



Doctoral Thesis

Wärme, Wasserdampf- und Kohlendioxidanfall in Schweinemast- und Hühnerställen

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WÄRME-, WASSERDAMPF- UND KOHLENDIOXIDANFALL
IN SCHWEINEMAST- UND HÜHNERSTÄLLEN

A B H A N D L U N G

zur Erlangung
der Würde eines Doktors der technischen Wissenschaften
der

E I D G E N Ö S S I S C H E N T E C H N I S C H E N H O C H S C H U L E
Z Ü R I C H

vorgelegt von

T H O M A S K E L L E R

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Dr. M. Rist, Korreferent

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1984

Abstract

Heat, moisture and carbon dioxide production in stables for growing pigs and laying hens.

by Th. Keller.

In 1971 the SWISS COMMISSION FOR QUESTIONS ON STABLE ENVIRONMENT (SKK) in co-operation with the COMMITTEE FOR INDUSTRIAL STANDARD (DIN) provided a first interim report on stable-environment standards for discussion.

Tests were carried out in the stables of the Chamau experimental farm run by the ETH Zurich and in those of the Swiss Association for pig fattening and slaughter efficiency tests in Sempach using simple technical aids in order to cross check some of the data for calculating stable-environmental conditions for growing pigs and laying hens.

Heat, moisture and carbon dioxide production was evaluated from the fresh-air intake and the exhaust air, as well as from heat loss through the building elements. Two methods for measuring heat production were available: one method was to calculate it from the CO₂ production values, based on the fact that every 100 kcal (=418 kJ) produces 19 litres of CO₂. The other was to establish the thermal balance in the stables, where by heat losses through the ground were also taken into account. Calculating CO₂ production proved to be the more reliable method because the many and often inconsistent effects of building construction could be ignored.

Growing pigs: Carbon dioxide production by the growing pigs was generally somewhat lower than the standards established by the SKK. Moisture production coincided with the SKK standard values only in the 60 - 100 kg body weight range. Heat production calculated on the basis of CO₂ production agreed usefully with the standard values. Establishing heat production by taking account of heat losses through buildings did not provide any usable results from Chamau, whereas the values established in Sempach were on average 7,1 % below the standard values when not taking heat loss through the ground into account and on average 11,9 % above them when heat loss through the ground was taken into account.

Laying hens: CO₂, heat and moisture attained somewhat higher values, which can be attributed to the hens' increased evaporative cooling under high temperatures.

The investigations prove that calculating the stable-environmental conditions on the basis of the values established by the SWISS COMMISSION FOR QUESTIONS ON STABLE-ENVIRONMENT (1983) does correspond in a satisfactory manner with the results achieved in practice using standard measuring equipment.