Hygiene of Bulk-tank parlors and milk quality of dairy sheep farms in Thrace

Tzatzimakis, G[1]., Alexopoulos, A[2]., Bezirtzoglou, E[2]., Sinapis, E[3]., **Abas, Z[1].**

[1]Faculty of Agricultural Development, Laboratory of Animal Science, **Democritus University of Thrace,** Orestiada, GR68 100, Greece

[2]Faculty of Agricultural Development, Laboratory of Microbiology, Biotechnology & Hygiene. **Democritus University of Thrace** Orestiada, GR68 100, Greece

[3] Department of Animal Production, Faculty of Agriculture, Aristotle University, 54006 Thessaloniki, Greece

OBJECTIVE of the RESEARCH

- **The aim of this study was the monitoring of milk quality produced in dairy ewe's farms from the regions of Xanthi and Evros, in the north-eastern Greece**

- **Survey of the microbial status in the bulk tank of the diary sheep farm.**

- **Exploring the relationship of current farm characteristics and management practices with the quality of milk**

Material and methods

Material of the research

- ✓ **21 flock with sheep dairy in the prefectures of Xanthi and Evros**
- ✓ **Milk samples were collected form every flock**
- ✓ *Season of sample collection:* **March-June 2008**
- ✓ *Sampling of milk:* **every 15 days**
- ✓ **The questionnaire was conducted by personal interview of the owners of the farm**
- ✓ **Farm inspection and graded the cleanliness of the bulk tank and milking parlors**

Material and methods

Measurements

✓Milk samples

- ✓ chemical components fat, protein, lactose, non-fat dry matter (NFDM)
- ✓ Somatic cells count (SCC).
- ✓ Total Bacterial Counts TBC or Standard plate count (SPC),
- ✓ Coliform count (CC),
- ✓ Staphylococcus aureus (SA),
- ✓ Environmental streptococcal count (FS),
- ✓ Preliminary incubation count (PIC).

✓ Air Sample collection from the parlor area

- ✓ Use of Surface Air System with a Flow rate 3 lt/sec
- ✓ A plate count agar used an is Incubated for 24 h at 30° C

Material and methods

QUESTIONNAIRE

The information that we code base on the questionnaire was

- System of production **(Transhumance, mixed, indoor)**
- Size of the flock (**101-200 ,201-300,301-500 ,501-1000)**
- breed of the flock used **(crossbreed chios)**
- Grazing **(yes , no)**
- Vaccinations program **(code to 1,2,3)**
  - **Mandatory vaccination (brucellosis)**
  - **Mandatory plus Enterotoxaemia**
  - **Mandatory plus Enterotoxaemia plus the Mycoplasma agalactiae and chlamydiosis**
- Problems with mastitis (Yes ,No)
- Milking application
  - **Milking parlor type (by hand, milking machine, use of bucked)**
  - **Year of purchase,**
  - **Method of operation**
  - **Maintenance**

Material and methods

Milk Samples collection

Samples of raw milk were aseptically collected from the bulk tanks after the morning milking

Transported to the laboratory in a proper cooler and immediately examined for their microbiological load.

Milk Samples analysis

Microbial contents All samples were serially diluted up to 10^{-5} in Peptone water and quantities of 100 µL from each dilution were plated on the surface of appropriate agar plates. After incubation for 24-48h at 30°C all colonies were enumerated and the results were expressed as Log_{10} per mL. When necessary colonies were father identified by using commercial available kits.

SPC= Standard Plate Count, PIC= Preliminary Incubation Count,
CC= *Coliform* Count, SA= *Staphylococcus aureus*, FS= Fecal *Streptococci*

Milk contents **(*Fat*, *Protein*, Lactose, Total Solids, Solids-non-*Fat* and SCC)** – use of Milkoscan-Fossomatic

AB= Airborn Bacteria Petri dishes contained standard plate count agar were exposed to different volumes of air, stored and transferred to the laboratory were incubated overnight at 30°C. All visible colonies were count and the results were expressed as CFU/L of air.

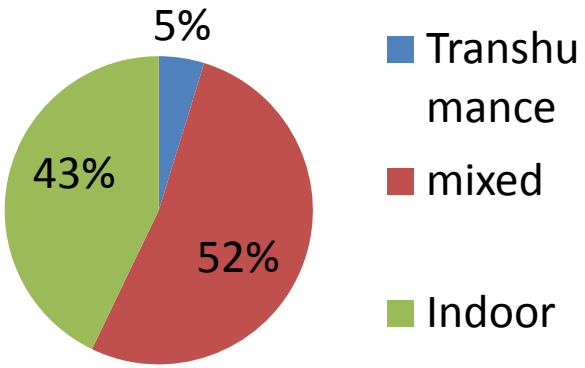
Statistical Analysis

- Data and all the analysis conducted on log transformation scale
- Correlation and between measures calculated and significance tested
- Use the linear model of SAS JMP software
- For every measurement used as response variables and from the questionnaire and the assessment on cleanliness coded answers and scorings as descriptive variables

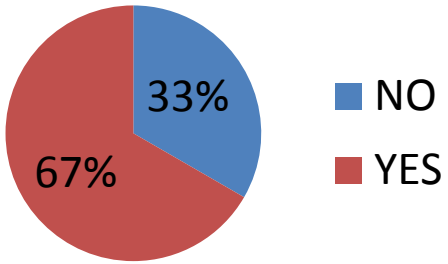
Result

Profile of farm characteristic and management practice base on the questionnaire

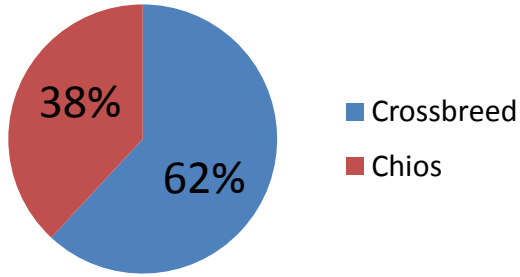
System of production



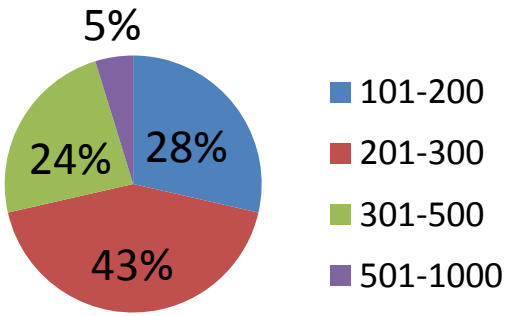
Grazing



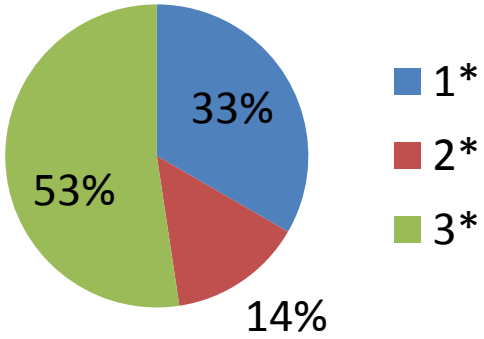
Breed



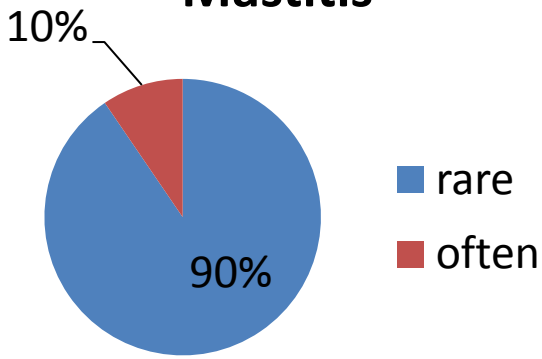
Flock Size



Vaccination program



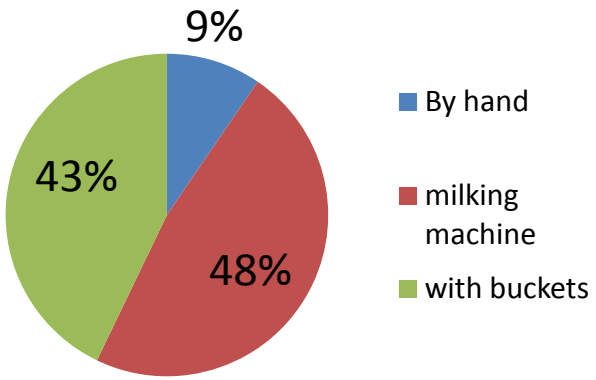
Problem with Mastitis



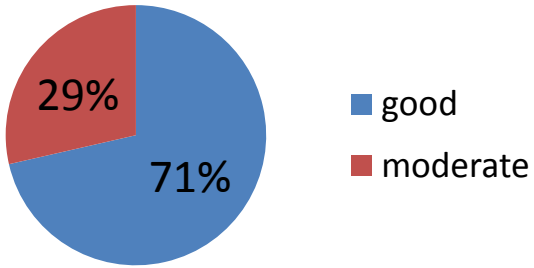
Result

Profile of farm characteristic and management practice base on sanitation

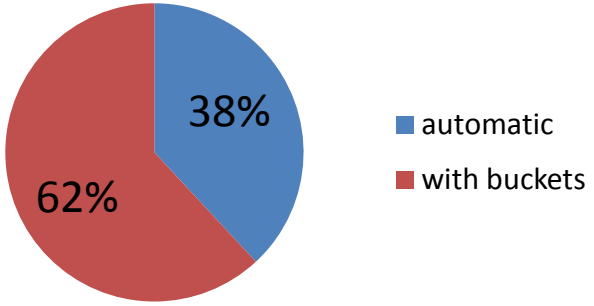
System of miking



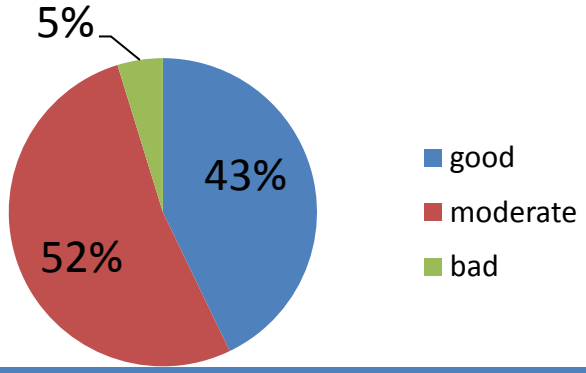
Bulk tank cleanliness



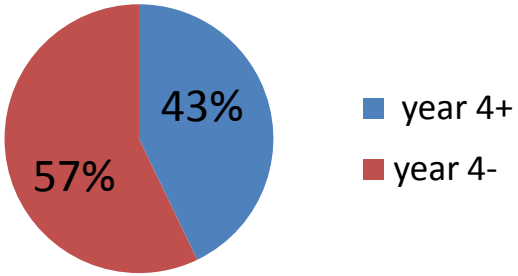
milk transportation



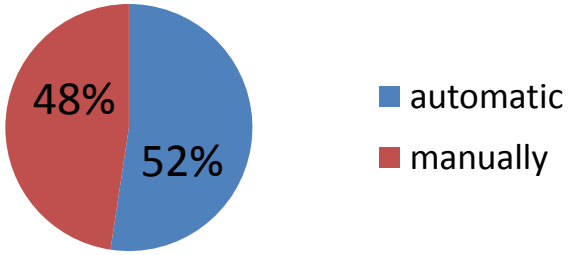
General assessment of the area



Year using the milking machine



Sanitation of the milking equipment



Mean of the data

	Mean	Standard deviation	Min	Maximum
Daily milk production per flock (kg)	199,321	144,541	39	798
Fat (%) (g/100g)	6,17	0,96	4,28	8.4
Protein (%) (g/100g)	5,28	0,44	4,4	6,67
lactose (%) (g/100g)	4,73	0,2	3,82	5,1
SNF (%) (g/100g)	10,95	0,45	9,71	12,18
SPC(log cfu/ml)	5,48	0,56	4,45	6,3
SCC (log cells/ml)	6,05	0,28	5,52	6,66
PIC (log cfu/ml)	5,7	0,53	4,76	6,3
CC (log cfu/ml)	4,49	1,22	2	6,91
SA (log cfu/ml)	3,94	0,55	2,6	5,23
FS (log cfu/ml)	4,95	1,2	2,3	7,55
AB (log cfu/ml)	2,36	0,63	1,22	3,57

SPC= Standard Plate Count SCC= Somatic Cell count , PIC= Preliminary Incubation Count, CC= Coliform Count, SA= *Staphylococcus aureus*, FS= Fecal Streptococci, AB= Airborn Bacteria

Matrix of Pearson correlation and the significance

	Daily milk production(kg)	Fat (%) (g/100g)	Protein (%) (g/100g)	lactose (%) (g/100g)	SNF (%) (g/100g)	SCC (log cells/ml)	SPC(log cfu/ml)	PIC (log cfu/ml)	CC (log cfu/ml)	SA (log cfu/ml)	FS (log cfu/ml)	AB (log cfu/ml)
Daily milk production(kg)	1,00	**-0,17**	**-0,19**	**0,31**	**0,08**	**-0,28**	**-0,23**	-0,10	0,11	-0,09	-0,12	0,06
Fat (%) (g/100g)		1,00	0,66	**-0,53**	**0,20**	0,13	**0,10**	0,12	0,06	0,18	0,11	-0,04
Protein (%) (g/100g)			1,00	**-0,49**	**0,58**	**0,24**	0,08	0,17	0,19	0,16	0,18	-0,14
lactose (%) (g/100g)				1,00	**0,27**	**-0,16**	**-0,20**	-0,15	-0,06	-0,21	0,00	-0,26
SNF (%) (g/100g)					1,00	**0,32**	**-0,20**	0,08	0,15	0,05	0,15	-0,27
SCC (log cells/ml)						1,00	0,10	0,04	-0,03	0,14	0,18	**-0,38**
SPC(log cfu/ml)							1,00	**0,84**	**0,37**	**0,27**	0,16	**-0,35**
PIC (log cfu/ml)								1,00	**0,39**	**0,36**	**0,44**	-0,26
CC (log cfu/ml)									1,00	**0,31**	**0,47**	0,11
SA (log cfu/ml)										1,00	0,10	-0,03
FS (log cfu/ml)											1,00	0,09
AB (log cfu/ml)												1,00

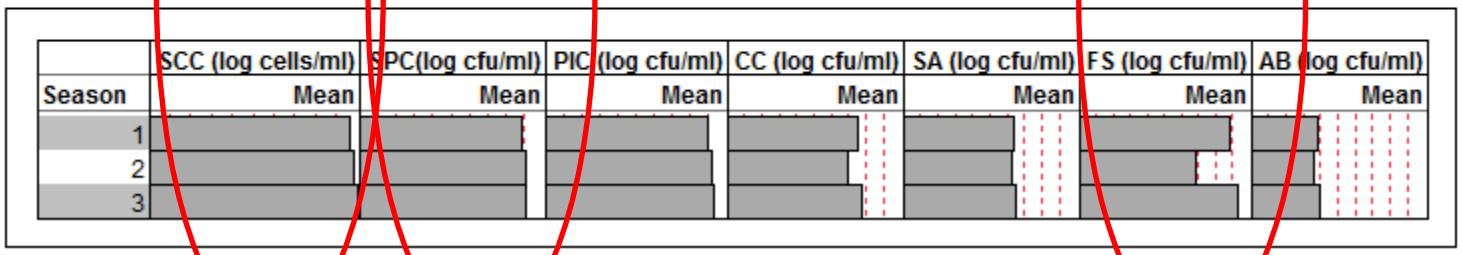
SPC= Standard Plate Count SCC= Somatic Cell count , PIC= Preliminary Incubation Count, CC= Coliform Count, SA= *Staphylococcus aureus*, FS= Fecal Streptococci, AB= Airborn Bacteria

Effect of the model	SCC	SPC	PIC	CC	SA	FS	AB
Flock Size	*	*	*	NS	NS	NS	NS
Production System	*	*	*	*	*	NS	NS
Breed	*	*	NS	NS	NS	NS	NS
Grazing	*	*	NS	*	NS	NS	NS
Vaccination program	*	*	*	*	NS	NS	NS
Problem with Mastitis	NS	*	NS	*	NS	NS	NS
System of milking	*	*	*	*	*	NS	NS
milk transportation	*	*	*	*	NS	NS	NS
Bulk tank cleanliness	NS	*	*	NS	NS	NS	NS
Sanitation of milk equipment	*	*	*	*	NS	NS	NS
Season	*	*	NS	NS	NS	*	NS
General assessment of the area	*	*	*	*	*	NS	NS
Year of using milking machine	*	*	NS	NS	NS	NS	NS
R^2	0,66	0,48	0,59	0,48	0,51	0,53	0,67

Result

Environmental effect

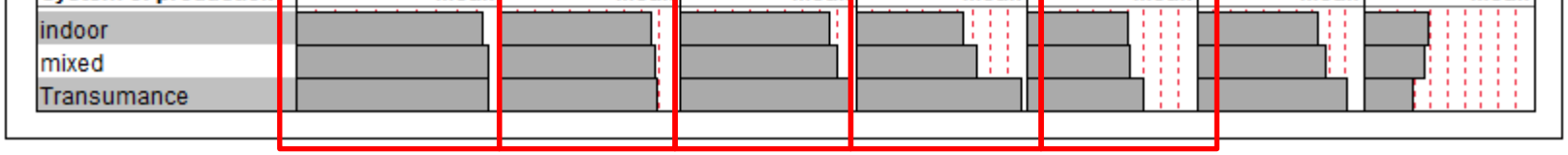
Season	SCC (log cells/ml) Mean	SPC(log cfu/ml) Mean	PIC (log cfu/ml) Mean	CC (log cfu/ml) Mean	SA (log cfu/ml) Mean	FS (log cfu/ml) Mean	AB (log cfu/ml) Mean
1	5.96	5.45	5.59	4.61	3.96	5.44	2.37
2	6.06	5.62	5.69	4.27	3.89	4.26	2.21
3	6.20	5.58	5.78	4.75	4.01	5.73	2.46



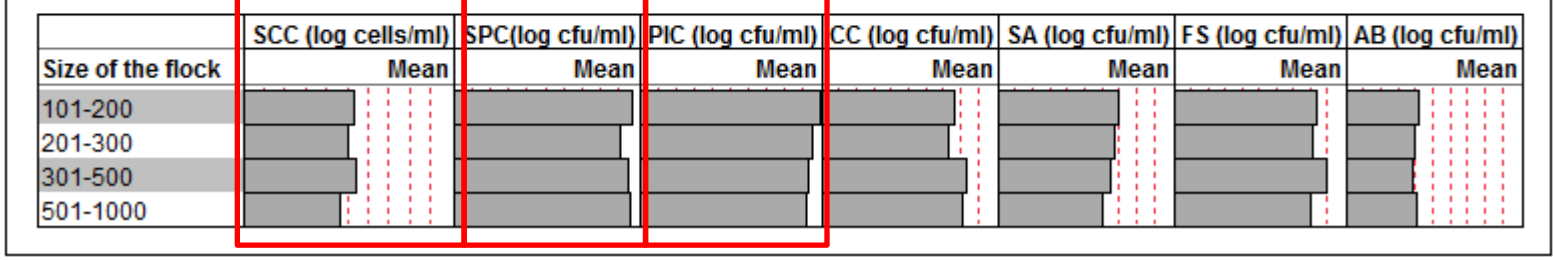
Result

Profile of farm characteristic

System of production	SCC (log cells/ml) Mean	SPC(log cfu/ml) Mean	PIC (log cfu/ml) Mean	CC (log cfu/ml) Mean	SA (log cfu/ml) Mean	FS (log cfu/ml) Mean	AB (log cfu/ml) Mean
indoor	6.00	5.46	5.53	4.13	3.84	4.74	2.48
mixed	6.17	5.60	5.80	4.63	3.97	5.06	2.31
Transumance	6.14	5.72	6.30	6.29	4.49	5.89	1.85



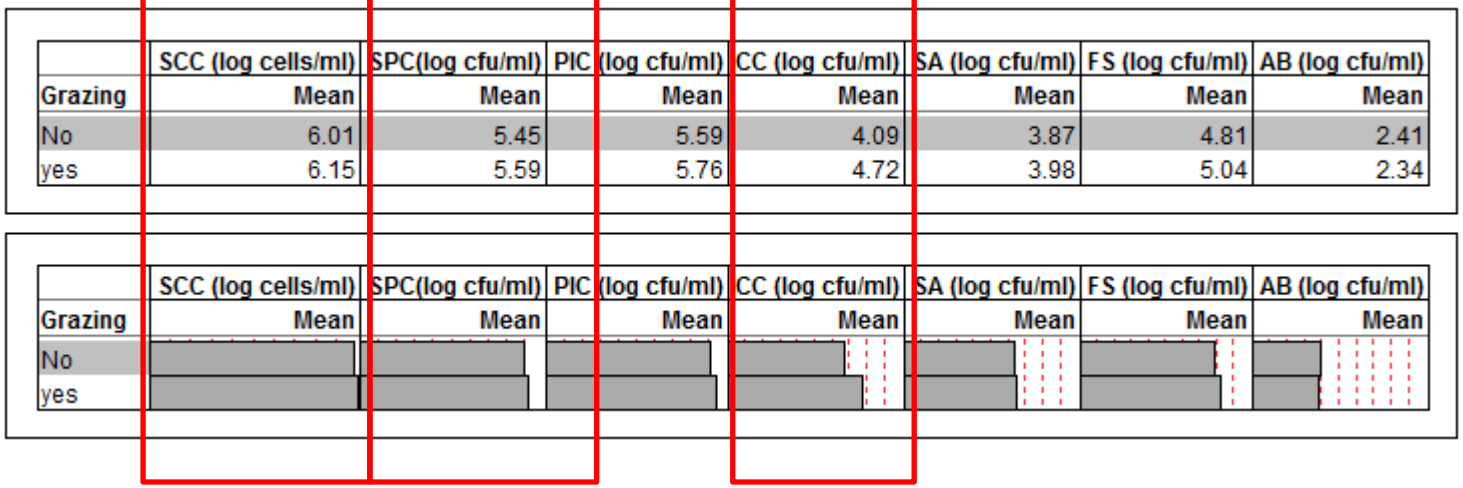
Size of the flock	SCC (log cells/ml) Mean	SPC(log cfu/ml) Mean	PIC (log cfu/ml) Mean	CC (log cfu/ml) Mean	SA (log cfu/ml) Mean	FS (log cfu/ml) Mean	AB (log cfu/ml) Mean
101-200	3,12	5,72	5,91	4,47	4,10	4,96	2,47
201-300	2,99	5,36	5,64	4,30	3,94	4,82	2,36
301-500	3,21	5,60	5,54	4,88	3,79	5,28	2,26
501-1000	2,73	5,66	5,48	4,74	3,58	4,77	2,40



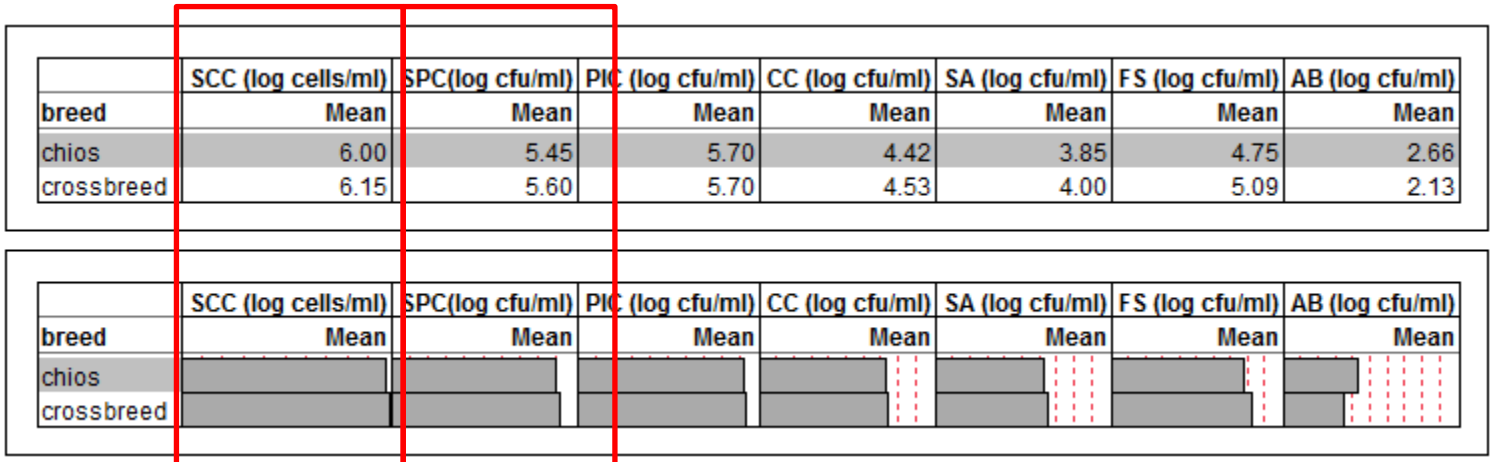
Result

Profile of farm characteristic

Grazing	SCC (log cells/ml) Mean	SPC(log cfu/ml) Mean	PIC (log cfu/ml) Mean	CC (log cfu/ml) Mean	SA (log cfu/ml) Mean	FS (log cfu/ml) Mean	AB (log cfu/ml) Mean
No	6.01	5.45	5.59	4.09	3.87	4.81	2.41
yes	6.15	5.59	5.76	4.72	3.98	5.04	2.34



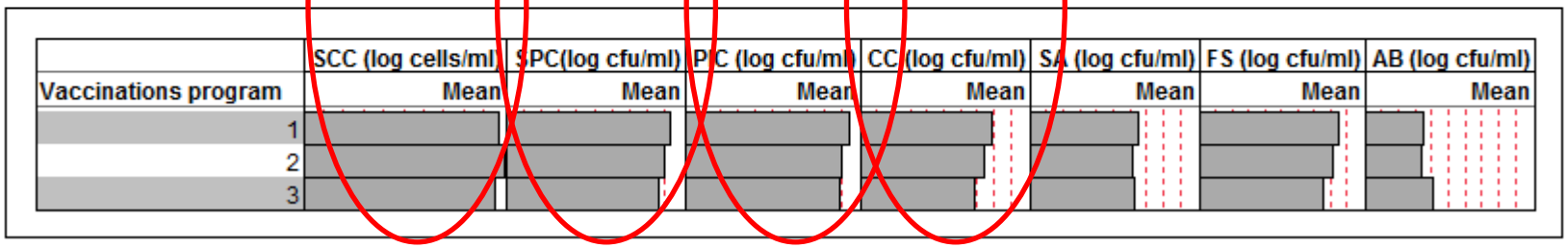
breed	SCC (log cells/ml) Mean	SPC(log cfu/ml) Mean	PIC (log cfu/ml) Mean	CC (log cfu/ml) Mean	SA (log cfu/ml) Mean	FS (log cfu/ml) Mean	AB (log cfu/ml) Mean
chios	6.00	5.45	5.70	4.42	3.85	4.75	2.66
crossbreed	6.15	5.60	5.70	4.53	4.00	5.09	2.13



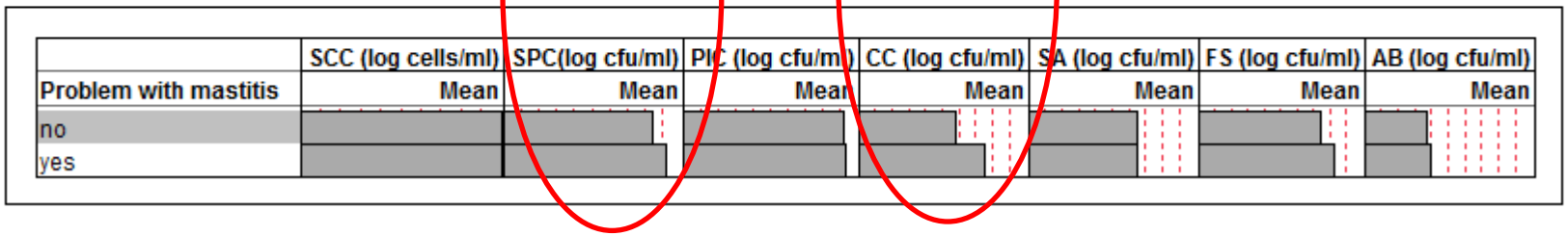
Result

Profile of farm characteristic

Vaccinations program	SCC (log cells/ml) Mean	SPC(log cfu/ml) Mean	PIC (log cfu/ml) Mean	CC (log cfu/ml) Mean	SA (log cfu/ml) Mean	FS (log cfu/ml) Mean	AB (log cfu/ml) Mean
1	6.10	5.80	5.90	4.88	4.07	5.29	2.15
2	6.29	5.57	5.64	4.59	3.84	5.09	2.10
3	6.00	5.40	5.56	4.23	3.89	4.74	2.55



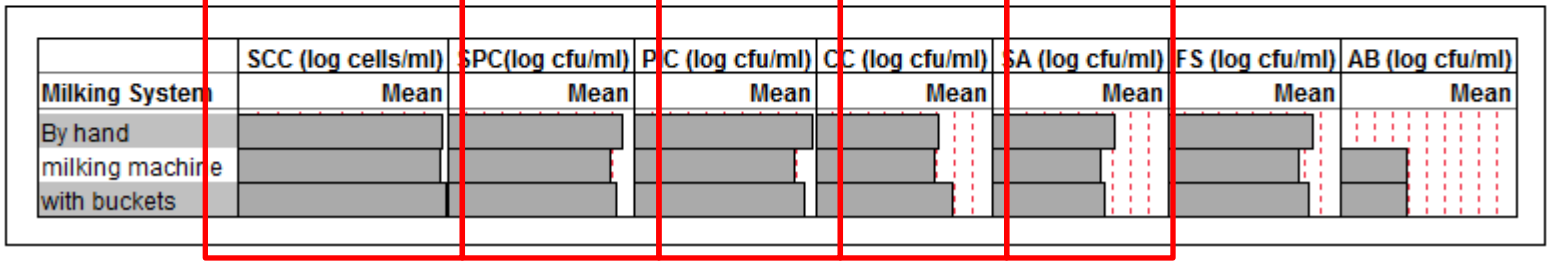
Problem with mastitis	SCC (log cells/ml) Mean	SPC(log cfu/ml) Mean	PIC (log cfu/ml) Mean	CC (log cfu/ml) Mean	SA (log cfu/ml) Mean	FS (log cfu/ml) Mean	AB (log cfu/ml) Mean
no	6.13	5.08	5.60	3.52	3.97	4.50	2.29
yes	6.10	5.57	5.71	4.59	3.94	5.00	2.37



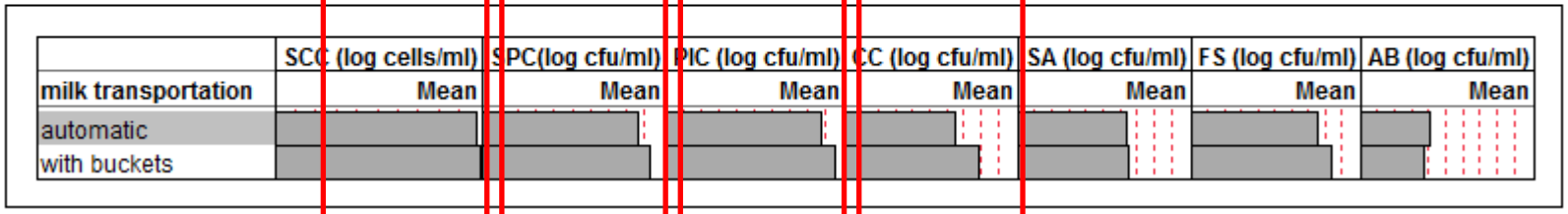
Result

management practice base on sanitation

Milking System	SCC (log cells/ml) Mean	SPC(log cfu/ml) Mean	PIC (log cfu/ml) Mean	CC (log cfu/ml) Mean	SA (log cfu/ml) Mean	FS (log cfu/ml) Mean	AB (log cfu/ml) Mean
By hand	6.03	5.80	6.09	4.32	4.32	5.24	.
milking machine	6.01	5.41	5.46	4.17	3.82	4.73	2.39
with buckets	6.19	5.63	5.83	4.80	3.96	5.09	2.33



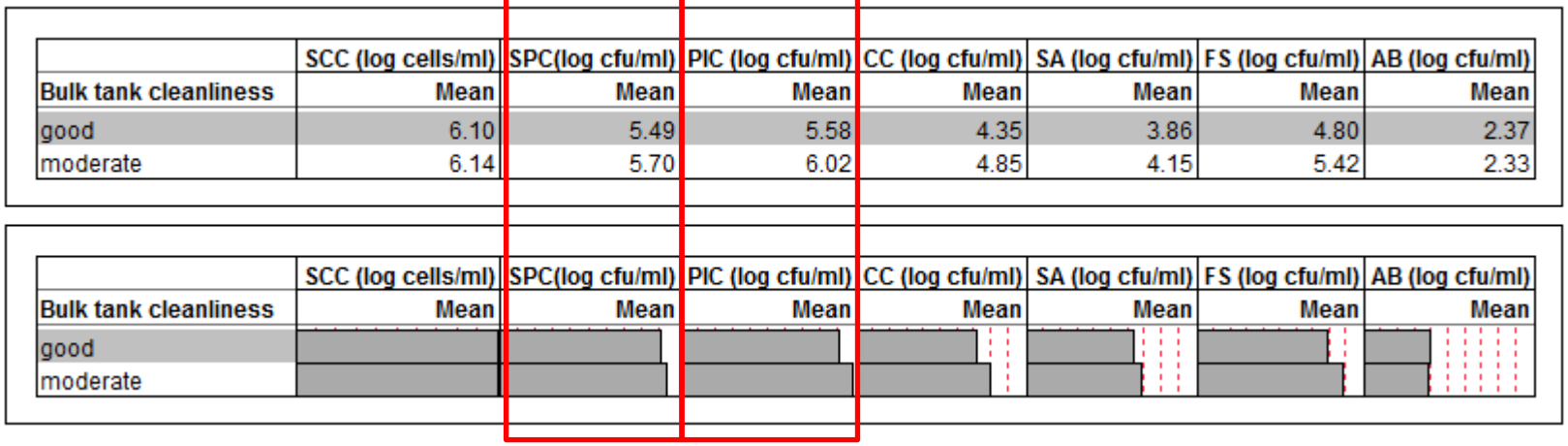
milk transportation	SCC (log cells/ml) Mean	SPC(log cfu/ml) Mean	PIC (log cfu/ml) Mean	CC (log cfu/ml) Mean	SA (log cfu/ml) Mean	FS (log cfu/ml) Mean	AB (log cfu/ml) Mean
automatic	6.00	5.31	5.39	3.96	3.89	4.66	2.46
with buckets	6.15	5.68	5.87	4.79	3.97	5.13	2.31



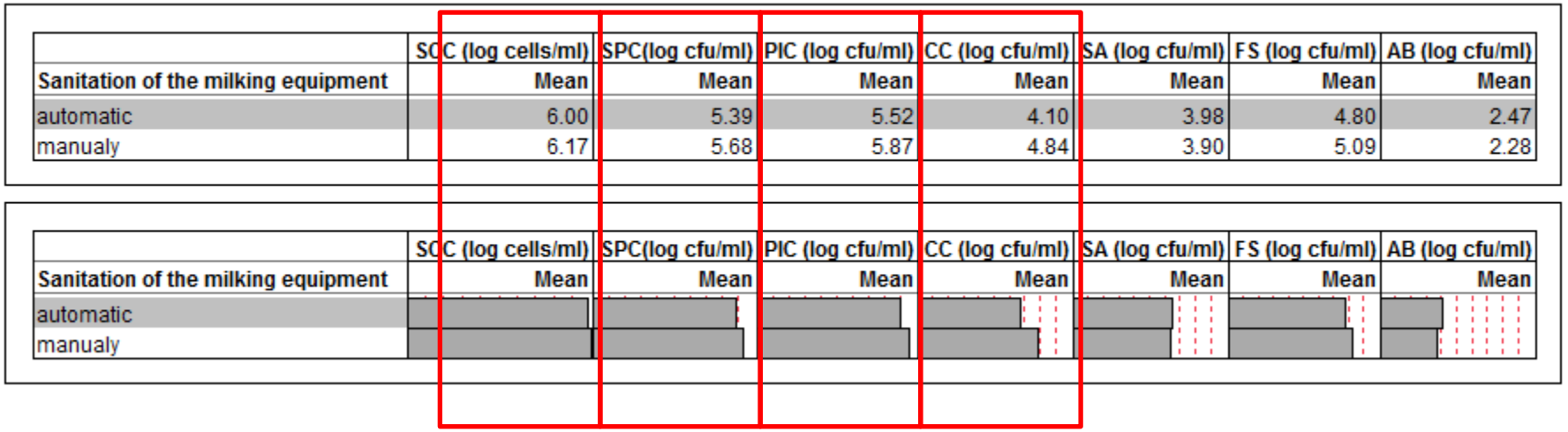
Result

management practice base on sanitation

Bulk tank cleanliness	SCC (log cells/ml) Mean	SPC(log cfu/ml) Mean	PIC (log cfu/ml) Mean	CC (log cfu/ml) Mean	SA (log cfu/ml) Mean	FS (log cfu/ml) Mean	AB (log cfu/ml) Mean
good	6.10	5.49	5.58	4.35	3.86	4.80	2.37
moderate	6.14	5.70	6.02	4.85	4.15	5.42	2.33



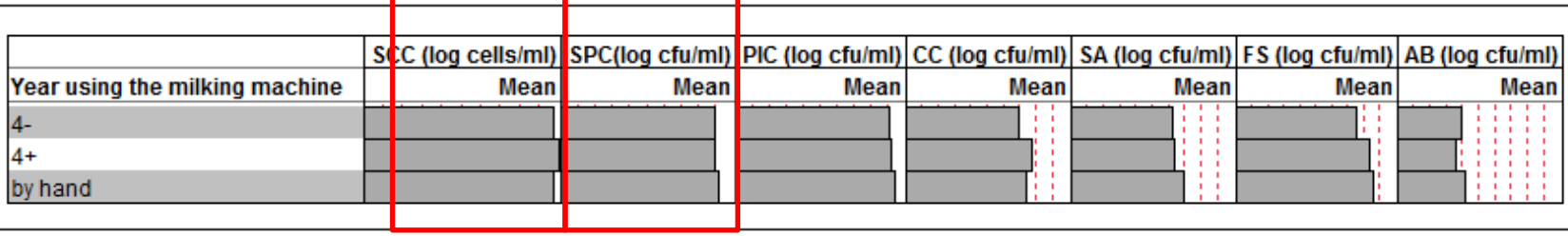
Sanitation of the milking equipment	SCC (log cells/ml) Mean	SPC(log cfu/ml) Mean	PIC (log cfu/ml) Mean	CC (log cfu/ml) Mean	SA (log cfu/ml) Mean	FS (log cfu/ml) Mean	AB (log cfu/ml) Mean
automatic	6.00	5.39	5.52	4.10	3.98	4.80	2.47
manualy	6.17	5.68	5.87	4.84	3.90	5.09	2.28



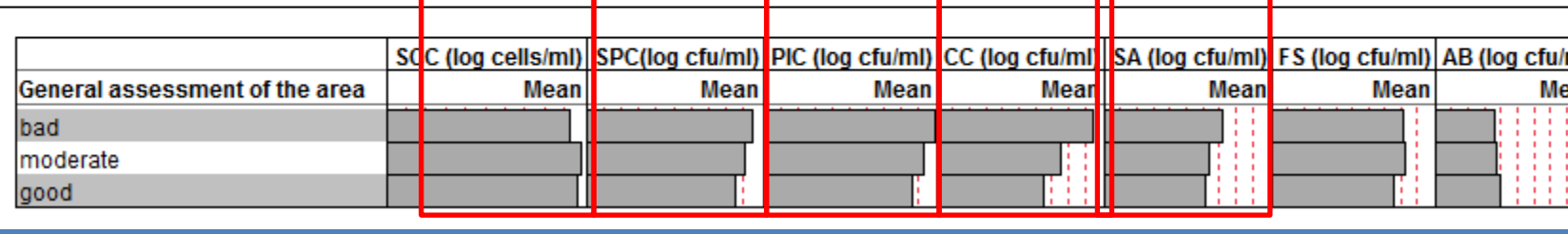
Result

management practice base on sanitation

Year using the milking machine	SCC (log cells/ml) Mean	SPC(log cfu/ml) Mean	PIC (log cfu/ml) Mean	CC (log cfu/ml) Mean	SA (log cfu/ml) Mean	FS (log cfu/ml) Mean	AB (log cfu/ml) Mean
4-	6.04	5.55	5.64	4.30	3.87	4.70	2.43
4+	6.22	5.51	5.73	4.74	3.93	5.19	2.25
by hand	6.00	5.68	5.87	4.57	4.28	5.34	2.55



General assessment of the area	SCC (log cells/ml) Mean	SPC(log cfu/ml) Mean	PIC (log cfu/ml) Mean	CC (log cfu/ml) Mean	SA (log cfu/ml) Mean	FS (log cfu/ml) Mean	AB (log cfu/ml) Mean
bad	5.82	5.92	6.27	5.89	4.47	5.11	2.28
moderate	6.17	5.69	5.85	4.70	3.95	5.16	2.30
good	6.01	5.31	5.42	4.04	3.86	4.70	2.44



Conclusion

- The quality of milk production requires practices to ensure proper use and sanitation of the milking machine and bulk tank
- In the indoor farms the management practice must have greater precautions on the hygiene of the animal
- Establishing tools for farm management practice can be applied as an help aid to the farmers to improve their quality

Thank you for your Attention!!!!

Acknowledgments

ΕΛΛΗΝΙΚΟΣ ΟΡΓΑΝΙΣΜΟΣ ΓΑΛΑΚΤΟΣ & ΚΡΕΑΤΟΣ

ΕΛΟΓΑΚ

Milk Quality Control Laboratory of Evro county