

## **Examples of New Section 18 Approach to Significant Economic Loss**

### **Example 1. Crop with Yield Loss (Wheat in the Pacific Northwest)**

Scenario. The emergency situation is that resistance has developed to an herbicide. Competition from weeds for water and nutrients may reduce crop yields. There is a registered herbicide, but it has limited efficacy.

Tier 1 Analysis. What is the yield loss?

The most appropriate comparison would be to compare yields before and after the development of resistance. However, this may be difficult because resistance develops over time and there may be other changes in production that would make comparison across many years difficult or inaccurate. In this case, the requested chemical may be used as a proxy for the non-emergency situation. Therefore, the applicant submits data from product performance studies, comparing the requested chemical to the registered alternative. Two studies are submitted. The most important elements are shown in Tables 1A and 1B.

Table 1A shows the results of a trial that compares the requested herbicide to the registered alternative, which is applied at different times. The trial is a randomized block design that allows statistical comparisons. Note that the measure of weed control is not necessarily aligned with measures of crop injury or yield. (There appears to be an error in the reporting of crop injury associated with the check, or no treatment, block.)

**Table 1A. Comparative efficacy study, Trial 1.**

Treatment	Rate (lb a.i./acre)	% Crop Injury	% Control	Yield (bu/acre)
Requested Chemical	0.42	11.3 c	100.0 a	130.6 a
Registered Alternative	0.011	15.0 bc	52.5 c	102.5 b
Registered Alternative	0.011	20.0 ab	85.3 b	118.2 a
Registered Alternative	0.011	25.0 a	52.5 c	83.4 c
Check	0.0	0.0 d	0.0 d	35.2 d

Notes: Registered alternative applied at different times.

Different letters within a column indicate statistically different means.

The second trial, shown in Table 1B, compares results for different rates of application. No statistically significant differences are noted in this trial.

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**Table 1B. Comparative efficacy study, Trial 2.**

Treatment	Rate (lb a.i./acre)	% Control 25 May	% Control 21 April	% Control 21 May	Yield (bu/acre)
Requested Chemical	0.3333	80.0	71.3	62.5	33.7
Requested Chemical	0.4175	82.5	73.8	40.0	33.5
Registered Alternative	0.0110	57.5	57.5	22.5	24.8
Registered Alternative	0.0132	55.0	56.3	40.0	26.0
Check	0.0	0.0	0.0	0.0	9.4

To calculate a percentage yield loss, we would take the difference between the treatment representing the non-emergency situation ( $Y_0$ ), which in this case is the requested chemical, and compare that to the emergency situation ( $Y_E$ ), which is the registered alternative. The percentage loss in yield is  $(Y_0 - Y_E)/Y_0$ . In Trial 1, we see yield losses of 9.5%, 21.5%, and 36.1%. In Trial 2, we see yield losses of 22.4% and 26.0%, when we compare the registered alternative to the lower of the two treatments with the requested chemical.

These results indicate that the typical yield loss will be over 20%, probably around 22-25%. This exceeds the yield-loss threshold for Tier 1 and imply that a significant economic loss would occur due to the emergency. No further information, on baseline yield, price or variable operating cost, needs to be submitted.

Note that in small test plots, the measured yield in bu/acre is quite different from a baseline yield you would obtain on-farm and see in agricultural statistics. For comparative efficacy or economic injury studies, we are interested in the relative impact of the emergency.

## **Example 2. Crop with Yield Loss (Cauliflower in California)**

Scenario. The emergency situation is that an insecticide has been withdrawn from the market. There is no registered alternative for use against the main target pest. Feeding damage will result in yield losses, but there is no other source of loss.

Tier 1 Analysis. Product performance studies, like those shown in Example 1, are submitted. They compare infested plots to plots treated with the old pesticide, and show that the pest inflicts, on average, a 15% yield loss (%YL). A 15% yield loss does not meet the Tier 1 criterion for SEL. Therefore, no determination can be made at this tier.

Tier 2 Analysis. Typically, at this stage, the applicant would submit baseline yield and price information, which may come from agricultural statistics. Baseline yield ( $Y_0$ ) and price ( $P_0$ ) for California cauliflower is 16,200 lb/acre and \$3.10/cwt, based on a 5-year (2000-2004) average from USDA NASS agricultural statistics (Vegetables, Annual Summary, various years). Given average yield and price, gross revenue without the emergency would be about \$5,022/acre ( $GR_0$ ).

Note that this is the data that had been required under the old method. However, it is not the only way the baseline could be established. If the problem were more localized, county-level statistics might be more appropriate. If the crop is mainly grown under contract, a market survey might be used to establish the price growers would receive this year, instead of an average over past years.

In this case, there are no sources of loss beyond yield. Therefore, loss as a percent of gross revenue is also 15%.

$$\frac{\text{Revenue Loss}}{\text{Gross Revenue}} \equiv \frac{P_0 \times (\%YL \times Y_0)}{P_0 \times Y_0} \equiv \%YL$$

This does not meet the Tier 2 criterion for SEL. No determination can be made at this tier.

Tier 3 Analysis. In addition to the yield loss data, baseline yield, and baseline price, the applicant will need to provide operating costs. Table 1 presents this data and the results of the analysis.

Operating costs are from the University of California Cooperative Extension service and represent Imperial County for 2004 (see <http://www.agecon.ucdavis.edu/>). Table 2 presents a summary of important categories. Baseline operating costs are around \$4,719/acre, which means net operating revenue is about \$303/acre.

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**Table 2. Emergency Exemption, Tier 3 Analysis, California Cauliflower.**

	Baseline	Emergency	Change	% Change
Yield (lb/acre)	16,200	13,770	-2,400	-15.0%
Price (\$/lb)	0.310	0.310	0	0.0%
Gross Revenue (\$/acre)	5,022	4,269	-753	-15.0%
Costs (\$/acre)				
Insecticides	140	120	-20	-14.3%
Other Operating Costs	1,057	1,057	0	0.0%
Harvest	3,522	2,993	-528	-15.0%
Total Operating Costs (\$/acre)	4,719	4,170	-548	-11.6%
Net Operating Revenue (\$/acre)	303	98	-205	-67.6%

Shaded cells indicate critical information on the emergency for this analysis.

With the emergency, an average of 15% decrease in yield is expected. This allows us to calculate yields and gross revenue under the emergency: 13,770 lb/acre worth \$4,269. This analysis considers changes in production cost, which in this scenario are favorable to the grower. The loss of an insecticide results in a savings of \$20/acre, as there is no alternative to control the pest. Further, the crop budget indicates that harvest costs depend on yield. Costs are reported to be \$5.00 per 23-lb carton. (More realistically, harvest costs may include a fixed charge, plus costs dependent on yield.) Therefore, a 15% reduction in yields also reduces harvest costs by 15%. Total operating costs with the emergency are \$4,170/acre, meaning net operating revenue is only \$98/acre.

Net operating revenue would decline about \$205/acre, or 67.6%, under the emergency. This exceeds the threshold (*i.e.*, meets the criterion) for SEL at Tier 3.

**Example 3. Crop with Quality Loss (Cherry in Washington)**

Scenario. The emergency situation is that resistance is developing to a fungicide within an area of Washington. There is no effective alternative. The pathogen does not result in yield losses, but many cherries cannot be sold in the fresh market and must be sold for processing, which brings a lower price.

Tier 1 Analysis. There is no yield loss, therefore the situation does not meet the Tier 1 criterion for SEL.

Tier 2 Analysis. The emergency has resulted in a shift in the amount of production from fresh to processed market. Because the situation has been developing over time, the applicant presents baseline information from 1998-2001, from USDA NASS statistics (Noncitrus Fruits and Nuts, various years), to calculate a 4-year average for yields and distribution between the fresh and processed market. At that time, yield was about 4.2 tons/acre and approximately 75% of Washington cherries went to the fresh market (*i.e.*, 3.15 tons/acre sold as fresh and 1.05 tons/acre sold for processing). Fresh cherry prices are currently (average over 2001-2003) about \$1,715/ton while the price for processed cherries is about \$535/ton (USDA NASS, Noncitrus Fruits and Nuts, various years). This implies gross revenue of about \$5,964/acre ( $\$1,715 \times 3.15 + \$535 \times 1.05$ ).

To inform the emergency situation, the state surveys packing houses in the affected counties. The results show that the fresh cherries make up only 50% of production. The rest is now sold for processing. Due to the emergency, only 2.1 tons make fresh grade, a decrease of 33.3%. Prices for the grades are unchanged. Under the emergency, gross revenue is about \$4,725/acre ( $\$1,715 \times 2.1 + \$535 \times 2.1$ ).

Table 3 compares the baseline and emergency scenarios. Gross revenue declines by over \$1,200/acre or 20.8% due to the emergency. This meets the criterion for SEL at Tier 2.

No data on operating costs would have to be submitted.

**Table 3. Emergency Exemption, Tier 2 Analysis, Washington Cherry.**

	Baseline	Emergency	Change	% Change
Yield (ton/acre)	4.20	4.20	0.00	0.0%
Fresh (% of yield)	75%	50%		
(ton/acre)	3.15	2.10	-1.05	-33.3%
Processed (% of yield)	25%	50%		
(ton/acre)	1.05	2.10	1.05	100.0%
Price, Fresh (\$/ton)	1,715	1,715	0	0.0%
Price, Processed (\$/ton)	535	535	0	0.0%
Gross Revenue (\$/acre)	5,964	4,725	-1,239	-20.8%

Shaded cells indicate critical information on the emergency for this analysis.

**Example 4. Crop with Cost Increase (Alfalfa in Idaho)**

Scenario. The emergency situation is an unusually large outbreak of a pest that typically does not cause economic injury. A registered alternative is available, but it provides only fair control and would have to be applied twice. With two applications, however, no damage is anticipated.

Tier 1 Analysis. Comparative product efficacy studies show that two applications of the registered pesticide provide sufficient control to avoid injury. Since there is no yield loss, the situation does not meet the Tier 1 criterion for SEL.

Tier 2 Analysis. The emergency has resulted in an increase in the cost of production. Baseline yield and price may be obtained from agricultural statistics. According to USDA NASS statistics (Crop Production 2004 Summary), the three-year average for alfalfa-hay mixtures is 3.9 tons dry matter/acre. The three-year average is appropriate because of moderate drought conditions over this period are expected to continue this year. Currently, USDA market news (<http://www.ams.usda.gov/LSMNPubs/HayW.htm>) reports alfalfa hay prices in Idaho of about \$115/ton for premium quality. The summer price is more appropriate, however, and was around \$95/ton last year. Baseline gross revenue is therefore about \$370/acre.

Increased production costs arise because growers must pay for two applications of a chemical they typically would not use. According to a survey of pesticide applicators, the chemical costs about \$10.50/acre, including labor for the application, so the total increase in production costs is about \$21/acre.

A \$21/acre increase in costs represents 5.7% of gross revenue (Table 4A). This does not meet the Tier 2 criterion for SEL.

**Table 4A. Emergency Exemption, Tier 2 Analysis, Idaho Alfalfa.**

	Baseline	Emergency	Change	% Change
Yield (ton/acre)	3.9	3.9	0	0.0%
Price (\$/ton)	95.00	95.00	0	0.0%
Gross Revenue (\$/acre)	371	371	0	0.0%
Additional Costs (\$/acre)				
Insecticide	0	21	-21	
% change (compared to gross revenue)				-5.7%

Shaded cells indicate critical information on the emergency for this analysis.

Tier 3 Analysis. In addition to baseline information for Tier 2, the applicant supplies cost of production data, in this case from the University of Idaho Cooperative Extension program. The cost of production, summarized in Table 4B, is based on the 2003 estimates for southwestern Idaho (<http://www.ag.uidaho.edu/aers/PDF/Crops/EBB2-AH-03.pdf>). Total operating costs are just over \$200/acre, implying net operating revenues of about \$167/acre.

The increase in cost is as estimated in the Tier 2 analysis, \$21/acre. While this represents a near doubling of insecticide costs, the \$21/acre loss is only 12.6% of net operating revenue. This does not meet the Tier 3 threshold for SEL. This would not be considered an emergency.

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**Table 4B. Emergency Exemption, Tier 3 Analysis, Idaho Alfalfa.**

	Baseline	Emergency	Change	% Change
Yield (ton/acre)	3.9	3.9	0	0.0%
Price (\$/ton)	95.00	95.00	0	0.0%
Gross Revenue (\$/acre)	371	371	0	0.0%
Costs (\$/acre)				
Insecticides	22	43	21	95.5%
Other Operating Costs	122	122	0	0.0%
Harvest	60	60	0	0.0%
Total Operating Costs (\$/acre)	204	225	21	10.3%
Net Operating Revenue (\$/acre)	167	146	-21	-12.6%

Shaded cells indicate critical information on the emergency for this analysis.

**Example 5. Post-Harvest Losses (Pear in Oregon)**

Scenario. The emergency situation is a fungal pathogen that attacks stored fruit. The registered control is failing as resistance develops and there is not another registered pesticide to control it. Cultural controls are likewise ineffective.

Stored fruit is sold in the fresh market, which receives a higher price than the processed market. To reduce storage losses, more fruit could be sold immediately, but it would probably have to be sold in the processing market. Prices would probably fall regardless of which end market the fruit was sold and there would still be some loss in the stored fruit. In addition to the direct loss, disease-damaged fruit may result in severe price penalties or rejection of shipments. However, packing houses can examine the fruit, discard those damaged, and repack for shipment.

The most likely result is that the amount of marketable fresh fruit is reduced and the grower incurs additional marketing (labor) costs, but price effects can be avoided.

Tier 1 Analysis. There is no yield loss in terms of harvested quantities. However, there are losses in storage. For this analysis, baseline information is needed on yield, distribution between end markets and typical storage losses. Agricultural statistics (NASS, Noncitrus Fruits and Nuts, various years) are used to establish baseline yield of 12.9 tons/acre. About one-third, 4.4 tons/acre, are processed and the rest, 8.5 tons/acre are sold in the fresh market. The fresh market includes fruit kept in cold storage and a survey of packing houses, conducted by the applicant, indicates that almost 95% of the fresh market produce is actually kept in cold storage for as much as 10 months. Typical storage losses are about 2% of the stored commodity (according to the survey), which implies post harvest losses of around 0.2 ton/acre. Utilized production is therefore about 12.7 tons/acre (USDA NASS often reports utilized production as well).

The survey of packing houses also indicates that the new pathogen is causing storage losses to increase to about 10% of the stored commodity. While this is a four-fold increase in storage losses, it represents only about 5% of utilized yield. This does not meet the Tier 1 criterion for SEL. Table 5A displays this information.

**Table 5A. Emergency Exemption, Tier 1 Analysis, Oregon Pears.**

	Baseline	Emergency	Change	% Change
Yield (ton/acre)	12.9	12.9	0.0	0.0%
Processed	4.4	4.4		
Fresh	8.5	8.5		
Stored	8.0	8.0		
Storage loss	0.2	0.8	0.6	400.0%
Utilized Yield (ton/acre)	12.7	12.1	-0.6	5.0%

Shaded cells indicate critical information on the emergency for this analysis.

Tier 2 Analysis. The emergency has two consequences to consider in calculating expected losses. One, the loss of production (yield) is in the higher-valued fresh produce, which implies an additional revenue impact. Two, additional marketing costs are incurred when boxes must be sorted and repacked.

Therefore, the baseline calculation of gross revenue should distinguish between the fresh and processed market. Again, USDA NASS statistics can be used to determine the appropriate prices: about \$170/ton for processed and \$470/ton for fresh, which is a weighted average of prices for the

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whole year. Baseline gross revenue, given utilized production, is calculated to be about \$4,670/acre ( $\$170 \times 4.4 + \$470 \times 8.3$ ).

Under the emergency, less produce is sold in the fresh market. Therefore, gross revenue with the emergency is calculated to be about \$4,370/acre ( $\$170 \times 4.4 + \$470 \times 7.9$ ), or about \$300 less than baseline.

To determine additional marketing costs, the survey of packing houses is again used to support the application. The survey finds that initial packing costs about \$4.00/44-lb box for labor, material, and storage fees. Repacking prior to shipping costs \$2.75/box for labor and material. The fungus progresses during the year but is somewhat controlled by the cold storage. Packing houses expect to have to repack about 15% of the utilizable stored commodity, about 2,400 lb or 55 boxes ( $8.0 \text{ ton} \times 15\% \div 44 \text{ lb}$ ). At \$2.75/box, the additional cost is about \$150/acre.

Total losses are around \$450/acre, which is about 9.7% of baseline gross revenue. This does not meet the Tier 2 criterion for SEL. Table 5B displays this information.

**Table 5B. Emergency Exemption, Tier 2 Analysis, Oregon Pear.**

	Baseline	Emergency	Change	% Change
Utilized Yield (ton/acre)	12.7	12.1	-0.6	-5.0%
Processed	4.4	4.4		
Fresh	8.3	7.2	-0.6	-7.5%
Price, Processed (\$/ton)	170.00	170.00		
Price, Fresh (\$/ton)	470.00	470.00		
Gross Revenue (\$/acre)	4,670.00	4,370.00	-300	-6.4%
Repacking Costs (\$/acre)			150	
Total Losses (% change compared to gross revenue)			-450	-9.7%

Shaded cells indicate critical information on the emergency for this analysis.

Tier 3 Analysis. In addition to information for Tier 2, the applicant supplies cost of production data in the form of an enterprise budget from the Oregon State University Extension Service ([http://oregonstate.edu/Dept/EconInfo/ent\\_budget/PDF/EM8679.pdf](http://oregonstate.edu/Dept/EconInfo/ent_budget/PDF/EM8679.pdf)). This information is summarized in Table 5C. The enterprise budget does not include marketing costs, which appears to be an oversight. The applicant should explain this sort of discrepancy. The budget does include harvest costs of \$12.80/bin, where a bin weighs 1,050 lb. Total baseline operating costs are about \$3,855/acre, leaving the grower net operating revenues of \$817/acre, assuming both harvest and marketing costs are incurred.

Total losses in gross revenue and increased marketing costs are as calculated in Tier 2, \$450/acre. This represents 55.2% of net operating revenue. This meets the Tier 3 criterion for SEL.

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**Table 5C. Emergency Exemption, Tier 3 Analysis, Oregon Pear.**

	Baseline	Emergency	Change	% Change
Utilized Yield (ton/acre)	12.7	12.1	-0.6	-5.0%
Processed	4.4	4.4		
Fresh	8.3	7.2	0	-7.5%
Price, Processed (\$/ton)	170.00	170.00		
Price, Fresh (\$/ton)	470.00	470.00		
Gross Revenue (\$/acre)	4,670.00	4,370.00	-300	-6.4%
Production Costs (\$/acre)	1,990.00	1,990.00		
Harvest Costs (\$/acre)	315.00	315.00		
Marketing Costs (\$/acre)	1,550.00	1,700.00	150	9.7%
Total Operating Costs (\$/acre)	3,855.00	4,005.00	150	3.9%
Net Operating Revenue (\$/acre)	815.00	365.00	-450	-55.2%

Shaded cells indicate critical information on the emergency for this analysis.