



UNIVERSITI PUTRA MALAYSIA

**IMPACT OF CREDIT RISK IN FARM PLANNING
IN THE CHIANG MAI VALLEY, THAILAND:
A MULTIPERIOD RISK-PROGRAMMING ANALYSIS
OF CREDIT RESERVES**

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By

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the Degree of Doctor of Philosophy in the Faculty
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LIST OF ABBREVIATIONS

BAAC	the Bank of Agriculture and Agricultural Cooperative
LP	Linear Programming
QP	Quadratic Programming
EUT	Expected Utility Theory
OAE	Office of Agricultural Economics
C.V.	Coefficient of Variation
ANOVA	Analysis of Variance
E-V	Mean and Variance



Abstract of the thesis submitted to the Senate of Universiti Pertanian Malaysia in fulfillment of the requirements for the degree of Doctor of Philosophy.

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May 1993

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Theoretical model indicates that credit risk affects farmers' debt use and, thus, farm organization. An empirical model is set up to test the hypothesis from the theoretical model. The purpose of this study is to examine how credit availability to individual farmers, as evaluated by their lenders, responds to changes in past levels of farm income. Effects of resulting credit risks on optimal farm portfolios, including credit reserves, are then evaluated with different degree of risk aversion coefficients.

The data used in this study were obtained from both primary and secondary sources. The historical data series of



farmers' income and supply of credit were elicited from individual borrower record keeping and approved loan request form. Five lenders and 259 borrowers were selected as the sample of the study. Farmers were classified into the following six groups: severe loss, moderate loss, average conditions, moderate gain, and favourable gain, based on their farm income experienced by the farmer in the preceding year. Thus, the likelihoods associated with the gain and loss conditions are derived with farm income risk parameters used in this study.

Results of two-way analysis of variance, where farm income risk were treated as treatments and lenders were treated blocks, indicated that (i) credit appears to be linearly related to past farm income, at the five percent level of significance, (ii) capital credit has a higher variability than operating credit, and (iii) capital credit is more sensitive to change in past farm income than operating credit. These results are consistent with the hypothesis that farmers' credit is positively correlated with changes in level of farm income, although the correlation appears stronger for capital credit than for operating credit. That is, risks associated with credit availability for capital purchases appears to add more to farmers' total portfolio risk than does credit for operating



Credit responses suggest that lenders exhibit, in general, flexibility toward rescheduling debt repayments from low return years to succeeding ones. However, lenders tend to favour capital expansion after the loan repayment reschedules are met and farm profits are at average level or gain condition of past level of farm income. Nevertheless, restricting capital credit is a favoured means of financial control by lenders for those farmers who are in a loss condition of farm income.

This study also evaluates the impact of credit risk in portfolio analysis. A multiperiod risk-programming model of a representative farm in the Chiang Mai Valley to measure the impact of credit risk on the expected utility maximizing portfolios of well defined classes of risk averse farmers was constructed. The risk-programming results obtained in this study are consistent with the anticipated responses. Model results with and without credit risk are also contrasted. Including credit risk takes fuller account of the overall risk position of farmers. When credit risk is included in the analysis (i) the average level of the credit reserve increases faster, and the use of capital credit and expansion of farm growth are more rapidly eliminated from optimal plans as the risk aversion coefficient increases, and (ii) for a given level of risk aversion, the average level of the credit reserves for both credit lines are generally much higher. Hence, these



results are consistent with the hypothesis that more credit risk brings slower growth, greater credit reserves and some idling of resources. These results support that credit risks should be taken into account in farm management.



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KESAN KE ATAS RISIKO KREDIT DI DALAM PERANCANGAN LADANG
PENDAPATAN LADANG DI LEMBAH CHIANG MAI, THAILAND:
SATU ANALISIS PEMPROGRAMAN RISIKO
TERHADAP RIZAB KREDIT

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Model berteori menyatakan bahawa risiko kredit mempunyai kesan terhadap penggunaan pinjaman oleh petani-petani dan organisasi sesuatu firma. Satu model empirikal telah dibentuk untuk menguji hipotesis daripada model berteori tersebut. Tujuan kajian ini adalah untuk melihat bagaimana kemudahan kredit yang diperuntukkan kepada seseorang petani dinilai dari segi reaksi terhadap perubahan paras pendapatan ladang pada masa-masa lepas oleh institusi kredit. Kesan daripada risiko kredit terhadap portfolio ladang yang optimum yang merangkumi rizab kredit akan dinilai dengan koefisien pengelakan risiko yang mempunyai darjah yang berlainan.



Data-data yang digunakan di dalam kajian ini adalah merupakan data sekunder dan primer. Siri-siri data sejarah mengenai pendapatan petani dan penawaran kredit didapati daripada rekod peminjam (petani) dan borang permohonan pinjaman yang telah diluuskan. Sebanyak 5 institusi yang memberi pinjaman dan seramai 259 peminjam telah dipilih sebagai sampel untuk kajian ini. Petani-petani telah dibahagikan kepada 6 kumpulan seperti berikut: rugi teruk, rugi sederhana, keadaan purata, keuntungan sederhana dan keuntungan yang memuaskan. Pengelasan kumpulan-kumpulan ini dibuat berasaskan pendapatan ladang yang diperolehi oleh petani pada satu tahun yang terdahulu. Maka kemungkinan yang boleh dikaitkan dengan keadaan kerugian dan keuntungan adalah didapati daripada parameter risiko pendapatan ladang yang digunakan di dalam kajian ini. Hasil daripada analisis dua hala varians di mana risiko pendapatan ladang dianggap sebagai pelaku dan institusi pinjaman sebagai blok, menunjukkan (i) bahawa kredit mempunyai kaitan yang linear dengan pendapatan ladang yang lepas di paras lima peratus keertian, (ii) kredit bagi input modal mempunyai kebolehubahan yang tinggi daripada kredit kendalian, dan (iii) kredit untuk input modal lebih peka kepada perubahan pendapatan ladang yang lepas daripada kredit untuk input-input kendalian. Penemuan ini adalah selaras dengan hypotesis yang menyatakan bahawa kredit yang diperolehi oleh petani mempunyai korelasi

yang positif dengan perubahan pendapatan ladang walaupun korelasi ini lebih cenderung kepada kredit input-input modal daripada kredit input-input kendalian. Ini bermakna bahawa risiko yang berkaitan dengan ketersediaan kredit untuk belian input-input modal menambahkan lagi jumlah risiko portfolio berbanding dengan kredit untuk belanja-belanja kendalian.

Gerakbalas terhadap kredit mencadangkan bahawa pemberi-pemberi pinjaman secara amnya mempunyai kebolehubahan menjadual semula bayaran balik pinjaman daripada tahun-tahun yang mempunyai pulangan rendah kepada tahun-tahun seterusnya. Walau bagaimanapun, pemberi-pemberi pinjaman selalunya memberi keutamaan kepada pinjaman untuk input-input modal setelah penjadualan semula pinjaman dipatuhi dan keuntungan ladang yang dihasilkan adalah melebihi atau separas dengan pendapatan purata ladang pada tahun-tahun yang terdahulu. Sekalipun begitu, tindakan mengetatkan lagi pinjaman kredit untuk input-input modal adalah satu yang diberi keutamaan daripada cara oleh pemberi-pemberi pinjaman sebagai salah satu cara kawalan kewangan terhadap petani-petani yang berada di dalam keadaan kerugian.

Kajian ini juga akan menilai kesan risiko kredit terhadap analisis portfolio. Satu model pemrograman risiko yang berbilang tempoh bagi ladang ladang di lembah Chiang Mai telah

dibentuk untuk mengukur akan kesan risiko kredit terhadap utiliti dijangka yang akan memaksimumkan portfolio untuk kumpulan-kumpulan petani yang mempunyai gelagat pengelak risiko. Hasil daripada pemrograman risiko yang diperolehi daripada kajian ini mendapati bahawa gerakbalas terhadap risiko adalah kekal sebagaimana yang telah dijangkakan. Model jua dibentuk untuk mengambil kira situasi kredit yang berisiko atau tidak berisiko. Didapati bahawa risiko kredit memainkan peranan yang penting di dalam gelagat kerisikoan petani-petani. Apabila risiko kredit diambil kira di dalam analisis kajian ini didapati (i) bahawa paras purata rizab kredit meningkat lebih cepat dan di samping itu juga penggunaan kredit untuk input-input modal dan pertumbuhan ladang-ladang telah dimansuhkan daripada perancangan yang optimum apabila koefisien pengelak risiko meningkat, dan (ii) untuk setiap koefisien pengelak risiko, paras purata rizab kredit untuk kedua aliran kredit adalah lebih tinggi. Maka keputusan kajian ini adalah kekal dengan hipotesis yang menyatakan bahawa risiko kredit yang tinggi akan membawa pertumbuhan ladang yang lembab, menambahkan lagi rizab kredit dan menyebabkan sumber-sumber terbiar. Kajian ini menunjukkan bahawa risiko kredit seharusnya diambil kira di dalam pengurusan ladang.



CHAPTER I

INTRODUCTION

Overview

Characteristics of Thai Agricultural Resources

The agricultural sector plays a dominant role in the economy of many developing countries. The majority of their population is engaged in agriculture. Thailand, a developing country, has 63 percent of its population engaged in the agricultural sector (Table 1). Agriculture in the country not only serves as the major source of food and fiber for domestic consumption but also as the main source of foreign exchange earnings. As for the foreign exchange earnings, agricultural commodities accounted for 48 percent of the total export value in 1988 (Table 2). The contribution of agriculture to the Gross Domestic Product (GDP), at a constant 1972 market price, was 26.1 percent in 1977-81 and 20.4 percent in 1987-90. Although the absolute value of the share of agricultural commodities in the GDP has been decreasing since 1961 (Table 3), the main contribution to the GDP still comes from agricultural commodities. Among the agricultural activities, crop production accounted for about 75 percent of agricultural GDP during the past two decades (Tables 4). Thus, in consideration of the



Table 1
Agricultural Population, 1979-1987

Year	Total population ('000)	Agricultural population ('000)	% of Ag-population to Total population
1979	46396	31322	67.51
1980	47724	31922	66.89
1981	49094	32546	66.29
1982	50002	32863	65.72
1983	50928	33195	65.18
1984	51871	33539	64.66
1985	52829	33896	64.16
1986	53638	34261	63.87
1987	54438	34624	63.60

Source: 1989 Population and Housing Census, National Statistics Office, Office of the Prime Minister, Thailand, 1989.