

ห้องสมุดงานวิจัย สำนักงานคณะกรรมการการวิจัยแห่งชาติ



E46265

RISK ASSESSMENT TO DEGRADATION OF MANDARIN CV.
SAI NAM PUENG ORCHARDS USING TOPOGRAPHICAL
AND SOIL PROPERTY UNDER MANAGEMENT
FACTORS: A CASE STUDY OF MAE SOON
SUB-DISTRICT, FANG DISTRICT,
CHIANG MAI PROVINCE

VASSANA VIRONRAT

DOCTOR OF PHILOSOPHY
IN SOIL SCIENCE AND NATURAL RESOURCES MANAGEMENT

THE GRADUATE SCHOOL
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VASSANA VIROONRAT

**A THESIS SUBMITTED TO THE GRADUATE SCHOOL IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS
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17 October 2011

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ACKNOWLEDGEMENT

First of all, I sincerely express my profound gratitude and respect to Assist. Prof. Dr. Taworn Onpraphai, my thesis advisor, and Assist. Prof. Dr. Ampan Bhromsiri for their intellectual supervision, invaluable guidance and comments to the successful completion of my thesis.

I am deeply grateful to members of the thesis committee, Dr. Choochad Santasup and Assist. Prof. Daruni Naphrom who have provided me the valuable comments and suggestions on the research contents. This study would not be completed without their support.

My sincere appreciation is extended to all mandarin farmers in Mae Soon sub district Fang district, Chiang Mai province for their cooperation with the survey questionnaires and their permission to conduct the experiments in their fields.

My hearth thanks and appreciations go to the staffs of tangerine competitiveness project, Mr. Nirut Kongpingkhum and Mr. Soomchat Tharat. According to the graduate and undergraduate students of Soil Science from years of 2008 –2011, whose names are not mentioned here for providing me their assistance to complete my study.

I would like to thank also the Graduate School, Chiang Mai University and Thailand Research Fund (TRF) for providing me some financial support for my research fund.

I am grateful to my father, mother, brother, and sister for inspiration, encouragement and helpfulness during many years of this Ph.D. research.

Vassana Viroonrat

ชื่อเรื่องวิทยานิพนธ์

การประเมินความเสี่ยงต่อความเสื่อมโทรมของสวนส้ม
พันธุ์สายน้ำผึ้งโดยใช้ปัจจัยสภาพภูมิประเทศ และ
สมบัติดินภายใต้การจัดการ: กรณีศึกษา ตำบลแม่สุ่น
อำเภอฝาง จังหวัดเชียงใหม่

ผู้เขียน

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ในการการประเมินความเสี่ยงต่อความเสื่อมโทรมของสวนส้มพันธุ์สายน้ำผึ้งโดยใช้ปัจจัยสภาพภูมิประเทศ และคุณสมบัติดินภายใต้การจัดการ ณ ตำบลแม่สุ่น อำเภอฝาง จังหวัดเชียงใหม่ ใช้ข้อมูลภาพถ่ายดาวเทียม THEOS ภาพหลายช่วงคลื่น รายละเอียดจุดภาพ 15 เมตร และข้อมูลภาพถ่ายดาวเทียม THEOS ขาวดำ รายละเอียดจุดภาพ 2 เมตร ในการจำแนกพื้นที่ปลูกส้ม จากนั้นคัดเลือกสวนส้มจำนวน 50 สวน ที่ยังสามารถให้ผลผลิตได้ เพื่อใช้สำหรับเก็บข้อมูล โดยใช้ข้อมูลจากแบบสอบถาม และการสำรวจภาคสนาม ข้อมูลที่บันทึก ได้แก่ การจัดการสวนของเกษตรกร ประวัติการใช้ที่ดิน สภาพของต้นส้มในสวน ทักษะของเกษตรกร ตำแหน่งที่ตั้งสวน ลักษณะภูมิประเทศ (ระดับความสูงและความลาดชันของพื้นที่) สมบัติทางเคมี กายภาพ และชีวภาพของดิน สภาวะธาตุอาหารพืชในใบส้มที่ใช้เป็นดัชนี ผลผลิต และขนาดของผลส้ม นำข้อมูลด้านสภาพภูมิประเทศ สมบัติดินมาพัฒนาเป็นฐานข้อมูลเชิงพื้นที่ และข้อมูลด้านอื่นพัฒนาเป็นฐานข้อมูลโดยใช้โปรแกรม ArcGIS 9.2 จากนั้นนำมาประเมินความเสี่ยงต่อความเสื่อมโทรมของสวนส้มพันธุ์สายน้ำผึ้งโดยใช้กระบวนการวิเคราะห์ตามลำดับขั้น (Analytic Hierarchy Process) จากผลการศึกษา

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พบว่า ในเขตตำบลแม่สุณมีพื้นที่ปลูกส้ม จำนวนอื่น 11,156 ไร่ สำหรับสวนส้มที่คัดเลือกจำนวน 50 สวนที่ยังสามารถให้ผลผลิตได้มีเนื้อที่ทั้งหมด 154.6 ไร่ สวนส้มบนพื้นที่ราบลุ่ม 56.5% ของพื้นที่สวนที่คัดเลือกไว้ สำหรับสวนส้มบนที่ราบเชิงเขา และพื้นที่ลาดชันมี 21.7% และ 21.8% ตามลำดับ

สำหรับสาเหตุความเสื่อมโทรมของสวนส้มมี 3 สาเหตุ ได้แก่ การเกิดโรครากเน่า การสูญเสียธาตุอาหาร โดยการชะล้างและการไหลบ่าของน้ำ และการขาดสมดุลของธาตุอาหารพืชในดิน โดยปัจจัยที่เกี่ยวข้องกับความเสื่อมโทรมของสวนส้มที่เกิดจากสาเหตุโรครากเน่า คือ ระดับความลาดชัน ระดับความสูง การระบายน้ำ ความหนาแน่นของดิน ความพรุนของดิน ปฏิกริยาของดิน และระดับอินทรีย์วัตถุในดิน สำหรับปัจจัยที่เกี่ยวข้องกับความเสื่อมโทรมของสวนส้มที่เกิดจากสาเหตุการชะล้างธาตุอาหารพืช คือ ระดับความลาดชัน การไหลบ่าของน้ำ การซึมซับน้ำของดิน ความลึกของดินความสามารถในการแลกเปลี่ยนประจุบวกของดิน ปฏิกริยาของดิน และระดับอินทรีย์วัตถุในดิน ส่วนความเสื่อมโทรมของสวนส้มที่เกิดจากสาเหตุการขาดสมดุลธาตุอาหารในดินมีปัจจัยที่เกี่ยวข้องกับคือ ปฏิกริยาของดิน ความสามารถในการแลกเปลี่ยนประจุบวกของดิน ระดับอินทรีย์วัตถุในดิน ปริมาณฟอสฟอรัสที่เป็นประโยชน์ได้ในดิน และปริมาณโพแทสเซียมที่แลกเปลี่ยนได้ในดิน

ผลการประเมินความเสี่ยงต่อการเกิดโรครากเน่า พบว่า 70% ของสวนส้มตัวอย่างที่ตั้งอยู่บนพื้นที่ราบลุ่ม และ 72% ของสวนส้มตัวอย่างที่ตั้งอยู่บนพื้นที่ราบเชิงเขา มีโอกาสเสี่ยงต่อการเกิดโรครากเน่า ในระดับที่สูง-สูงมาก แต่สวนส้มตัวอย่างที่ตั้งอยู่บนพื้นที่ลาดชันมีเพียง 16% เท่านั้น ในกรณีของความเสี่ยงต่อการชะล้างธาตุอาหารพืช พบว่า 73% ของสวนส้มตัวอย่างที่ตั้งอยู่บนพื้นที่ลาดชัน มีโอกาสเสี่ยงต่อการถูกชะล้างธาตุอาหารพืชในระดับที่สูง-สูงมาก ในขณะที่สวนส้มตัวอย่างที่ตั้งอยู่บนพื้นที่ราบลุ่มและพื้นที่ราบเชิงเขาไม่พบว่ามีความเสี่ยงในระดับนี้ ส่วนผลการประเมินความเสี่ยงต่อความไม่สมดุลธาตุอาหารในดิน พบว่า 50% ของสวนส้มตัวอย่างที่ตั้งอยู่บนพื้นที่ราบเชิงเขา และ 57% ของสวนส้มตัวอย่างที่ตั้งอยู่บนพื้นที่ลาดชัน มีโอกาสที่จะเกิดความเสี่ยงสูง-สูงมาก ในขณะที่สวนส้มตัวอย่างที่ตั้งอยู่ในพื้นที่ราบลุ่มนั้นพบความเสี่ยงระดับนี้เพียง 3.1%

Thesis Title	Risk Assessment to Degradation of Mandarin cv. Sai Nam Pueng Orchards Using Topographical and Soil Property Under Management Factors: A Case Study of Mae Soon Sub-district, Fang District, Chiang Mai Province	
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Abstract

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Risk assessment to degradation of mandarin cv. Sai Nam Pueng orchards using topographical and soil property under management factors were conducted at Mae Soon sub-district, Fang district, Chiang Mai province. THEOS multispectral image with 10 meter – resolution and panchromatic with 2 meter – resolution were used in combination with 0.75 meter – resolution orthophoto in order to classify mandarin cultivated area. Farmer – interviews and field survey were used in order to

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select the 50 productive orchards. The following data, farmer practices, land use history, the condition of mandarin trees in the farmers' orchards, farmers' skills, position of the orchards, topography (elevation and slope) soil physical, chemical and biological properties, status of plant nutrients in the index leaves, fruit yield and fruit sizes were collected. The spatial database of orchard boundary, topographic condition, soil quality, plant nutrient status of index leaves, fruit yield and fruit size of 50 selected orchards were developed using ArcGIS 9.2. Analytical Hierarchy Process (AHP) which is the multi-criterion decision analytical process was used for risk assessment of the factors affecting on productivity declination of mandarin orchards. It was found that, the mandarin cultivated areas in Mae Soon sub district in 2010 had the total areas of 11,156.6 rais. The selected 50 productive orchards had the total areas of 154.6 rais which were on the lowland 56.5%, on the flat plain at the base of the hill 21.7% and on the sloping land 21.8%. The declination of productivity of the selected orchards were due to three main causes as follows ; root rot, plant nutrient lost through leaching and runoff and plant nutrient imbalanced condition of the orchard soils.

The factors contributed to root rot damage were, slope, elevation, drainage, bulk density, porosity, pH and organic matter content of the soils. In the case of plant nutrient lost the influencing factors were, slope, runoff, permeability soil depth, CEC, pH and soil organic matter. The factors contributed to plant nutrient imbalance of the soils were pH, CEC, soil organic matter, available P and exchangeable K.

In the case of the risk to root rot damage it was found that 70% of the selected orchards on the lowland and 72% of the orchards on the foothill had the risk at high and very high levels while the orchards on the sloping land with such risky levels

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were only 16%. None of the studied orchards on the lowland and the flat plain at the base of the hill were risky to nutrient lost by leaching and run off while 73% of the total orchards on the sloping land had risk at high and very high levels. In the case of the risk on plant nutrient imbalance of the soils, 50% of the orchards on the flat plain at the base of the hill and 50% on the sloping land were risky at the level of high to very high while those in the lowland with such risky levels were only 3.1%.

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