UNIVERSITI PUTRA MALAYSIA

SYSTEMS APPROACH TO EVALUATE GROWTH AND MEAT PRODUCTION OF SHEEP UNDER TWO PRODUCTION SYSTEMS

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By

CHAIYAWAN WATTANACHANT

Dissertation Submitted in Fulfilment of the Requirement for the Degree of Doctor of Philosophy in the Faculty of Veterinary Medicine and Animal Science, Universiti Putra Malaysia

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Dedicated to

My father, Chaiyong Wattanachant
and my mother, Wannee Wattanachant
for their understanding and encouragement
which have been a great constant source of inspiration

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LIST OF ABBREVIATIONS

ADG	Average Daily Gain
AHP	Area for Herbage Production per Hectare
ANHP	Area Not for Herbage Production
AUE	Animal Unit Equivalent
A	Asymptotic Weight
BC	Botanical Composition
BI	Biological Index
CAR_{FAT}	Carcass Fat
CAR_{PRO}	Carcass Protein
CC	Carrying Capacity
CE	Carcass Energy
CF	Crude Fibre
cm	Centimetre (s)
CP	Crude Protein
CRCF	Chromium Concentration in One Gram of Faeces
CW	Carcass Weight
CCW	Chilled Carcass Weight
DBG	Daily Bone Gain
DCG	Daily Carcass Gain
DE	Digestible Energy
DFG	Daily Fat Gain
DM	Dry Matter
DMalin	Dorset x Malaysian Indigenous Breed
DMD	Dry Matter Digestibility
DMG	Daily Muscle Gain
DMI	Dry Matter Intake
DP	Dressing Percentage
DSLT	Dorset x Siamese Long Tail
e (or exp)	Exponential
EE	Ether Extract
E_F	Energy Concentration from Fat
ELW	Empty Live Weight
ELWW	Empty Live Weight Without Wool
E_{PROT}	Energy Concentration from Protein
EV_g	Energy Value of Gain
FCR	Feed Conversion Ratio
FD	Fat Depth
FFCW	Fat Free Carcass Weight
FI	Feed Intake
FM	Fasting Metabolism

FO	Faecal Output
FPA	Four Palm Area
F-value	Faecal Output / Live Weight
g	Gram (s)
GE	Gross Energy
GM	Gradient Movement
GR	Relative Growth Coefficient
ha	Hectare (s)
HDMY	Herbage Dry Matter Yield per Hectare per Month
HI	Herbage Intake
HM	Horizontal Movement
J	Joule (s)
k_g	Efficiency of Utilisation of Metabolisable Energy for Gain
kg	Kilogram (s)
kJ	Kilojoule (s)
k_m	Efficiency of Utilisation of Metabolisable Energy for Maintenance
km	Kilometre (s)
ln	Natural Logarithm
Log_{10}	Common Logarithm
LP	Light Penetration
LS	Level of Significance
LW	Live Weight
M/B	Meat/Bone Ratio
M/F	Meat/Fat Ratio
ME	Metabolisable Energy
MEI	Metabolisable Energy Intake
MER	Metabolisable Energy Requirement
MER_g	Metabolisable Energy Requirement for Gain
MER_{GR}	Metabolisable Energy Requirement for Growth
MER_m	Metabolisable Energy Requirement for Maintenance
min	Minute (s)
MJ	Megajoule (s)
ml	Millilitre (s)
MR	Maturity Rate
NA	Nutrient Available
NER_g	Net Energy Requirement for Gain
NER_m	Net Energy Requirement for Maintenance
NFE	Nitrogen Free Extract
NPH	Number of Palm per Hectare
NS	Non-significant difference ($P>0.05$)
NV	Nutrient Value
PA	Palm Age
PF	Preference Index

PHDMY	Predicted Herbage Dry Matter Yield
PS	Plot Size
q-value	Metabolisability
R^2	Coefficient of Determination
RE	Retained Energy
REA	Rib Eye Area
RE_B	Retained Energy in Bone
RE_{CAR}	Retained Energy in Carcass
RE_F	Retained Energy in Fat
RE_M	Retained Energy in Muscle
RHGA	Rate of Herbage Growth per Day
SAS	Statistical Analysis System
SHDMY	Selective Herbage Dry Matter Yield
SHY	Selective Herbage Yield
SI	Selective Index
SLW	Live Weight at Starved
SLT	Siamese Long Tail
TDN	Total Digestible Nutrients
TLW	Transformed Live Weight
VI	Voluntary Intake
$W_{t.}$	Weight

Abstract of the dissertation presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the Degree of Doctor of Philosophy

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By

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May 1999

Chairman: **Professor Dahlan Ismail, Ph. D.**

Faculty: **Agriculture**

The growth and carcass performance of sheep reared under integration in the mature oil palm plantation and feedlot system were studied using a systems approach. Simulation models of the growth and carcass of the Dorset x Siamese Long Tail (DSLT) and Dorset x Malin (DMalin) sheep were described.

To construct simulation models to evaluate a production system, a series of studies were carried out. Firstly, the dry matter intake, energy intake and energy requirements of sheep were determined. Secondly, the live weight changes, carcass, muscle, fat and bone weight changes were measured. Thirdly, the models were constructed to describe the growth and carcass performance of sheep under the two production systems. Validations of the simulation models were done by comparing the simulated data with the actual data of live weight, carcass and its tissue weight.