EXPECTED COSTS EXPLAINED

Disease control is an issue of risk management: you don't know if the disease will strike your farm or how many animals will be infected. You may know about the cost of a sick animal. The expected cost of the disease is simply the cost of a sick animal weighted by the percentage of animals infected and by the probability of getting the disease in the farm. This cost must be weighed against the cost of preventing the disease. Basically the biosecurity practices work to reduce:

- The probability of getting the disease
- And/or the morbidity rate
- And/or the cost of a sick animal.

The *Expected_Cost* file gives the expected cost of a disease for each combination of:

- Cost per sick animal
- Probability of getting the disease in the farm (low, medium and high)
- Morbidity rate
- Farm size (number of head)

It has 2 spreadsheets, *General* and *Custom* that work basically the same way. They estimate the expected cost of disease by weighting the expected cost per sick animal by the expected morbidity rate (percent of infected animals) and probability that an outbreak occurs in the farm.

General spreadsheet

A) Suppose you face a disease that costs $150/sick animal and there is a medium probability (20% probability for this specific disease) that you get it in a certain year. Its expected cost for a 40% morbidity outbreak is $720 (red cell).
B) Now suppose that there is a biosecurity measure that reduces the probability to the low level (to 1%) and the morbidity to 5% but doesn't change your cost per case. The expected cost of the disease under this alternative is $9 (green cell).

Implementing the biosecurity measure includes some costs that should be compared to the difference in the expected cost of disease with and without biosecurity ($711 for the example). The difference between the alternatives A) and B) is the maximum amount of money a risk neutral producer spends in implementing the biosecurity measure.

This table can also be used to evaluate the benefit of alternative biosecurity measures. Notice in this example that by reducing the **probability** of getting the disease from 20% to 1% (from medium $720 to low $36) had more impact than reducing the **morbidity** from 40% ($720) to 10% ($180). Also note that as the cost of a sick animal increases the financial incentive to reduce the probability and morbidity rates increase.

Table to estimate the expected cost of disease for different combinations of: cost per sick animal, morbidity rate, and probability of getting the disease level (low, medium, high)

Number of Head	60	Cost per sick animal					
Morbidity	**Probability**	50	100	150	200	250	300
10	Low	3.0	6.0	9.0	12.0	15.0	18.0
	Medium	60.0	120.0	180.0	240.0	300.0	360.0
	High	150.0	300.0	450.0	600.0	750.0	900.0
20	Low	6.0	12.0	18.0	24.0	30.0	36.0
	Medium	120.0	240.0	360.0	480.0	600.0	720.0
	High	300.0	600.0	900.0	1200.0	1500.0	1800.0
30	Low	9.0	18.0	27.0	36.0	45.0	54.0
	Medium	180.0	360.0	540.0	720.0	900.0	1080.0
	High	450.0	900.0	1350.0	1800.0	2250.0	2700.0
40	Low	12.0	24.0	36.0	48.0	60.0	72.0
	Medium	240.0	480.0	720.0	960.0	1200.0	1440.0
	High	600.0	1200.0	1800.0	2400.0	3000.0	3600.0
50	Low	15.0	30.0	45.0	60.0	75.0	90.0
	Medium	300.0	600.0	900.0	1200.0	1500.0	1800.0
	High	750.0	1500.0	2250.0	3000.0	3750.0	4500.0
60	Low	18.0	36.0	54.0	72.0	90.0	108.0
	Medium	360.0	720.0	1080.0	1440.0	1800.0	2160.0
	High	900.0	1800.0	2700.0	3600.0	4500.0	5400.0
70	Low	21.0	42.0	63.0	84.0	105.0	126.0
	Medium	420.0	840.0	1260.0	1680.0	2100.0	2520.0
	High	1050.0	2100.0	3150.0	4200.0	5250.0	6300.0
80	Low	24.0	48.0	72.0	96.0	120.0	144.0
	Medium	480.0	960.0	1440.0	1920.0	2400.0	2880.0
	High	1200.0	2400.0	3600.0	4800.0	6000.0	7200.0
90	Low	27.0	54.0	81.0	108.0	135.0	162.0
	Medium	540.0	1080.0	1620.0	2160.0	2700.0	3240.0
	High	1350.0	2700.0	4050.0	5400.0	6750.0	8100.0
100	Low	30.0	60.0	90.0	120.0	150.0	180.0
	Medium	600.0	1200.0	1800.0	2400.0	3000.0	3600.0
	High	1500.0	3000.0	4500.0	6000.0	7500.0	9000.0

Probability	
Low	1.00%
Medium	20.00%
High	50.00%

The user can input the probability rate that corresponds to each of the 3 level

The blue underlined numbers are the ones the user can change

The user working with his/her veterinarian or extension specialist needs to determine:

- An estimate of what is considered a low, medium and high level of probability for the disease he/she is trying to prevent
- An estimate of the morbidity rate for each disease
- An estimate of the cost per sick animal for each disease
- Farm size (number of head)

Custom spreadsheet

This spreadsheet works basically the same way as the *General* spreadsheet. One advantage it has is that all the variables can be set independently from one scenario to the next. It can also compare 4 different scenarios at a time and the results of the different scenarios will be printed in the same row for easy evaluation.

The user can input the cost per sick animal, morbidity rate and probability of getting the disease for each scenario and the table estimates the expected cost of the disease. The producer can also compare the cost of biosecurity practices needed for each scenario with the expected cost of the disease under each scenario.

Table to estimate the difference in the expected cost of disease for two or more different scenarios of disease with different cost per sick animal, probability of getting the disease and morbidity rate.

Number of Head	60				
	Alternative				
	1	**2**	**3**	**4**	
Cost per sick animal ($)	150	150	100	200	A
Expected morbidity rate (%)	50.0%	5.0%	30.0%	1.0%	B
Probability of getting the disease in the farm	40.0%	10.0%	20.0%	2.0%	C
Expected Cost of Disease	**1800.00**	**45.00**	**360.00**	**2.40**	**=A*B*C*#heads**

The blue underlined numbers are the ones the user can change

Note: The user needs to be provided with the farm size (number of head) and an estimate of the:

- Expected probability rate for the disease under each of the situations he/she is trying to compare
- Expected morbidity rate for the disease under each of the situations he/she is trying to compare
- Cost per sick animal for the disease under each of the situations he/she is trying to compare

Additional comments

Estimating the cost per sick animal is not always easy. Therefore, this set of spreadsheets provides partial budgets to estimate the cost per sick animal for each disease based on information provided by the farmer and his/her own veterinarian. Please see:

- *Cow Calf budgets* for cow-calf operations
- *Feedlot budgets* for feedlot operations
- *Dairy budgets* for dairy operations

Users will want to use their farms own costs, or cost of production budgets appropriate to their own region.

There are several biosecurity practices that can be implemented and each one has its own cost. Many of these costs vary from farm to farm. Therefore, this set of spreadsheets also provides examples of how to estimate the cost of implementing preventive practices such as quarantine, vaccination, testing for disease, etc... (Please see *Biosecurity Cost*) It is important to recognize that the cost and effectiveness of a practice is site specific and that the economic principle of diminishing marginal returns applies. That is, the better a farm is at a particular practice the more costly it is to improve. For

example, if a farm is already limiting animal, people and equipment movement on to the farm, the next step of restricting traffic even more will be more costly and have a smaller effect. However, a farm that does not have any restrictions may see more improvement from small changes that limit introduction of disease risks.

Extreme cases

In the event of an outbreak of some very contagious diseases (such as FMD or another foreign animal disease) it may be recommended to slaughter all the cattle on the farm and repopulate after a quarantine period. There are a set of spreadsheets to provide guidelines to estimate the depopulation-repopulation costs. These can be found in the files:

- *Depopulation Repopulation Cow calf* for cow-calf operations
- *Depopulation Repopulation Feedlot* for feedlot operations
- *Depopulation Repopulation Dairy* for dairy operations