalty[7].

From an economic damage quantification standpoint, if a dairy farm suffers a loss in which production will only be impacted for a short period of time (20 days or less) it is possible that the farmer will use some of their existing under credits during the loss period and when they resume operations produce over quota to 'pay back' the under credits used. In this situation the presence of the over/under credits would allow the farmer to partially or entirely mitigate the loss.

Loss Calculation Approach

The first step in calculating a dairy farm loss is to project the production of quota that would have occurred but for the loss. Typically a review of the monthly pre-loss milk reports for the farm as provided by the DFO will outline any issues in historical production and provide a basis for projecting production during the loss period. If the actual butterfat produced by the dairy farm is consistently at quota, it is reasonable to assume that during the loss period the dairy farm would have produced at quota. If the farm produced under quota on average, the projection should be adjusted accordingly.

[7] Dairy Farmers of Ontario, DFO Policy Handbook, [Online], Available: https://www.milk.org/Corporate/pdf/Publications-DFOPolicyBook.pdf, [May 15, 2013]

The next step is to determine if the dairy farm utilized available incentive days. This information is available on the milk reports. If a farm consistently utilized incentive days prior to the loss, it is reasonable to assume that the farmer would have utilized the incentive days during the loss period. If a farm is not producing at 100% of quota, the farmer will not be using any incentive days as incentive days are over and above the normal quota held.

Step three involves determining what average percentage of butterfat was achieved by the dairy farm prior to the loss. Milk contains water, butterfat and other solids. As quota is measured in butterfat, the percentage of butterfat is required to project the number of litres of milk the farmer would have to produce to meet quota. If the health of the animals has been impacted as a result of the loss, this may impact the quality of the milk produced and change the percentage of butterfat produced.

Once the number of litres of milk is projected, this is compared to the actual litres produced (if any) during the indemnity period. The shortfall in litres is then multiplied by the price per litre as reported on the DFO milk report to arrive at the dairy farm revenue loss. The price per litre of milk is set by the DFO and will fluctuate over time and therefore, the actual monthly price per litre should be utilized in the measurement of the milk loss.

Once it has been determined if there is a loss of production and corresponding revenue, the next step is to identify the various expenses not incurred as a result of the loss. In

doing so, the actual operating expenses of the farmer should be reviewed for both the year prior to the loss and the loss period in order to assess which expenses are lower than expected. Once any reduced expenses have been identified, the expense must be examined to determine the reason for the reduction and if that reduction is as a result of the loss. The saved expenses should be netted against the revenue loss to arrive at the net loss of profit. Typical examples of expenses which would be reduced could include, feed, bedding, and veterinary costs.

As many farms will often have more than one line of business (dairy, crops, and power generation), the books and records of a farm often do not fully differentiate between the revenues and expenses of each line of business. In these cases, it is necessary to analyze the financial statements and determine the costs that are impacted by the loss, relative to the costs associated with any other lines of business that are not impacted by the loss[8].

Issues

When considering the business loss of a dairy farm there are several issues that will commonly arise which must be addressed. Among the most common issues is loss mitigation. Depending on the specifics of the loss, there are a few ways in which the farmer may be able to mitigate the loss, including:

[8] Based on previous file experience

- **Quota Sharing** – In the event that the farmer has lost the ability to milk some or all of the cows as a result the loss, often due to the death of the animals and/or the destruction of the milking equipment, the farmer may be able to mitigate the loss through the use of quota sharing agreements with other dairy farms. Under a quota sharing agreement, another dairy farm will specify a portion of the monthly milk production as belonging to the farmer. The DFO will then allocate the specified production as having been produced by the farmer and make payment to the farmer based on the actual quality and quantity allocated. The farmer is then responsible for making payment to the other farm which allocated the production.[9]

  The amount of the milk payment from the DFO retained by the farmer, relative to the amount paid to the farm with which quota is being shared will vary from business to business and on the specifics of each agreement. For example, if a portion of the farmer's herd survives the loss and has been sent to the farm with which quota is being shared, then the payment made to the other farmer may be greater to reflect the cost of boarding the cows, compared to an agreement where no cows are to be boarded in conjunction with the quota share. Based on our experience, typical payments made under a quota share plan are equal to between 60% and 70% of revenue, meaning the farmer would retain 30% to 40% of the revenues during the loss period[10].

[9] Based on previous experience and discussions with the DFO
[10] Ibid

It is not uncommon for quota share agreements to be put in place with multiple farms as it is unlikely that any one farm would have enough excess production capacity to meet their own monthly production requirements as well as the claimant farmer's production.

- **Temporary Facilities** – When a significant portion of the milking herd survives a loss but the milking facility is destroyed, the loss can be mitigated through the rental of a temporary facility while repairs are undertaken. In such cases, the farmer will often seek facilities which are either currently vacant or under-utilized within the same geographic region as the loss location from which to continue operations. While this option will permit the farmer to continue operating while the repairs are completed, mitigating some or all of the loss of profit, there are some aspects to consider.
    - **Increased Costs** – When preparing an unused facility for use as a dairy farm and subsequently maintaining that facility for use, significant costs can often be incurred. Accordingly, when looking at setting up a temporary facility, the costs of setting up that facility must be carefully considered against the income losses which will be avoided.
    - **Allocation of Costs** – Another issue which must be considered when a farmer temporarily relocates to another facility which is currently in use by another farm is whether costs are being allocated between the two businesses accurately. For example, costs associated with water treatment of wells utilized to provide drinking water to all animals should

not be borne entirely by the farmer who incurred the loss if those costs would have been incurred at that facility regardless of the claimant farmer's presence. When renting temporary facilities, it is generally a good idea to put a formal rental agreement in place as soon as possible. This should which will outline components such as monthly rental cost and all provided services and expenses which are covered by the rent (water, utilities, repairs and maintenance, etc.).

- **Salvage Value** – Often when temporary facilities are set up, equipment is purchased to make the facility usable. When this equipment has a residual value, efforts should be made as early as possible to assess what that potential residual value is and how that salvage value will be treated when the temporary facility is no longer needed[11].

In any given situation it is possible that quota sharing and/or a temporary location will be utilized. Regardless of which method is selected for loss mitigation it is important to be aware of the potential issues which may arise. If the loss has not been mitigated using the above methods, it is also crucial that an explanation be obtained from the insured party to determine the reasons.

Documentation

In reviewing any dairy loss, there are certain important records which must be obtained from the farmer in order to properly measure this loss. While there will be some

[11] Based on previous filed and discussions with dairy farmers.

variation depending on the loss, generally the following are the key documents to obtain:

- *Monthly Milk Reports* from the DFO for the period commencing two years prior to the date of the loss and extending through the entire indemnity period. These reports will contain all the relevant production and revenue information such as quota level, butterfat content, monthly revenue, and production credits. This information provides the basis for projecting the milk production that would have been achieved absent the loss, and the actual milk production that was achieved as a result of the loss.
- *Monthly Operating Statements* commencing two years prior to the date of loss and continuing through the loss period. These will contain all of the information regarding the insured's expenses and allow for the identification of both saved and increased costs.
- *Financial Statements* for the fiscal year ended prior to the loss. These will be useful for identifying total annual revenues for the business and assessing compliance with any contractual commitments or limitations such as bank covenants.
- *Payroll Records*, by employee, and pay period, for the three months prior to the loss and through the entire indemnity period. These will allow for assessment of any increasing or decreasing payroll costs.
- *Quota Sharing Agreements*, along with documentation to support payment under the quota share plan. These are necessary to measure the cost incurred under the quota share plan, if applicable.

Beef

Common Terms

The following are common terms that one needs to understand in order to quantify a beef farm loss:

- Calves – Newborn cows
- Heifers – A cow that has not given birth
- Bulls – Male cow, main purpose is reproduction
- Steer – A castrated male cow
- Cow Farm – Where calves are born and kept until they are old enough to move to a feedlot (age 15 months)
- Backgrounder – A weaned cow around age 5-6 months and approximately 227kg that is not yet old enough to move to a feedlot (age 15 months and approximately 400kg.)
- Feedlot – Where cattle go once they reach 15 months of age to gain weight for market. Cattle typically reach market weight of 550kg to 600kg by 24 months of age[12].

[12] Farm Food Care Ontario, Beef Cattle, [Online], Available: http://www.farmfoodcare.org/images/pdfs/Beef%20Cattle.pdf, [May 16, 2013]

Beef farming starts on the Cow Farm where the cows are bred and calves are born. A heifer can be bred for the first time at approximately 2 years old. Cows have a gestation period of about 9 months[13].

After weaning at around 5 or 6 months of age, calves become backgrounders. The backgrounders remain on the cow farm until approximately 15 months of age when they are large enough to be on a feedlot[14].

At the feedlot, the cow gains weight and gets ready for market. Once a cow reaches market weight of 550 to 600kg (at around 2 years old) the cow is sent to auction[15].

Loss Calculation Approach

Although beef cattle losses can occur at all stages of the production cycle, cow farms typically keep the beef cows on pasture. Therefore, if a barn burns down there is typically minimal resulting damage to the herd on a cow farm.

Considering the foregoing, this section will focus on feedlot losses.

[13] Farm Food Care Ontario, Beef Cattle, [Online], Available: http://www.farmfoodcare.org/images/pdfs/Beef%20Cattle.pdf, [May 16, 2013]
[14] Ibid]
[15] Ibid

There are two parts to consider when calculating a feedlot loss. This first is quantifying the loss related to the cattle that were lost and the second step relates to quantifying any ongoing loss associated with the lack of a feedlot.

Cattle Herd Loss

The first step in quantifying a cattle loss is understanding the number of cattle that were at the farm and the approximate age and sex of each. This information is usually kept by the farmer in an effort to track all animals for food production cycle purposes.

Once the number of cattle and age/sex of each is established, the approximate weight of each animal can be determined. Cattle prices are set by the market through local livestock auctions; however the Chicago Mercantile Exchange also publishes sales prices. Prices are generally expressed as a price per kg, however the price usually only refers to the 'dressed' weight. This is the approximate weight of the meat that will be available from the cattle. Dressed weight for a steer is approximately 360kgs or 60% of the body weight (based on a 600kg steer). Dressed weight for a heifer is approximately 318kgs or 53% of the body weight (based on a 600kg heifer)[16].

Utilizing the herd information and the current price per kg the value of the herd can be established.

[16] Farm Food Care Ontario, Beef Cattle, [Online], Available: http://www.farmfoodcare.org/images/pdfs/Beef%20Cattle.pdf, [May 16, 2013]

In addition to the loss of the value of the cattle, the farmer will have also loss the gross margin that would have been earned had the cattle achieved market weight. This loss can be established by comparing the approximate weight of the cattle at the time of the loss to the end market weight at the future sale date. Applying the dressing percentage to the difference in weight and the price per pound results in the revenue that would have been made in absence of the loss.

The approximate weight of the lost cattle can be determined by multiplying the number of days the cattle were on the feedlot by the average daily weight gain experienced by the feedlot. The farmer should be able to provide this information; however in absence of the farmer providing this information, the average daily weight gain can be calculated by reviewing historical purchase and sale invoices. Comparing the purchase weight and sale weight for the cattle and determining the number of days between will result in the average daily weight gain experienced by the farmer.

In addition, the variable costs saved as a result of not having to raise the cattle to market weight must be deducted from the revenue loss as the farmer did not incur these costs. Typical variable costs include feed, bedding and veterinary expenses. Bedding and veterinary costs can usually be determined by reviewing the profit and loss statements. Feed however, is often bought in large quantities when it is inexpensive. Therefore, the profit and loss statement is generally not an accurate way to calculate saved feed expenses over a short period of time.

To calculate saved feed expenses, the first step is establishing how much longer the cattle would have been on the feedlot before sale. Using the approximate weight of the cattle at the time of loss, the normal selling weight and considering the average daily weight gain, the number of days before between the loss and the projected sale date can be determined.

Utilizing the feed expenses from profit and loss statements for the prior year compared to the total weight gain experienced by the feedlot, which is a function of the average number of cattle on hand over the course of the year and average daily weight gain, the daily feed cost is calculated. Multiplying the daily feed cost by the number of days between the loss and the sale date results in the saved feed costs.

Deducting all saved variable costs from the revenue that would have been made in absence of the loss results in the farmer receiving the profit on the cattle that would have been made but for the loss.

Ongoing Income Loss

In the event that the feedlot is lost and no suitable temporary facilities can be procured, the farmer will have an ongoing income loss. Assuming there was a cattle herd loss, any ongoing income loss begins after the cattle herd that was onsite at the time of the loss was expected to go to auction.

The first step in determining the ongoing income loss, is determining the average number of cattle held at the feed lot on a daily basis. Multiplying the average number of cattle by the number of days that income was forgone and the average daily weight gain results in the total weight gain forgone during the loss period. Applying the dressing percentage and the price per kg results in the revenue forgone as a result of the loss.

Similar to the cattle herd loss, all feed, bedding and veterinary costs that were saved need to be deducted. The resulting amount is the income loss experienced by the feedlot.

Documentation Required

1) Summary of Inventory for the two years prior to the loss
2) Daily Market Information from Ontario Cattlemen's Association
3) Sales Summary for the two year period prior to the loss
4) Sales invoices for the two years prior to the loss
5) Purchases Summary for the two year period prior to the loss;
6) Purchase invoices for the two years prior to the loss
7) Monthly profit and loss statements for the two years prior to the loss and ongoing through the loss period
8) Invoices supporting any extra expenses incurred as a result of the loss

Hogs

Common Terms

The following are common terms that one needs to understand in order to quantify a hog farm loss:

- Sows – Female pigs used for breeding
- Piglet – Newborn Pigs
- Weaners – Pig 3 to 12 weeks old
- Gilt – Young female pig
- Barrow – Neutered male pig
- Boar – Full grown intact male pig
- Farrow – To give birth
- Finish – To grow a hog to market weight[17]

Hog Farm

Hog farm operations are generally segregated into three separate stages of production; farrowing, weaner and finishing. The first stage is the farrowing stage; this is where the sows give birth to the piglets. Sows typically have 8 to 12 piglets per litter and have between two and three litters per year as the gestation period is typically 115 days[18].

[17] Farm Food Care Ontario, Pigs, [Online], Available: http://www.farmfoodcare.org/images/pdfs/Pigs.pdf, [May 16, 2013]
[18] Ibid

At the age of 3 weeks and at approximately 7kg the piglets are weaned and moved into a weaner barn. Here the weaners are raised until they are 12 weeks old and approximately 37 kg[19].

At the age of 12 weeks the weaners are big enough to join the general population and are moved to a growing/finishing barn. At this point they are referred to as gilts and barrows. The gilts and barrows remain in the finishing barn until they reach market weight which is approximately 100 to 110kg. This occurs when the pigs are around six months of age[20].

Loss Types

Hog farm losses can occur at all stages of the growing cycle and each has its own considerations.

Farrowing:

In the case of a farrowing barn loss, the farmer has lost the ability to produce new hogs. If the farm operated solely as a farrowing barn, the production loss would be noticeable right away as the farmer would not have any income from the sale of the piglets. However, if the farm was a multi-stage farm and operated from farrow to weaner or

[19] Farm Food Care Ontario, Pigs, [Online], Available: http://www.farmfoodcare.org/images/pdfs/Pigs.pdf, [May 16, 2013]
[20] Ibid

farrow to finish, the farmer would not have an immediate drop in income as the weaner and finishing barns would continue to operate and sell the stock that were in the unaffected barns. It is not until all the stock in the weaner and finishing barns is sold that the farmer would start to incur an income loss. From an insurance loss standpoint, policies are rarely written to consider the time lag between a farrowing barn loss and the finish barn sales loss. One must be careful to always consider the wording of the insurance policy and get instructions from the insurer or legal counsel as to whether a loss is indemnified.

Weaner

Similar to a farrow barn loss, if the farmer only operates as a weaner farm, a loss at the weaner stage immediately impacts the farmer's ability to earn revenue. In these cases the farmer may choose to rent out temporary facilities to continue to operate the weaner barn, but this is not always possible.

If the farmer operates a multi-stage hog operation a loss at the weaner stage results in the farmer not being able to grow his own weaners. In this case it is likely that the farmer will outsource the weaner growing stage of the hog operation. This will minimize the loss' impact on revenue as the farmer has only lost 9 weeks of production from the loss of the weaners; however the farmer will incur extra expenses related to the outsourcing as well as the freight to and from the outsource location.

Finishing

A loss at the finishing stage immediately impacts the farmer's ability to earn revenue regardless of whether the farmer has a multi-stage operation or solely operates a finishing barn.

Loss Calculation

In all cases the losses incurred will include both the income loss from the deceased hog(s) as well as the value of the actual animal (inventory/stock loss).

Hog Inventory/Stock Loss

For a farrowing loss, this calculation typically considers the value of the sows lost along with a relatively nominal value for the piglets lost.

In a weaner and finishing loss, the weight of the hog is considered as the hogs are considered to be sold on the day of loss. Market pricing per kg is usually available through various livestock exchanges on the Pork Producers of Ontario website[21].

It should be noted that any proceeds paid out to a farmer that consider market pricing, include the profit margin the farmer would have made on that hog up to the date of loss.

[21] Ontario Pork, Daily Market Outlook, [Online], Available: http://www.ontariopork.on.ca/PriceReporting.aspx, [May 16, 2013]

While the farmer may have been able to earn more profit on the hogs had the loss not occurred, (had the farmer had kept them to their ending market weight), the farmer would have also incurred more costs to feed, shelter and vet the hog.

The profit from the extra weight the hog could put on during the period between the loss and end market can be considered as part of the income loss calculation and is usually denoted as an 'early sale' profit loss.

Income Loss Calculation Approach

The first step in calculating a hog farm income loss is to understand how the farm operates.

Revenue Shortfall Projection:

Single Stage Farming:

Farrowing

If the loss occurs at the farrowing stage, the first consideration is to project how many piglets would have been born had the loss not occurred. Information from the farmer should allow for a calculation of average piglets per birth. The farmer should also be

able to indicate the typical death rate among the piglets as this information must also be considered.

If the farm is strictly a farrowing operation, the piglets are sold at 3 weeks when they become weaners. The farmer should be able to provide sales invoices for pre-loss litters. This will help establish the price typically received by the farmer and will also act as a test against the number of piglets calculated.

Weaner:

Weaner farms tend to operate in an all-in/all-out fashion, meaning that a full group of weaners is brought in at one time and raised to 37kg, and then all are sold to the finishing barn at the same time. This allows for proper decontamination of the facility between groups. Therefore, a loss in a single stage weaner farm is relatively straight forward[22].

The first step is to understand how many groups of weaners the farmer raised each year and how many weaners were in a group. Considering weaner age is from 3 to 12 weeks, a farm would have 4 to 5 groups a year, depending on the length of the decontamination stage. The farmer will have this information available from a historical prospective[23].

[22] Farm Food Care Ontario, Pigs, [Online], Available: http://www.farmfoodcare.org/images/pdfs/Pigs.pdf, [May 16, 2013]
[23] Ibid

The farmer will also know the number of weaners per historical group. Both purchase and sale records should be considered as some weaners will be lost.

Once the number of groups and weaners per group is established, market price information can be utilized to project the sales foregone as a result of the loss.

Finishing

The first step in calculating a finishing barn loss is to understand trending in that hog operation (i.e. how many times the barn turned over in a year, what is the average sales weight, is the barn usually kept at full capacity, average daily weight gain, etc.). Typically a review of pre-loss purchase and sales invoices is needed to determine the number of hogs bought and sold. This will also establish the ending weight at the time they were sold. The farmer will be able to advise on how many hogs are typically kept in the facility and should be able to advise on the average daily weight gain. The farmer will also be able to advise if there is any reason operations were expected to change in the post-loss period.

Using the pre-loss sales invoices the number of hogs sold every week or month is determined as well as the average sales weight. From this, sales projections but for the loss can be established, assuming operations at the farm were going to remain steady. Sales projections should consider the number of hogs expected to be sold, the average selling weight of the hogs and the applicable market price per pound.

Multi Stage Farming

In the case of a multi-stage farm, losses at both the farrowing and weaner stage result in the income loss calculation being delayed as the income stream expected from the hogs would not be affected immediately. Similar to single stage finishing losses, multi-stage losses that occur at the finishing stage result in an income loss immediately.

The difference with a multi-stage finishing loss is that the farmer can sell the weaners produced to other finishing barns and thus recoup some of the profits the farmer would have earned had the farmer finished the hogs himself.

Revenue projections are similar to the single stage finishing barn. Reviewing pre-loss sale invoices indicates the average selling weight experienced by the farmer and farm records will indicate the average number of hogs on hand at the time of the loss and the average number of daily/weekly/monthly sales.

The projected sales are reduced by the actual weaner revenue, as noted above, earned by the farmer during the loss period to calculate the revenue shortfall.

Saved Variable Expenses

As with other types of losses, non-operational hog farms will experience a savings in variable expenses when compared to an operational hog farm. Review of the pre-loss monthly profit and loss statements compared to the post-loss profit and loss statements provides detailed information on what expenses were discontinued during the loss. Typically in a hog farm the variable expenses will include veterinary, feed, bedding and labour. In addition, in single stage hog farming, weaner and finish hog farms will realize a significant savings absent the need to purchase stock.

Issues

When considering the business loss of a hog farm there are several issues that will commonly arise which must be addressed. These include:

- **Sickness** – As hogs are animals they are susceptible to diseases. Considering the close quarters of the hogs, if a disease affects one hog, it usually results in an outbreak that may lead to a cull, reduced weight gain or drop in sales. If a farm has an experienced a disease outbreak in the pre-loss period, which had finished by the loss date, the sales invoices will reflect that, therefore, the most recent sales invoices are not the most reliable data for post-loss sales projections. A review of sales invoices prior to the outbreak will be required. It should be noted that if the outbreak was ongoing at the time of the loss or if the

farm frequently experienced outbreaks, the disease affected sales invoices may be appropriate to project normal sales patterns.

- **Temporary facilities** – Farmers are sometimes able to transfer their operations to temporary facilities. Renting temporary facilities limits the income loss of the farmer as the operations can usually restart shortly after the loss occurred or as soon as they can get access to the temporary facility. In cases where a temporary facility is secured, additional cost for rent and occupation should be anticipated.

Documentation

In reviewing any hog loss, there are certain records which will be important to obtain from the farmer in order to properly measure the loss. While there will be some variation depending on the nature of the loss, generally the following are the key documents to obtain:

1. Sales invoices for the two years prior to loss, identifying the number of hogs sold as well as the selling weights of each. In some cases total weight will be provided as opposed to individual weight. If this is the case, use the average sales weight of the lot.
2. Purchase invoices for the two years prior to loss, identifying the number of hogs purchased as well as the selling weights of each. In some cases total weight will

be provided as opposed to individual weight. If this is the case, use the average purchase weight of the lot.

3. Monthly production/performance reports for the two years prior to loss. This should provide a good basis for trending of the following:
    a. Litter size
    b. Inventory
    c. Farrowing intervals
    d. Deaths

    In addition, the monthly production/performance reports provide information on any disease outbreaks that occurred or abnormal death rates.
4. Monthly profit and loss statements for the two years prior to the loss and ongoing throughout the loss. This will help identify any saved variable expenses as well as any increases in cost of working.

Poultry/Chicken

Common Terms

The following are common terms that one needs to understand in order to quantify a chicken farm loss:

- Flock – term used to denote a group of chickens. Flocks range in size but are typically about 30,000 birds.
- Chick – a baby chicken, up to three weeks old

- Cockerel – A young male chicken
- Pullet – A young female chicken
- Hen – A mature female chicken used for breeding
- Rooster – A mature male chicken used for breeding
- Roaster – A meat chicken raised to a weight over 2.65kgs.
- Broiler – A meat chicken raised to a weight under 2.65kgs.
- Cleanout – The act of decontaminating the barn that the chickens are housed in once the flock has gone to market. Cleanout is done in between every flock[24].

There are three distinct stages of a meat chicken operation. They are:

1. **Broiler breeder stage** - At this stage eggs are produced for the purposes of hatching chickens for meat, a single hen can produce up to 300 fertilized eggs a year;
2. **Hatcheries** – Once the hens lay the fertilized eggs the eggs are collected and incubated. After approximately 21 days the eggs hatch.
3. **Broiler Farm** – within 24 hours of hatching, chicks are usually transported to a broiler farm. Here they will grow for approximately five to eight weeks depending on whether broilers or roasters are desired. A typical broiler farm will have approximately six flocks a year[25].

[24] Farm Food Care Ontario, Chickens, [Online], Available: http://www.farmfoodcare.org/images/pdfs/chicken.pdf, [May 16, 2013]
[25] Ibid

Quota

The broiler chicken supply is controlled through the use of quota managed by the Ontario Broiler Hatching and Egg Commission (Commission). The Commission manages the quota by limiting the number of hatched eggs per flock. Each farmer has a set amount of quota which can be bought and sold according to the farmers needs within the limits defined by the Commission[26].

The Commission also sets out the price per chick which is routinely adjusted based on feed costs[27].

Loss Calculation Approach

Broiler Breeder

In a loss at a broiler breeder operation the first step in quantifying the damages is to understand how long a farmer usually keeps a flock producing. Typically a flock is kept for approximately 58 to 60 weeks, however does not start laying eggs until age 26 weeks[28]. This information is used to project the length of period remaining for the flock in place at the time of the loss and for projecting the length of time any subsequent flocks would produce eggs for.

[26] Based on previous file experience
[27] Farm Food Care Ontario, Chickens, [Online], Available: http://www.farmfoodcare.org/images/pdfs/chicken.pdf, [May 16, 2013]
[28] Ibid

There are two key indicators for broiler breeder operations.

The first is eggs per hens housed. As the hens start laying at week 26, the indicator is based on the number of hens housed at age 26 weeks, as opposed to the number of hens originally purchased as some loss is expected.

The second is the hatch rate which is calculated based on the number of hatched saleable chicks compared to the number of eggs produced.

Both of the above indicators can be derived from the historical monthly marketing reports provided from the Hatchery.

For quantifying a flock loss part way through a cycle, the actual results of the flock to date should be compared to a historical flock in the same barn to calculate any variance. This variance is then applied to the historical results that represent the loss period to project the saleable chicks, but for the loss. It should be noted that utilizing an average saleable chicks per hen housed is not an appropriate measure to project saleable chicks as flock productivity decreases as the hens age.

For quantifying a flock loss for a full cycle, the historical results for the same barn can be used to project saleable chicks. Alternatively, if the farmer has more than one

flock/barn, the results of the current flock in another location can be used to project saleable chicks.

As the number of eggs hatched per flock is subject to quota, a comparison of the number of chicks to the quota level for that flock is required to ensure the saleable chick projections do not exceed the actual saleable chicks the farmer would have sold.

In either loss scenario, revenue is projected by applying the applicable Commission price per chick (less any licensing fees/hatching costs) to the projected saleable chicks. The net price the farmer will receive is indicated on the monthly marketing statements.

Considering that the farmer does not have to feed and care for the flock, the farmer would experience a cost savings of expenses. For flock losses, the simplest way to determine the saved expenses is to review the monthly profit and loss statements, comparing the pre-loss average expenses to the expenses experienced following the loss. Any reduction reasonably related to the loss should be considered a saved expense.

Hatchery

Hatcheries are where the eggs go to be incubated and hatched. Typically, hatcheries earn a percentage of the revenue per saleable chick, often called a licensing fee[29].

[29] Based on previous file experience and discussions with chicken farmers

In the event that a hatchery experiences a loss, revenue can be projected based on historical hatching rates. Assuming operations have remained steady and no expansion or restructuring is expected, historical production records are the most accurate way to project the production but for the loss.

Considering the projected eggs hatched in absence of the loss and the applicable Commission price per saleable chick, total revenue is projected. As the hatchery typically earns a percentage of the revenue, the applicable percentage is applied to total revenue to project the revenue lost by the hatchery.

As hatcheries do not buy the eggs hatched, variable costs are limited to the power required to incubate the eggs and any payroll directly related to caring for the eggs/chicks.

Broiler Farm

Broiler farms are where the chicks are raised into the pullets and cockerels that are processed for meat. The birds are brought in as a flock. Between flocks the barn is cleaned out and disinfected to limit the potential for disease to spread between flocks. A farm usually houses six flocks per year[30].

[30] Farm Food Care Ontario, Chickens, [Online], Available: http://www.farmfoodcare.org/images/pdfs/chicken.pdf, [May 16, 2013]

The birds are sold for processing between the age of five and eight weeks, depending on the desired weight[31].

To project broiler farm production, historical production records are utilized. In the event that the flock perished mid-production, the value of the flock at the time of loss will be considered an inventory loss and the profit forgone as a result of the loss will be an income loss.

Inventory Loss

Typically, the inventory loss will be based on the sale price of the birds at the date of loss. As such, the inventory loss will compensate the farmer for the profit margin earned on the birds up to the date of loss.

To project the value of the flock lost the number of birds needs to be determined. Purchase records for the flock, combined with the number of birds lost to date, will result in the number of birds on hand at the time of the loss.

The Chicken Farmers of Ontario publish the price per kg based on the average live weight of the bird[32]. Considering the age of the birds at the time of loss, average weight

[31] Farm Food Care Ontario, Chickens, [Online], Available: http://www.farmfoodcare.org/images/pdfs/chicken.pdf, [May 16, 2013]
[32] Ibid

per bird can be estimated. Utilizing the price per kg and the number of birds on hand, the value of the birds at the time of loss can be established.

Income Loss

Revenue Projection

Flock on hand

For the flock that was on hand at the time of the loss, the profit margin on the birds up to the date of loss is paid out as part of the inventory loss. Accordingly, the profit margin on the flock on hand at the time of loss should only consider the weight gain from the date of loss onwards (weight gain foregone) adjusted for the normal loss rate as not all birds on hand at the time of the loss would survive to sale.

A review of historical flock sales information should indicate the average historical weight of the birds at the date of sale. Assuming the farmer is not expected to change operations to consider higher or lower sales weight, the loss can be based on the historical average sales weight. Deducting the weight at the time of loss from the average historical sales weight, the weight gain forgone is determined.

The price per kg is published by the Chicken Farmers of Ontario. As the price per kg differs depending on the total live weight of the bird, the price utilized should be based on the average sales weight per bird and not the weight forgone.

Multiplying the weight gain foregone by the price per kg, the income loss from the flock on hand at the time of the loss is determined.

Future Flocks

Assuming the loss is the result of the loss of the barn and not due to heat prostration, the losses sustained by the farmer will continue into the future. If the farmer is able to rent out temporary facilities, it is likely that the income losses will cease at that point, however the farmer will have an increase in cost of working. If the farmer is unable to find a suitable temporary facility, an income loss will be incurred.

Similar to the calculation of the income loss for the flock on hand at the time of the loss, to calculate the future flock income loss the average historical sales weight needs to be determined. Assuming operations were not expected to change, the average historical sales weight can be used to determine the expected sales weight for the flocks foregone as a result of the loss.

Historical records will also indicate the number of birds typically purchased for a flock and the survival rate of birds from purchase to sale.

Multiplying the average sales weight of the birds by the price per kg as published by the Chicken Farmers of Ontario, the revenue forgone per bird is calculated. Considering the number of birds on hand and adjusting for the historical survival rate of the birds, the flock revenue foregone is determined.

Considering the length of the loss, the number of flocks can be determined. Multiplying the number of flocks that would have been raised by the revenue foregone per flock, the total revenue foregone is calculated.

Saved Expenses

As the farmer did not have to purchase, feed or care for the birds during the loss period, a savings in variable expenses occurred. Based on a review of the historical monthly profit and loss statements, the average pre-loss variable expenses can be determined as a percentage of revenue. Applying the percentage of revenue to the projected revenue forgone, estimates the value of the saved variable expenses.

In addition, in the case of a barn loss, it is likely that the farmer will experience a reduction in certain fixed expenses, such as repairs and maintenance, depreciation, etc. As these expenses were not incurred by the farmer, the loss calculation should consider the reduction in these expenses. Saved fixed expenses can be determined by reviewing the monthly profit and loss statements, comparing the pre-loss average

expenses to the expenses experienced following the loss. Any reduction reasonably related to the loss should be considered a saved expense.

Deducting the saved expenses from the revenue foregone results in the income loss as a result of the loss.

Issues

When considering the business loss of a poultry farm there are several issues that will commonly arise which must be addressed. These include:

- Disease - Avian influenza (bird flu) is a contagious viral infection that primarily affects domestic poultry, including chickens. If a farmer has experienced disease in a prior flock, it is not reasonable to project production during the loss period based on a historically diseased flock. In these cases, further analysis is required, including: review of previous flocks in excess of 1 year prior to the loss, review of flock production amongst competitors, review of flock production in other facilities operated by the farmer[33].
- Heat Prostration – Chickens are very sensitive to increases in temperature. Heat prostration is a condition whereby the chickens have died as a result of uncontrolled increase in the barn temperature, usually due to a breakdown of a

[33] Farm Food Care Ontario, Chickens, [Online], Available: http://www.farmfoodcare.org/images/pdfs/chicken.pdf, [May 16, 2013]

fan. In the case of a heat prostration loss, the income loss will be limited to the flock on hand as the barn will be repaired before a new flock is introduced[34].

Documentation

In reviewing any poultry loss, there are certain records which will be important to obtain from the farmer in order to properly measure this loss. While there will be some variation depending on the loss, generally the following are the key documents to obtain:

- Monthly marketing report for the period 2 years prior to the loss to date
- Flock management reports for the flock for the period 1 year prior to the loss to date
- Budgeted Egg and Bird Production Quota Reports
- Historical Weekly Egg Production and Hatch Rate Reports
- Documentation to support the production and marketing quota levels immediately prior to the loss
- Documentation to support any flock destroyed due to the loss

[34] Farm Food Care Ontario, Chickens, [Online], Available: http://www.farmfoodcare.org/images/pdfs/chicken.pdf, [May 16, 2013]

Greenhouse

Greenhouse production is a science designed to maximize the production of the product being grown. Everything from the humidity, temperature, growing medium moisture and even the number of bees per acre is controlled. There are many types of products grown in greenhouses, the most common being:

- Tomatoes
- Cucumbers
- Peppers
- Flowers[35]

This discussion will focus on the production of vegetables.

Common Terms

The following are common terms that one needs to understand in order to quantify a greenhouse loss:

- Greenhouse – an enclosed building where growing conditions can be controlled by the greenhouse operator to maximize the crop yield
- Yield – A unit of measure indicating the amount of crop that is produced in an area (acre, square meter, square foot, etc.)
- Irrigation system – the system in place to water the crops

[35] Farm Food Care Ontario, Greenhouse Vegetables, [Online], Available: http://www.farmfoodcare.org/images/pdfs/Greenhouse%20Vegetables.pdf, [May 16, 2013]

- Acre – a unit of measure that equals approximately 43,560 square feet or approximately 2 hockey rinks
- Hectare – a unit of measure that equates to approximately 2.47 acres[36]

Types of Greenhouses

Greenhouses come in all shapes and sizes and can be made out of various materials. The most common are noted below:

Roof Shapes[37]

- Peaked Roofs
- Curved Domes
- Multi-peaks
- Arched Domes

Greenhouse Materials

Glass – this is the most expensive material for building a greenhouse, however it is also produces the highest yield as it lets in the most light. It also lasts the longest but is susceptible to breakage during heavy weather.

[36] Farm Food Care Ontario, Greenhouse Vegetables, [Online], Available: http://www.farmfoodcare.org/images/pdfs/Greenhouse%20Vegetables.pdf, [May 16, 2013]
[37] University of Massachusetts Amherst, Selecting and Building a Commercial Greenhouse, [Online], Available: http://extension.umass.edu/floriculture/fact-sheets/selecting-and-building-commercial-greenhouse, [May 15, 2013]

- **Polyethylene Plastic Film** – This is essentially special rolled plastic that is draped over the greenhouse structure. It is the cheapest exterior material however it produces lower yields and needs to be replaced every 3 to 4 years.
- **Polycarbonate Panels** – A mid-priced product that produces yields between that of glass and polyethylene plastic film. As it is still plastic it is not as susceptible to heavy weather and is hail resistant.
- **Combination** – A greenhouse can be made of any combination of the above products, depending on the investment desired by the farmer[38].

Issues

When considering the business loss of a greenhouse there are several issues that need to be considered:

- Seasonality/Crop Cycles – The amount of light that a crop receives affects the yield. Crops in the winter tend to produce less yield than crops in the summer. Therefore, when comparing to pre-loss crop yields, the time of year that the crop was producing must be considered. Pre-loss crop yield comparisons should be matched by time of year[39].
- Weather – As mentioned above, the amount of sunlight affects the crop yield. Therefore, a year of bad weather, significant rain and overcast skies will yield lower production than a year of good weather and clear sunny skies.

[38] West Virginia University, Types of Greenhouses, [Online], Available: http://www.wvu.edu/~agexten/hortcult/greenhou/building.htm#Types of Greenhouses, [May 14, 2013]
[39] Discussions with various growers and greenhouse operators during loss quantification engagements.

Accordingly, pre-loss yield comparisons should consider any significant changes in weather[40].

- Change in Product Mix – Greenhouses often change what they grow. This may not be as apparent as changing from cucumbers to tomatoes, as the greenhouse could decide to change from one strain of beefsteak tomatoes to another strain of beefsteak tomatoes. While changes in strain does not generally result is large differences in yield, the change was presumably made to increase the yield. Therefore and changes in strain should be discussed with the greenhouse operator to better understand the expected result[41].

Loss Calculation Approach

Yield Projection

The first step in calculating a greenhouse loss is to understand the operations of the greenhouse and the product they were expecting to grow or were growing. Greenhouses can switch up the product that they grow from cycle to cycle so understanding the expected product of a greenhouse during the loss period is imperative to projecting production.

Assuming the product is the same, the size of the greenhouse is the same, and there were no plans to alter the planting plans for the current crop, projecting production can

[40] Discussions with various growers and greenhouse operators during loss quantification engagements.
[41] Ibid.

be done based on prior crop yields. If the crop fails partway through a growing season comparison of that crop yield to date to a prior crop yield should be performed to ensure that the current crop was tracking similar to the prior crop. It should be noted that different vegetables have different growing season lengths and in the case of cucumbers, more than one crop can occur in one year. Considering that the amount of light a crop receives affects the yield, any comparison to prior crops needs to consider the same time of year to reflect the same number of daylight hours.

Greenhouse farmers are very meticulous in their records and generally can provide weekly production information indicating both the quantity and sizes of the product. This information should be considered in the yield projections as different sizes command different prices. Generally, the larger the size, the higher the price.

Pricing

Current market pricing can be derived through a contract with a buyer, which the farmer should be able to provide, or through United State Department of Agriculture (USDA) market pricing available on a weekly basis for various crops and points of origin[42]. If the USDA pricing is used, comparison of prior years' prices received to the USDA price at that point should be done to determine if the prices received by the farmer were similar.

[42] United States Department of Agriculture, Market News, [Online], Available: http://marketnews.usda.gov/, [May 14, 2013]

In addition, market pricing should be reviewed and determined on a weekly basis. Average pricing from prior crops should not be used as the prices fluctuate on a weekly basis and reflect the supply and demand at that point in the year. Therefore, prices in the winter months tend to be higher than prices in the summer months. Using an average price would not reflect this change.

Applying the appropriate weekly price to the weekly yield results in projected sales but for the loss.

Saved Variable Expenses

As with other loss types, the absence of production results in some saved expenses. In the case of a greenhouse these can include:

- **Packaging costs** – Saved packaging costs arise due to the lack of product to package for market. The saved packaging costs are usually the most prominent and easy to calculate and are a function of the packaging costs per unit (can be based on prior year) multiplied by the projected yield.
- **Gas/Heat** – Assuming the greenhouse ceased operating when the crop failed or when the greenhouse experienced damage, there would be no need to heat the premises. Gas/heat is one of the largest expenses incurred at a greenhouse during the winter months so, the savings can be substantial. Using prior monthly profit and loss statements and comparing current profit and loss statements, any savings in heat can be calculated.

- **Electricity** – Similar to gas/heat, if the greenhouse is not operating the amount of electricity utilized should decrease.
- **Water** – Similar to gas/heat & electricity, if the greenhouse is not operating the amount of water utilized should decrease as there are no plants to water.
- **Payroll** – A large portion of greenhouse payroll relates to the picking and care of the plants. Most of the workers would not be considered key to the operations and therefore it is likely that a portion of payroll will discontinue. By reviewing pre-loss profit and loss statements compared to post-loss profit and loss statements any decrease in payroll can be calculated.

Documentation

In addition to the documents normally required for all loss calculations, greenhouse losses require the following unique documentation:

1. Weekly sales reports by product indicating the dollars and quantity sold for the two years prior to the loss;
2. Historical and future crop planting schedules;
3. Invoices to support and crop input costs (if the crop was re-planted to mitigate)
4. Planting reports by crop indicating the number of plants planted per crop and the variety of plant including the planting dates for 2 years prior to the loss to date; and,
5. Weekly production reports by crop for 2 years prior to the loss to date (this may not be available, as not all growers track waste).

Grain Commodities

Common Terms

The following are common terms that one needs to understand in order to quantify a grain commodity loss:

- CBOT – Chicago Board of Trade, the base price for commodity futures traded in Ontario
- Non - GMO – Non genetically modified crops. Increasingly markets are demanding Non-GMO strains of crops. Strict regulations control the care and handling of Non-GMO crops. Non-GMO crops need to be contained in separate areas and be free of any other crops, especially crops that do not meet the Non-GMO standard.
- Crops – Corn, soybeans and wheat are some of the most common crops grown in Ontario.
    - Corn – Planted in spring and harvested in October or November
    - Soybeans – Planted in Spring and harvested in September or early October
    - Wheat – Planted in fall and harvested between July and September

- Crop rotation – Crops are rotated from year to year to control the degradation of the soil as different crops require different nutrients. A typical cycle is three years long. Corn is planted in the first year, followed by soybeans and wheat. Wheat is planted in the fall after the soybeans are harvested.[43]

Loss Approach

For the purposes of this report, the specific crop discussion is limited to corn, soybeans and winter wheat however, the loss approach is similar for other crops.

Stock Loss

Crop field losses tend to be rare as it is not often that a field will be burned or lost completely for reasons that can be insured against. In the event that a loss does occur, the loss is usually limited to a stock loss calculation. Typically, field crop stock loss calculations have a valuation based on the sales value of the crop.

Crops are measured in either bushels or metric tonnes. A metric tonne of corn equals 39.368 bushels and a metric tonne of soybeans or wheat equals 36.744 bushels[44].

To value the crops in the field, the size of the field must be considered. The amount of crop that can be harvested per acre will depend on the type of crop planted. In 2012, Ontario farmers experienced the following average yields:

[43] Based on discussions with various farmers while engaged to perform loss quantification calculations
[44] Alberta Agriculture and Rural Development, Bushel/Tonne Converter, [Online] Available: http://www.agric.gov.ab.ca/app19/calc/crop/bushel2tonne.jsp, [May 15, 2013]

- Corn produces 153.2 bushels an acre
- Soybeans produces 46.5 bushels an acre; and,
- Winter wheat produces 78.4 bushels an acre.[45]

Based on the foregoing, considering the type of crop planted, yield is estimated considering the number of acres affected by the loss and expected number of bushels an acre.

As corn, soybeans and winter wheat are commodities, there is an open market at which farmers can always sell the crops produced. Therefore, a production loss is considered equal to a sales loss.

The next step in determining the value of a crop loss is determining the price of the crop. Stock losses are valued at the date of loss. Due to the commodity nature of the crop, prices are always available. Typically, prices are expressed per bushel, however per metric tonne is also utilized.

Prices for crop commodities are expressed as a function of the CBOT price with a base adjustment for local elevators denoted as follows:

[45] Ontario Ministry of Agriculture, Farming and Rural Affairs, Estimated Area, Yield, Productions, and Farm Value of Specified Field Crops Ontario, [Online], Available: http://www.omafra.gov.on.ca/english/stats/crops/estimate_new.htm, [May 15, 2013]

CBOT + Base

In some cases a premium adjustment is offered based on the crop being sold. For instance, Non-GMO soybeans command a higher price than regular soybeans, so a premium adjustment is likely added to the price[46], denoted as follows:

CBOT + Base + Premium

It should be noted that the Base price reflects both the demand for the crop at local elevators as well as the current foreign exchange rate. Base prices are determined daily by each elevator and purchaser of wholesale grains across the province and are published by Farm Market News out of the University of Guelph. To accurately determine the base price applicable, discussions with the farmer relating to where the crops are usually sold is necessary.

Applying the price per bushel to the expected number of bushels lost results in the sales value of the crop.

Saved Costs

As the crop was not yet harvested and fit for sale, and saved costs experienced by the farmer need to be deducted from the sales value of the crop previously calculated. Typically, farmers treat the crops with fertilizer, herbicide and pesticide. As these costs

[46] Based on discussions with grain elevator operators in the course of a litigation engagement.

are generally known to the farmer on a per acre basis discussion with the farmer is required to determine these saved costs[47]. The farmer will also be able to indicate which treatments were still required on the lost field.

Other saved costs may relate to the actual harvesting of the crops. However, it is likely that this amount would be minimal as regardless of whether the crop is saleable, the plants need to be removed from the field to prepare the field for the next crop.

In addition harvested crops incur costs related to drying, storage, elevator fees etc. However, considering that the crop is being valued at the date of loss and not a future date saved costs relating to drying, storage and elevator fees are not considered.

Deducting the saved costs from the sales value of the crop results in the value of the stock loss.

Business Interruption Loss

In the event that a field crop loss continues into the future the value of subsequent crops needs to be determined.

Crops are grown on a rotational basis to ensure the best use of the soil as crops need different nutrients from the soil and also help restore different nutrients in the soil[48]. For

[47] Based on discussions with grain elevator operators in the course of a litigation engagement.
[48] Based on discussions with farmers

this reason, when projecting future crops the point in the crop rotation must be considered. As mentioned above, the crop rotation is as follows:

- Corn – Planted in spring and harvested in October or November
- Soybeans – Planted in Spring and harvested in September or early October
- Winter Wheat – Planted in fall after soybeans are harvested and harvested between July and September the following year.

Similar to the stock loss calculation the first step in determining the value of the business interruption loss is to determine the amount of lost crops. This is a function of the crops expected to have been grown and the amount of acres expected to be planted.

The difficulty with business interruption losses is determining the price at which the crops should be valued at. If the calculation is looking back onto production that would have already occurred but for the loss, historical pricing will be available. However, if the loss calculation is looking into the future, pricing is subject to a lot of unknown variables. Discussion with the farmer regarding any expected changes in the market, as well as research, can be done to determine if market factors are expected to change in the future. Pricing in this case is based on assumptions. CBOT does publish a limited amount of future pricing on crops, so depending on when the crop would have gone to market, but for the loss, CBOT pricing can be helpful. However, the base price

also fluctuates so any local adjustments, including foreign exchange need to also be considered.

For the above reasons, pricing future crop losses is difficult. It is suggested that a discussions with the farmer, as well as various elevator operators local to the farmer take place. This should provide the best resource for projecting prices into the future.

Multiplying the crop production shortfall by the expected future price results in the projected sales shortfall.

Saved Costs

Similar to the stock loss, saved costs need to be considered in a business interruption loss. In addition to the fertilizer, herbicide and pesticide noted above, under a business interruption loss the farmer would also save costs relating to planting and harvesting the crops foregone as a result of the loss. This would include a savings in seeds, gas and payroll.

In addition, when the grain crop is ready for sale it is taken to a grain elevator. If the moisture content is too great for the crop to be stored in the silos the grain will need to be dried prior to storage. Additional costs typically incurred when the crop is sold are incoming elevator fees and storage fees. These costs are charged by the metric tonne.

A historical review of the farmer's grain sales invoices will help determine what costs are usually incurred. Elevators also can provide service price details.

Deducting the saved costs from the sales value of the crops forgone as a result of the loss results in the value of the business interruption loss.

Documentation Required

In addition to the typical information required for a stock or business interruption file, the following actions and unique documents are required:

- Documentation to support what crops were expected to be planted and the acreage of each field
- The number and timing of fertilizer, herbicide and pesticide treatments on an annual basis, by field and price per acre
- CBOT and Base pricing details from Farm Market News
- Documentation to support as expected premium adjustments to the grain price
- Discussions with the farmer and grain elevators close to the farmer

Conclusion

Canada is one of the largest producers of agricultural goods in the world, and as such, experiences a high number of business interruption losses in this industry. Overall, agricultural losses can be unique and damages are often difficult to determine. Many distinctive factors are encountered in agricultural loss quantification that are not generally incurred in other sectors. This results in each loss being different from the last. The key to calculating these types of losses is a thorough understanding of how farming operations work. Familiarize yourself with each industry sector and understand the terminology commonly used.

As agriculture in Canada continues to grow and expand, and alternative uses for various products increases (e.g. for renewable sources of fuel, etc.), it will become increasingly important for forensic accountants working in the area of economic damage quantification to understand how to calculate these types of losses.

Bibliography

Alberta Agriculture and Rural Development, *Bushel/Tonne Converter*, [Online] Available: http://www.agric.gov.ab.ca/app19/calc/crop/bushel2tonne.jsp, [May 15, 2013]

Dairy Farmers of Ontario, *DFO Policy Handbook*, [Online], Available: https://www.milk.org/Corporate/pdf/Publications-DFOPolicyBook.pdf, [May 15, 2013]

Dairy Farmers of Ontario, *Our Role*, [Online], Available: https://www.milk.org/corporate/view.aspx?content=AboutUs/OurRole,[May 15, 2013]

Farm Food Care Ontario, *Beef Cattle*, [Online], Available: http://www.farmfoodcare.org/images/pdfs/Beef%20Cattle.pdf, [May 16, 2013]

Farm Food Care Ontario, *Chickens*, [Online], Available: http://www.farmfoodcare.org/images/pdfs/chicken.pdf, [May 16, 2013]

Farm Food Care Ontario, *Dairy Cows*, [Online], Available: http://www.farmfoodcare.org/images/pdfs/Dairy%20Cows.pdf, [May 16, 2013]

Farm Food Care Ontario, *Greenhouse Vegetables*, [Online], Available: http://www.farmfoodcare.org/images/pdfs/Greenhouse%20Vegetables.pdf, [May 16, 2013]

Farm Food Care Ontario, *Pigs*, [Online], Available: http://www.farmfoodcare.org/images/pdfs/Pigs.pdf, [May 16, 2013]

GGS Greenhouses, *All Products*, [Online], Available: http://ggs-greenhouse.com/all-products, [May 16, 2013]

Grain Farmers of Ontario, *Production Resources*, [Online], Available: http://www.gfo.ca/Production.aspx, May 16, 2013

Government of Manitoba, *Starting a Commercial Greenhouse Bedding Plant Operation in Manitoba*, [Online], Available: http://www.gov.mb.ca/agriculture/crops/greenhouse/bng01s03.html#Getting_Started, [May 15, 2013]

Index, *Farm Issues*, [Online], Available: http://www.farmissues.com/index.php, [May 15, 2013].

Ontario Cattleman's Association, *Market Information Service,* [Online], Available: http://www.cattle.guelph.on.ca/markets/marketinfo.asp, [May 16, 2013]

Ontario Greenhouse Growers, *2013 Industry Fact Sheet*, [Online], Available: http://www.ontariogreenhouse.com/ontario-growers/fact-sheet/, [May 15, 2013]

Ontario Ministry of Agriculture, *Farming and Rural Affairs, Estimated Area, Yield, Productions*, and Farm Value of Specified Field Crops Ontario, [Online], Available: http://www.omafra.gov.on.ca/english/stats/crops/estimate_new.htm, [May 15, 2013]

Ontario Pork, Daily Market Outlook, [Online], Available: http://www.ontariopork.on.ca/PriceReporting.aspx, [May 16, 2013]

United States Department of Agriculture, *Market News*, [Online], Available: http://marketnews.usda.gov/, [May 14, 2013]

University of Massachusetts Amherst, *Selecting and Building a Commercial Greenhouse*, [Online], Available: http://extension.umass.edu/floriculture/fact-sheets/selecting-and-building-commercial-greenhouse, [May 15, 2013]

West Virginia University, *Types of Greenhouses*, [Online], Available: http://www.wvu.edu/~agexten/hortcult/greenhou/building.htm#Types of Greenhouses, [May 14, 2013]

Sources Reviewed but Not Utilized

Canlii.Org, *Case Law Review*, [Online], Available: http://www.canlii.org/, [May 16, 2013]

Litigation Economics Review, *Article Search*, [Online], Available: http://nafe.net/search-results.html, [May 17, 2013]

Journal of Forensic Economics, *Article Search*, [Online], Available: http://www.journalofforensiceconomics.com/, [May 17, 2013]

Journal of Forensic & Investigative Accounting, *Article Search*, [Online], Available: http://www.bus.lsu.edu/accounting/faculty/lcrumbley/jfia/Default.htm, [May 17, 2013]