

COMPANION MODELLING TO ANALYSE THE LAND/WATER USE
AND LABOUR MIGRATION INTERACTIONS
IN LAM DOME YAI WATERSHED, LOWER NORTHEAST THAILAND



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for the Degree of Doctor of Philosophy Program in Agricultural Technology

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แบบจำลองเพื่อนคู่คิดเพื่อวิเคราะห์อันตรกิริยาระหว่างการใช้ที่ดินและน้ำ
กับการย้ายถิ่นของแรงงานในลุ่มน้ำลำโดมใหญ่
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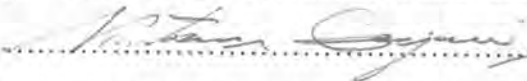
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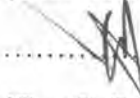
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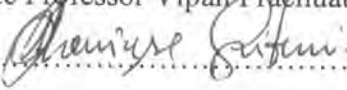
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85% ของพื้นที่ปลูกข้าวในภาคตะวันออกเฉียงเหนือ เป็นพื้นที่นาเขตน้ำฝน ที่ขาดความอุดมสมบูรณ์ โดยเฉพาะสภาพดินทราย และความไม่แน่นอนของการกระจายตัวของน้ำฝนทั้งในเชิงปริมาณและช่วงเวลา ทำให้ได้ปริมาณผลผลิตข้าวที่ต่ำ โดยเฉลี่ยที่ 290 กก. ต่อไร่ และเกษตรกรสามารถทำนาได้เพียงแค่ 1 ครั้งต่อปี สิ่งเหล่านี้เป็นสาเหตุหลักที่ทำให้เกษตรกรในภูมิภาคนี้มีรายได้ต่อหัวที่ต่ำกว่าภูมิภาคอื่น การอพยพย้ายถิ่นไปทำงานนอกภาคเกษตร เพื่อหาเงินจุนเจือครอบครัวจึงเป็นการปรับตัวที่สำคัญของเกษตรกรรายย่อยที่มีฐานะยากจนในภาคตะวันออกเฉียงเหนือเพื่อช่วยเหลือเกษตรกรเหล่านี้ให้สามารถขยายเวลาและพื้นที่การเพาะปลูก โครงการผันน้ำจากแม่น้ำโขงที่มีมูลค่ากว่า 500,000 ล้านบาท ได้ถูกสร้างขึ้น โดยขาดความเข้าใจปฏิกิริยาสัมพันธ์ระหว่างการใช้ที่ดินของแรงงาน กับการจัดการทรัพยากรที่ดิน และแหล่งน้ำของเกษตรกรในภูมิภาคนี้ งานวิจัยนี้จึงมีวัตถุประสงค์ที่จะทำความเข้าใจปฏิกิริยาสัมพันธ์ดังกล่าว โดยนำการสร้างแบบจำลองแบบมีส่วนร่วมของผู้ที่มีส่วนได้ส่วนเสียที่เรียกว่า "แบบจำลองเพื่อนคู่คิด (Companion Modelling: ComMod)" มาใช้

ComMod เป็นกระบวนการคิดและสร้างความเข้าใจแบบหมุนวน จึงเป็นกระบวนการหนึ่งที่สนับสนุนการศึกษาแบบบูรณาการด้วยแบบจำลองที่ยืดหยุ่นและผ่านการวิเคราะห์จากบุคคลหลายสาขา ทำให้เกิดการพูดคุยวิเคราะห์ผ่านแบบจำลองเสมือนจริง แล้วนำเอาข้อมูลความรู้จากการวิเคราะห์ที่มีความเกี่ยวข้องกับระบบที่ทำการศึกษามาปรับปรุงประกอบเข้าเป็นแบบจำลองเดียวกัน กระบวนการนี้มีการนำเครื่องมือสองชนิดมาใช้ร่วมกันคือ การสวมบทบาทในเกมส์ (Role-Playing Game: RPG) และแบบจำลองภาคี (Agent-Based Model: ABM) โดยพัฒนาร่วมกันกับเกษตรกรที่มีอาชีพทำนาในหมู่บ้านมากมาย อำเภอเดชอุดม จังหวัดอุบลราชธานี

เกษตรกรที่เข้าร่วมยอมรับว่าแบบจำลองภาคีที่ร่วมกันสร้างและให้ชื่อว่า BanMakMai (บ้านมากมาย) สามารถเป็นตัวแทนของระบบสังคมเกษตรของหมู่บ้านมากมายได้ จากการติดตามผลกระทบของกระบวนการใช้ ComMod ที่มีต่อผู้เข้าร่วมพบว่า มีการปรับตัวของเกษตรกรในการจัดการทรัพยากรดิน, น้ำ และแรงงาน และ เกษตรกรผู้เข้าร่วมเห็นว่าเป็นกระบวนการเรียนรู้ร่วมกัน โดยใช้สื่อการเล่นสวมบทบาท และแบบจำลองภาคีเป็นรูปแบบวิธีการการแลกเปลี่ยนองค์ความรู้ที่มีประสิทธิภาพ

ภาควิชา.....ลายมือชื่อผู้คิด.....
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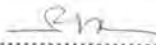
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 LAM DOME YAI WATERSHED, LOWER NORTHEAST THAILAND .
 THESIS ADVISOR : ASSOCIATE PROFESSOR NANTANA GAJASENI,
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85% of rice production, the largest type of land use in the northeast region of Thailand, is under rainfed conditions constrained by erratic rainfall distribution and coarse textured soils limiting the regional paddy yield at an average of 1.8 t ha^{-1} and enabling farmers to have only 6 months in the wet season to carry out rice-growing activities. This harsh agroecosystem and related poor crop productivity leads to very low per capita incomes. A common adaptive strategy for these resource-poor rice farmers is labour migration. However, the interaction between labour migration and changes in land and water use is still not well understood. The future spending of 500,000 million baht on hydro-shield tunnels to divert water from the Mekong River has been planned without prior understanding of this interaction. The purpose of this research is to better understand this interaction by using the Companion Modelling (ComMod) approach to facilitate co-learning between researchers and a heterogeneous group of farmers.

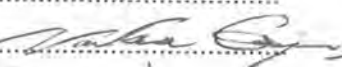
ComMod is an iterative, continuous, evolving approach that facilitates dialogue, shared learning, and collective decision-making through interdisciplinary and implicated action-oriented research to strengthen the adaptive management capacity of stakeholders facing a common resource management problem. In this case study, ComMod is used to enhance co-learning through knowledge exchange to integrate indigenous and academic knowledge, aimed at building a shared representation of the interaction under study. Importantly, such a shared representation allows stakeholders to efficiently explore possible scenarios of change in the future and to agree upon suitable collective actions. In this implementation of the ComMod process, associated tools i.e., a Role-Playing Game (RPG) and an Agent-Based Model (ABM) were developed with local rice farmers of Ban Mak Mai village, Det Udom district, Ubon Ratchathani province.

According to the participating farmers, the co-designed ABM, named "BanMakMai", sufficiently represents their farm management and labour migration practices. Subsequent monitoring and evaluation activities found various effects of ComMod on participating farmers regarding knowledge acquisition and changes in perceptions of the system under study, decision-making, and practices. The farmers also said that such a co-learning process, facilitated and stimulated by the evolutionary gaming and simulation exercises, is a very effective means for knowledge exchange.

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LIST OF ABBREVIATIONS

Acronym	Description
ABM	Agent-Based Model
ADD	Agriculture et Développement Durable
ALRO	Agricultural Land Reform Office
APS	Agricultural Production Systems
ARD	Agricultural Research and Development
BAAC	Bank for Agriculture and Agricultural Co-operatives
BMM	Ban Mak Mai village
BNs	Bayesian Networks
CAS	Complex Adaptive Systems
CGIAR	Consultative Group on International Agricultural Research
CIRAD	Centre de coopération internationale en recherche agronomique pour le développement
CM	Cognitive Mapping
ComMod	Companion Modelling
CORMAS	Common-pool resource Multi-Agent Systems
CPWF	Challenge Program on Water and Food
DAI	Distributed Artificial Intelligence
DSS	Decision Support Systems
GIS	Geographic Information System
INRM	Integrated Natural Resource Management
IRRI	International Rice Research Institute
IRRM	Integrated Renewable Resource Management
KDML105	Non-glutinous Khao Dawk Mali 105 variety
LDY	Lam Dome Yai watershed
MAS	Multi-Agent Systems
MCA	Multi-Criteria Analysis
M&E	Monitoring and Evaluation
NESDB	Office of National Economic and Social Development Board

NSO	National Statistical Office
OAE	Office of Agricultural Economics
ODD	Overviews, Design concepts, Details protocol
PET	Potential evapotranspiration
PS	Probability and Statistical method
RD6	Glutinous Rice Department 6 variety
RID	Royal Irrigation Department
RLR	Rainfed Lowland Rice
RPG	Role-Playing Game
RRD	Office of Rapid Rural Development
RRM	Renewable Resource Management
SAES	Social-Agroecological Systems
SD	System Dynamics
TAO	Tambon (sub-district) Administrative Office
TDRI	Thailand Development Research Institute
UBU	Ubon Rajathanee University
UML	Unified Modelling Language
V-E	Value-Expectancy
WaLa	4 farm ponds for all farms and 20 farm workers from other villages scenario
WaLi	4 farm ponds for all farms and 10 farm workers from other villages scenario
WaLn	4 farm ponds for all farms and no farm worker from other villages scenario
WiLa	2 farm ponds for B and C farms and 20 farm workers from other villages scenario
WiLi	2 farm ponds for B and C farms and 10 farm workers from other villages scenario
WiLn	2 farm ponds for B and C farms and no farm worker from other villages scenario
WnLa	No farm pond and 20 farm worker from other villages scenario

WnLi	No farm pond and 10 farm worker from other villages scenario
WnLn	No farm pond and no farm worker from outside scenario
WPI	Water Poverty Index