# EFFECT OF CLIMATE CHANGE ON MILK PRODUCTION OF HOLSTEIN COWS MAINTAINED IN THE NILE DELTA OF EGYPT

**By**

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**B.Sc. Agric. Sci. (Animal Production), Fac. Agric., Cairo Univ., Egypt, 1999**
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APPROVAL SHEET

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**Date:** 5/3/2016

SUPERVISION SHEET

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**Title of Thesis:** Effect of Climate Change on Milk Production of Holstein Cows Maintained in the Nile Delta of Egypt.
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## ABSTRACT

The main objective of the study was to monitor the current and future climate changes and to evaluate their effects on milk yield of Holstein cattle in the Delta of Egypt. This thesis includes two studies, the first was conducted to evaluate the effect of current climate changes on milk yield. Data of test-day milk yield (TDMY) comprised 109759 records, were collected from four herds (5546 Holstein cows). The four herds represented different parts of the Delta region: west of the Delta (Dina farm, included two herds, H1 and H2), east (Sami Asaad farm, H3) and middle of Delta (El-Karada farm, H4). Meteorological data (monthly air temperature and relative humidity) throughout the period from 2000 to 2014, and their expected corresponding values in the two years 2025 and 2050 were obtained from the Central Laboratory for Agricultural Climate.

Analysis of meteorological data revealed a significant increase in temperature-humidity index (THI) values, and confirmed a marked change in climate starting the year 2011. So, the study period (2000-2014) was devided into two periods: the first was with almost a constant value of THI (2000-2011), and the second with a higher value (2012-2014). All the factors (Herd, Parity, THI, Period and all interactions among factors) showed a highly significant effect ($P<0.0001$) on TDMY. Test-day milk yield decreased ($P<0.05$) when THI was >74. Test-day milk yield, also decreased ($P<0.05$) in the second period. Test-day milk yield was 24.2 and 22.8kg for the first and second period, respectively. This decline is due to the expected effect of climate change.

The objectives of the second study were to develop a new accurate equation to estimate THI under the Egyptian conditions. The equation accounted for 99.5% of the variance of THI. The same numbers of TDMY records and Holstein cows in the four above-mentioned herds were used in this study. The VIP, regression analysis program and the new developed equation were used to estimate THI values during the period from 2000 till 2014, and also in the two years 2025 and 2050. The obtained results confirmed a marked change in climate. Temperature-humidity index values were 69.1, 78.7 and 81.2 for the years 2000, 2025 and 2050, respectively. Also, the expected increase in THI values were 13.9 and 17.5% in the two years 2025 and 2050, respectively compared to the year 2000.

The results showed a marked climate change explained by an increase in both air temperature and THI, and this change affects negatively TDMY from Holstein cows maintained in the Egyptian Delta region. The results confirmed a significant decrease of 0.12kg for each increase of one THI unit above 74 under the current managerial practices. The study expected a continuous negative effect of climate change till the year 2050.

**Key words:** Climate change, Holstein, test-day milk yield, temperature-humidity index, Delta region, Egypt.

# *DEDICATION*

*No words in the world can express my gratefulness to my **beloved mother**, for her patience, help, encouragement, endless love and lovely offered support. She was with me and stood by me all the time. So, to her I dedicate this thesis.*

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