
Associations of Climatic Variables with Health Problems in Dairy Sheep Farms in Greece

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Table S1. The questionnaire used for collection of information during visits to 325 sheep farms in Greece.

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Table S2. Details of multivariable models ($n = 4$) employed for the evaluation of associations with the incidence rate of mastitis, abortion, lamb pneumonia or lamb diarrhoea in 325 sheep flocks in Greece.

Outcome	Variables		
	assessed in univariable analyses (n)	offered to the multi-variable models (n)	required in the final models
Incidence rate of abortion in sheep farms	29	6	(a) Precipitation for the year preceding the visit
Incidence rate of clinical mastitis in sheep farms	32	4	(a) No. of ewes on farms, (b) Vaccination against staphylococcal mastitis
Incidence rate of lamb pneumonia in sheep farms	38	16	(a) Availability of a separate barn for lambs, (b) Proximity to industrial sites, (c) Age for lamb removal from their dams, (d) Minimum temperature at 2 m for the year preceding the visit, (e) Maximum temperature at 2 m for the year preceding the visit, (f) Temperature range at 2 m for the year preceding the visit, (g) Precipitation for the year preceding the visit
Incidence rate of lamb diarrhoea in sheep farms	36	16	(a) Routine prophylactic administration of antibiotics to newborn lambs, (b) Maximum temperature at 2 m for the year preceding the visit, (c) Temperature range at 2 m for the year preceding the visit

Table S3. Results of univariable analysis for predictors of incidence rate of abortion in 325 sheep flocks in Greece.

Variable	r_{sp}	p
Management system applied in farm	0.017	0.76
Total grazing land by the farm animals	-0.019	0.73
No. of adult animals on farms	-0.017	0.76
Breed of animals	0.042	0.46
Month of the start of the lambing season	0.064	0.25
Total milk quantity obtained during the preceding milking period	-0.021	0.71
Average number of lambs born per ewe during the preceding lambing season	0.055	0.32
Common grazing of sheep with wildlife ruminants	0.109	0.049
Presence of cats on farm	0.026	0.64
No. of cats on farm	0.016	0.77
Duration of grazing annually	-0.073	0.19
Average age of culling ewes	0.142	0.010
Collaboration with a veterinarian	-0.014	0.80
Administration of oxytetracycline to the pregnant animals (yes / no)	-0.016	0.78
Source of replacement animals	-0.035	0.53
Vaccination against <i>Chlamydia</i> infection	-0.046	0.41
Age of farmer	-0.017	0.76
Length of previous animal farming experience	-0.017	0.76
Highest general education level achieved	-0.091	0.10
Farmer by profession	-0.067	0.23
Daily period of presence at the farm	0.080	0.15
Family tradition in farming	0.050	0.37
Presence of working staff at the farm	-0.065	0.24
Temperature at 2 m for the year preceding the visit	0.011	0.85
Temperature of Earth skin for the year preceding the visit	0.003	0.96
Minimum temperature at 2 m for the year preceding the visit	-0.011	0.84
Maximum temperature at 2 m for the year preceding the visit	-0.061	0.27
Temperature range at 2 m for the year preceding the visit	-0.019	0.73
Relative humidity at 2 m for the year preceding the visit	0.008	0.89
Precipitation for the year preceding the visit	0.080	0.15
Wind speed at 10 m for the year preceding the visit	-0.008	0.89

Table S4. Results of univariable analysis for predictors of incidence rate of clinical mastitis in 325 sheep flocks in Greece.

Variable	r_{sp}	p
Management system applied in farm	−0.001	0.98
Availability of a milking parlour	−0.017	0.77
No. of adult animals on farms	−0.200	0.0003
Breed of animals	−0.001	0.98
Month of the start of the lambing season	0.048	0.39
Total milk quantity obtained during the preceding milking period	0.070	0.21
Average age of culling ewes	0.010	0.86
Collaboration with a veterinarian	−0.032	0.57
Use of laboratory diagnostic examinations in samples of milk	0.027	0.63
Daily number of milking sessions	0.053	0.34
Use of teat disinfection after milking	0.008	0.89
Method for drying-off at the end of the lactation period	0.018	0.75
Administration of ‘dry-ewe’ treatment at the end of the lactation period	0.101	0.07
Duration of the dry-period	0.015	0.79
Age for lamb removal from their dams	0.008	0.89
Vaccination against staphylococcal mastitis	0.149	0.007
Vaccination against contagious agalactia	0.029	0.60
Age of farmer	0.005	0.93
Length of previous animal farming experience	0.018	0.75
Highest general education level achieved	−0.171	0.002
Farmer by profession	0.013	0.82
Daily period of presence at the farm	0.032	0.56
Family tradition in farming	0.021	0.71
Presence of working staff at the farm	−0.030	0.59
Temperature at 2 m for the year preceding the visit	0.021	0.71
Temperature of Earth skin for the year preceding the visit	0.017	0.75
Minimum temperature at 2 m for the year preceding the visit	0.022	0.70
Maximum temperature at 2 m for the year preceding the visit	−0.019	0.74
Temperature range at 2 m for the year preceding the visit	−0.020	0.71
Relative humidity at 2 m for the year preceding the visit	−0.020	0.71
Precipitation for the year preceding the visit	0.023	0.68
Wind speed at 10 m for the year preceding the visit	0.033	0.56

Table S5. Results of univariable analysis for predictors of incidence rate of lamb pneumonia in 325 sheep flocks in Greece.

Variable	r_{sp}	p
Management system applied in farm	−0.045	0.41
Altitude at the location of farm	0.015	0.78
Availability of a separate barn for lambs	−0.141	0.011
Availability of a dedicated lambing area	−0.003	0.95
Proximity to industrial sites	0.169	0.002
No. of adult animals on farms	0.070	0.21
Breed of animals	−0.002	0.97
Month of the start of the lambing season	−0.062	0.26
Average number of lambs born per ewe during the preceding lambing season	−0.065	0.24
Average age of culling ewes	−0.059	0.29
Application of reproductive management	−0.017	0.76
Collaboration with a veterinarian	−0.039	0.49
Total visits made annually by veterinarians to the farm during the preceding season	0.036	0.52
Administration of selenium to pregnant animals	0.016	0.77
Administration of selenium to newborn animals	0.046	0.41
Newborn care and specific monitoring	0.059	0.29
Maintenance of a colostrum bank	−0.045	0.42
Lamb fostering to female animals other than their dams	−0.024	0.67
Age for lamb removal from their dams	−0.073	0.19
Administration of milk replacer to lambs	0.100	0.07
Routine prophylactic administration of antibiotics to newborn lambs	0.169	0.0004
Vaccination against bacterial respiratory infections	0.102	0.07
Annual frequency of systemic disinfections in the farm	0.010	0.85
Age of farmer	−0.140	0.012
Length of previous animal farming experience	−0.139	0.012
Highest general education level achieved	−0.033	0.55
Farmer by profession	0.123	0.027
Daily period of presence at the farm	0.035	0.53
Family tradition in farming	−0.020	0.72
Presence of working staff at the farm	0.107	0.06
Temperature at 2 m for the year preceding the visit	0.019	0.74
Temperature of Earth skin for the year preceding the visit	0.026	0.65
Minimum temperature at 2 m for the year preceding the visit	0.131	0.018
Maximum temperature at 2 m for the year preceding the visit	−0.085	0.13
Temperature range at 2 m for the year preceding the visit	−0.129	0.020
Relative humidity at 2 m for the year preceding the visit	0.098	0.08
Precipitation for the year preceding the visit	0.103	0.07
Wind speed at 10 m for the year preceding the visit	0.087	0.12

Table S6. Results of univariable analysis for predictors of incidence rate of lamb diarrhoea in 325 sheep flocks in Greece.

Variable	r_{sp}	p
Management system applied in farm	−0.061	0.27
Availability of a separate barn for lambs	−0.062	0.27
Availability of a dedicated lambing area	0.028	0.61
Total grazing land by the farm animals	−0.025	0.65
No. of adult animals on farms	0.016	0.78
Breed of animals	−0.016	0.78
Month of the start of the lambing season	0.110	0.049
Total milk quantity obtained during the preceding milking period	0.072	0.19
Average number of lambs born per ewe during the preceding lambing season	−0.053	0.34
Common grazing of sheep with wildlife ruminants	0.187	0.0007
Collaboration with a veterinarian	−0.061	0.27
Administration of selenium to pregnant animals	−0.042	0.45
Administration of selenium to newborn animals	0.097	0.08
Newborn care and specific monitoring	0.001	0.98
Maintenance of a colostrum bank	−0.008	0.89
Lamb fostering to female animals other than their dams	0.006	0.91
Age for lamb removal from their dams	−0.097	0.08
Administration of milk replacer to lambs	−0.021	0.70
Routine prophylactic administration of antibiotics to newborn lambs	0.085	0.13
Vaccination against clostridial infections	0.021	0.57
Annual frequency of systemic disinfections in the farm	0.038	0.49
Age of farmer	−0.098	0.08
Length of previous animal farming experience	−0.064	0.25
Highest general education level achieved	−0.084	0.13
Farmer by profession	0.011	0.85
Daily period of presence at the farm	0.056	0.32
Family tradition in farming	−0.095	0.09
Presence of working staff at the farm	0.011	0.84
Temperature at 2 m for the year preceding the visit	0.077	0.16
Temperature of Earth skin for the year preceding the visit	−0.105	0.06
Minimum temperature at 2 m for the year preceding the visit	−0.195	0.0003
Maximum temperature at 2 m for the year preceding the visit	0.230	< 0.0001
Temperature range at 2 m for the year preceding the visit	0.170	0.002
Relative humidity at 2 m for the year preceding the visit	−0.201	0.0003
Precipitation for the year preceding the visit	0.069	0.22
Wind speed at 10 m for the year preceding the visit	−0.228	< 0.0001

Figure S1. Cross-plot of the incidence rate of lamb diarrhoea in 325 sheep farms in Greece, in accordance with the annual temperature range at the location of the farms and the routine administration of antibiotics to lambs (green dots: farms with no routine administration of antibiotics, red dots: farms with routine administration of antibiotics) (dashed lines are respective trendlines).

