Summary

The milk consumption in Asia has increased during the last years. To improve the milk production high yield breeds like Holstein and Jersey are introduced however they are more sensible to the hot and humid climate compared to local breeds. To keep their milk production at a high level some sort of cooling must be used.

Heat stress in dairy cows is a well-documented problem in South America and the southern part of the USA. But in parts of Asia the problem with heat stress is even worse because of the constant heat.

This study aims to search for and evaluate different cooling or heat stress relief system in hot and humid climate.

The thesis is divided in two parts, a literature study and a practical study. In the practical study five farms in Vietnam and two farms in Malaysia were studied during September 2002. At three of the five farms the measurements were performed on two different days but due to the lack of time the other farms were studied only one day.

Data collected were out and inside air temperature, incoming solar radiation towards the barn, the relative humidity inside and the surface temperature of the inside of the roof. On the three highest yielding cows the temperature of the hair coat surface and respiration rate were measured.

When the sun was shining both respiration rate and THI (Temperature and Humidity Index) showed that the cows in these farms were heat stressed. The theoretical calculated milk production loss on these farms was in average about 7 kg milk/day and cow.

Before the milking the farmers washed the cows from dirt, that gave the effect of decreasing the heat stress. One farm sprinkled the roof to get the building cooler. This showed to have a positive impact by decreasing the breathing rate compared to a day when the sprinklers were not in use. Another farm had fans or vertical air circulation installed in the ceiling. But because of rainy weather the effect by these fans could not be evaluated.

To avoid or reduce heat stress and by that increase milk production on these farms, the farmers should make sure that the cows are always able to stand in the shade and that water is always available. Painting the roof white on the upper side and black on the under side, installing air circulation fans, showering the cows more often, using zone cooling (directing a jet of mechanically cooled air onto a part of the body for example neck or head to get a better heat dissipation), during the hottest time of the day or using tunnel ventilation (getting a sufficient air velocity across the building by using fans) are other options to decrease heat stress.

Earlier made field studies shows that evaporative cooling with showers and fans will give an increase in milk production and feed intake and a decrease in respiration rate and body temperature.
Mechanical cooling with AC will probably give the best climate for the cows but the energy consumption is high with 2500 W/cow. Therefore the mechanical cooling could only be feasible to high-producing cows in hot humid climate.

New buildings should be optimal constructed to utilise the natural wind for convective cooling of the cows. Other measures could be using materials in roof and possible walls that will decrease the effect of solar radiation and also use proportions of the building that will optimise good shade and ventilation. The minimum height of the roofs is recommended to be 3.6 m or 4.3 m if wider than 12.2 m to get sufficient air movement in the centre of the shade. Roof material with insulating capability is the best materials to be used in tropical climate.