Effect of Temperature- Humidity Index (THI) on resting pattern of dairy cows in different agro-ecological areas of Sri Lanka

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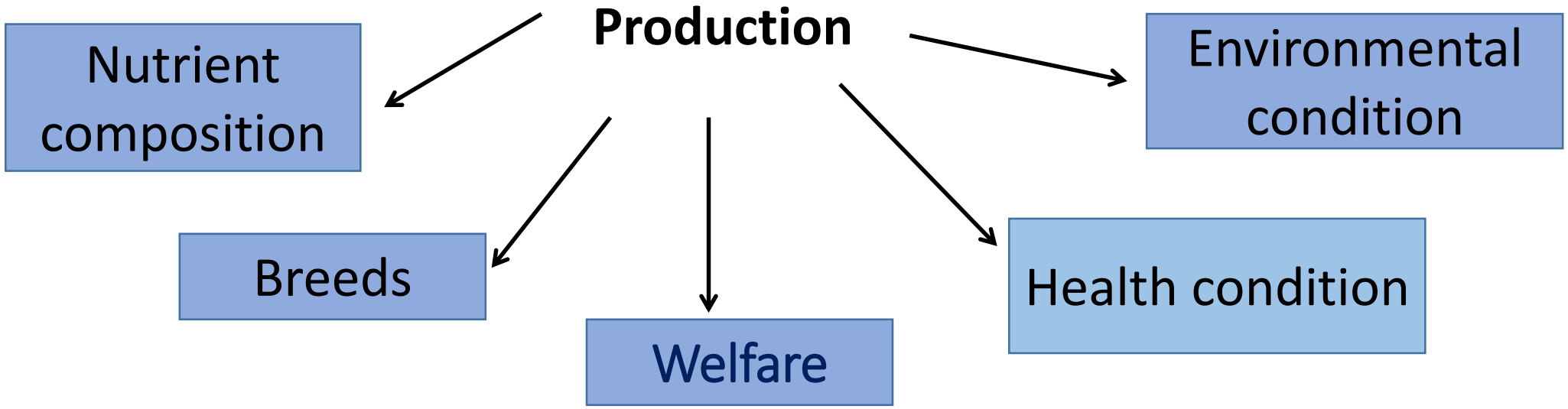
Introduction

- Dairy cattle industry has higher consumer demand
- Apply new concepts and technologies to increase dairy production



Welfare

- Five freedom concept (Free from Hunger, Thirst & Malnutrition, Pain, Injury & Diseases, Fear & Distress, Discomfort due to environment, Express normal Behavior)

Research problem

- **Resting (Lying) behavior**
  - ✓ Perfect time of lying: maximize production, welfare of cows
  - ✓ Alternation of resting pattern - create economical losses
    - ➢ Housing design and management, Health status of cows, Lactation stage, Bedding, Environmental conditions
  - ✓ Many experiments – regarding lying time (temperate countries)
    - ➢ Fregonesi *et al*., 2007 - 9 to 14 h/d lying down
    - ➢ Canadian Dairy Code of Practice - for at least 12 h/d
  - ✓ Situation in tropical or sub-tropical areas

Objectives

1. Identification of resting behavior of dairy cows in Sri Lanka (different agro-ecological areas)

2. Effect of heat stress condition (Temperature-Humidity Index -THI) on lying behaviors

Methods

- Interview - open ended questionnaire (dairy management practices)
  - ✓ (Up Country – UP, Mid-Country – MC, Coconut Triangular – CT, Western Province - WP)
- Farms were selected - responses of farmers
- 170 tie-stall lactating cows (UP- 49, MC- 49, CT- 48, WP- 24)

- Cows -

✓Holstein-Friesian or Jersey crosses

✓Parity - 1-4, pregnancy ≤ 4 (mon)

✓BCS ≥3

✓No – lameness/mastitis/hock swelling /severe hock wounds

- Bed - length -1.60 ± 0.33 m/ width - 1.12 ± 0.06 m cow/cubical
- HOBO® Pendant G Acceleration Data Loggers/ HOBO® temperature logger

- THI = (1.8 x t +32) – (0.55-0.0055 x RH) (1.8T – 26)

(Ravagnolo and Misztal, 2002)

- ✓ Comfort (THI < 68)
- ✓ Mild discomfort (68 < THI < 72)
- ✓ Discomfort (72 < THI < 75)
- ✓ Alert (75< THI < 79)
- ✓ Danger (79 < THI < 84)
- ✓ Emergency (THI > 84)

Statistical Analysis

- IBM SPSS 23.0 / SAS 9.2
- t – Test, GLM (Repeated measures of ANOVA)

Results and Discussion

Average values:

- Total lying time - 9.0 – 11.7 h/d
- Lying bout duration - 48.3 -84.9 min/bout
- Lying bout frequency - 9.8 – 13.2

- Sri Lanka –

✓ Tropical country (28.0-32.0 ^{0}C)

- ➢ UP - 16.0- 20.0 ^{0}C
- ➢ MC -20.0-28.0 ^{0}C
- ➢ CT - 20-30 ^{0}C
- ➢ WP - 24-31 ^{0}C

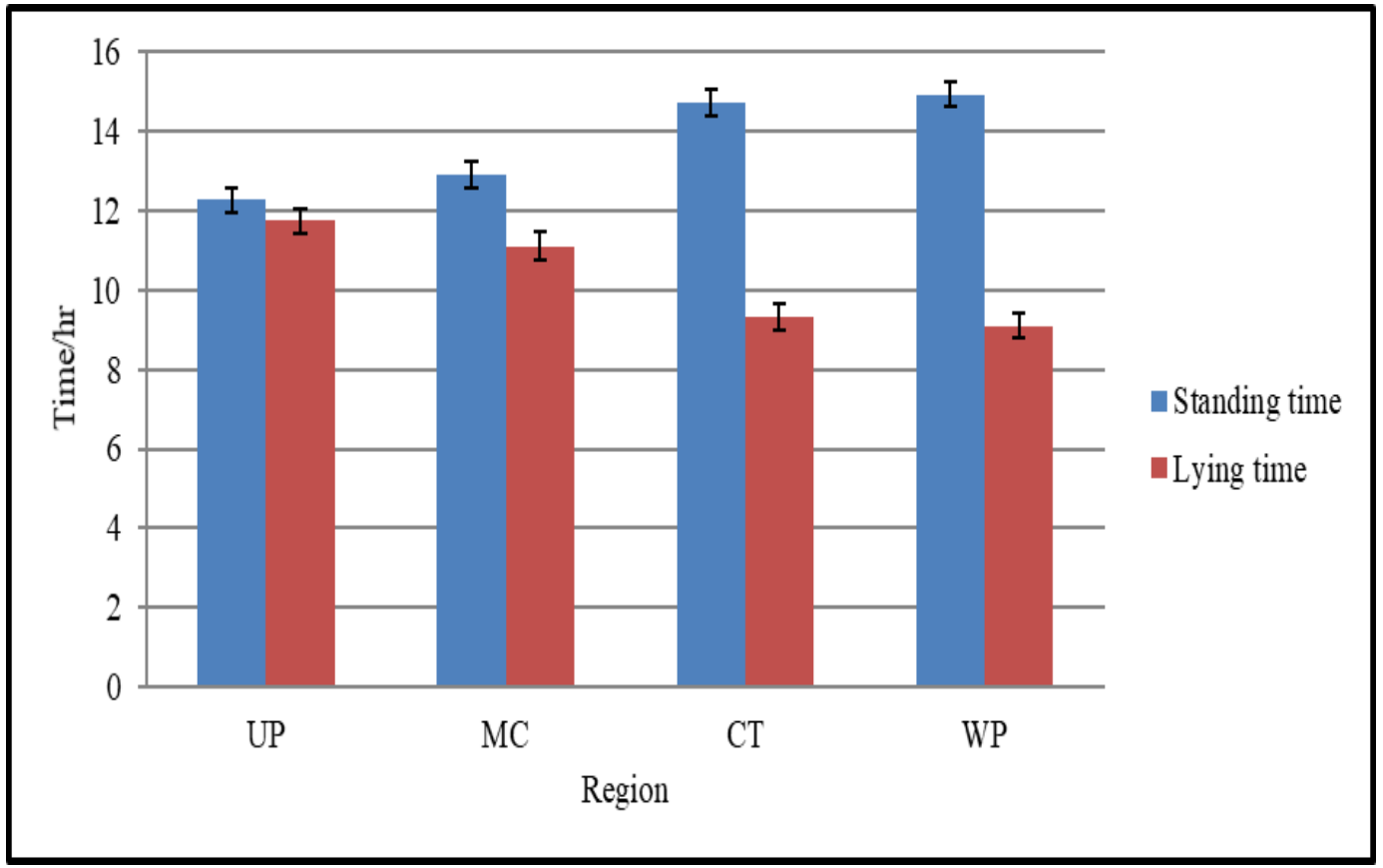
(Department of Metrology, year)

- Resting behaviors: (Regional variation)

✓ Lying time : UP (11.74 h/d), MC (11.26 h/d), CT (9.26 h/d), WP (9.00 h/d)

✓ Lying bout duration (UP - 78.0 min, MC - 84.95 min, CT - 64.34 min, WP - 48.32 min)

✓Higher frequency of lying bouts - WP (13.22)

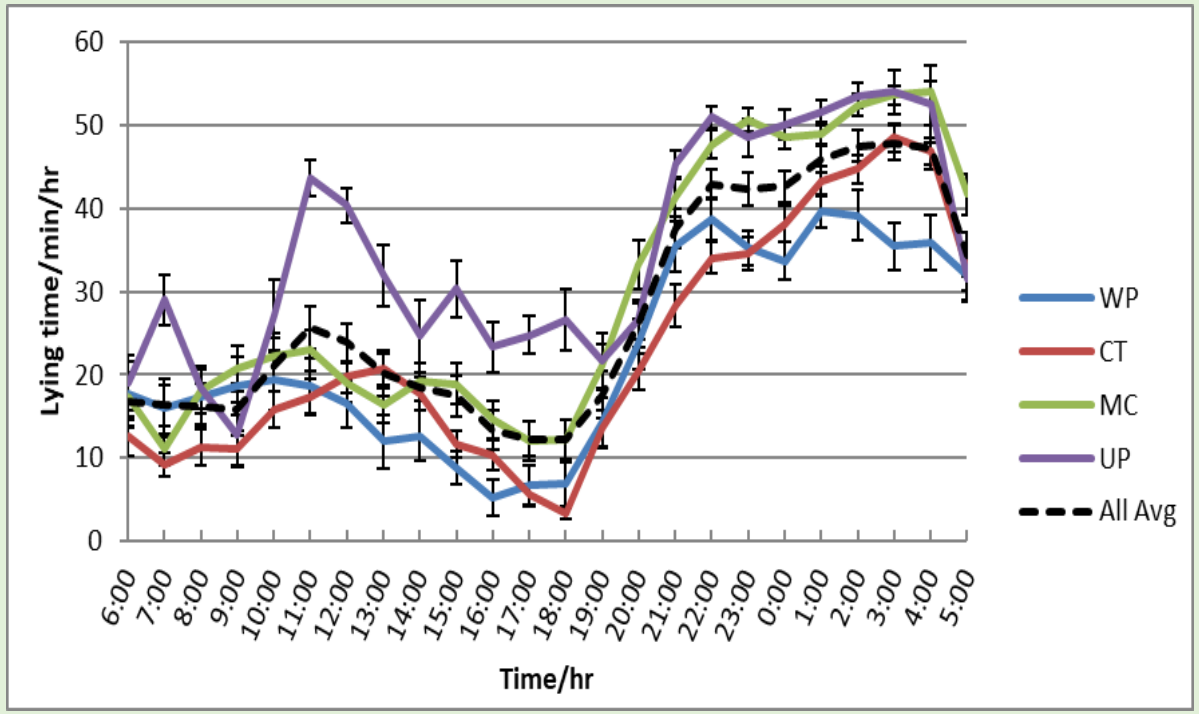


- In low temperatures - reduce activities and save heat and energy (Keck *et al.*, 2004)
- In hot environment - less lying

- Cows in all four regions prefer to lie on their left side than on right side

	UP	MC	CT	WP
Right Lying time (h/d)	5.66	5.20	4.39	4.37
Right Lying duration (min/bout)	82.45	85.41	64.34	48.82
Left Lying time (h/d)	6.08	6.06	4.91	4.63
Left Lying duration (min/bout)	73.29	86.79	66.95	52.75

- Unique pattern of diurnal lying down / A peak line : 21:00 to 05:00



- Majority (78%) were in thermal stress condition

✓ UP – 58.3%, MC – 43.5%, WP = CT= 100%

- THI (P<0.05) correlation:
  - ✓ Total lying time (ρ=-0.492)
  - ✓ Lying bout duration (ρ=-0.341)
  - ✓ Total lying time at right side (ρ=-0.213)
  - ✓ Right side lying bout duration (ρ=-0.353)
  - ✓ Total lying time at left side (ρ =-0.429)
  - ✓ Left side lying bout duration (ρ=-0.341)

Conclusions

- Satisfactory resting behavior (Mean - 9.0 – 11.7 h/d)
- Regional variations were observed
- Could further improve by several modifications to control the microclimatic conditions inside shed

Collaborators

Funding partner

Audience