Invited lecture and paper presented at the EAAP. Session title: Animals in extreme environments (C*, N, H, MedWG M&H, G, S&G). Chairs: Isabel Carcasus & Andre Georgoudis.

Operating robotic milking under arid environment

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Background. Robotic milking could be the 'lifeboat' of the **family farms.** A milking robot (a) attracts the younger generation to the farm; (b) reduces the routine work (milking); (c) shifts the workload to more "human timetable"; (d) frees more time to management; (e) contributes to the farming image - "high tech" instead of "low-tech", (f) Occasionally local tourism has developed around a milking robot; (g) frequently a robot allows one of the family members to work outside the farm while his spouse may raise the livestock by himself. The alternative is industrial large/mega dairies holding thousands of cows and many cheap labour workers in the milking. However, the first robots were developed in Holland - North west Europe: forever green grazing fields, cubicles housing in closed-wall barns fitted to colder climate. In order to make it works under hot climate conditions - feed, housing and husbandry under hot climate conditions - should be developed.

Under hot climate conditions, high-roof open cowshed; no grazing; around–the-year TMR are common practices. When TMR (total mixed ratio) feeding is applied, the concentrate feed is mixed and served in the feeding lane. In previous studies, a specially designed cowshed, designed for milking robot under hot climate conditions was reported (Halachmi 2004). Other studies addressed variety of feeding issues under hut climate condition (Halachmi et al.,2004; Halachmi et al.,2005; Halachmi et al.,2006; Halachmi et al.,2009). Cow traffic has been investigated under colder condition (Halachmi 1999 Katler PhD thesis Malin PhD thesis) and under grazing systems (such as New Zealand), but not under the Mediterranean hot climate condition. Under hot climate condition, the cow cooling system has the potential to pull the cows towards the robot. Therefore, **the aim** of this study was to compare two alternative cow traffics guided by the cow cooling systems.

Terminology: Treatment A: a cow cooling is located at the robot entrance.

Treatment B: a cow cooling is located at the robot exit, along the forage feeding lane.

The today situation is treatment A. However, it generates a queue ("traffic jam") at the robot entrance, this queue blocks the robot entrance. A low ranking cow cannot reach the robot frequently enough.

The hypothesis was: relocating the cooling system, form the robot entrance to the robot exit may improve cow traffic towards the robot.

Material and methods.

A small holder family farm who has one single cowshed with three milking robots, each robot serves 50-60 cows. The robot model is Lely A3. One robot was equipped with electric ventilators and sprinklers at the robot enternce. The second robot was equipped with ventilators and sprinklers at the robot exit.

Both cooling systems ware identical (the producer, the same model, measured air velocity, water flow, and average droplet size etc). Measurement included: animal behavior (using video camera), cow performance, natural wind direction and velocity, radiation, and air humidly.

Results.

The cows changed their behavior. In an hot day, the cow queue was shifted from the robot entrance to the forage feeding lane. However no significant change in number of milking and milk yield, for production raise we need longer period.

Table 1. Production and cow attending to the robot

Treatments	Protein (%)	Fat (%)	Mik yield (kg)	Robot visits
Control group (cooling before the robot)	2.96	3.4	43.6	3.8
Experiment group (cooling before the robot)	3.05	3.3	45.5	3.7

no significant difference among treatments

Acknowledgment.

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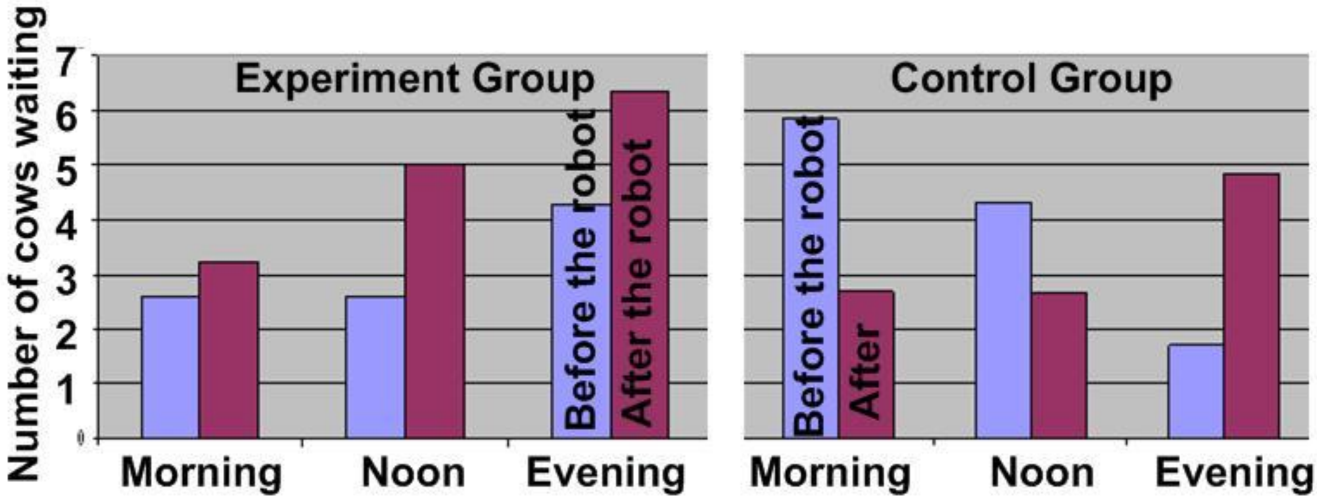

Figure 2. Number of cows queuing before and after the robots during the morning (10:30-12:30), noon (14:00-15:00) and evening (18:00-19:00). Left column in each pair is the number of cows waiting before the robot. Right column in each pair is the number of cows waiting after the robot. It can be seen that the queue was shifted during the morning and the noon when the hot stress is higher.

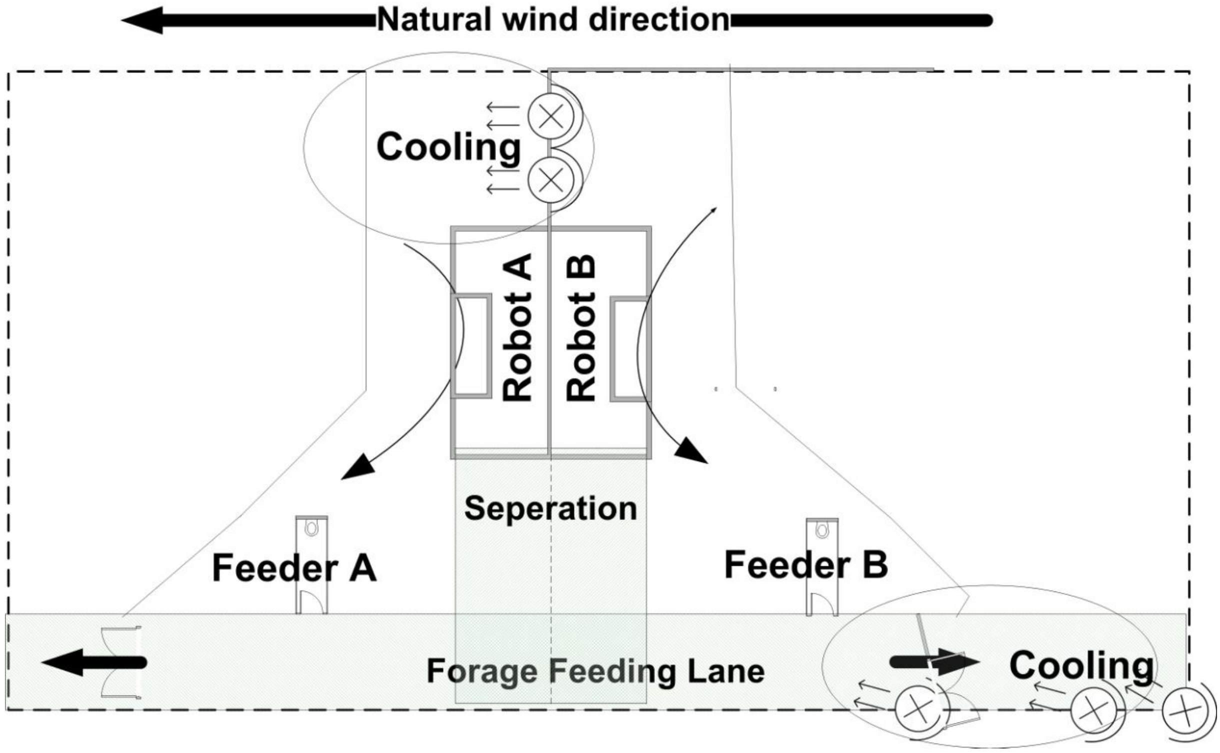

Figure 1. Experiment design and farm layout. Two cow groups milked by two robots located in the centre of the cowshed. The arrows pointing are the cow gait direction. The cows are separated, cows from group A can be milked only in robot A and vice versa – cows from group B can be milked only by robot B.

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