

# Economic threshold ready reckoners

## Quick reference tables for key insect pests

Economic thresholds are a key decision tool for growers and agronomists managing insect pests in their crops. Dynamic economic thresholds enable individual costs of control and grain prices to be included in the calculations to ensure the decision to treat or not to treat the pest infestation is as accurate as possible.

These ready reckoners have been calculated for a range of pest densities, costs of control and grain prices. Where two ready reckoners are provided for a pest, we see them being used in the following ways:

- 1) **Potential yield loss** tables are useful for planning a course of action and provide a basis for discussion on the economic viability of spraying a crop for a given pest density. They answer the question “How much will I lose (\$/ha) if I do nothing?”.
- 2) **Economic threshold** tables provide an estimate of pest density at the economic breakeven point (where the cost of control = the cost of the spray) and are useful guides for making decisions on sampling data.

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# Sorghum

## Helicoverpa in sorghum

### Potential yield loss

Sorghum crop value (\$/t)	Value of potential yield loss (\$/ha)*							
	0.5 larvae/hd	1 larvae/hd	1.5 larvae/hd	2 larvae/hd	2.5 larvae/hd	3 larvae/hd	3.5 larvae/hd	4 larvae/hd
100	12	24	36	48	60	72	84	96
150	18	36	54	72	90	108	126	144
200	24	48	72	96	120	144	168	192
250	30	60	90	120	150	180	210	240
300	36	72	108	144	180	216	252	288

\*based on potential yield loss estimate per larva/head = 2.4 g or 24 kg/ha at 10 head/m row and 1 m row spacing (100,000 head per ha).

### Economic threshold

Control cost (\$/ha)	Sorghum grain value (\$/t)				
	\$100	\$150	\$200	\$250	\$300
\$15	0.63	0.42	0.31	0.25	0.21
\$20	0.83	0.56	0.42	0.33	0.28
\$25	1.04	0.69	0.52	0.42	0.35
\$30	1.25	0.83	0.63	0.50	0.42
\$35	1.46	0.97	0.73	0.58	0.49
\$40	1.67	1.11	0.83	0.67	0.56

## Sorghum midge in sorghum

### Potential yield loss

Midge rating of hybrid	Estimated yield loss (t/ha)*	Economic value of yield loss at a varying sorghum prices			
		\$160/t	\$200/t	\$250/t	\$300/t
<b>1 midge per panicle</b>					
Susceptible (rating 1)	0.52	42	104	130	156
3 Rating	0.18	14	36	45	54
5 Rating	0.10	8	20	25	30
7 Rating	0.08	6	16	20	24
8+ Rating	0.05	4	10	13	15
<b>3 midge per panicle</b>					
Susceptible (rating 1)	1.58	252	315	394	473
3 Rating	0.53	84	105	131	158
5 Rating	0.32	50	63	79	95
7 Rating	0.23	36	45	56	68
8+ Rating	0.12	25	24	30	36

Assumptions made in calculations: A crop of 75,000 heads/ha; damage over 4-5 days; all heads exposed to midge over the 4-5 days. Estimate of potential yield loss per midge per panicle = 1.4g.

# Chickpea

## Helicoverpa in chickpea

### Potential yield loss (beatsheet)

Chickpea price (\$/t)	Value of potential yield loss (\$/ha)*				
	1 larva/m <sup>2</sup>	2 larva/m <sup>2</sup>	3 larva/m <sup>2</sup>	4 larva/m <sup>2</sup>	5 larva/m <sup>2</sup>
200	4	8	12	16	20
300	6	12	18	24	30
400	8	16	24	32	40
500	10	20	30	40	50
600	12	24	36	48	60

\* Potential yield loss estimate per larva/m<sup>2</sup> = 20 kg/ha (QDAFF)

### Economic threshold (beatsheet)

Cost of control (\$/ha)	Chickpea crop value (\$/t)							
	200	250	300	350	400	450	500	550
10	2.5	2.0	1.7	1.4	1.3	1.1	1.0	0.9
15	3.8	3.0	2.5	2.1	1.9	1.7	1.5	1.4
20	5.0	4.0	3.3	2.9	2.5	2.2	2.0	1.8
25	6.3	5.0	4.2	3.6	3.1	2.8	2.5	2.3
30	7.5	6.0	5.0	4.3	3.8	3.3	3.0	2.7
35	8.8	7.0	5.8	5.0	4.4	3.9	3.5	3.2
40	10.0	8.0	6.7	5.7	5.0	4.4	4.0	3.6

### Potential yield loss (sweep net sampling)

Chickpea price (\$/t)	Value of potential yield loss (\$/ha)*				
	1 larva/10 sweeps	2 larva/10 sweeps	3 larva/10 sweeps	4 larva/10 sweeps	5 larva/10 sweeps
200	6	12	18	24	30
300	9	18	27	36	45
400	12	24	36	48	60
500	15	30	45	60	75
600	18	36	54	72	90

\*potential yield loss estimate per larva per 10 sweeps = 30 kg/ha (DAFWA)

### Economic threshold (beatsheet)

Cost of control (\$/ha)	Chickpea crop value (\$/t)							
	200	250	300	350	400	450	500	550
10	1.7	1.3	1.1	1.0	0.8	0.7	0.7	0.6
15	2.5	2.0	1.7	1.4	1.3	1.1	1.0	0.9
20	3.3	2.7	2.2	1.9	1.7	1.5	1.3	1.2
25	4.2	3.3	2.8	2.4	2.1	1.9	1.7	1.5
30	5.0	4.0	3.3	2.9	2.5	2.2	2.0	1.8
35	5.8	4.7	3.9	3.3	2.9	2.6	2.3	2.1
40	6.7	5.3	4.4	3.8	3.3	3.0	2.7	2.4

# Soybeans

## Helicoverpa in podding soybeans

### Potential yield loss (beatsheet)

Soybean crop value (\$/t)	Value of potential yield loss (\$/ha) at larval densities listed below							
	0.5/m <sup>2</sup>	1/m <sup>2</sup>	1.5/m <sup>2</sup>	2/m <sup>2</sup>	2.5/m <sup>2</sup>	3/m <sup>2</sup>	3.5/m <sup>2</sup>	4/m <sup>2</sup>
350	7	14	21	28	35	42	49	56
400	8	16	24	32	40	48	56	64
450	9	18	27	36	45	54	63	72
500	10	20	30	40	50	60	70	80
550	11	22	33	44	55	66	77	88
600	12	24	36	48	60	72	84	96
650	13	26	39	52	65	78	91	104
700	14	28	42	56	70	84	98	112
750	15	30	45	60	75	90	105	120
800	16	32	48	64	80	96	112	128
850	17	34	51	68	85	102	119	136

### Economic threshold (beatsheet)

Control cost (\$/ha)	Helicoverpa thresholds* (larvae/m <sup>2</sup> ) at soybean crop values listed below (\$/t)									
	\$350	\$400	\$450	\$500	\$550	\$600	\$650	\$700	\$750	\$800
\$15	1.1	0.9	0.8	0.8	0.7	0.6	0.6	0.5	0.5	0.5
\$20	1.4	1.3	1.1	1.0	0.9	0.8	0.8	0.7	0.7	0.6
\$25	1.8	1.6	1.4	1.3	1.1	1.0	1.0	0.9	0.8	0.8
\$30	2.1	1.9	1.7	1.5	1.4	1.3	1.2	1.1	1.0	0.9
\$35	2.5	2.2	1.9	1.8	1.6	1.5	1.3	1.3	1.2	1.1
\$40	2.9	2.5	2.2	2.0	1.8	1.7	1.5	1.4	1.3	1.3
\$45	3.2	2.8	2.5	2.3	2.0	1.9	1.7	1.6	1.5	1.4
\$50	3.6	3.1	2.8	2.5	2.3	2.1	1.9	1.8	1.7	1.6
\$55	3.9	3.4	3.1	2.8	2.5	2.3	2.1	2.0	1.8	1.7
\$60	4.3	3.8	3.3	3.0	2.7	2.5	2.3	2.1	2.0	1.9

### Podsucking bugs (GVBAEQ)<sup>#</sup> in edible soybeans economic threshold (quality)\*

Potential yield (t/ha)	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Nato soybeans	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Normal soybeans	0.1	0.1	0.2	0.3	0.3	0.4	0.4	0.5	0.6	0.6

# Podsucking bugs include green vegetable bug, redbanded shield bug, brown shield bug and the brown bean bug. The damage potential of each species (adults and nymphs) in a mixed population is standardised by calculating the Green Vegetable Bug Adult Equivalent (GVBAEQ) for the number of each species. See the Good Bug, Bad Bug book for detailed information on species identification and calculation of the GVBAEQ.

\*Threshold based on a rate of damage of approximately 80 harvestable seeds per adult bug per square metre. Spray bugs at the 2% action threshold, before the critical 3% damage level is reached. This allows for other insect damage not caused by podsucking bugs. Note that thresholds increase in 'larger' crops as more bugs are required to inflict a given percentage (%) of damage.

# Mungbeans

## Helicoverpa in podding mungbeans

### Potential yield loss (beatsheet)

Mungbean crop value (\$/t)	Value of potential yield loss (\$/ha) at larval densities listed below							
	Helicoverpa larvae per square metre (beatsheet)							
	0.5/m <sup>2</sup>	1/m <sup>2</sup>	1.5/m <sup>2</sup>	2/m <sup>2</sup>	2.5/m <sup>2</sup>	3/m <sup>2</sup>	3.5/m <sup>2</sup>	4/m <sup>2</sup>
350	6	12	18	25	31	37	43	49
400	7	14	21	28	35	42	49	56
450	8	16	24	32	39	47	55	63
500	9	18	26	35	44	53	61	70
550	10	19	29	39	48	58	67	77
600	11	21	32	42	53	63	74	84
650	11	23	34	46	57	68	80	91
700	12	25	37	56	61	74	86	98
750	13	26	39	60	66	79	92	105
800	14	28	42	64	70	84	98	112
850	15	30	45	68	74	89	104	119

### Economic thresholds

Control cost (\$/ha)	Helicoverpa thresholds* (larvae/m <sup>2</sup> ) at mungbean crop values listed below (\$/t)									
	\$400	\$450	\$500	\$550	\$600	\$650	\$700	\$750	\$800	\$850
\$15	1.1	1.0	0.9	0.8	0.7	0.7	0.6	0.6	0.5	0.5
\$20	1.4	1.3	1.1	1.0	1.0	0.9	0.8	0.8	0.7	0.7
\$25	1.8	1.6	1.4	1.3	1.2	1.1	1.0	1.0	0.9	0.8
\$30	2.1	1.9	1.7	1.6	1.4	1.3	1.2	1.1	1.1	1.0
\$35	2.5	2.2	2.0	1.8	1.7	1.5	1.4	1.3	1.3	1.2
\$40	2.9	2.5	2.3	2.1	1.9	1.8	1.6	1.5	1.4	1.3
\$45	3.2	2.9	2.6	2.3	2.1	2.0	1.8	1.5	1.6	1.5
\$50	3.6	3.2	2.9	2.6	2.4	2.2	2.0	1.9	1.8	1.7
\$55	3.9	3.5	3.1	2.9	2.6	2.4	2.2	2.1	2.0	1.8
\$60	4.3	3.8	3.4	3.1	2.9	2.6	2.4	2.3	2.1	2.0

\* Thresholds based on beatsheet sampling. Yield loss estimate of 35 kg/ha for every larva per square metre (DAFF Qld)

### Green vegetable bug/m<sup>2</sup> in mungbeans economic threshold (quality)\*

Potential yield (t/ha)	0.25	0.5	1.0	1.5	2.0	2.5	3.0
GVBAEQ to damage 1.4% of seeds	0.1	0.2	0.5	0.8	1.1	1.4	1.7

\*Threshold based on a rate of damage of approximately 50 harvestable seeds per adult bug per square metre. Spray bugs at the 1.4% action threshold, before the critical 2% damage level is reached. This allows for other insect damage not caused by posdsucking bugs. Note that thresholds increase in 'larger' crops as more bugs are required to inflict a given percentage (%) of damage. When mixed bug populations are present (adults & nymphs) convert their damage potential to green vegetable bug adult equivalents (GVBAEQ).

## Mirids (*Creontiades* spp.) in mungbeans

### Potential yield loss

Mungbean crop value (\$/t)	Mirids per square metre (beatsheet)							
	0.1	0.2	0.5	1	1.5	2	2.5	3
350	2.1	4.2	10.5	21.0	31.5	42.0	52.5	63.0
400	2.4	4.8	12.0	24.0	36.0	48.0	60.0	72.0
450	2.7	5.4	13.5	27.0	40.5	54.0	67.5	81.0
500	3.0	6.0	15.0	30.0	45.0	60.0	75.0	90.0
550	3.3	6.6	16.5	33.0	49.5	66.0	82.5	99.0
600	3.6	7.2	18.0	36.0	54.0	72.0	90.0	108.0
650	3.9	7.8	19.5	39.0	58.5	78.0	97.5	117.0
700	4.2	8.4	21.0	42.0	63.0	84.0	105.0	126.0
750	4.5	9.0	22.5	45.0	67.5	90.0	112.5	135.0
800	4.8	9.6	24.0	48.0	72.0	96.0	120.0	144.0
850	5.1	10.2	25.5	51.0	76.5	102.0	127.5	153.0

### Economic thresholds

Control cost (\$/ha)	Mirid thresholds* (adults + nymphs/m <sup>2</sup> ) at mungbean crop values listed below (\$/t)									
	\$400	\$450	\$500	\$550	\$600	\$650	\$700	\$750	\$800	\$850
\$10	0.4	0.4	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2
\$15	0.6	0.6	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.3
\$20	0.8	0.7	0.7	0.6	0.6	0.5	0.5	0.4	0.4	0.4
\$25	1.0	0.9	0.8	0.8	0.7	0.6	0.6	0.6	0.5	0.5
\$30	1.3	1.1	1.0	0.9	0.8	0.8	0.7	0.7	0.6	0.6
\$35	1.4	1.3	1.2	1.1	1.0	0.9	0.8	0.8	0.7	0.7
\$40	1.7	1.5	1.3	1.2	1.1	1.0	1.0	0.9	0.8	0.8

\*Table based on a measured yield loss of 60 kg/ha for every mirid per square metre inflicted over a 28 day period. There is therefore no need to spray low mirid populations immediately at early flowering. Delaying sprays for low mirid populations by up to 7 days for low mirid populations will have no impact on yield, will reduce the risk of flaring helioverpa and may mean you only have to apply 1 mirid spray Cross-reference the cost of control versus the crop value to determine the economic threshold (ET), e.g. if cost of control = \$15/ha and crop value = \$600/t, the ET = 0.42. The higher the cost of control, and the lower the crop value, the higher the threshold.

Note that if dimethoate is phased out, the higher cost of the replacement thresholds will raise the thresholds considerably - e.g. x 2 or more.

# Navy beans

## Helicoverpa in podding navy beans

### Potential yield loss (beatsheet)

Navy bean crop value (\$/t)	Value of potential yield loss (\$/ha) at larval densities listed below							
	0.2/m <sup>2</sup>	0.5/m <sup>2</sup>	1/m <sup>2</sup>	1.5/m <sup>2</sup>	2/m <sup>2</sup>	2.5/m <sup>2</sup>	3/m <sup>2</sup>	3.5/m <sup>2</sup>
350	4.7	11.7	23.5	35.2	46.9	58.6	70.4	82.1
400	5.4	13.4	26.8	40.2	53.6	67.0	80.4	93.8
450	6.0	15.1	30.2	45.2	60.3	75.4	90.5	105.5
500	6.7	16.8	33.5	50.3	67.0	83.8	100.5	117.3
550	7.4	18.4	36.9	55.3	73.7	92.1	110.6	129.0
600	8.0	20.1	40.2	60.3	80.4	100.5	120.6	140.7
650	8.7	21.8	43.6	65.3	87.1	108.9	130.7	152.4
700	9.4	23.5	46.9	42.0	93.8	117.3	140.7	164.2
750	10.1	25.1	50.3	45.0	100.5	125.6	150.8	175.9
800	10.7	26.8	53.6	48.0	107.2	134.0	160.8	187.6
850	11.4	28.5	57.0	51.0	113.9	142.4	170.9	199.3

### Economic thresholds

Control cost (\$/ha)	Helicoverpa thresholds* (larvae/m <sup>2</sup> ) at navy bean crop values listed below (\$/t)									
	\$400	\$450	\$500	\$550	\$600	\$650	\$700	\$750	\$800	\$850
\$15	0.6	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.2
\$20	0.7	0.6	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.2
\$25	0.9	0.7	0.6	0.5	0.5	0.4	0.4	0.3	0.3	0.3
\$30	1.1	0.9	0.7	0.6	0.6	0.5	0.4	0.4	0.4	0.3
\$35	1.3	1.0	0.9	0.7	0.7	0.6	0.5	0.5	0.4	0.4
\$40	1.5	1.2	1.0	0.9	0.7	0.7	0.6	0.5	0.5	0.5
\$45	1.7	1.3	1.1	1.0	0.8	0.7	0.7	0.6	0.6	0.5
\$50	1.9	1.5	1.2	1.1	0.9	0.8	0.7	0.7	0.6	0.6
\$55	2.1	1.6	1.4	1.2	1.0	0.9	0.8	0.7	0.7	0.6
\$60	2.2	1.8	1.5	1.3	1.1	1.0	0.9	0.8	0.7	0.7

\* Table based on a measured yield loss of 67 kg/ha for every larva per square metre. Cross-reference the cost of control versus the crop value to determine the economic threshold (ET), e.g. if cost of control = \$35/ha and crop value = \$1000/t, the ET = 0.5.

\*\* Spray helicoverpa only if they exceed the threshold which is the break even point. The higher the const of control, and the lower the crop value, the higher the threshold

## Ready reckoner calculators

### Potential yield loss

To calculate a ready reckoner for the potential yield loss per pest

$$\text{Potential yield loss (\$/ha)} = P \times D \times V / 1000$$

Where:

P = pest number per unit of measure e.g. per 1m<sup>2</sup> beatsheet sample; or per head; or per 10 sweeps

D = yield loss per larva per sampling unit (kg/ha)

V = crop price (\$/t)

### Economic threshold

To calculate a ready reckoner for breakeven economic thresholds (pest density)

$$\text{Economic threshold (number of larvae/sampling unit)} = C \div (D \times V)$$

Where:

C = cost of control (\$/ha)

D = yield loss per larva per sampling unit (kg/ha)

V = crop price (\$/t)

### Damage (D) values

D describes the relationship between the crop damage caused by an individual pest and the compensation of the crop for the damage. The resulting value (D) is an estimate of the potential yield loss if the pest were allowed to complete its development in the crop (uncontrolled).

#### Helicoverpa

sorghum	2.4 g/larva
chickpea	2.0 g
soybean	4.0 g
mungbean	3.5 g
navy bean	6.7 g

#### Green mirid

Mungbean	6.0 g/insect
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