

1 **Table 1.** Summary of the intervention message “Six steps to sound sheep” developed using current
2 best practice for treatment of sheep lame with footrot

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Step	Instruction
1	CATCH sheep within three days of becoming lame
2	INSPECT the feet clean away dirt do not trim hoof horn
3	DIAGNOSE the cause of lameness
4	TREAT all sheep with footrot or scald with antibiotic injection and spray do not trim the foot (spray alone is sufficient for lambs with scald)
5	MARK and RECORD all sheep with footrot or scald
6	CULL sheep that are repeatedly lame

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Table 2. Enrolment, allocation, follow up numbers of flocks and comparator in one-to-one, group and postal intervention studies

	One to one	Group	Postal
Enrolment 2013	32 flocks	78 flocks	1081 flocks
Allocation	Targeted	Stratified by geographical region then random invitation	Stratified by region, random invitation
Loss to follow up after 10 months	2 flocks	23 flocks	280 flocks
Useable responses	29 (91%)	51 (65%)	779 (72%)
Comparator			
2013 to 2014	Within flock	Within flock	Within flock
Trial arm	n/a	n/a	Between flock, stratified random allocation
Gain versus loss messages	n/a	n/a	Between flock, stratified random allocation
Repeated and seasonal messages	n/a	n/a	Between flock, stratified random allocation
Latent class	n/a	n/a	Between flock

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Table 3. Global mean, geometric mean (GM) and 95% confidence intervals and within flock proportional and percentage change in the prevalence of lameness between 2013 and 2014 for (a) 859 flocks and (b) 381 flocks with 5 – 15% lameness in 2013 by intervention type and within the postal trial by trial arm (TA), gain and loss framed messages and latent class

Year	No.	Global mean (%)		Geometric mean (%)		95% confidence interval of GM		Mean within flock absolute change in lameness (%)	Mean within flock proportional reduction in lameness (%)
		2013	2014	2013	2014	2013	2014	2014 - 2013	2014 - 2013
<i>a) All flocks</i>									
Overall	859	5.2	4.3	3.7	3.3	3.5 – 3.8	3.1 – 3.4	-0.85	22
One-to-one	29	8.4	5.3	7.6	4.3	7.1 – 8.2	3.6 – 5.0	-3.05	35
Group	51	5.7	4.0	4.5	3.1	3.9 – 5.0	2.4 – 3.7	-1.64	27
TA1 (control)	119	5.6	4.5	3.6	3.3	3.1 – 4.1	2.9 – 3.7	-1.03	20
TA2	119	4.6	4.3	3.6	3.5	3.1 – 3.8	3.2 – 4.0	-0.34	21
TA3	102	4.9	4.2	3.5	3.2	3.0 – 4.0	2.8 – 3.6	-0.70	21
TA4	110	4.3	4.0	3.4	3.1	3.1 – 3.8	2.7 – 3.5	-0.29	20
TA5	117	5.3	4.2	3.9	3.0	3.5 – 4.3	2.6 – 3.4	-1.16	23
TA6	107	5.2	4.5	3.5	3.4	3.0 – 4.0	2.9 – 3.8	-0.76	17
TA7	105	5.0	4.3	3.2	3.2	2.7 – 3.7	3.1 – 3.3	-0.70	28
Postal total	779	5.0	4.3	3.5	3.2	3.4 – 3.7	3.1 – 3.4	-0.71	21
TA Loss	331	4.6	4.2	3.5	3.2	3.3 – 3.7	3.0 – 3.5	-0.43	20
TA Gain	329	5.2	4.3	3.5	3.2	3.3 – 3.8	2.9 – 3.4	-0.88	22
Postal TA2-7	660	4.9	4.3	3.5	3.2	3.3 – 3.7	3.1 – 3.4	-0.67	22
LC1	94	4.0	3.4	2.8	2.6	2.3 – 3.3	2.1 – 3.0	-0.66	19
LC2	476	5.1	4.3	3.6	3.2	3.3 – 3.8	3.0 – 3.4	-0.75	19
LC3	289	5.7	4.6	4.2	3.5	3.9 – 4.5	3.3 – 3.7	-1.08	28
<i>b) Flocks with 5 -15% lameness in 2013</i>									
Overall	381	7.2	5.4	6.7	4.3	6.6 – 6.9	4.1 – 4.5	-1.84	30
Group	28	7.1	4.6	6.7	3.5	6.2 – 7.3	2.6 – 4.4	-2.52	31
One-to-one	27	8.1	5.4	7.5	4.4	6.9 – 8.0	3.6 – 5.1	-2.61	35
TA1 (control)	51	7.2	6.4	6.7	4.8	6.3 – 7.1	4.2 – 5.4	-0.77	26
TA2	56	7.0	5.2	6.5	4.4	6.1 – 6.9	3.9 – 4.9	-1.89	34
TA3	37	7.0	4.7	6.6	4.2	6.1 – 7.0	3.7 – 4.8	-2.23	31
TA4	42	6.6	5.0	6.2	4.0	5.8 – 6.6	3.4 – 4.6	-1.56	28
TA5	55	7.6	5.3	7.0	3.7	6.6 – 7.4	3.0 – 4.3	-2.33	26
TA6	44	7.6	5.5	7.0	4.6	6.6 – 7.5	4.1 – 5.1	-2.16	31
TA7	41	7.0	5.9	6.5	4.8	6.1 – 7.0	4.1 – 5.4	-1.04	36
Postal total	326	7.2	5.4	6.7	4.3	6.5 – 6.8	4.1 – 4.5	-1.72	30
TA Loss	135	6.9	5.0	6.4	4.2	6.2 – 6.7	3.9 – 4.5	-1.88	31
TA Gain	140	7.4	5.5	6.9	4.2	6.6 – 7.1	3.9 – 4.6	-1.90	30
Postal TA2-7	275	7.2	5.3	6.6	4.2	6.5 – 6.8	4.0 – 4.5	-1.89	31
LC1	31	6.2	4.8	5.9	3.7	5.4 – 6.4	3.0 – 4.5	-1.39	25
LC2	211	7.3	5.2	6.8	4.2	6.6 – 7.0	3.9 – 4.4	-2.12	28
LC3	139	7.3	5.8	6.8	4.5	6.6 – 7.0	4.2 – 4.9	-1.51	35

41 LC: Latent class; LC1: ‘best practice’; LC 2: ‘slow to act’; LC3: ‘slow to act and delayed culling’; TA: postal
42 intervention trial arm; TA Loss: TA 2 – 4 loss framed message(s); TA Gain: TA 5 – 7 gain framed message(s),
43 TA2 and 5 one message, TA3 and 6 three identical messages TA4 and 7, three seasonal messages

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45 **Table 4.** Reliable change index number (N) and percentage (%) of (a) 859 flocks and (b) 381 flocks
 46 with 5 – 15% lameness in 2013 with decreased increased or no change in within flock prevalence of
 47 lameness between 2013 and 2014 by intervention latent class and gain and loss framed messages
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	Number and significance*	Significant decrease		Significant increase		No significant change	
		N	%	N	%	N	%
<i>a) All flocks</i>							
Overall	859*	383	44.6	259	30.2	217	25.3
Postal	779*	334	42.9	247	31.7	198	25.4
Postal minus control	660*	284	43.0	207	31.4	169	25.6
Group	51*	28	54.9	11	21.6	12	23.5
One-to-one	29*	21	72.4	1	3.5	7	24.1
LC1	94	36	38.3	32	34.0	26	27.7
LC2	476*	205	43.1	148	31.1	123	25.8
LC3	289*	142	49.1	79	27.3	68	23.5
TA1 (control)	119	47	39.5	37	31.1	35	29.4
TA2	119	47	39.5	36	30.3	36	30.3
TA3	102*	48	47.1	29	28.4	25	24.5
TA4	110	46	41.8	36	32.7	28	25.5
TA5	117*	56	47.9	32	27.4	29	24.8
TA6	107	45	42.1	37	34.6	25	23.4
TA7	105	42	40.0	37	35.3	26	24.8
TA Loss	331*	141	42.6	101	30.5	89	26.9
TA Gain	329*	143	43.5	106	32.2	80	24.3
<i>b) Flocks with 5 -15% lameness in 2013</i>							
Overall	381*	249	65.4	47	12.3	85	22.3
Postal (TA1 – 7)	326*	211	64.7	43	13.2	72	22.1
Postal (TA2 – 7)	275*	179	65.1	33	12.0	63	22.9
Group	28*	19	67.9	3	10.7	6	21.4
One-to-one	27*	19	70.4	1	3.7	7	25.9
LC1	31*	20	64.5	5	16.1	6	19.4
LC2	211*	136	64.5	21	10.0	54	25.6
LC3	139*	93	66.9	21	15.1	25	18.0
TA1 (control)	51*	32	62.8	10	19.6	9	17.7
TA2	56*	34	60.7	4	7.1	18	32.1
TA3	37*	24	64.9	2	5.4	11	29.7
TA4	42*	27	64.3	4	9.5	11	26.2
TA5	55*	41	74.6	6	10.9	8	14.6
TA6	44*	28	63.6	9	20.5	7	15.9
TA7	41*	25	61.0	8	19.5	8	19.5
TA Loss	135*	85	63.0	40	29.6	10	7.4
TA Gain	140*	94	67.1	23	16.4	23	16.4

49 LC: Latent class; LC1: used best practice; LC 2: slow to act; LC3: slow to act and delayed culling; TA: Trial
 50 arm; TA Loss: TA 2 – 4 loss framed message(s); TA Gain: TA 5 – 7 gain framed message(s); * Chi-Square
 51 Goodness-of-Fit test $P < 0.05$.

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Table 5. Statistically significant changes in farmers' responses to management and opinion statements between 2013 and 2014 by one-to-one, group and postal intervention type

	2013		2014		Farmer change in responses				Total N
	Mean	Mode	Mean	Mode	decrease		increase		
					N	%	N	%	
Did you trim the feet of ewes lame with footrot? Never (1) Sometimes (2) Usually (3) Always (4)									
One-to-one*	3.0	2	2.1	2	18	72.0	1	4.0	25
Group*	3.0	4	2.5	2	21	50.0	6	14.3	42
Postal without TA1*	3.1	4	2.6	2	272	46.9	51	8.8	580
TA1 (control)*	3.2	4	2.9	3	38	36.5	11	10.6	104
Did you trim the feet of lambs lame with footrot? Never (1) Sometimes (2) Usually (3) Always (4)									
One-to-one *	2.6	2	1.7	2	15	55.6	1	3.7	27
Group*	2.3	2	1.6	1	20	50.0	3	7.5	40
Postal without TA1*	2.3	2	1.8	2	230	44.0	54	10.3	523
TA1 (control)*	2.4	2	1.9	2	37	43.5	11	12.9	85
How many times did you routinely foot trim your flock? Never (1) Once (2) Twice (3) More than twice (4)									
One-to-one	1.5	1	1.4	1	5	17.2	3	10.3	29
Group*	2.1	2	1.6	1	16	31.4	1	2.0	51
Postal without TA1*	1.8	1	1.7	1	143	22.4	68	10.7	638
TA1 (control)	1.9	2	1.8	2	27	23.3	18	15.5	116
Approximately what percentage of sheep did you trim at a routine foot trim? <25% (1) 25% (2) 50% (3) 75% (4) 100% (5)									
One-to-one *	3.0	5	1.5	1	7	70.0	0	0.0	10
Group*	3.6	5	2.8	1	12	40.0	5	16.7	30
Postal without TA1*	3.0	5	2.3	1	106	32.2	45	13.7	329
TA1 (control)*	3.1	5	2.5	1	18	25.7	9	12.9	70
Did you treat ewes lame with footrot with an antibiotic injection? Never (1) Sometimes (2) Usually (3) Always (4)									
One-to-one *	2.9	3	3.2	4	3	11.1	11	40.7	27
Group	2.9	4	2.9	3	12	28.6	11	26.2	42
Postal without TA1*	2.6	2	2.7	2	109	18.5	155	26.3	589
TA1 (control)	2.7	3	2.7	2	28	27.5	18	17.6	102
Footrot is caused by overgrown horn on the feet Strongly disagree (1) Disagree (2) Neither agree nor disagree (3) Agree (4) Strongly agree (5)									
One-to-one *	3.3	4	2.8	2	14	48.3	2	6.9	29
Group*	2.9	2	2.4	2	20	42.6	5	10.6	47
Postal without TA1*	3.1	4	2.7	2	279	43.1	100	15.4	648
TA1 (control) *	3.0	4	2.7	2	36	31.9	19	16.8	113
When a sheep is lame with footrot trimming the foot will delay healing Strongly disagree (1) Disagree (2) Neither agree nor disagree (3) Agree (4) Strongly agree (5)									
One-to-one *	2.5	2	3.3	4	5	17.9	17	60.7	28
Group*	2.4	2	3.2	3	5	10.6	29	61.7	47
Postal without TA1*	2.3	2	2.8	3	83	12.7	303	46.5	652
TA1 (control)	2.3	2	2.5	2	22	19.3	34	29.8	114
Even mildly lame sheep with footrot should be treated with antibiotic injection Strongly disagree (1) Disagree (2) Neither agree nor disagree (3) Agree (4) Strongly agree (5)									
One-to-one *	2.9	4	3.9	4	2	6.9	19	65.5	29
Group	3.2	4	3.5	4	15	32.6	21	45.6	46
Postal without TA1*	3.0	2	3.1	4	152	23.5	220	33.9	648
TA1 (control)	2.9	2	3.1	2	29	25.0	34	29.3	116
How many sheep in the group would have had to be lame (at the lowest locomotion score you caught sheep for treatment) for you to catch them and treat them? 1 (1) 2-5 (2) 6-10 (3) >10 (4) did not treat individuals (5)									
One-to-one *	2.9	3	2.3	2	15	51.7	4	13.8	29
Group	2.1	2	2.0	2	13	26.5	10	20.4	49
Postal without TA1	2.3	2	2.3	2	163	25.5	145	22.7	638

TA1 (control)	2.5	2	2.3	2	38	33.6	29	25.7	113
When you saw lame sheep how soon did you treat them?									
First day (1) Within 3 days (2) Within 1 week (3) Within 2 weeks (4) >2 weeks (5) did not treat individuals (6)									
One-to-one	3.2	3	3.0	3	11	37.9	4	13.8	29
Group*	2.5	2	2.2	2	13	26.5	3	6.1	49
Postal without TA1	2.5	2	2.5	2	135	21.1	132	20.6	640
TA1 (control)	2.7	3	2.6	2	31	26.3	23	19.5	118
Generally how easy did you find it to catch an individual lame sheep?									
Very difficult (1) Difficult (2) Neither easy nor difficult (3) Easy (4) Very easy (5)									
One-to-one	2.6	2	2.8	3	4	13.8	8	27.6	29
Group	3.1	3	2.9	3	18	36.0	11	22.0	50
Postal without TA1*	2.9	3	2.8	3	151	23.7	117	18.4	636
TA1 (control)	2.8	3	2.7	3	26	22.4	25	21.6	116
Sheep that are repeatedly lame with footrot should be culled									
Strongly disagree (1) Disagree (2) Neither agree nor disagree (3) Agree (4) Strongly agree (5)									
One-to-one	4.3	5	4.4	5	4	13.8	6	20.7	29
Group	4.2	4	4.3	5	5	10.9	11	23.9	46
Postal without TA1*	4.2	4	4.3	4	103	15.8	157	24.2	650
TA1 (control)	4.1	4	4.2	4	17	14.8	29	25.2	115
Having footrot in my flock makes me feel angry									
Strongly disagree (1) Disagree (2) Neither agree nor disagree (3) Agree (4) Strongly agree (5)									
One-to-one	2.4	2	2.8	3	4	14.8	10	37.0	27
Group*	3.0	3	3.3	3	4	8.9	11	24.4	45
Postal without TA1*	2.7	3	2.9	3	122	19.3	216	34.2	631
TA1 (control)	2.7	3	3.0	3	21	18.9	33	29.7	111
Having footrot in my flock makes me feel miserable									
Strongly disagree (1) Disagree (2) Neither agree nor disagree (3) Agree (4) Strongly agree (5)									
One-to-one *	3.0	4	3.4	4	5	17.9	15	53.6	28
Group	3.6	3	3.7	3	12	26.7	12	26.7	45
Postal without TA1*	3.2	3	3.4	3	113	17.7	203	31.8	639
TA1 (control)	3.3	3	3.4	4	26	23.0	32	28.3	113

59 N: number; %: percentage; decrease: *N* and % of 2014 responses moving down the scale from 2013; increase: *N*
60 and % of 2014 responses moving up the scale from 2013 * = $P < 0.05$

61 **Table 6.** Over-dispersed Poisson regression model of the number of lame ewes in 2014 in
 62 326 flocks with 5 – 15% lameness in 2013 by postal trial arm
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Variables	Number	Relative risk	Lower 95% CI	Upper 95% CI
Intercept				
Log10 flock size	326	0.86	0.67	1.11
GM % lame ewes in 2013	326	1.08	1.05	1.10
Trial arm 1	51	baseline		
Trial arm 2	56	0.69	0.53	0.91
Trial arm 3	37	0.67	0.51	0.89
Trial arm 4	42	0.71	0.54	0.93
Trial arm 5	55	0.66	0.51	0.84
Trial arm 6	44	0.75	0.58	0.96
Trial arm 7	41	0.82	0.63	1.08
Latent class 3	119	baseline		
Latent class 1	23	1.17	0.88	1.54
Latent class 2	184	0.86	0.74	1.01

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 65 Latent class farmer categories: 1 ‘best practice’; 2 ‘slow to act’; 3 ‘slow to act and delayed culling’. Trial arm; 2
 66 – 4 loss framed message(s); TA 5 – 7 gain framed message(s); GM: Geometric mean, % percentage; SE:
 67 Standard error of the geometric mean; CI: confidence interval
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71 **Table 7.** Attributable fraction and population attributable fraction by management factors associated
 72 with proportion of lame sheep on 1294 English farms in 2013 and a subset of 884 flocks in 2014
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Management	AFe (%) 2013	AFp(%) 2013	AFe(%) 2014 ¹
Lowest locomotion score at which the farmer recognised sheep were lame: 2 compared with 1	16.0	5.6	5.7
Number of sheep in the group lame when farmers treated them: 6 – 10 compared with 1	22.0	4.0	4.3
Number of sheep in the group lame when farmer treated >10 compared with 1	29.0	4.4	2.7
Time to treatment of lame sheep: ≤ 1 week compared with <3 days	26.0	10.0	9.7
Time to treatment of lame sheep: > 1 week compared with <3 days	30.0	3.3	2.6
Catching individual lame sheep difficult or very difficult compared with easy	15.0	4.9	5.0
Using a dog to catch individual lame sheep compared with not using a dog	17.0	2.4	NA
Using footbathing to treat ewes lame with footrot vs not footbathing to treat footrot	12.0	4.3	NA
Footbathing ewes at turnout versus not footbathing at turnout	24.0	1.1	1.6
Footbathing new sheep on arrival versus not footbathing on arrival	15.0	2.6	3.1
Rely on memory to identify sheep previously lame sheep for culling versus not relying on memory	18.0	2.4	NA
Sheep left the farm then returned for shows versus not doing this practice	23.0	1.3	NA
Sheep left the farm then returned for summer grazing versus not doing this practice	16.0	2.4	NA
1 - < 5% sheep / year feet bled during routine foot trimming versus no routine foot trimming practised	25.0	5.6	4.1
5 - < 10% sheep / year feet bled during routine foot trimming versus no routine foot trimming practised	28.0	1.8	1.0
≥ 10% sheep / year feet bled during routine foot trimming versus no routine foot trimming practised	41.0	2.1	1.2
NOT catching sheep in the corner of a field versus using a corner of a field to catch sheep	12.3	3.7	NA
NOT using footbath to prevent interdigital dermatitis (ID) versus using a footbath to prevent ID	13.0	4.6	NA
NOT avoiding selecting breeding ewes to sell from mothers that were repeatedly lame versus using this management	23.1	0.7	NA
NOT vaccinating ewes with footvax once per year versus vaccinating once per year	20.0	3.3	3.3
NOT sometimes check feet of new sheep on arrival versus checking	18.7	2.3	NA
NOT isolating new sheep on arrival for > 3 weeks versus isolating	18.0	4.9	5.3
NO sheep sent market and returned versus using this practice	28.1	0.7	NA
Farm location: NOT hill versus hill	30.1	0.8	NA

Farm location: NOT lowland versus lowland	18.0	15.7	NA
Organic status: NOT organic versus organic	31.0	1.6	NA
NOT producing breeding stock for sale versus producing breeding stock	13.0	3.5	NA
	<i>Total</i>	<i>100</i>	<i>49.6</i>

74 AFe: Attributable fraction (exposed); AFp: Population attributable fraction; ¹: AFps are calculated using the
75 numbers of farms using this management practice in 2014; NA: this question was not included in the 2014
76 questionnaire and so AFp for 2014 cannot be calculated.

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