INCREASING FERTILIZER USE EFFICIENCY AND AVAILABILITY OF PHOSPHORUS AND ZINC IN FURROW CULTIVATION FOR SUSTAINABLE AGRICULTURE ON SLOPING LAND

METHINEE PHOLINTA

MASTER OF SCIENCE
IN SUSTAINABLE AGRICULTURE AND INTEGRATED
WATERSHED MANAGEMENT

THE GRADUATE SCHOOL
CHIANG MAI UNIVERSITY
JANUARY 2012

INCREASING FERTILIZER USE EFFICIENCY AND AVAILABILITY OF PHOSPHORUS AND ZINC IN FURROW CULTIVATION FOR SUSTAINABLE AGRICULTURE ON SLOPING LAND

METHINEE PHOLINTA

A THESIS SUBMITTED TO THE GRADUATE SCHOOL IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF MASTER OF SCIENCE
IN SUSTAINABLE AGRICULTURE
AND INTEGRATED WATERSHED MANAGEMENT

THE GRADUATE SCHOOL
CHIANG MAI UNIVERSITY
JANUARY 2012

INCREASING FERTILIZER USE EFFICIENCY AND AVAILABILITY OF PHOSPHORUS AND ZINC IN FURROW CULTIVATION FOR SUSTAINABLE AGRICULTURE ON SLOPING LAND

METHINEE PHOLINTA

THIS THESIS HAS BEEN APPROVED

TO BE A PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE DEGREE OF MASTER OF SCIENCE

IN SUSTAINABLE AGRICULTURE AND INTEGRATED

WATERSHED MANAGEMENT

EXAMINING COMMITTEE

THESIS ADVISORY COMMITTEE

J. Inthoson CHAIRPERS

CHAIRPERSON

ADVISOR

Dr. Jiraporn Inthansan

Assoc.Prof. Dr. Mattiga Panomtaranichagul

Mattiga P. MEMBER

....CO- ADVISO

Assoc.Prof. Dr. Mattiga Panomtaranichagul

Prof. Dr. Karl Stahr

Prof. Dr. Karl Stahr

9 January 2012

© Copyright by Chiang Mai University

ACKNOWLEDGEMENTS

The author would like to express her sincere appreciation and gratitude to her advisor Assoc. Prof. Dr. Mattiga Panotaranichagul for her generous support, advises recommendations and guidance at various stage of her studies. The author would like to say a big thanks to Prof. Dr. Karl Stahr for his valuable comments. The author grateful to The Uplands Program, National Research Council of Thailand (NRCT) for the financial support of the field experiment, and sincerely thank DAAD foundation, Germany for financial supporting for her studying in Germany and Thailand during her studied two years.

Further, the author is also grateful and would like to thank the lecturers and administrative staff of SAIWAM program, Chiang Mai University and Hohenheim University for sharing their knowledge and experience during the studied. Gratitude goes also to all staff in laboratory for their cooperation and grateful to the farmer who help in conducting the field work. The author would like to thank all her friends in Chiang Mai and Stuttgart for sharing the happy times and lonely moments with hers.

Finally, the author is thankful withal gratitude to her parents and sister for their understanding, patience, sacrifices and encouragement which are the source of inspiration and motivation behind to complete her studied in master program.

inspiration and motivation behind to complete her studied in master program.

Methinee Pholinta