LARVAL ECOLOGY OF *HAEMONCHUS CONTORTUS*

FINAL REPORT: MARCH 2018

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PATTERNS OF INFECTION IN SPRING

Faecal egg counts (FECs) in lambs on pasture in 2017 were recorded for the same farm that has been used as a sentinel location since 2013; counts were analysed from June 4 to August 17. Analyses were discontinued due to removal of lambs from pasture to avoid predator problems, and to lack of continuing technical assistance. These data, however, have added to a general model of parasite prevalence on pasture over the last 6 years and the significance of variation in weather conditions in the first weeks after ewes and lambs are turned out to pasture.

Ewes were turned out to pasture in mid-May. The earliest species of nematode identified in spring, as in previous years, was the thread-necked worm, *Nematodirus battus* (Table 1). Eggs of this species are easily identifiable, and appear in the faeces within 3 weeks after turnout on this farm. Trichonstrongyle eggs appeared almost one month after turnout, and were present at low levels throughout June. When cultured for larval identification, almost all were short-tailed larvae, all or most of which were *Teladorsagia.* Only 1% were medium-tailed larvae, all or most of which are *Haemonchus,* on June 17, 21 and 27, and only 3% were in this group by June 27.

Table 1 shows the variability in FECs in random samples during this early period. There was no evidence for the marked increase in FECs associated with the highly prolific *Haemonchus,* which is consistent with the larval identifications.

Table 1: Variability in FECs in lambs, 3-7 weeks after turn out to pasture

	Trichostrongyles				*Nematodirus*			
	Prevalence	Intensity	Range		Prevalence	Intensity	Range	N
04-Jun	0	0	0		0.7	79	0-200	10
12-Jun	0.6	70	0-150		0.8	163	0-650	14
15-Jun	0.75	128	0-300		0.75	128	0-250	12
17-Jun	0.5	90	0-250		0.9	310	0-1300	75
22-Jun	0.7	192	0-500		0.5	150	0-350	20
27-Jun	0.8	106	0-200		1	330	50-950	5
28-Jun	0.8	164	0-600		0.8	332	0-1200	14

Faecal egg counts rose through July and August in 2017, and were similar to those recorded in 2016 (Fig. 1). Since animals are not turned out to pasture on the same date each year, FECs recorded by date appear more variable than if they are recorded by time from turnout (Fig. 1, 2). They start to rise 8-9 weeks after turnout (Fig. 2). This generally begins 2-3 weeks after infective larvae are first found on the pasture.

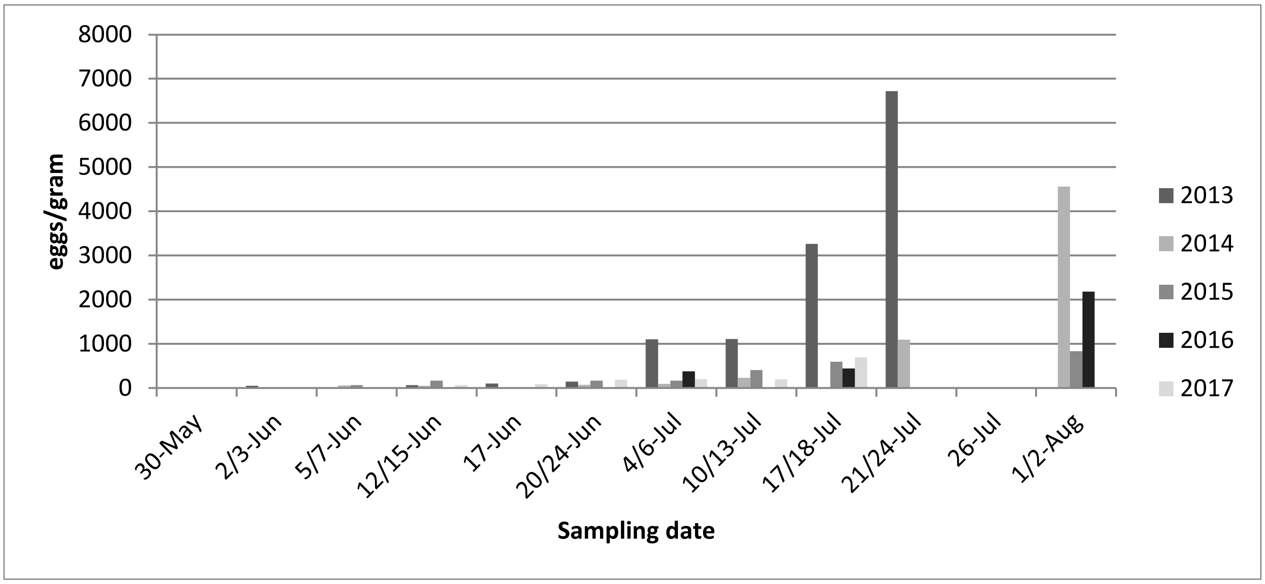

Fig. 1: Faecal egg counts in spring and summer vary considerably from year to year, depending on weather conditions in the spring and the date of turnout

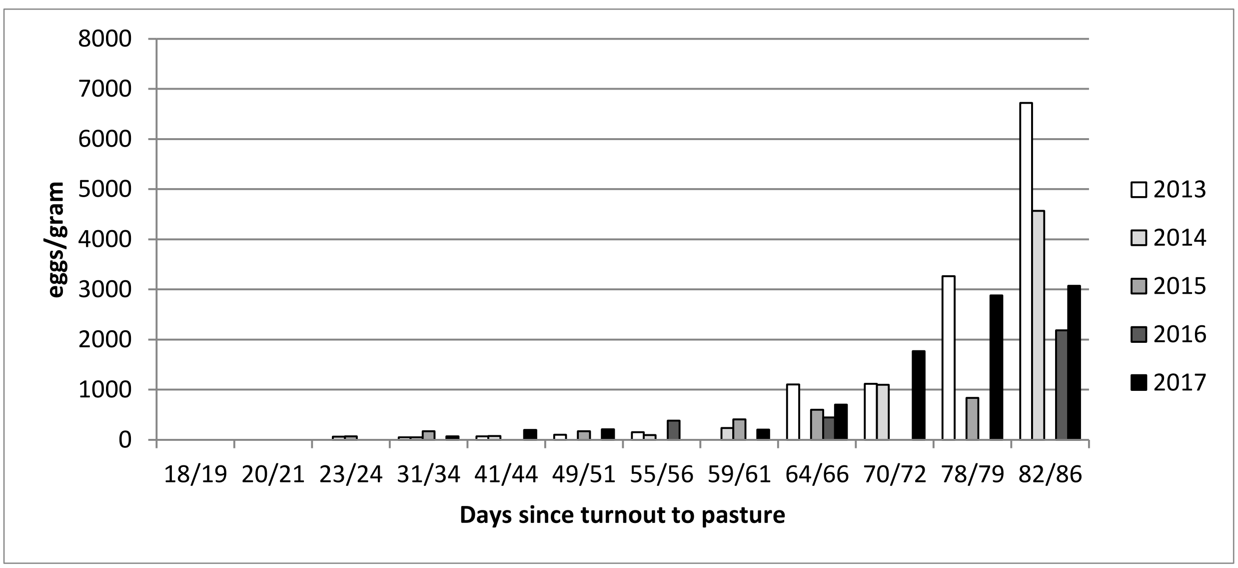

Fig. 2: Faecal egg counts show a consistent pattern over time since turnout

Many of the lambs this year had good eyelid colour (F1-2 by FAMACHA score) and did not need dosing at least until well into August. Overall, since we began our observations in 2013, we have seen two years (2013, 2014) where severe problems had developed by mid to late July, 80-85 days after turnout. In 2015-2017 we found lower FECs, which did not reach high levels until later in the season (later in August, September). At the beginning of August, counts in 2016 and 2017 were half or less compared with those in 2013, and in 2015 counts were even lower (Fig. 1, 2).

Interestingly, 3 recent years (2012, 2016, 2017) show a similar pattern, and this might represent a baseline with which to compare the marked variations seen in other years (Fig. 3).

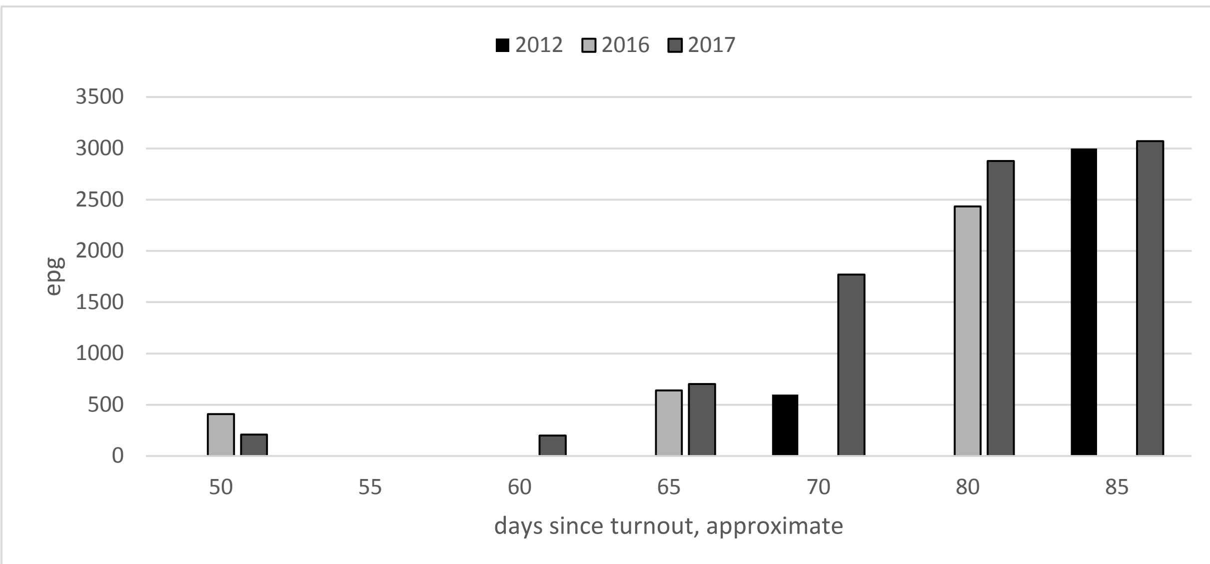

Fig. 3: Similar patterns of FEC rise in three years

In 2013 and 2014 FECs rose much higher through July, and in 2015 they were consistently lower (Fig. 1, 2). These variations correlated well with the differences in weather patterns in spring and early summer.

Temperature and moisture are the factors determining the buildup of infective larvae on the pasture. Larvae develop faster at higher temperatures, so that the buildup of infection is slower in a cool spring. Early larval stages do not survive desiccation well, but once they have reached the infective stage, they are much more resistant. Unembryonated eggs are generally less tolerant of environmental stress than hatched free-living larvae and these are less tolerant than infective third stage larvae. Infective larvae need moisture, however, in order to leave the fecal pellets and appear on the herbage; once they are outside the faeces they can survive for many weeks under temperate conditions. Temperature data from the nearest Environment Canada weather station have been compiled to give an estimate of weather variability for this farm (Fig. 4).

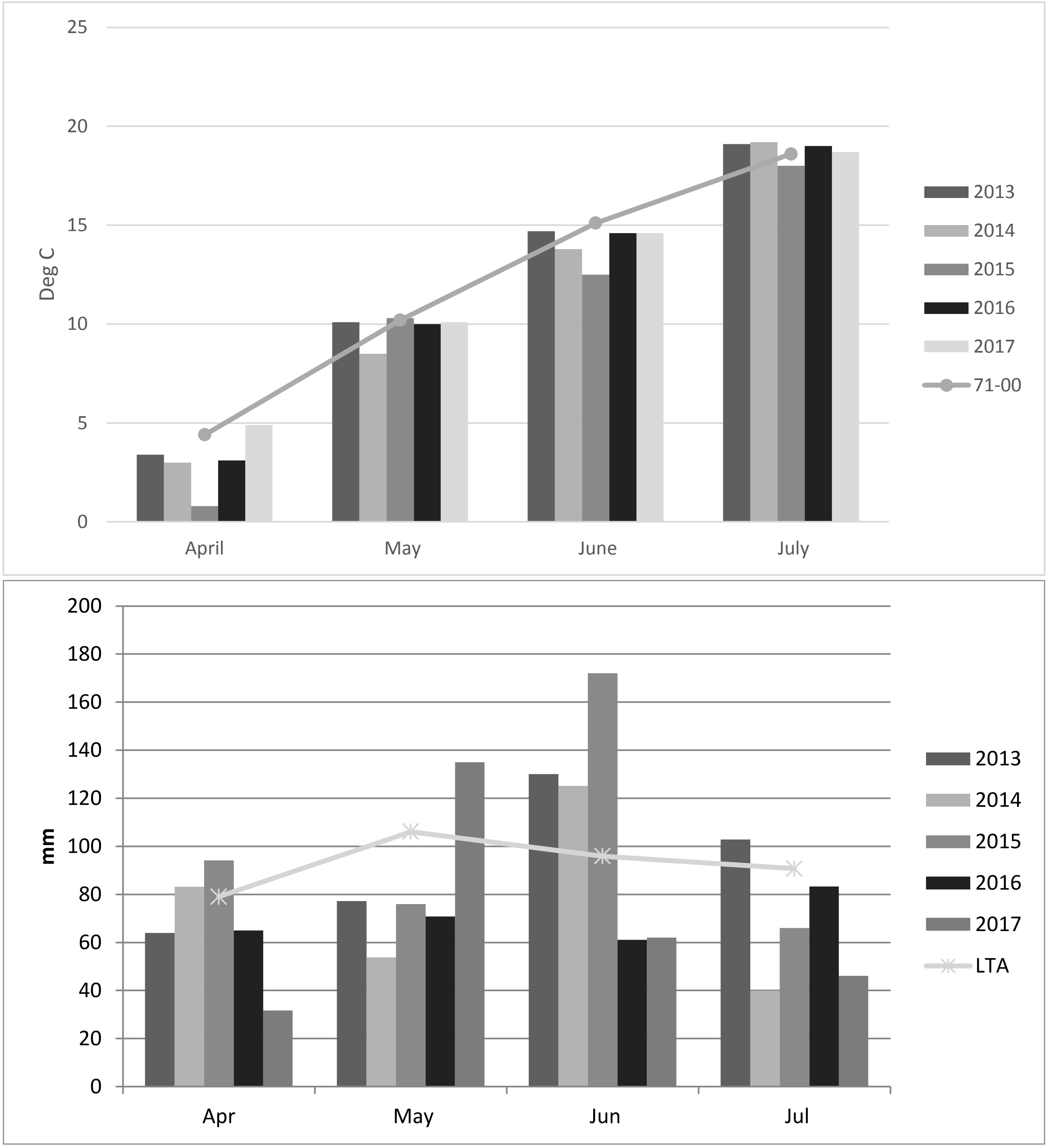

Fig. 4: Mean monthly temperature, deg. C (upper) and total monthly precipitation, mm (lower) for Environment Canada weather station Debert: 2013-2017 and long-tern average, 1971-2000

In 2016 and 2017, spring months were dry in our area; May was wetter this year but most of the rain fell before turnout, with only 37 mm falling in the second half of the month. June was dry both years, with total precipitation 61 and 62mm respectively. So, although temperatures were suitable for rapid development of the larvae, survival of the pre-infective stages was reduced in both years. In comparison, 2013 was warmer and wetter than the long-term average, and 2014 and 2015 were wetter but cooler. These results indicate that producers could monitor risk on their own farms by recording data from an appropriate Environment Canada station.

EFFICACY OF CLOSANTEL

Now that closantel (Flukiver^{TM}) is licensed in Canada, we tested this wormer on a group of lambs, following FEC's through July and August. For 19 twin lamb pairs, we randomly dosed one twin and left the other untreated as a control. After dosing on July 3, counts in the treated group remained low (an average of 350 eggs/gram on August 1, compared with almost 3,000 eggs/gram in controls) (Fig. 5). No difference in *Nematodirus* counts was seen between the two groups; this was expected since *Nematodirus* is not a blood feeder

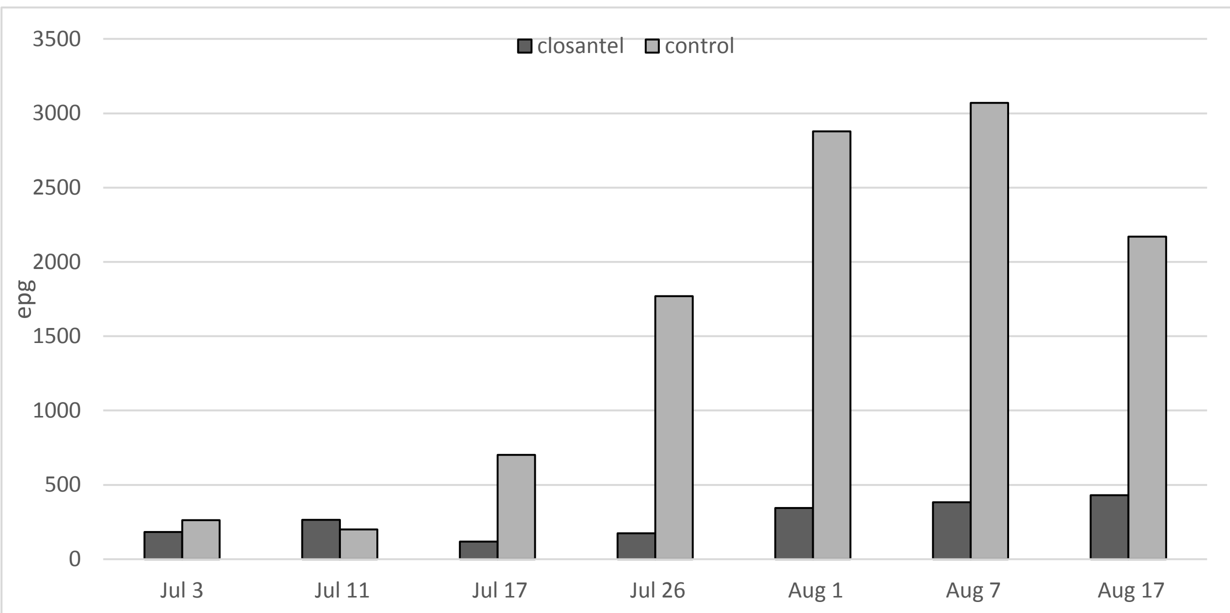

Fig. 5: Faecal egg counts in lambs dosed with closantel and in untreated controls.

Since closantel only affects the blood=feeding *Haemonchus*, FECs will not be zero in the treated group. Random faecal samples (minimum of 10 individuals) were pooled and cultured for larval identification; the results are shown in Fig. 6 and 7.

Short tailed larvae (STL) include *Teladorsagia* and *Trichostrongylus*, the main species responsible for sever souring in lambs in late summer and fall. Medium tailed larvae (MTL) are almost all *Haemonchus*, although it is possible that small numbers of less pathogenic *Cooperia* may also be present. Long tailed larvae (LTL) include the less pathogenic *Chabertia*; it is interesting that there is a clear difference in LTL between the treated and untreated group, since it was not expected that closantel would affect this species.

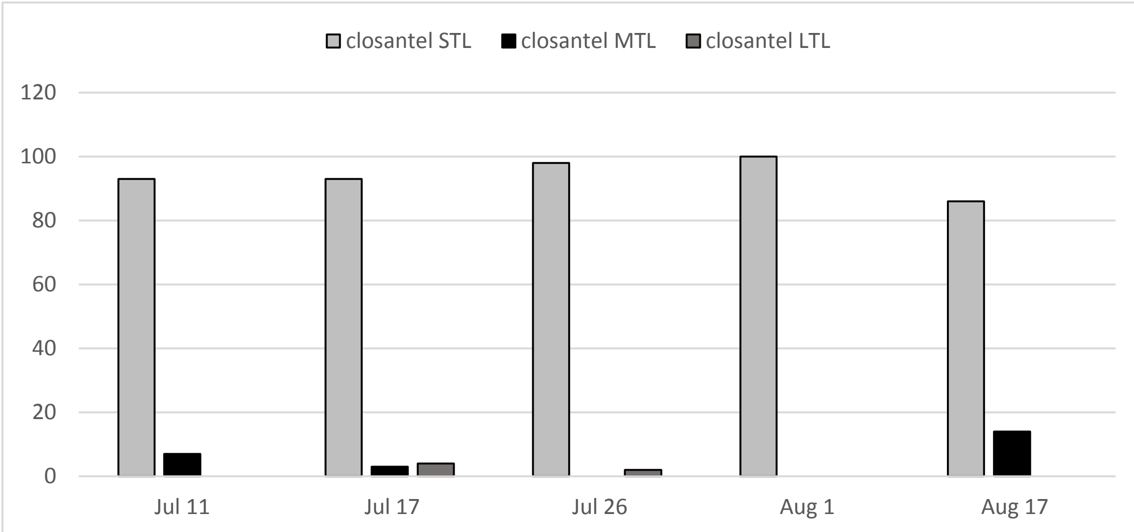

Fig. 6: Larval identification: Percent recovery of short, medium and long tailed larvae in lambs treated with closantel.

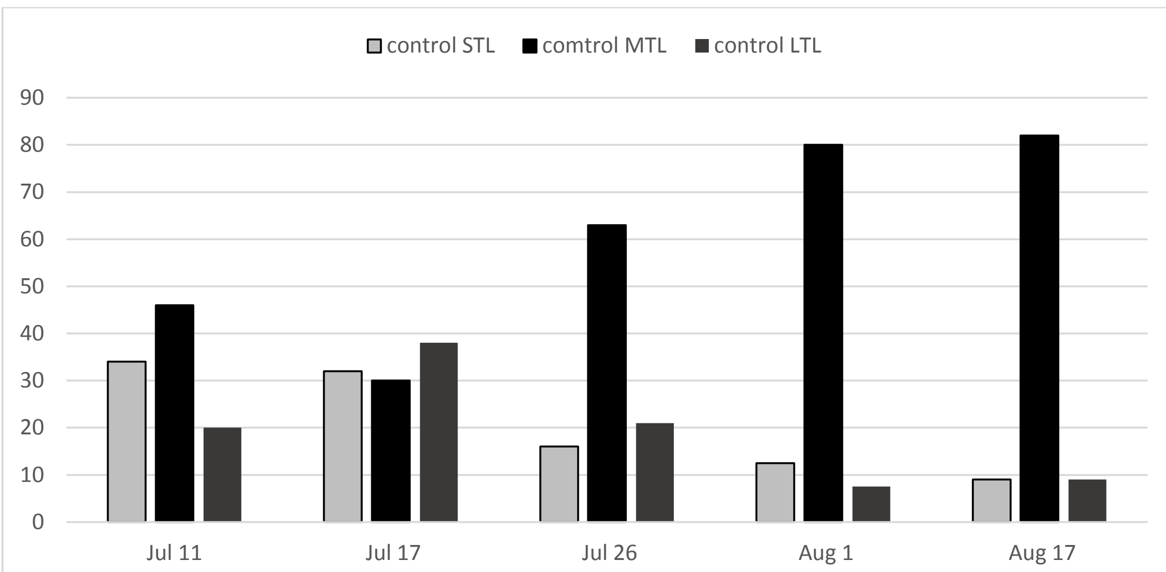

Fig. 7: Larval identification: Percent recovery of short, medium and long tailed larvae in untreated controls.

While this confirms the efficacy of closantel in preventing infection, specifically with *Haemonchus*, for about a month, the long withdrawal time is a drawback especially in years when weather conditions result in a later risk period, when they are closer to market weight.