Comparison of Commodity Specific Agricultural Programs to Income Safety Net Programs

by

K. Alberto Vera

A Thesis
Presented to the University of Manitoba
in Partial Fulfilment of the
Requirements for the Degree of
Master of Science
in
Agricultural Economics and Farm Management

Winnipeg, Manitoba

ISBN 0-612-16352-0

Name K. ALBERTO VERA LESCANO

Dissertation Abstracts International is arranged by broad, general subject categories. Please select the one subject which most nearly describes the content of your dissertation. Enter the corresponding four-digit code in the spaces provided.

AGRICULTURAL ECONOMICS | 0 | 5 | 0 | 3 | U·M·I

SUBJECT TERM — SUBJECT CODE

Subject Categories

THE HUMANITIES AND SOCIAL SCIENCES

COMMUNICATIONS AND THE ARTS
- Architecture 0729
- Art History 0377
- Cinema 0900
- Dance 0378
- Fine Arts 0357
- Information Science 0723
- Journalism 0391
- Library Science 0399
- Mass Communications 0708
- Music 0413
- Speech Communication 0459
- Theater 0465

EDUCATION
- General 0515
- Administration 0514
- Adult and Continuing 0516
- Agricultural 0517
- Art 0273
- Bilingual and Multicultural 0282
- Business 0688
- Community College 0275
- Curriculum and Instruction 0727
- Early Childhood 0518
- Elementary 0524
- Finance 0277
- Guidance and Counseling 0519
- Health 0680
- Higher 0745
- History of 0520
- Home Economics 0278
- Industrial 0521
- Language and Literature 0279
- Mathematics 0280
- Music 0522
- Philosophy of 0998
- Physical 0523
- Psychology 0525
- Reading 0535
- Religious 0527
- Sciences 0714
- Secondary 0533
- Social Sciences 0534
- Sociology of 0340
- Special 0529
- Teacher Training 0530
- Technology 0710
- Tests and Measurements 0288
- Vocational 0747

LANGUAGE, LITERATURE AND LINGUISTICS
- Language
  - General 0679
  - Ancient 0289
  - Linguistics 0290
  - Modern 0291
- Literature
  - General 0401
  - Classical 0294
  - Comparative 0295
  - Medieval 0297
  - Modern 0298
  - African 0316
  - American 0591
  - Asian 0305
  - Canadian (English) 0352
  - Canadian (French) 0355
  - English 0593
  - Germanic 0311
  - Latin American 0312
  - Middle Eastern 0315
  - Romance 0313
  - Slavic and East European 0314

PHILOSOPHY, RELIGION AND THEOLOGY
- Philosophy 0422
- Religion
  - General 0318
  - Biblical Studies 0321
  - Clergy 0319
  - History of 0320
  - Philosophy of 0322
- Theology 0469

SOCIAL SCIENCES
- American Studies 0323
- Anthropology
  - Archaeology 0324
  - Cultural 0326
  - Physical 0327
- Business Administration
  - General 0310
  - Accounting 0272
  - Banking 0770
  - Management 0454
  - Marketing 0338
- Canadian Studies 0385
- Economics
  - General 0501
  - Agricultural 0503
  - Commerce-Business 0505
  - Finance 0508
  - History 0509
  - Labor 0510
  - Theory 0511
- Folklore 0358
- Geography 0366
- Gerontology 0351
- History
  - General 0578
  - Ancient 0579
  - Medieval 0581
  - Modern 0582
  - Black 0328
  - African 0331
  - Asia, Australia and Oceania 0332
  - Canadian 0334
  - European 0335
  - Latin American 0336
  - Middle Eastern 0333
  - United States 0337
- History of Science 0585
- Law 0398
- Political Science
  - General 0615
  - International Law and Relations 0616
  - Public Administration 0617
- Recreation 0814
- Social Work 0452
- Sociology
  - General 0626
  - Criminology and Penology 0627
  - Demography 0938
  - Ethnic and Racial Studies 0631
  - Individual and Family Studies 0628
  - Industrial and Labor Relations 0629
  - Public and Social Welfare 0630
  - Social Structure and Development 0700
  - Theory and Methods 0344
- Transportation 0709
- Urban and Regional Planning 0999
- Women's Studies 0453

THE SCIENCES AND ENGINEERING

BIOLOGICAL SCIENCES
- Agriculture
  - General 0473
  - Agronomy 0285
  - Animal Culture and Nutrition 0475
  - Animal Pathology 0476
  - Food Science and Technology 0359
  - Forestry and Wildlife 0478
  - Plant Culture 0479
  - Plant Pathology 0480
  - Plant Physiology 0817
  - Range Management 0777
  - Wood Technology 0746
- Biology
  - General 0306
  - Anatomy 0287
  - Biostatistics 0308
  - Botany 0309
  - Cell 0379
  - Ecology 0329
  - Entomology 0353
  - Genetics 0369
  - Limnology 0793
  - Microbiology 0410
  - Molecular 0307
  - Neuroscience 0317
  - Oceanography 0416
  - Physiology 0433
  - Radiation 0821
  - Veterinary Science 0778
  - Zoology 0472
- Biophysics
  - General 0786
  - Medical 0760

EARTH SCIENCES
- Biogeochemistry 0425
- Geochemistry 0996
- Geodesy 0370
- Geology 0372
- Geophysics 0373
- Hydrology 0388
- Mineralogy 0411
- Paleobotany 0345
- Paleoecology 0426
- Paleontology 0418
- Paleozoology 0985
- Palynology 0427
- Physical Geography 0368
- Physical Oceanography 0415

HEALTH AND ENVIRONMENTAL SCIENCES
- Environmental Sciences 0768
- Health Sciences
  - General 0566
  - Audiology 0300
  - Chemotherapy 0992
  - Dentistry 0567
  - Education 0350
  - Hospital Management 0769
  - Human Development 0758
  - Immunology 0982
  - Medicine and Surgery 0564
  - Mental Health 0347
  - Nursing 0569
  - Nutrition 0570
  - Obstetrics and Gynecology 0380
  - Occupational Health and Therapy 0354
  - Ophthalmology 0381
  - Pathology 0571
  - Pharmacology 0419
  - Pharmacy 0572
  - Physical Therapy 0382
  - Public Health 0573
  - Radiology 0574
  - Recreation 0575
  - Speech Pathology 0460
  - Toxicology 0383
- Home Economics 0386

PHYSICAL SCIENCES

Pure Sciences
- Chemistry
  - General 0485
  - Agricultural 0749
  - Analytical 0486
  - Biochemistry 0487
  - Inorganic 0488
  - Nuclear 0738
  - Organic 0490
  - Pharmaceutical 0491
  - Physical 0494
  - Polymer 0495
  - Radiation 0754
- Mathematics 0405
- Physics
  - General 0605
  - Acoustics 0986
  - Astronomy and Astrophysics 0606
  - Atmospheric Science 0608
  - Atomic 0748
  - Electronics and Electricity 0607
  - Elementary Particles and High Energy 0798
  - Fluid and Plasma 0759
  - Molecular 0609
  - Nuclear 0610
  - Optics 0752
  - Radiation 0756
  - Solid State 0611
- Statistics 0463

Applied Sciences
- Applied Mechanics 0346
- Computer Science 0984
- Engineering
  - General 0537
  - Aerospace 0538
  - Agricultural 0539
  - Automotive 0540
  - Biomedical 0541
  - Chemical 0542
  - Civil 0543
  - Electronics and Electrical 0544
  - Heat and Thermodynamics 0348
  - Hydraulic 0545
  - Industrial 0546
  - Marine 0547
  - Materials Science 0794
  - Mechanical 0548
  - Metallurgy 0743
  - Mining 0551
  - Nuclear 0552
  - Packaging 0549
  - Petroleum 0765
  - Sanitary and Municipal 0554
  - System Science 0790
- Geotechnology 0428
- Operations Research 0796
- Plastics Technology 0795
- Textile Technology 0994

PSYCHOLOGY
- General 0621
- Behavioral 0384
- Clinical 0622
- Developmental 0620
- Experimental 0623
- Industrial 0624
- Personality 0625
- Physiological 0989
- Psychobiology 0349
- Psychometrics 0632
- Social 0451

Nom ______________________________

Dissertation Abstracts International est organisé en catégories de sujets. Veuillez s.v.p. choisir le sujet qui décrit le mieux votre thèse et inscrivez le code numérique approprié dans l'espace réservé ci-dessous.

______________________________ ☐☐☐☐ U·M·I

SUJET — CODE DE SUJET

Catégories par sujets

HUMANITÉS ET SCIENCES SOCIALES

COMMUNICATIONS ET LES ARTS
- Architecture 0729
- Beaux-arts 0357
- Bibliothéconomie 0399
- Cinéma 0900
- Communication verbale 0459
- Communications 0708
- Danse 0378
- Histoire de l'art 0377
- Journalisme 0391
- Musique 0413
- Sciences de l'information 0723
- Théâtre 0465

ÉDUCATION
- Généralités 515
- Administration 0514
- Art 0273
- Collèges communautaires 0275
- Commerce 0688
- Économie domestique 0278
- Éducation permanente 0516
- Éducation préscolaire 0518
- Éducation sanitaire 0680
- Enseignement agricole 0517
- Enseignement bilingue et multiculturel 0282
- Enseignement industriel 0521
- Enseignement primaire. 0524
- Enseignement professionnel 0747
- Enseignement religieux 0527
- Enseignement secondaire 0533
- Enseignement spécial 0529
- Enseignement supérieur 0745
- Évaluation 0288
- Finances 0277
- Formation des enseignants 0530
- Histoire de l'éducation 0520
- Langues et littérature 0279
- Lecture 0535
- Mathématiques 0280
- Musique 0522
- Orientation et consultation 0519
- Philosophie de l'éducation 0998
- Physique 0523
- Programmes d'études et enseignement 0727
- Psychologie 0525
- Sciences 0714
- Sciences sociales 0534
- Sociologie de l'éducation 0340
- Technologie 0710

LANGUE, LITTÉRATURE ET LINGUISTIQUE
- Langues
  - Généralités 0679
  - Anciennes 0289
  - Linguistique 0290
  - Modernes 0291
- Littérature
  - Généralités 0401
  - Anciennes 0294
  - Comparée 0295
  - Mediévale 0297
  - Moderne 0298
  - Africaine 0316
  - Américaine 0591
  - Anglaise 0593
  - Asiatique 0305
  - Canadienne (Anglaise) 0352
  - Canadienne (Française) 0355
  - Germanique 0311
  - Latino-américaine 0312
  - Moyen-orientale 0315
  - Romane 0313
  - Slave et est-européenne 0314

PHILOSOPHIE, RELIGION ET THÉOLOGIE
- Philosophie 0422
- Religion
  - Généralités 0318
  - Clergé 0319
  - Études bibliques 0321
  - Histoire des religions 0320
  - Philosophie de la religion 0322
- Théologie 0469

SCIENCES SOCIALES
- Anthropologie
  - Archéologie 0324
  - Culturelle 0326
  - Physique 0327
- Droit 0398
- Économie
  - Généralités 0501
  - Commerce-Affaires 0505
  - Économie agricole 0503
  - Économie du travail 0510
  - Finances 0508
  - Histoire 0509
  - Théorie 0511
- Études américaines 0323
- Études canadiennes 0385
- Études féministes 0453
- Folklore 0358
- Géographie 0366
- Gérontologie 0351
- Gestion des affaires
  - Généralités 0310
  - Administration 0454
  - Banques 0770
  - Comptabilité 0272
  - Marketing 0338
- Histoire
  - Histoire générale 0578
  - Ancienne 0579
  - Médiévale 0581
  - Moderne 0582
  - Histoire des noirs 0328
  - Africaine 0331
  - Canadienne 0334
  - États-Unis 0337
  - Européenne 0335
  - Moyen-orientale 0333
  - Latino-américaine 0336
  - Asie, Australie et Océanie 0332
- Histoire des sciences 0585
- Loisirs 0814
- Planification urbaine et régionale 0999
- Science politique
  - Généralités 0615
  - Administration publique 0617
  - Droit et relations internationales 0616
- Sociologie
  - Généralités 0626
  - Aide et bien-àtre social 0630
  - Criminologie et établissements pénitentiaires 0627
  - Démographie 0938
  - Études de l' individu et de la famille 0628
  - Études des relations interethniques et des relations raciales 0631
  - Structure et développement social 0700
  - Théorie et méthodes 0344
  - Travail et relations industrielles 0629
- Transports 0709
- Travail social 0452

SCIENCES ET INGÉNIERIE

SCIENCES BIOLOGIQUES
- Agriculture
  - Généralités 0473
  - Agronomie. 0285
  - Alimentation et technologie alimentaire 0359
  - Culture 0479
  - Élevage et alimentation 0475
  - Exploitation des péturages 0777
  - Pathologie animale 0476
  - Pathologie végétale 0480
  - Physiologie végétale 0817
  - Sylviculture et faune 0478
  - Technologie du bois 0746
- Biologie
  - Généralités 0306
  - Anatomie 0287
  - Biologie (Statistiques) 0308
  - Biologie moléculaire 0307
  - Botanique 0309
  - Cellule 0379
  - Écologie 0329
  - Entomologie 0353
  - Génétique 0369
  - Limnologie 0793
  - Microbiologie 0410
  - Neurologie 0317
  - Océanographie 0416
  - Physiologie 0433
  - Radiation 0821
  - Science vétérinaire 0778
  - Zoologie 0472
- Biophysique
  - Généralités 0786
  - Medicale 0760

SCIENCES DE LA TERRE
- Biogéochimie 0425
- Géochimie 0996
- Géodésie 0370
- Géographie physique 0368
- Géologie 0372
- Géophysique 0373
- Hydrologie 0388
- Minéralogie 0411
- Océanographie physique 0415
- Paléobotanique 0345
- Paléoécologie 0426
- Paléontologie 0418
- Paléozoologie 0985
- Palynologie 0427

SCIENCES DE LA SANTÉ ET DE L'ENVIRONNEMENT
- Économie domestique 0386
- Sciences de l'environnement 0768
- Sciences de la santé
  - Généralités 0566
  - Administration des hipitaux 0769
  - Alimentation et nutrition 0570
  - Audiologie 0300
  - Chimiothérapie 0992
  - Dentisterie 0567
  - Développement humain 0758
  - Enseignement 0350
  - Immunologie 0982
  - Loisirs 0575
  - Médecine du travail et thérapie 0354
  - Médecine et chirurgie 0564
  - Obstétrique et gynécologie 0380
  - Ophtalmologie 0381
  - Orthophonie 0460
  - Pathologie 0571
  - Pharmacie 0572
  - Pharmacologie 0419
  - Physiothérapie 0382
  - Radiologie 0574
  - Santé mentale 0347
  - Santé publique 0573
  - Soins infirmiers 0569
  - Toxicologie 0383

SCIENCES PHYSIQUES

Sciences Pures
- Chimie
  - Genéralités 0485
  - Biochimie 487
  - Chimie agricole 0749
  - Chimie analytique 0486
  - Chimie minérale 0488
  - Chimie nucléaire 0738
  - Chimie organique 0490
  - Chimie pharmaceutique 0491
  - Physique 0494
  - PolymÇres 0495
  - Radiation 0754
- Mathématiques 0405
- Physique
  - Généralités 0605
  - Acoustique 0986
  - Astronomie et astrophysique 0606
  - Electronique et électricité 0607
  - Fluides et plasma 0759
  - Météorologie 0608
  - Optique 0752
  - Particules (Physique nucléaire) 0798
  - Physique atomique 0748
  - Physique de l'état solide 0611
  - Physique moléculaire 0609
  - Physique nucléaire 0610
  - Radiation 0756
- Statistiques 0463

Sciences Appliqués Et Technologie
- Informatique 0984
- Ingénierie
  - Généralités 0537
  - Agricole 0539
  - Automobile 0540
  - Biomédicale 0541
  - Chaleur et ther modynamique 0348
  - Conditionnement (Emballage) 0549
  - Génie aérospatial 0538
  - Génie chimique 0542
  - Génie civil 0543
  - Génie électronique et électrique 0544
  - Génie industriel 0546
  - Génie mécanique 0548
  - Génie nucléaire 0552
  - Ingénierie des systämes 0790
  - Mécanique navale 0547
  - Métallurgie 0743
  - Science des matériaux 0794
  - Technique du pétrole 0765
  - Technique minière 0551
  - Techniques sanitaires et municipales 0554
  - Technologie hydraulique 0545
- Mécanique appliquée 0346
- Géotechnologie 0428
- Matières plastiques (Technologie) 0795
- Recherche opérationnelle 0796
- Textiles et tissus (Technologie) 0794

PSYCHOLOGIE
- Généralités 0621
- Personnalité 0625
- Psychobiologie 0349
- Psychologie clinique 0622
- Psychologie du comportement 0384
- Psychologie du développement 0620
- Psychologie expérimentale 0623
- Psychologie industrielle 0624
- Psychologie physiologique 0989
- Psychologie sociale 0451
- Psychométrie 0632

COMPARISON OF COMMODITY SPECIFIC AGRICULTURAL PROGRAMS

TO INCOME SAFETY NET PROGRAMS

BY

K. ALBERTO VERA

A Thesis submitted to the Faculty of Graduate Studies of the University of Manitoba in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

To my Parents Jose y Libertad

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to my advisor, Dr. Daryl Kraft for his guidance and support throughout the course of my studies.

The assistance of other members of the department as well as Dr. Merle Faminow is appreciated.

I am indebted to the University of Manitoba for financial assistance in the form of Graduate Assistantship.

Finally, I would like to express my gratitude to my Parents, Brother, Sisters and Maria for their continuous support.

ABSTRACT

The objectives underpinning government assistance to Canadian farmers have been to increase and stabilize income. Recently in an effort to reduce cost and comply with recent trade agreements, the Federal and Provincial governments have implemented a safety net program not linked to a commodity; namely the Net Income Stabilization Account (NISA) and plan to introduce a program called the Value Added Income Stabilization Account (VAISA). This study assesses the financial implications of NISA and VAISA on three different types of farm operations relative to those obtained under commodity specific programs such as the National Tripartite Stabilization Plan (NTSP) and the Gross Revenue Insurance Plan (GRIP).

The procedures followed include the specification of a simulation model that recreates the economic and financial structure of a farm specialization in hogs, grain or a diversified livestock-grain operation located in the Province of Manitoba. The farm models are simulated over the period 1980-1992. The performance of the farm business under each stabilization program is compared to a baseline scenario without any government program.

The general results indicate that NISA and VAISA can generate comparable levels of farm income to NTSP and GRIP, with a lower annual average subsidy. Farm diversification increases the stability of farm income and enhances the potential of NISA and VAISA to accumulate wealth. Short term benefits of NTSP and GRIP (positive cash flow, and farm capital acquisitions) are offset by long term benefits of NISA and VAISA (accumulated wealth). Commodity specific programs are better at reducing income and cash flow variability for specialized farms. However, similar results in variability are achieved without any government program for diversified farm.

The limitations of this study are that results are restricted to a particular farm operation which may not be representative for all farms. Since the farm operations are historical simulation models, results reflect particular events that occurred between 1980 to 1992. Differences in results when choosing other time periods will depend on how different production and market conditions are between periods of analysis.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Chapter 1 Introduction

1.1 Problem Statement

Agricultural trade is influenced by political and economic circumstances. The adjustments and restructuring experienced by agricultural trade are functions of domestic response to longstanding internal and external conflicts. Currently, a consensus for greater cooperation in a more liberalized international trade environment is gaining momentum. This is reflected in the 1994 agreement by members of the General Agreement on Tariff and Trade (GATT), the North America Free Trade Agreement (NAFTA) and prospects of a trade agreement among nations of the Pacific Rim.

The agricultural trade environment has been affected by domestic agricultural policies. These policies have generated artificial market conditions which increased supply and maintained farm operations through income transfers from tax payers and consumers. When these transfers occur with high unemployment, budget deficits and the uncertain recovery for major agricultural exports, the setting encourages governments to implement less trade distorting and less costly agricultural programs. Consequently, recent trade agreements will have a bearing upon development of farm income support programs less tied to production (decoupled), while limited fiscal capability will seek to identify more cost effective programs which achieve a greater level income and stabilization per dollar transferred.

The Farm Income Act (1991) fostered the Net Income Stabilization Account (NISA), a new farm income stabilization program in Canada that reflects the spirit of the

1994 GATT agreement of financial assistance that is not tied to production. Compared to deficiency payments programs such as the Gross Revenue Insurance Plan (GRIP) and National Tripartite Stabilization Plan (NTSP[1]), NISA is expected to stabilize farm income with less influence upon how a farm allocates resources than when the support is received though deficiency payments. Income transfers under NISA are made based on the current overall financial performance of the farm relative to previous years and past contributions to the individually unique account. GRIP consists of crop insurance (C.I.), a yield guarantee, and revenue insurance (R.I.), a price and/or revenue guarantee. Deficiency payments under NTSP are triggered by hog price and producers' expenses. The Value Added Income Stabilization Account (VAISA)[2] is a farm income stabilization program currently under study. It is similar to NISA, with the only difference being that contributions to the program account are a percentage of the farm's gross margin rather than commodity sales.

The level of income transfer to farm producers depends on the nature of each particular program and the frequency of events that trigger indemnities. Table 1.1 shows net payment to producers from NTSP, GRIP and NISA together exceeded a billion dollars in 1992. Turvey (1992) indicates that commodity-specific revenue insurance such as GRIP encourages farmers to increase planting of high-risk crops in response to coverage levels and premium subsidization. A farmer's involvement in riskier activities increases the potential of a larger income transfer.

---

[1] NTSP stands for TPRT in figures and tables

[2] VASA refers to VAISA in figures and tables

Table 1.1 Net payments to producers

(thousand $)

calendar year	NTSP		GRIP[1]		NISA[2]	
	Manitoba	Canada	Manitoba	Canada	Manitoba	Canada
1990	8536	76048	-	-	-	-
1991	2993	35221	73347	460464	9749	60892
1992	29711	286654	109379	795613	58021	337912

Source: Agriculture Economic Statistics, Statistics Canada - Catalogue No.21-603E
(1) Payments less producer premiums
(2) Matching government contributions and interest payments

1.2 Objective of the study

The objective of this study is to determine the effect of different income support programs on the financial performance of a Manitoba farm. Three farm types are analyzed in terms of their specialization in the production of hogs, grains and a combination of both. The analysis uses a simulation model to compare the income support programs in the context of historical production and market conditions. The financial performance of the farm operation is analyzed with and without the programs. The effectiveness of a program is measured in terms of:

i) reducing the variability of gross margin, cash flow and farm income,

ii) increasing the level of gross margin, cash flow and farm income, and

iii) increasing the farm business's net worth at the end of the simulation period.

With the exception of the countervailing duties on hog exports, the Manitoba simulation model assumes the historical market and production conditions experienced by farm operations from 1980 to 1992 were not, or would not be, influenced by different income stabilization programs.

1.3 Outline of the study

This study focuses principally on the effect of income stabilization programs and the performance of an individual farm operation located in the Red River Valley, Manitoba. To differentiate the effect of government programs under the same conditions, the location of the farm operation is fixed and management skills of the farm operator are assumed to be unchanged during the period of simulation.

Chapter 1 includes the objectives of the study and the literature review. Chapter 2 includes a brief overview of the hog and grain industry in Manitoba and a description of the farm model and the agricultural programs considered in the study. Additionally, this chapter includes the definition of variables used in the simulation model and the way these variables are specified to measure the economic performance of the model farm. The consistency and accuracy of the farm simulation model is tested in terms of accounting identities. The results and analysis for each type of enterprise are presented in Chapter 3. Chapter 4 presents the summary, conclusions and policy implications.

The farrow to finish hog farm model corresponds to the model developed for the NTSP and it is based on an efficient, commercial and family level operation. The model's feed components are wheat, barley and supplement[3]. The grain farm is a family operation involved in the production of wheat, barley and canola. The combined farrow to finish hogs-grain model farm is a two-family operation. Wheat and barley production is primarily for feed while the canola is marketed off the farm.

1.4 Literature review

Several studies have addressed the question of government support programs and the use of simulation models to analyze the effect of policy changes on farmers' income. This section reviews these studies.

1.4.1 Sector and farm simulations

1.4.1.1 Industry level simulation

Goodwin and Ortalo-Magné analyze the effects of alternative agricultural policy scenarios on the value of agricultural assets in wheat-producing regions of North America and Europe. Agricultural policies affect expectations of future returns to farming by reducing price and production uncertainty. These particular studies focus on the determination of land values as a function of expected levels of government support, prices and yields.

The empirical results show a 0.38 land value elasticity with respect to government support for wheat producers, when measured by producer subsidy equivalents. Expected yields and producer prices influence land value with unitary elasticities. The simulation

[3] Supplement include protein concentrate; limestone, calcium, phosphate cobalt iodized salt plus a vitamin-mineral micro premix and sources of additional energy.

differentiates effects among regions; agricultural policies that reduce government support were projected because of greater decline in land values in Europe than in Canada and the United States.

Martin and Goddard examine the impact of federal and provincial hog stabilization programs on both the marketing of hogs in Canada and the export of hogs and pork to the United States, for the period from 1974 to 1983. Supply response models are used to estimate market risk, measured in terms of variability in market price and the difference between expected and actual prices. The data is desegregated to account for differences in resource bases, alternative opportunities and stabilization programs across Canada. The study concludes that only feed grain prices and lagged hog marketings were significant in the model. Risk variables, hog prices and stabilization payments were not significant in explaining the level of hog sales. According to Martin and Goddard, Canadian stabilization programs on hog production do not affect U.S. hog prices because of the low U.S. price elasticity on the excess demand for Canadian hogs.

Meilke and Weersink analyze the effects of government stabilization programs on total crop area and the allocation of that area to individual crops in Eastern and Western Canada. The study recognizes that changes in crop mix and total area seeded are a function of output and input prices, production technology, rotations and differential rates of growth in crop yields. These studies attempted to determine the effect of Western Grains Stabilization Act (WGSA), the Special Canadian Grains Programs (SCGP), and the Agricultural Stabilization Act (ASA) on crop mix and area seeded. The econometric models for Eastern Canada include five major crops barley, soybeans, oats, corn and wheat. For Western Canada the models include barley, bread wheat, canola, oats, flax, rye and durum wheat. The area seeded for each crop is a function of expected returns for that crop in comparison to other crops. Expected return is the product of expected price (previous five years average) and expected yield (average of last three years).

Results for Eastern Canada indicate that the area seeded to all crops has a positive own-price response. Increase in variance of returns for individual cash crops has an inverse effect on crop area seeded, with the exception of wheat. For Western Canada, area seeded is found to have a positive own-price response. Increase in variance of returns for bread wheat has the largest effect on area seeded. Total area seeded will decline with an increase of market uncertainty. The study is complemented with a simulation analysis on the effects of different levels of government support on total area harvested and allocation of seeded area to the various crops. The removal of support payments lowered total area seeded by 1.6 percent and affects crop allocation over the period 1977-88 for Eastern Canada. The largest reduction occurred in area seeded to corn. The simulation model for Western Canada shows that a removal of payments through WGSA reduces seeded acreage by 1.59 percent, with the largest relative decrease coming from durum, wheat and rye.

1.4.1.2 Firm level simulation

King and Narayanan analyzed the effectiveness of GRIP and NISA safety net programs over the WGSA and ad hoc income support programs between from 1987 to 1990. The ex-post economic evaluation was for a representative grain and oilseed farm located in the brown soil zone of southwestern Saskatchewan. A comparative static analysis approach generated a baseline simulation representing WGSA and ad hoc support followed by scenarios where GRIP and NISA replaced the other programs. The analysis focused mainly on income effects. Results in Table 1.2 indicate that GRIP and NISA provide a lower level of financial support than the payments from WGSA and ad hoc programs.

Table 1.2 Simulation results on a grain and oilseed farm operation

($/acre/year)

	Baseline[1]	GRIP/NISA	GRIP	NISA
government payment	17	18.3	16.4	5.6
producer premium	2.1	5.5	5.5	0
Net Cash Income	29	26.4	24.6	19.2

(1) Baseline includes WGSA and Ad Hoc income support programs
Source: King and Narayanan (1992)

Government payments represent annual averages, and were not triggered every year. This study failed to compare the effectiveness of each program in increasing income stability, plus it overlooked any changes in a farm net worth and whether the programs incurred a deficit or surplus during the simulation period.

Chapter 2 Hog and Grain Industry, Farm Model and Program Characteristics

2.1 Overview of the hog and grain industry in Manitoba

The importance of a hog, grain and oilseed production is reflected in their contribution to farm income and as well as Canada's export revenues.

2.1.1 The hog industry

The livestock industry is an important component of the agricultural sector in Manitoba. Livestock production remains an important source of revenue even though cash receipts from livestock sales as a percentage of total farm cash receipts have fallen from 60 percent in 1970 to 38 percent in 1992. In the same period cash receipts from the sale of hogs as a percentage of total livestock sales have increased from 17 percent to 32 percent. Hog sales represent the second largest source of livestock farm cash receipts after cattle and calves.

Hog production generates additional secondary activities in terms of slaughtering and meat processing. Most of the hogs marketed in Manitoba are slaughtered in the province before the pork products are sold throughout North America and Asia. In 1992, 86 percent of hog production was slaughtered in the province (Manitoba Livestock Industry profiles, 1992).

Manitoba is a surplus producing region, and therefore, relies on exports to international markets. Hog exports from Manitoba have increased consistently from 8.6 percent of commercial marketing hogs in 1980 to 16 percent in 1992, reaching as high as 22 percent in 1984 and 1991. The United States represents the single most important market for Manitoba hog exports because of its size and proximity. The exchange rate and a relatively low cost structure tends to make Manitoba hogs competitive in international markets.

2.1.2 The grain industry

Grain and oilseed production represents an important activity for the economy of the Prairie region. In Manitoba, sales of grain and oilseeds represents the largest source of farm cash receipts. Since 1980, an average of 50 percent of total farm receipts in Manitoba have been originated from grain and oilseed sales, followed by 37 percent of receipts from livestock. Among the crops, wheat has been the predominant source of cash receipts, with an average of 50 percent of total receipts from crop sales in the last 10 years. Historically, barley has been the second most important source of cash receipts. However, cash receipts from canola have increased constantly from 10% in 1982 to 20% in 1991 surpassing barley as a source of farm cash receipts.

Profitability of the farm operation is affected by price fluctuations of farm produces and by weather conditions which affect yield and quality. Farm support programs implemented by the government to reduce production and market risks are an important component in the feasibility of the farm business. In 1992, program payments to producers in Manitoba represented $383 million, equivalent to 18 percent of total farm cash receipts. Program payments are expected to be $307 million in 1994[4]. Farm support programs have been successful in reducing farm income instability and have enabled many producers in the Prairies to maintain a financially viable business.

2.2 Characteristics of representative farm model

The farm model is located in the Red River Valley (township 1, range 3E). This area was selected because hog production is predominant as well as combined operations of hogs and grain. Three farm models were developed to represent a farrow to finish hog operation, a grain operation and a diversified hog/grain farm.

2.2.1 Specialized farrow to finish hog operation

The farrow to finish hog model used in this study, corresponds to the NTSP hog model. With the exception of grain and replacement hogs expenditures, the model reflects weighted average production costs and prices for Western Canada, and the parameters are simulated on a quarterly basis. The assumptions for the farrow to finish hog enterprise will be discussed under the categories given in the following subsections:

2.2.1.1 Farm size

The model farm is a farrow to finish hog operation with 130 sows and 8 boars. An annual average of 2.1 litters are produced by a sow, with 10 piglets born per farrowing. A 15

[4] Farm Income, Financial conditions and Government expenditure Data book, Agriculture Canada, January 1994.

percent piglet death loss is assumed and only 8.5 piglets are weaned per farrowing. The finisher stage assumes 3 percent death loss. The assumptions results in the model hog farm selling 2,239 hogs per year, which includes 2,183 finishers, 64 culled sows and 4 boars.

2.2.1.2 Replacement breeding herd cost

These costs are incurred by the hog farm operation to maintain efficient levels of animal reproduction. Sows are culled after an average of 5 litters with a replacement value that equals the cost of home grown replacement gilts (Table 2.1). Given the herd size, 14 sows are sold each year at half the price of a finished hog, with 50 percent more weight than a finisher. Sixteen sows are purchased at 3 times the market price of hogs, with 80 percent the weight of a finisher. Boars are culled after two years in the enterprise. A boar is sold at half the market price of a hog with 4.5 times the weight of a finisher. Boars are acquired at 5 times the market price of index 100 hogs.

2.2.1.3 Ration components

The ration composition for hogs is determined by the availability of feed grains and desired protein level in the ration. In Western Canada, rations are composed principally of barley, wheat and supplement (soymeal). The National Tripartite Hog Stabilization Committee estimates the feed consumption on a marketable hog basis, based on barley, wheat and supplement fed to sows, boars, starter pigs, growing pigs and finishing pigs. For the breeding herd and marketed hogs, the average annual consumption relates to 247

Table 2.1 Estimation of annual replacement cost for the breeding herd

	head	price ($/ckg)	weight (%)	final value
cost (sow)	16	3 * PH	80	34.4 * PH
cost (boar)	1	5 * PH	80	4 * PH
revenue (sow)	14	0.5 * PH	150	10.5 * PH
revenue (boar)	1	0.5 * PH	450	2.25* PH

Source: Technical Subcommittee of the National Tripartite Hog Stabilization report (1990)

PH = hog market price
ckg = 100 kg
final value = is the product of # of head, price and weight

kg. of barley, 116 kg. of wheat and 52 kg. of supplement per hog sold.

2.2.1.4 Feed Prices

Prices used for feed barley and feed wheat are the historical Manitoba records. Supplement prices correspond to the landed U.S. soybean meal prices adjusted to Canadian values using the exchange rate.

2.2.1.5 Buildings and equipment

The initial capital investment for the model farm size is $175,600 in buildings and $225,800 in equipment (1980 prices). Using a straight line method[5], the annual

[5] Under the Straight-line method, the cost or other basis of the property less its estimated salvage value is deducted in equal amounts over its estimated useful life.

depreciation rate is assumed to be 5 percent for buildings and 10 percent for equipment. The annual capital replacement of buildings and equipment (depreciation value) is $31,360. For the purpose of the simulation model, replacement costs are adjusted by the Farm Input Price Index (FIPI) for buildings and equipment.

2.2.1.6 Debt

It is assumed that the producer obtains a loan to purchase part of the machinery, equipment and livestock. The total debt is considered to be $0.82 per dollar of sales[6], which is $180,000 out of $218,695 gross sales in 1980. Assuming that producer amortizes the debt at 10 percent each year, the annual interest payments of the model hog farm are assumed to be $18,000 throughout the simulation period.

2.2.1.7 Other costs

Other costs include marketing, insurance for breeding stock, buildings and equipment, utilities and hired labour. They are determined according to the estimation procedure provided by the National Tripartite Hog Stabilization Committee. All non grain and livestock costs are determined from the base value of 1980 and are adjusted quarterly using the Farm Input Price Index.

---

[6] Based on the debt/gross sales ratio for a hog operation in Manitoba and Canada (Farm Credit Corporation, 1980).

2.2.2 Specialized grain operation

The grain farm is comprised of 1,200 acres of land. Based on the financial structure of cash crops farms in Manitoba[7], it is assumed that 720 acres of land are owned and 480 acres are rented. The farm operation is specialized in the production of wheat, barley and canola. Wheat and barley where included because they are used as feed in the combined grain-hog operation model.

The area seeded for each crop in the grain and the combined farm operation remains constant for the period of simulation. The corresponding areas are 420 acres on wheat, 480 acres on barley and 300 acres on canola. The areas allocated to wheat and barley production will enable the combined operation to be self sufficient in feed in most years.

The initial capital investment[8] at 1980 prices, that corresponds to the size of grain operation is \$185,616 in equipment, \$49,219 in grain storage and \$471,948 in land (720 acres). Using straight line method, the annual depreciation rate is assumed to be 10% for equipment and 5% for grain storage. The annual capital replacement of equipment and building is \$21,023. The amount of rent paid by the grain farmer is 25 percent of the annual revenue which is determined using the following equation:

---

[7] Farm Survey, Farm Credit Corporation, Canada. 1981.

[8] Values are generated based on data obtained from "Historical Review of Crop Cost in Manitoba in the 70's", Manitoba Agriculture.

$$R_t = 0.25 * CY * \overline{PC} * A \qquad 2.2.2.1$$

Where: R_t = rent

CY = crop yield

$\overline{PC}$ = weighted average price of each crop

A = area rented

The average crop yield and crop price are weighted based on the share of each crop in the rented land (35% wheat, 40% barley and 25% canola). The area shared for each crop remains constant throughout the simulation.

Based on the average debt to gross sales ratio for Manitoba grain farms (Farm Credit Corporation), a $0. 62 per dollar of debt for every dollar of sales in 1980 the long term liabilities for the model grain farm which is estimated to be $90,917. Annual interest costs for long term debt were determined to be $9,000 throughout the simulation.

2.2.3 Diversified farrow to finish hog and grain operation (combined)

The farrow to finish hog and grain farm enterprise is the combination of each specialized enterprise. It is assumed that the combined operation is operated by two families. The capital requirements cost are the same as adding the specialized operations together less $2000 for a pick up truck shared in both enterprises. Initial capital investment at 1980 prices is $1,106,183 which is the combination of initial capital investment for each specialized farm operation after subtracting the cost of shared equipment. An annual debt payment is $27,000 and annual depreciation is $52,383. In the combined operation, production of barley and wheat is used as feed in the hog enterprise. The area seeded (constant throughout the simulation period) which consists of 480 acres of barley and 420 acres of wheat is expected to cover requirements of feed for the volume of hog production in an average year. In years when grain production is below feed required, producers purchases feed at market prices. Excess supplies of grain are sold off the farm.

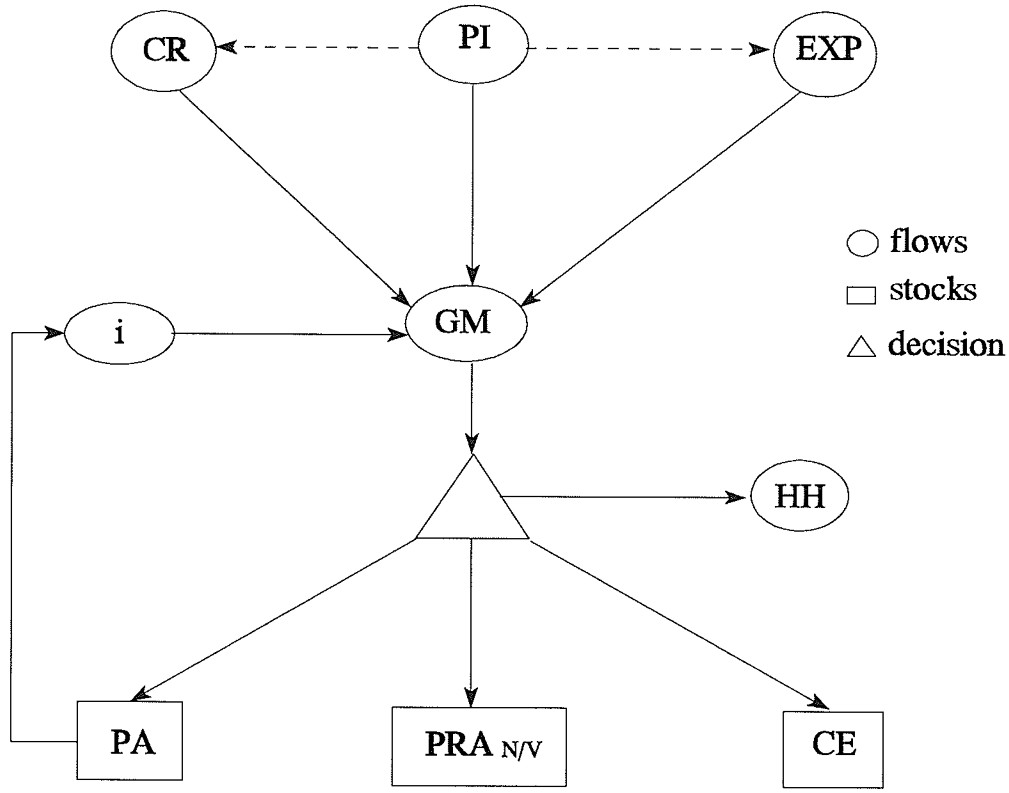
2.2.4 Financial model

A schematic representation of the components of the financial model is shown in Figure 2.1. It is a general description of the components and their ability to determine the financial performance of the farm. In the following sections, each variable is explained in detail. The gross margin (GM), a flow, is determined by commodity receipts (CR), program indemnities (PI) from GRIP and NTSP and operating expenses (EXP). Commodity receipts and operating expenses are to some extent affected by GRIP and NTSP indemnities. Starting from the gross margin (GM), the model farm allocates earnings to the personal bank account (PA), NISA/VAISA accounts ($PRA_{N/V}$) and capital expenditure (CE), all three of which are defined as stocks, and household expenditures (HH), defined as a flow.

2.3 Agricultural programs considered in the study

2.3.1 National Tripartite Stabilization plan - (hogs)

The National Tripartite Stabilization Plan (NTSP) was instituted in 1986. It was designed primarily to bring a more homogeneous deficiency payment policy throughout Canada,



CR=commodity receipts
PI=program indemnity
EXP=operating expenses
GM= gross margin
PA=personal bank account
i=interest
PRA=program account
CE=capital expenditure on machinery & equipment
HH=household expenditure

Figure 2.1 Components of the financial model instead of various provincial programs. Before NTSP was established, differential provincial subsidies altered the relative profitability of production between regions, with the potential misallocation of resources. NTSP was designed to be self-financing. In other words, premiums paid by governments and producers, plus interest were expected to equal total payments over time. Calculations of the indemnities and premiums are based on prices and expenses for a farrow-to-finish hog operations.

2.3.1.1 Program qualifications

The stabilization plan for hogs provides coverage on slaughter hogs grading over index 80 and sold for slaughter. Premiums are collected from participating producers, provinces and the federal government. They are placed into a stabilization fund from which payments are made. The premium rates are set before the start of each quarter. The amount paid by the producer for each hog marketed is matched by each of the federal and provincial governments to a maximum of 3 percent of the average aggregate market value of hogs in the last three years.

2.3.1.2 Program payouts

All producers receive the same level of support per unit of production. The support level (PS_t) is announced at the end of each quarter and it equals the national current cash costs (C_t) of production in the quarter plus 95 percent of the difference between the average price of hogs ($\overline{PH}$) and cash costs ($\overline{C}$) in the same quarter for the preceding five years.

The deficiency payment (IT_t) in effect guarantees a margin above the current cash costs of production. Conditions required to trigger payouts from NTSP account are indicated in equations 2.3.1.3.1 to 2.3.1.3.3.

$$PS_t = C_t + 0.95 * (\overline{PH} - \overline{C}) \qquad 2.3.1.3.1$$

$$if[PS_t - PH_t] \leq 0, \quad IT_t = 0 \qquad 2.3.1.3.2$$

$$if[PS_t - PH_t] > 0, \quad IT_t = PS_t - PH_t \qquad 2.3.1.3.3$$

Where:
PS_t = price support
PH_t = current hog price (index 100)
C_t = current cash cost
$\overline{PH}$ = average hog price (index 100)
$\overline{C}$ = average production cost
IT_t = indemnity (program payout)

The National Tripartite Stabilization Plan is a government supported price floor that skews the probability distribution of expected hog prices to the right. NTSP has two main effects, it increases the expected price, whether or not the floor is binding, and it reduces price variability (Moschini and Meilke).

2.3.1.3 Program trade issues

A countervailing duty (CVD) on live hogs and pork imported from Canada was imposed by the United States in April of 1985 to offset the provincial hog subsidies. Since its implementation, the countervailing duty has varied from $4.85 per ckg in January 1989 to \$20.55 per ckg in October 1991. The CVD represents an additional cost to be paid by the exporter when hogs are shipped to the United States. A countervailing duty is used by an importing country to offset the competitive advantages of subsidized imports. The imposition of CVD causes the price of the exported product to decline.

The imposition of CVD to offset the domestic production subsidy is explained graphically in Figure 2.2. Explaining the equilibrium prior to the subsidy and CVD, Canada would produce OQ_2 hogs and consume OQ_1 in Canada and export Q_1 - Q_2. The level of imports to the United States is represented by OQ_m and this equals Q_1 - Q_2. The implementation of NTSP provides a price support of P_s to hog producers in Canada, increasing the quantity of hogs supplied, which is represented by moving along the supply curve from b to c. Exports of live hogs increases to OQ^1_m units as the subsidy induced excess supply curve shifts from ES_1 to ES_2. Consequently, in the United States, hog prices drop because of increased supply, and in Canada, hog prices drop to P^1_o with OQ_3 consumed in Canada and Q_3 - Q_4 exported. The imposition of a countervailing duty against live hog imports from Canada, makes the U.S. hog market less profitable. Consequently, Canada's live hog exports drop and more hogs are sold domestically to meat packers. Theoretically, it should result in lower hog price paid by meat packers. Assuming the size of the CVD equals d, this is represented by a parallel upward shift of excess supply from ES_2 to ES_3. Hog prices in Canada will drop further to P_0^{cvd} with a CVD of d. The lower hog price in Canada implies consumer gains, represented by the area P_0aeP^{cvd}. The deficiency payment under the NTSP will be the difference between the post CVD domestic price P_0^{cvd} and P_s times the level of sales OQ_4. The amount paid in the form of countervailing duty is represented by the area egfh. That is, the product of hogs exported and CVD paid at the border. The amount of the revenue losses to CVD depends on the price elasticity of supply of exported hogs. The more inelastic the excess supply of hogs (steeper supply curve) the greater the producer losses. A CVD imposed on live hogs increases the supply of hogs to meat packers in Canada who are expected to pay a lower price per live hog. However, the impact of CVD on live hog prices can differ across Canada. Benson, Faminow, Marquis and Sauer (1994) indicate that due to high transport costs, provinces with excess capacity in meat packing should see an increased demand for hogs, relative to provinces which have limited processing capacity and, therefore, price reductions due to CVD will be greatest in regions with full or close to full capacity utilization.

An economic model was specified to estimate the effect of countervailing duty had on the domestic hog prices. The results for Manitoba, Saskatchewan and Alberta are indicated in Appendix A. They show that the prices paid by the domestic meat packing industry fell in Saskatchewan and Alberta in relation to the countervailing duty, but were no significantly affected in Manitoba. The simulation model assumed that NTSP was in effect from 1980 and therefore countervail duty was imposed in the model. For Manitoba hog prices based on the average pooled price from the sales in the export and domestic markets were reduced by the countervail duty on the exports. No price effect was simulated on domestic sales. This latter assumption would not reflect market conditions for Alberta and Saskatchewan.

2.3.2 Crop Insurance (C.I.)

Crop insurance was introduced in 1961 to protect farmers against yield losses due to natural hazards, such as drought, frost, floods, fire, hail, insects, and plant diseases. Crop insurance is a production guarantee, where the guarantee is basically a function of the regional based average yield and the level of average yield (70% or 80%) the farmer signs a contract for. If the insured production level is not achieved, crop insurance is obligated to pay the difference at prices that reflect current market conditions. Total premiums reflect coverage levels, previous claims and current crop prices. For the simulation model, the level of yield coverage is assumed to be 70 percent of the long term average yield (LTAY). The insured revenue is the product of the coverage level times the current market price. The equations below are used to estimate the level of premiums and payouts that occur under crop insurance. The model farm does not receive payout from crop insurance when the current yield is greater than the insurance coverage. Otherwise the payout is the difference between the actual and the coverage yield times the market price of the crop. A rate (r) used to estimate total premiums (equation 2.3.2.2), is the ratio of past payouts and previous coverage levels. It is assumed to be 6 percent throughout the simulation, where the farmer contributes half of the premium. The remaining portion is paid by government.

$$ICV_t = YCV_t * PC_t \qquad 2.3.2.1$$

$$Pr_t = r * ICV_t \qquad 2.3.2.2$$

$$PPr_t = 0.50 * Pr_t \qquad 2.3.2.3$$

$$YCV_t = 0.7 * \overline{CY} \qquad 2.3.2.4$$

$$IF\,[\,CY_t - YCV_t\,] \geq 0, \quad CIT_t = 0 \qquad 2.3.2.5$$

$$IF\,[\,CY_t - YCV_t\,] < 0, \quad CIT_t = (\,CY_t - YCV_t) * PC_t \qquad 2.3.2.6$$

Where:
ICV_t = insurance coverage
CY_t = crop yield
YCV_t = yield coverage
Pr = premium for crop insurance
r = rate
PPr = producer premium for crop insurance
$\overline{CY}_t$ = average crop yield
CIT_t = crop insurance indemnity
PC_t = current market price of crop

2.3.3 Revenue Insurance (R.I.)

Revenue Insurance is a deficiency payment to farmers if crop revenues fall because of low crop prices or yields. Total premiums reflect coverage levels, previous claims and current prices. The rate (r) is assumed to be 9 percent throughout the simulation. Farmers pay one third of the total premium, with the reminder contributed by the government. When the combined market revenue crop insurance payouts are lower than the target revenue, the producer is entitled to a payout under revenue insurance. The following equations are a representation of how premiums and payouts under revenue insurance are simulated for the model farm.

$$TR_t = \overline{CY}_t * IMAP_t \qquad 2.3.3.1$$

$$MR_t = CY_t * PC_t \qquad 2.3.3.2$$

$$Pr_t = r * TR_t \qquad 2.3.3.3$$

$$PPr_t = 0.33 * Pr_t \qquad 2.3.3.4$$

$$If\,[\,TR_t - MR_t\,] \leq 0, \quad RIT_t = 0 \qquad 2.3.3.5$$

$$If\,[\,TR_t - MR_t\,] \geq 0, \quad RIT_t = TR_t - MR_t - CIT_t \qquad 2.3.3.6$$

Where:
MR_t = market revenue
$\boldsymbol{TR_t}$ = target revenue in year t
IMAP = indexed moving average price in year t
RIT = revenue insurance indemnity

2.3.4 Gross Revenue Insurance Plan (GRIP)

The Gross Revenue Insurance Plan was instituted in 1991. It is a program that permits farmers to insure themselves against drastic drops in yield or price of cereal grain, oilseeds and pulse crops by placing a floor to the crop revenue per acre (target revenue). The GRIP program merely combines the crop insurance and a revenue insurance contracts. If a farmer's actual market revenue for an enrolled crop falls below the target revenue, the producer receives an indemnity from both crop insurance and revenue insurance.

2.3.5 Net Income Stabilization Account (NISA)

The net Income Stabilization Account was established in 1991. It is a voluntary farm stabilization

program whereby a producer can make regular deposits to an income stabilization account. NISA is based on eligible net sales, determined as the difference between gross sales and the purchase of all comparable agricultural commodities including seed, feed and livestock. An initial deposit can be up to 2 percent of eligible net sales and an additional deposit up to 20 percent of eligible net sales. Matching government contributions are paid up to a maximum of $250,000 of eligible net sales. Therefore, the government contributions are capped at $5,00 per account. The producer's deposits earn an interest bonus of 3 percent above the market value which is paid by governments. NISA applies to the entire farm enterprise when a payout is triggered. Entitlements to withdraw funds occur when:

a) the gross margin of the farm falls below the previous five year average gross margin; or

b) an individual's income falls below a minimum level.

Neither hog or grain prices are assumed to be affected by NISA. If a program similar to NISA was substituted for NTSP the countervail duties were assumed to occur. Therefore the hog market simulation for Manitoba sales results in the same historical prices between 1980 and 1985 while the average pooled prices incurred after 1985 because no countervail duties are paid on exports.

2.3.6 Net Income Stabilization Account - grains: NISA(g)

Under this program, a farmer establishes an individual account and a government account where contributions are deposited, but contributions are based upon an approximation of farm fed grain. Net grain sales are estimated by subtracting a feed equivalent from total receipts of hog sales. The feed equivalent value is an approximation to feed costs and represents a percentage of receipts from livestock sales. Throughout the simulation, a feed equivalent coefficient of 0.513 is assumed, which corresponds to the coefficient used in 1991 for hog producers registered in NISA. Individual matching contributions are 2 percent of net sales. A farmer withdraws funds from the NISA account when the current gross margin is lower than the five year average gross margin, or when the individual's income falls below a minimum level. The hog and grain market assumptions with respect to historical prices are the same as NISA.

2.3.7 Value Added Income Stabilization Account (VAISA)

VAISA is modelled in terms of producer access to an individual account and a government account. Unlike NISA, the contributions to the accounts are a based on the farm gross margin rather than the net sales. In the model, individual and matching government contributions are a percentage of gross margin, while additional contributions are limited to 40 percent of gross margin. The balance in the individual accounts earns an interest bonus of 3 percent while the balance in the government account receives the competitive rate[9]. The model farm has the option to withdraw funds from the VAISA account when the current gross margin is lower than the five year average gross margin. The hog and grain market assumptions with respect to historical prices are the same as NISA.

2.3.8 No Safety Net (NSN)

Under this scenario, the model farm does not receive deficiency payments or any type of income support from the government. All farm revenue other than interest earnings occurs because of hog, grain and oilseed sales. The hog and grain market assumptions with respect to historical prices are the same as NISA.

2.4 Time frame of the analysis

2.4.1 Historical simulation of market and growing conditions (1980-1992)

The historical simulation intends to replicate market and production conditions between 1980 and 1992. The simulated financial performance of each farm type under the different safety net programs was initiated in 1980. Crop yields correspond to the particular location in Manitoba.

[9] The interest rate is 90 percent of the monthly average of the treasury bill for the preceding month.

2.5 Definition of Variables and Parameters

The following variables represent the structure of safety net programs in the simulated operation of a farm business. The simulation for each variable is determined on a calender year basis.

2.5.1 Net Sales

Net sales represent the difference between the sales and purchases of the same commodity. Purchases are simulated to occur in terms of seed for the grain operation and breeding herd replacements and feed grain for the hog operation. Net sales under NISA (grains) are obtained by subtracting the feed equivalent[10] value from total receipts from hog sales. Total eligible receipts for NISA and VAISA includes payouts from Gross Revenue Insurance Plan (GRIP), Crop Insurance (C.I.) and Revenue Insurance (R.I.) programs. Payouts from NTSP are not considered part of eligible receipts for NISA and VAISA. The following is an equation used to calculate net sales:

$$NS_t = FR_t + CIT - RIT \qquad 2.5.1.1$$

Where:
NS_t = net sales
FR_t = receipts from commodity sales
PCH_t = purchases of commodities
CIT = indemnity from crop insurance
RIT = indemnity from revenue insurance

[10] The feed equivalent value is an approximation to feed costs and represents a percentage of receipts from hog sales. Throughout the simulation, a feed equivalent coefficient of 0.513 is assumed, which correspond to the coefficient used in 1991 for hog producers registered in NISA.

2.5.2 Gross Margin

Gross margin is defined as the difference between total receipts from the sale of commodities and the operating expenses incurred to produce them. Indemnities from GRIP, C.I. and R.I. are included as part of total receipts when estimating gross margin under NISA and VAISA. Fixed cost and capital expenditures are excluded as a deduction because they are assumed to be constant in the short term. Another way of viewing gross margin is to consider it the enterprise's contribution to fixed costs and profit after the variable costs have been paid (Kay, 1986).

For a grain operation, eligible expenses includes seed, fuel, fertilizer, chemicals, machinery operating costs, property taxes, and drying costs. Operating costs and purchases used for the model grain operation are based on crop production figures published by Manitoba Agriculture in 1990.

For a hog operation, eligible expenses include replacement breeding stock, feed, repair and maintenance, utilities, veterinarian and health expenses, hired labour and marketing costs. Operating expenses for the hog model correspond to the case farm used by the National Tripartite Stabilization Plan.

Gross margin under NISA and VAISA considers premiums paid for GRIP, crop insurance and revenue insurance programs as an expense in the corresponding calender year. Premiums under NTSP are included as an expense only to estimate gross margin for the corresponding program. Gross margin reflects the level of government payouts from NISA and VAISA accounts and the interest earned or paid in the personal account as indicated in the following equation:

$$GM_t = NS_t - EXP_t - Pr_{GRIP/TPRT} + RIT_{N/V} + CIT + PAI_t + GIT_{N/V} \qquad 2.5.2.1$$

Where:
GM_t = gross margin
EXP_t = operating expenses
CIT = crop insurance indemnity
RIT = Revenue insurance indemnity
PAI_t = personal bank account interest
$Pr_{GRIP/TPRT}$ = premium
$GIT_{N/V}$ = government payout from NISA or VAISA

2.5.3 Household expenditure

Household expenditure represents the annual farm family expenditure in food, shelter, clothing transportation, education and taxes. An additional consumption occurs when a portion of the positive cash flow is not saved and deposited in the personal bank account. Household expenditure was estimated to be $16,185 for a farm family on the Prairie provinces in 1978 (Family Expenditure in Canada, Statistics Canada, 1978). This value is assumed to be similar for the family in each specialized farm model. For the combined hog and grain operation (i.e. the two family operation), the family expenditures are doubled. The base household expenditure is adjusted each year for the periods of simulation according to the consumer price index. An additional household expenditures is assumed to occur when the farm simulates a positive cash flow. When the personal bank account balance is positive, additional household expenditure above the base level is 70 percent of remaining cash flow. In other words the model farm household saves 30 percent of the positive cash flow.

2.5.4 Expenditures related to capital

2.5.4.1 Interest on debt

Interest paid on the long term debt was fixed for the time period analyzed. The debt was based on the typical debt structure published by Farm Credit Corporation in 1980.

2.5.4.2 Rent

Based on the farm structure published by Farm Credit Corporation (1980), the grain farm is assumed to rent 480 acres. The amount of rent paid by the producer is explained in section 2.2.2.

2.5.4.3 Capital acquisition

Capital purchases represent the funds the farmer allocates to replacing buildings and machinery. Ideally, these are equal to the annual depreciation, however, as indicated below (section 2.5.6), the model farm must meet certain basic conditions before the funds eventually needed to acquire capital are reinvested.

2.5.5 Net Capital Requirement (NCR)

The net capital requirement represents the annual amount that the model farm is required to save to purchase machinery and buildings at the end of their useful life. That is, the amount or portion of the cost of a capital asset that represents the normal wear due to use.

Depreciation is estimated using the straight-line method. In years when the producer does not invest in capital (the amount of depreciation), the net capital requirement increases to reflect the amount the producer did not save.

$$NCR_t = AD_t - ACE_t \qquad 2.5.5.1$$

Where: NCR_t = net capital requirement
AD_t = accumulated depreciation
ACE_t = accumulated capital expenditure

2.5.6 Capital expenditure

Based on the size of the operation and the capital invested, the estimated annual depreciation rates for the hog farm and grain farm are $31,360 and $21,023, respectively (see section 2.2.2 and 2.2.2). Depreciation represents the loss in value of buildings, machinery and equipment, which a business has to put aside in order to replace an item at the end of its useful life. Ideally, a farm business deposits an amount equal to depreciation to a savings account each year. The model assumes that the farmer attempts to invest funds to replace or repair machinery and buildings. However, before the producer is in a position to consider replacing depreciated equipment, more basic needs must be fulfilled. As indicated in the following equations (2.5.6.1 and 2.5.6.2), the annual gross margin must be sufficient to cover household expenses, debt payments and rent before the farmer decides upon the funds available to replace buildings and equipment.

The initial funds used to replace buildings and equipment are either the NCR or the gross margin available after household expenditure, debt and rent obligations are attended to.

$$IF([GM_t - Dt - Rt - HH_t] \vee [GM_t - Dt - Rt - HH_t + PAB_{-t}]) < 0,\ 0 \qquad 2.5.6.1$$

$$IF([GM_t - Dt - Rt - HH_t] \wedge [GM_t - Dt - Rt - HH_t + PAB_{-t}]) > 0,\ Min(GM_t - Dt - Rt - HH_t\ ,\ NCR_t) \qquad 2.5.6.2$$

Where: Dt = debt
Rt = rent
HH_t = household expenditure
PAB_{-t} = personal account balance
$\wedge$ = and
$\vee$ = or

2.5.7 Cash Flow

The purpose of a cash flow statement is to identify the timing and magnitude of cash flows during a particular period. Cash flow is an important instrument for measuring the capacity of the business to keep operating (financial feasibility) independently of the level of profit (economic feasibility). Over time, cash flow represents a summary of cash inflows and outflows for a business (Kay, 1986). In the model, cash inflows consist of commodity receipts, indemnities, and interest credited to the personal bank account. Cash outflows consist of commodity purchases, operating expenses, individual contributions to NISA/VAISA (matching and additional), debt payments, rent, capital expenditure and household expenses. For a specified time period, cash flow is the difference between cash inflows and cash outflows. In the simulation model, part of a positive cash flow is assumed to be spent by the household while the remainder is saved. A deficit cash flow is assumed to be offset by a debit to the personal bank account. The following are the equations used to represent the consequences of a positive and negative cash flow.

$$IF\,[\,GM_t + IIT_t + GIT_t + PAI - IC_t - Dt - Rt - CE_t - HH_t\,] < 0\,,\quad (\,GM_t + IIT_t + GIT_t + PAI - IC_t - Dt - Rt - CE_t - HH_t\,) \qquad 2.5.7.1$$

$$IF\,[\,GM_t + IIT_t + GIT_t + PBAI - IC_t - Dt - Rt - CE_t - HH_t\,] \wedge [\,PAB_{-t}\,] > 0,\quad 0.3 * (\,GM_t + IIT_t + GIT_t + PAI - IMC_t - Dt - Rt - CE_t - HH_t\,) - IAC_t \qquad 2.5.7.2$$

$$IF\,[\,GM_t + IIT_t + GIT_t + PAI - IC_t - Dt - Rt - CE_t - HH_t\,] > 0 \wedge [\,PAB_{-t}\,] < 0,\quad 0.7 * (\,GM_t + IIT_t + GIT_t + PAI - IMC_t - Dt - Rt - CE_t - HH_t\,) - IAC_t \qquad 2.5.7.3$$

Where:
IC_t = individual contribution (matching and additional)
IMC_t = individual matching contribution
IAC_t = individual additional contribution
IIT_t = indemnity (individual payout)
GAI_t = government account interest
$GIT_{N/V}$ = government indemnity (government payout)
$\mathbf{CE}_t$ = capital expenditure

A deficit cash flow triggers withdrawals from a personal bank account. With a positive cash flow and positive personal account balance, the model farm saves 30 percent of cash flow, and spends the remaining amount on the household. When personal bank account balance is negative, the model farm deposits 70 percent of the positive cash flow to reduce the current liability. The model assumes the additional individual contribution to NISA\VAISA account as a saving, therefore, it is subtracted before the decision of additional savings is made.

2.5.8 Personal Bank Account (PA)

A personal chequing/savings account was included in the model because a farmer could experience a deficit in the cash flow for the business and household. Therefore, when unable to meet basic financial requirements for the business/household the model would debit the PA by the same amount. Credits to the personal account occur whenever receipts exceed all expenditures (business and household). The farm model borrows from the personal account when a deficit in the cash flow exists after receiving payouts from NISA/VAISA accounts. When cash flow exceeds zero at the end of the calender year the farmer is assumed to deposit 30 percent of the cash surplus in the personal account and spend the remaining amount on the household. The interest credited to the personal account is assumed to be equivalent to the 90 days treasury bill rate.

2.5.9 Minimum net income

The minimum net income is a condition set to activate the trigger mechanism of the NISA/VAISA program. The following equations show the conditions required to potentially withdraw funds from the NISA\VAISA accounts when the model farm does not generate a minimum income.

$$IF\,[\,GM_t - CE_t - Dt - Rt - MNI\,] > 0\,,\ 0 \qquad 2.5.9.1$$

$$IF\,[\,GM_t - CE_t - Dt - Rt - MNI\,] < 0\,, \quad MNI - (\,GM_t - CE_t - Dt - Rt\,) \qquad 2.5.9.2$$

Where: MNI = minimum net income
CE_t = capital expenditure

If level of profit is sufficient to meet capital expenditures, rent, debt and the minimum net income the farm model does not withdraw funds from NISA/VAISA accounts. A simulated profit lower than minimum income triggers payouts from the NISA/VAISA accounts.

2.5.10 Farm income

Farm income is the profit from the year's operation, and represents the return to the owner for personal and family labour, management and equity capital used in the farm business (Kay, 1986). Farm income is the difference between commodity receipts and operating expenses, interest payments on debt, rent and depreciation. It is estimated at the end of each calendar year using the following equation:

$$CR_t + CIT + RIT - EXP_t - Dt - Rt - Pr - Dp \qquad 2.5.10.1$$

Where: Dp = annual depreciation

2.5.11 NISA and VAISA individual account

This account was created under NISA and VAISA to simulate the funds contributed by the farmer. Interest earned on the balances in this account is 90 percent of the 90 days treasury bill rate plus a 3 percent premium. All interest is credited to the government NISA/VAISA accounts. Presently, NISA does not allow the producer to have a negative account balance. The balance of the individual account is obtained in the following way:

$$IAB_t = IAB_{t-1} + IMC_t + IAC_t - IIT_{N/V} \qquad 2.5.11.1$$

Where: IAB_t = individual account balance
IMC_t = individual matching contribution
IAC_t = individual additional contribution
$IIT_{N/V}$ = individual withdrawal

2.5.12 NISA and VAISA contributions

NISA and VAISA contributions have two components. The first is, an individual contribution which is matched for up to 2 percent of a positive net sales for NISA and a percentage of a positive gross margin for VAISA. The second component is an additional individual contribution (non-matchable) which is a function of a number of variables explained in the following set of equations (2.5.12.1 and 2.5.12.2). Funds determined for both components are deposited in a NISA\VAISA individual account. This account earns an interest bonus of 3 percent, which is provided by the government and can be considered an additional subsidy to the matching contribution. The government's matching contribution is similar to the individual's matching contribution however, it is deposited in a NISA\VAISA government account. The conditions the model farm are required to meet in order to make an additional contribution are a positive level of net sales under NISA, a positive gross margin under VAISA, and a positive balance in the personal bank account. Before an additional contribution is determined, the model has to be able to cover household expenditure, debt payments, rent, net capital requirements and the individual matching contribution. If either condition is not met the model cannot make an additional contribution to the NISA\VAISA individual account. The following conditions generate an additional contribution in the model:

$$IF([NS_t] \vee [GM_t - Dt - Rt - CE_t - HH_t - IMC_t] \vee [PAB_t]) < 0, 0 \quad 2.5.12.1$$

$$IF([NS_t] \wedge [GM_t - Dt - Rt - CE_t - HH_t - IMC_t] \wedge [PAB_t]) > 0, \; Min[0.2 * NS_t, \; 0.5 * (GM_t - Dt - Rt - CE_t - HH_t - IMC_t), \; 0.4 * PAB_t] \quad 2.5.12.2$$

2.5.13 NISA and VAISA government account

The NISA and VAISA government account holds the funds provided by the government that matches the initial individual contribution and the accrued interest transferred from the individual account. This reflects the current rules of NISA. This account earns 90 percent of the 90 day treasury bill rate. Funds are taken from the government account when the producer is entitled to a government payout. The following formula is used to estimate the portion of the NISA account contributed by the government:

$$GAB_t = GAB_{t-1} + GMC_t + GAI_t + IAI_t - GIT_{N/V} \quad 2.5.13.1$$

Where: GAB_t = government account balance
GMC_t = government matching contribution

GAI_t = government account interest
IAI_t = individual account interest
$GIT_{N/V}$ = government payouts

2.5.14 NISA and VAISA trigger mechanism

The stabilization trigger are the rules that allow a producer to withdraw funds from the program account when certain conditions are met. As indicated in the following equations, withdrawals are activated from the model's NISA/VAISA accounts when the current gross margin is lower than the average gross margin of the last five years or a minimum income level is not met. If both conditions do not occur, the model does not withdraw funds from the program account and the trigger becomes zero.

$$IF[GM_t - \bar{GM}] > 0 \wedge [MID_t] = 0, 0 \qquad 2.5.14.1$$

$$IF([GM_t - \bar{GM}] \vee [ID_t]) > 0, \quad Min(GM_t - \bar{GM}, ID_t) \qquad 2.5.14.2$$

Where: MID_t = minimum income deficit
$\bar{GM}$ = average gross margin

2.5.15 NISA and VAISA government payout

A NISA and VAISA government payout occurs when the annual gross margin is lower than the five year average gross margin or a minimum income level is not achieved and the government account balance is positive. Government payout occurs when either condition is met. When the trigger mechanism allows access to NISA/VAISA accounts, the model uses the funds from the government account first and the individual account thereafter. Only when the government payout is below the amount allowed to be withdrawn will the model remove funds from the individual account. The following are the conditions required to obtain a payment from the government account:

$$IF([GAB_t + GAI_t + IAI_t + GMC_t] < 0 \vee [TG] = 0),\ 0 \qquad 2.5.15.1$$

$$IF([GAB_t + GAI_t + IAI_t + GMC_t] \wedge [TG]) > 0,\ Min(GAB_t + GAI_t + IAI_t + GMC_t,\ TR) \qquad 2.5.15.2$$

Where: TG = trigger

2.5.16 Potential cash flow deficit (PNCF)

Potential cash flow represents the level of cash flow before a producer is entitled to a NISA/VAISA withdrawal in the form of an individual payout. In the model, a positive potential cash flow assumes that the producer does not require an individual account payout because the total of profits, government payout received and interest credited from the personal bank account exceeds the total of contributions to NISA/VAISA accounts, debt payments, rent, capital purchases and household expenses. In this case, the potential cash flow is zero. In the model, a deficit potential net cash flow triggers withdrawals from the personal bank account. A positive potential net cash flow prevents the model farm from obtaining an individual payout from the NISA/VAISA accounts. The following equations report the terms used to determine the potential net cash flow:

$$IF\,[\,GM_t + GIT + PAI - IC_t - Dt - Rt - CE_t - HH_t\,] > 0\,,\ 0 \qquad 2.5.16.1$$

$$IF\,[\,GM_t + GIT + PAI - IC_t - Dt - Rt - CE_t - HH_t\,] < 0\,, \\ (\,GM_t + GIT + PAI - IC_t - Dt - Rt - CE_t - HH_t\,) \qquad 2.5.16.2$$

2.5.17 Potential individual payout

The potential individual payout is a variable created to represent the availability of funds to be received by the producer in the form of an individual payout. Equations 2.5.18.1 and 2.5.18.2 indicated below, show that if the NISA/VAISA individual account balance is positive, this amount is added to the current contributions (matched and non-matched). Together they represent the funds available to be received as a payout, otherwise only current individual contributions are returned to producer in the form of an individual payout.

2.5.18 NISA and VAISA individual payout

A withdrawal from the NISA/VAISA individual account occurs when funds in the account contributed by government is less than what the conditions allow to be withdrawn. The condition required to withdraw funds from the NISA/VAISA individual account in the form of an individual payout are shown in the following equations:

$$IF\,[\,TR - GIT_t\,] < 0,\ \ 0 \qquad 2.5.19.1$$

$$IF([TR - GIT_t] \wedge [PNCF_t]) > 0, \quad 0 \qquad 2.5.19.2$$

$$IF([TR - GIT_t] > 0 \wedge [PNCF_t] < 0, \quad (PAB - PNCF_t) \qquad 2.5.19.3$$

$$IF[PAB - PNCF_t] > 0, \quad 0 \qquad 2.5.19.4$$

$$IF[PAB - PNCF_t] < 0, \quad Min(TR_t - GIT_t, PIT_t, PNCF_t - PAB) \qquad 2.5.19.5$$

Where: $PNCF_t$ = potential net cash flow
PIT_t = potential individual payout

A payout from the government account below the amount allowed by the trigger is simulated to occur when the deficit in the cash flow plus the savings in the personal bank account are less than the trigger payouts from individual NISA/VAISA accounts. Present rules of NISA prevent producers from withdrawing more than what is available in the individual account and in these circumstances the amount withdrawn is also below the trigger level.

2.5.19 Change in Wealth

Since the model does not include decisions to buy and sell land or livestock, the change in wealth is limited to savings (debt) and capital in machinery and equipment. Wealth is composed of a personal bank account, NISA/VAISA individual and government account balance, and the value of machinery and equipment. The change in wealth is obtained by subtracting the net capital requirement from the savings because the model farm begins with a zero balance in the personal bank account and the NISA/VAISA account.

$$\Delta W_t = PAB_t + IAB_{N/V} + GAB_{N/V} - NCR_t \qquad 2.5.20$$

Where: ΔW_t = change in wealth

2.5.20 Subsidy

A subsidy consists of premiums paid by the government to the NTSP, crop insurance, revenue insurance and government contributions to NISA and VAISA accounts plus a 3% bonus on the NISA/VAISA individual account. By the end of 1992, if a deficit exists in either the NTSP or GRIP program accounts, unique to the model accounts, it also is considered to be a subsidy because the government is responsible for the account balance.

2.6 General components of the simulation model

A schematic representation of the simulation model and the interaction of the components are set out in Figure 2.3. The model first determines net sales and gross margin based on receipts from sales and payouts and premiums from GRIP and/or NTSP. Individual and government contributions are deposited in corresponding NISA/VAISA accounts from where funds are withdrawn when the trigger mechanism is positive. The model farm withdraws first from the government account in the form of a government payout. Withdrawal from the NISA/VAISA individual account occurs only when government payout is less than the amount indicated by the trigger. The cash flow realized by the farm business will determine the way the model accesses the personal bank account. A positive cash flow permits the model farm to retain savings as part of the cash flow and spend the remainder on the household. A negative cash flow forces the model farm to withdraw funds from the personal account. In either case the interest credited or debited to the personal bank account becomes a component of the gross margin.

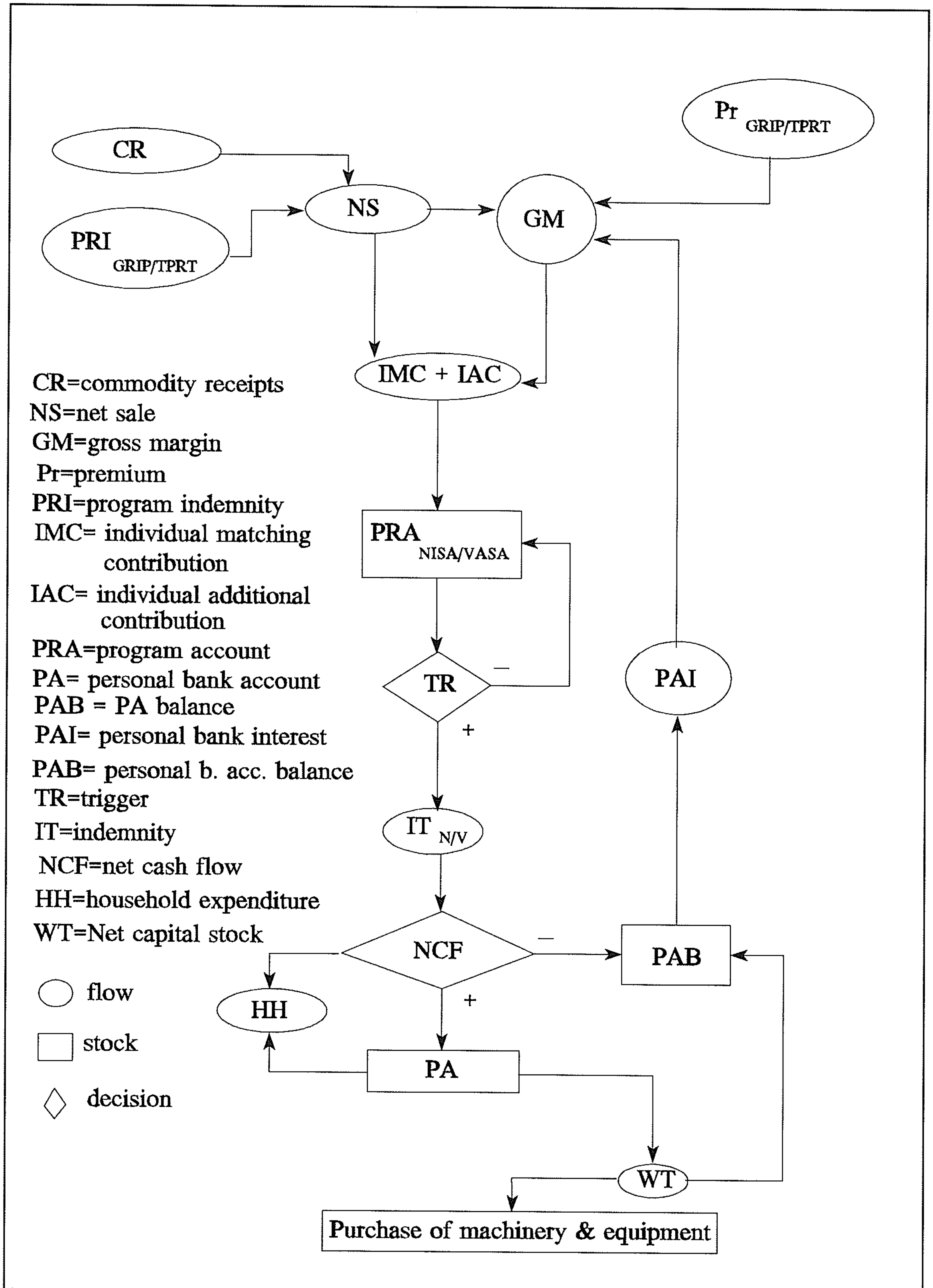


Figure 2.3 General components of simulation model

Chapter 3 Historical Simulations Results

3.1 Introduction

The analysis focuses upon each program with respect to how farm income is stabilized and augmented, and whether wealth tends to increase or decreases. A baseline case with no safety net is use for each of the farrow to finish hog farm, grain farm and combined hog - grain farm. These benchmark results are compared to the financial status of the model farm when the simulations include participation in the NISA, NISA(grain), VAISA, tripartite GRIP, revenue insurance and crop insurance.

The performance of each farm operation under different safety net programs and no safety net is assessed by comparing the level of subsidy payments, gross margins, cash flows and farm incomes generated throughout the simulation period. The assessment includes the analysis of the relative change in the performance of a farm operation when a subsidy is received compared to the performance without any safety net program. The matching contributions are set to 2 percent of net sales under NISA and 4 percent and 6 percent of gross margin under VAISA. The required matching contributions are developed in order to make NISA/VAISA as financially rewarding as NTSP and GRIP in terms of income, gross margin and wealth generate.

3.1.1 No safety net - farrow to finish hogs

3.1.1.1 Wealth

The wealth generated by the farrow to finish hog farm is analyzed in terms of the change in accumulated wealth over 13 years in the farm business. Wealth is accrued as current, intermediate and fixed assets categorized in the following form:

i) Personal bank account: This is employed by the farm model to credit or debit a cash surplus or deficit during the time of business operation. At January, 1980, the personal bank account started with zero balance. As of December, 1992, the model farm business generated a debt in the personal bank account of $12,777. As explained below, this debt occurs because of a deficit in cash flow for the years 1980, 1982, 1986, 1988, 1989, 1990 and 1992.

ii) Machinery and buildings: If all the buildings and machinery were replaced as they wore out the value of machinery and buildings in January, 1992, would have been $401,400. Each calendar year the model farm incurred a capital expenditure similar to or lower than the accumulated depreciation. Simulation results indicate that on December, 1992, the capital value of machinery and equipment was $244,600. In other words, $156,800 of depreciated assets had not been replaced.

iii) Inventory: The two primary variable costs are replacement of hogs and feed supplement. Their market value on December, 1979, were $18,225 and $12,198, respectively. Their values on December, 1992, as changed by market prices, were $18,325 for hogs and $8,818 for feed.

iv) Combined change in wealth: The model farm generates a net loss in wealth of $169,577 from 1980 to 1992. This loss in wealth is made up of $12,777 from the personal bank account and $156,800 of net capital requirements.

3.1.1.2 Gross Margin

Gross margin is the difference between commodity receipts and operating expenses. The farrow to finish model farm generates an annual (calendar year) average margin of $67,617. It varies

from $145,458 in 1987 to $23,549 in 1989. Simulation results indicate that the gross margin has a standard error of $36,930. The variability of gross margin is explained principally by historical fluctuations in commodity sales (Figure 3.1).

3.1.1.3 Cash flow

Cash flow is an important indicator of the ability of the farm business to cover debt payments, household expenditures and capital acquittance. A deficit cash flow obliges the farmer to borrow from the personal bank account. In the 13 years simulated with no government program, the farrow to finish hog farm generated an annual average deficit cash flow of $983. The largest deposit occurred in 1990 with $18,000 and the largest operating loan of $33,000 occurred in 1989. The annual standard error of the cash flow is $12,183.

3.1.1.4 Farm income

The farm income is the difference between commodity receipts and commodity purchases, operating expenses, debt and depreciation. The farrow to finish hog farm without any government program generates an annual average net income of $17,358. A loss is simulated to occur in the first two years of operation and throughout 1988 and 1989. Hog sales in terms of prices received have the largest effect on farm income variability.

3.1.2 Stabilization programs - Farrow to finish hogs

Table 3.1 summarizes the simulated financial performance of the model grain farm when it participates in the aforementioned programs.

3.1.2.1 Level of subsidy

The means by which government transfers money to the Canadian hog farm varies with each program. Two thirds of premiums to the NTSP account are paid by the federal and provincial governments. Government contributes matching funds to individually controlled accounts in NISA and VAISA, plus the interest bonus of 3 percent which accrues on the funds deposited by the farmer. Simulation results for the hog operation show that average subsidy payments to a producer are $2,256 with NISA(2%), which is equivalent to $1.01 per hog. Subsidy payments increase with producer's eligibility to increase the matching contribution, up to $2,771 under VAISA(4%) and $4,162 under VAISA(6%). These subsidies are equivalent to $1.24 and $1.87 per hog, respectively. NTSP provides the largest annual average subsidy payments of $14,987, which is equivalent to $8.30 per hog.

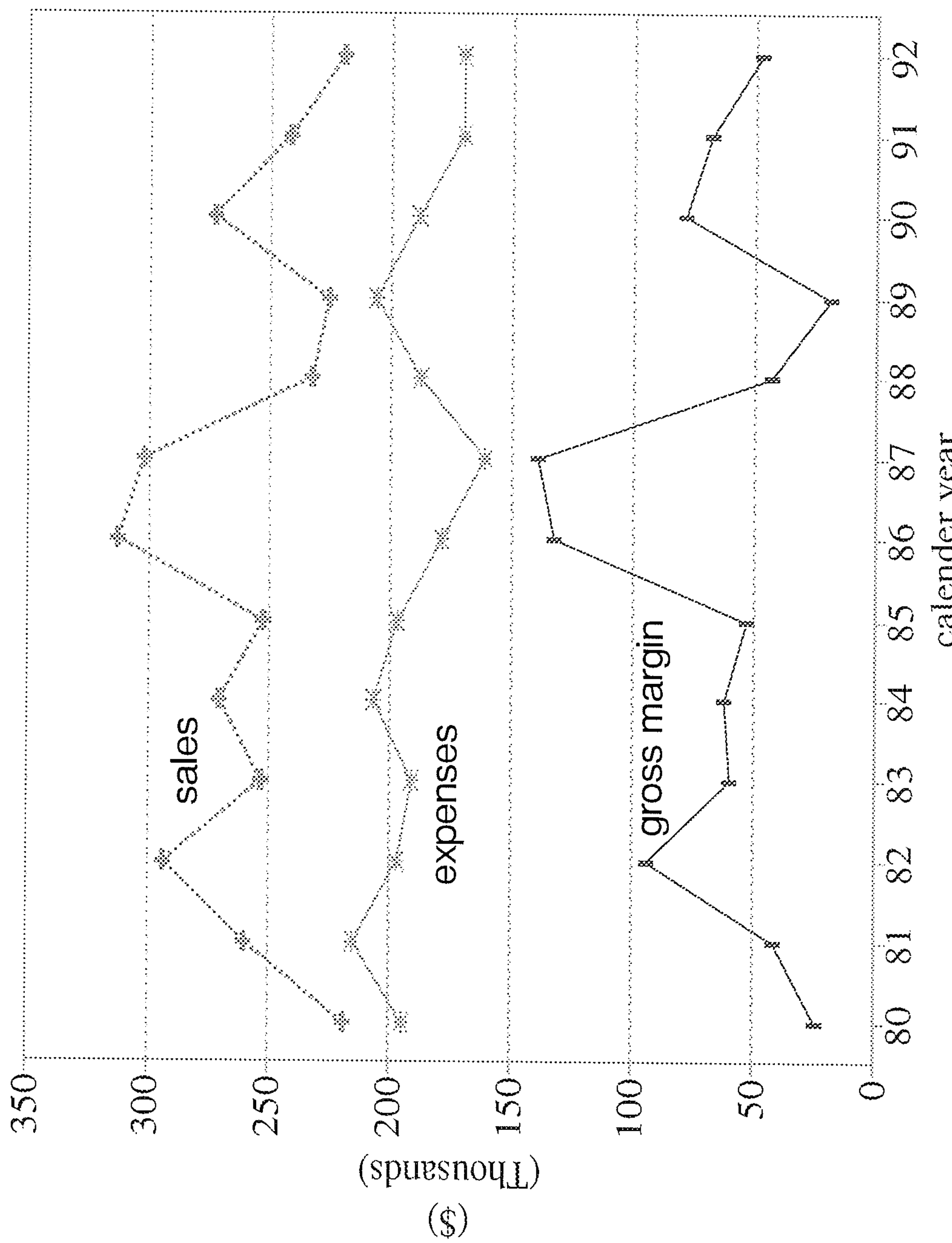


Figure 3.1 Indicators of gross margin variability for a hog farm without government program

Table 3.1 Hog farm simulation results under stabilization and no program (1980-1992)

($/year)

	No Sty Net	NISA (2%)	NISA (9%)	VASA (6%)	VASA (15%)	NTSP
annual average subsidy	0	2256	11998	4162	11823	14987
average Gross Margin	67617	70632	82648	72924	81875	82987
std error GM	37252	36078	29648	35515	30366	22366
average Cash Flow	-938	-653	-2377	-1264	-2775	1659
std error CF	12183	8396	11134	7214	10942	4546
average Farm Income	17358	20373	32389	22665	31616	32729
std error Farm Income	37236	36059	29612	35495	30331	22355
change in wealth ($)	-169577	-126060	36165	-95121	44016	-1642

No Sty Net = No Safety Net

The largest annual subsidy of $15,209 occurs under the combined NISA(g)/NTSP, representing the largest annual transfer to the hog farm (Figure 3.2).

NTSP subsidies exceeded the premiums contributed by government because the program account balance was simulated to be in a deficit position of $12,845 by the end of 1992. In NISA and VAISA the subsidy depends on the overall financial performance of the farm, levels of matching contribution and the trigger mechanism. Current proposal NISA and VAISA programs are more restricted than NTSP. NTSP incured countervailing duties that did not affect domestic price of hogs to Manitoba packers but reduced the average pooled price received by Manitoba hog farmers since over 10 percent of hogs were exported (see appendix A). The net effect reduced the NTSP subsidy in raising the model farms gross margin, income and cash flow. No countervail effect was assumed to occur in the NISA or VAISA simulation.

3.1.2.2 Comparison of gross margin

With no government program, gross margin is the difference between sales and operating expenses plus accrued interest to a personal bank account. With NTSP, the government payouts and premiums are included in the determination of gross margin. Simulation results shown in Table 3.1 indicate that NTSP provides the largest annual average gross margin of $82,987, which is equivalent to $37.20 per hog. Under VAISA(6%) and VAISA(4%) the model hog farm's annual average gross margin drops respectively to $72,924, which is equivalent to $32.70 per hog, and $71,209, which is equivalent to $31.90 per hog. NISA(2%) reduces the annual gross margin to $70,632, or $31.60 per hog. Under each stabilization program the model hog farm achieves a larger gross margin than without a program.

Unforeseen changes in production and market conditions can affect the performance of a farm business. One of the major objectives of stabilization programs is to offset such unforeseen changes and, therefore, reduce the risk of uncertain events. Changes in production and market conditions are reflected in the variability of gross margin and are measured by the standard error[11]. Table 3.1 indicates that in the historical simulation, NTSP generates the most stable gross margin among individual programs with a standard error of $22,366, close to NISA(g)/Tripartite with the smallest standard error of $22,289. VAISA(6%) and VAISA(4%) reduce stability in the gross margin with a standard error of $35,515 and $35,943 respectively. The standard error under NISA(2%) is $36,078. As expected, the hog operation with no safety net program generates the largest variability in the gross margin, with a standard error of $37,252. Historically, the variability of GM reduces substantially under NTSP because of larger payouts in low revenue years (1980 and 1989) and premiums are paid in high revenue years (1982 and 1987). It can be concluded that in absolute terms, NTSP has the largest effect in increasing levels of gross margin as well as stabilizing gross margin.

---

[11] The terms standard error and standard deviation are synonymous. They supply information about the amount of error in the sample mean when used to estimate the population mean (Snedecor and Cochran, 1967).

The larger the standard error the larger the variation from the mean and the lower the stability of the variable.

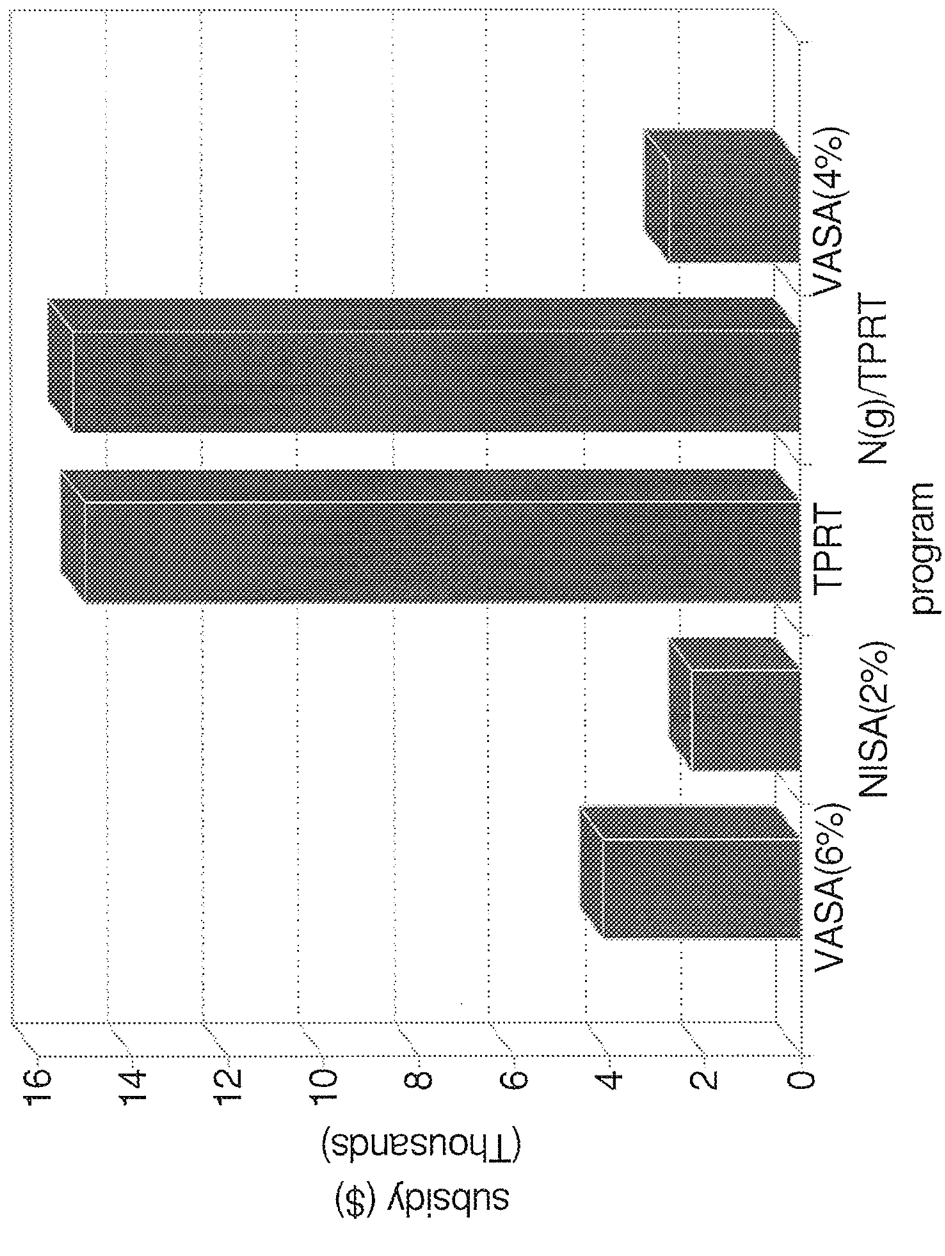


Figure 3.2 Average annual subsidy received by hog producer model

The following is an analysis of the cost effectiveness of subsidy payments[12] in achieving a larger and more stable gross margin relative to a farm operation without a safety net.

In Figure 3.3, the x-axis represents the increase of stability in gross margin per dollar of subsidy relative to a no safety (NSN) case. As the standard error becomes smaller relative to the standard error under NSN (more positive value in the x-axis), the stability increases. The y-axis

represents the increase in the average gross margin relative to the NSN case per dollar of subsidy. Clearly, under NISA(2%) the subsidy is the most cost effective in increasing GM with over \$1.29 per dollar of subsidy compare to \$1.04 under NTSP and NISA(g)/NTSP. Under VAISA(6%) and VAISA(4%), cost effectiveness of increasing gross margin is reduced to \$1.24 per dollar of subsidy. The cost effectiveness for the farm exceeds a dollar return for every dollar of subsidy because without any government support the farm borrowed money most years. The added interest cost is eliminated or reduced substantially when the model farm qualifies for government support. The analysis suggests the money transferred through the NISA/VAISA type programs is more effective in raising the model farms gross margin per dollar transferred. This occurs because less money is transferred relative to NTSP and the NISA/VAISA type programs were assumed to have no effect upon hog prices received by farmers.

---

[12] Cost effectiveness of subsidy payments is measured in two forms: first, as the difference between gross margin with stabilization and no program over the level of subsidy, and second, as the difference between the standard error of gross margin with stabilization and no program over the level of subsidy. It represents the net change of level of gross margin and change in stability of gross margin per dollar of subsidy payment.

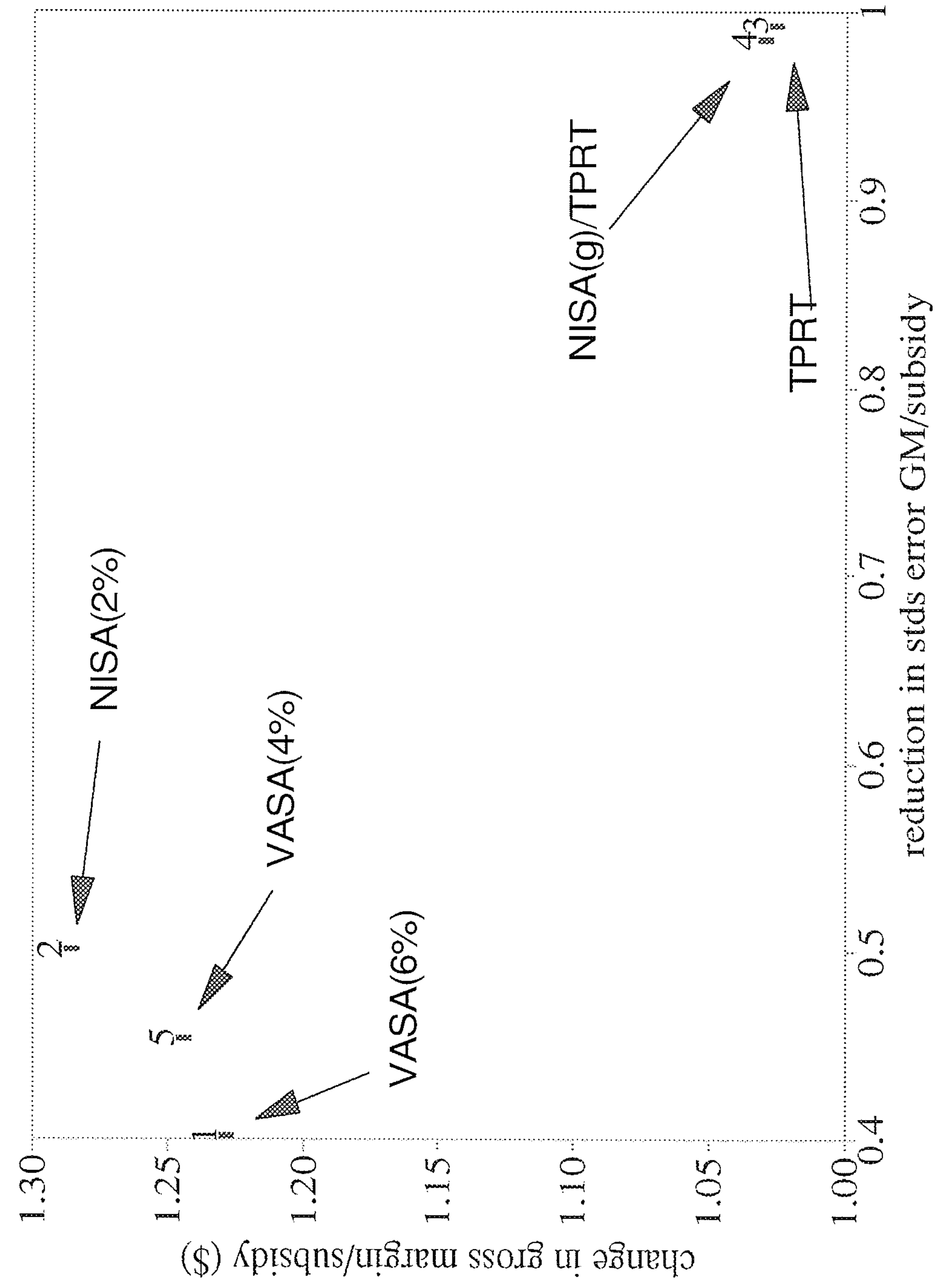


Figure 3.3 Change in annual gross margin between stabilization and no program (hog farm)

In terms of the efficiency of subsidy in increasing the stability of GM relative to the performance without safety net, NTSP and NISA(g)/NTSP are the most cost effective. Subsidies paid through VAISA(4%) and VAISA(6%) is less effective in reducing of gross margin variability. All of the safety net programs reduce gross margin variability relative to no program.

3.1.2.3 Comparison of cash flow

Cash flow is an important indicator of the ability of the farm business to meet debt payments, household expenses and capital replacements without the need to borrow funds. In absolute terms, the simulation results displayed in Table 3.1 show that NTSP has the largest annual average cash flow ($1,659). In fact, for each of the 13 years simulated, the farm business did not experience need to withdraw more funds than were deposited in the personal bank account. Over time, the NTSP program payouts offset any deficit in the cash flow generated by the farming operations. Under VAISA(6%), VAISA(4%), NISA(2%) and No safety net (NSN) the farm required a line of credit. This was true particularly in 1980 and 1989. Table 3.1 shows that the model hog farm generates an average cash flow deficit under NISA(2%) and VAISA(4%) of $653 and $574 respectively. The stability of the cash flow is increased when the producer registers under a safety net because the upper and lower extremes are reduced due to contributions and payouts. When cash flow becomes negative the model farm obtains the necessary funds to cover the deficit from the personal bank account. In absolute terms, NTSP achieves the largest stability in cash flow, with a standard error of $4,546.

The cost effectiveness of subsidy payments in achieving stability and larger levels of cash flow under each program relative to a no safety net is shown in Figure 3.4. The x-axis represents the increase of stability in cash flow per dollar of subsidy relative to a NSN case. As the standard error becomes smaller relative to the standard error under NSN (more positive value in the x-axis), the stability increases. The y-axis represents the increase in the average cash flow relative to the NSN case per dollar of subsidy. VAISA(6%) is less cost effective in reducing cash flow than no program as the deficit increases by $0.06 per dollar of subsidy. NISA(2%) and VAISA(4%) increase cost effectiveness to $0.15 per dollar of subsidy. This effectiveness is increased under NTSP to $0.18 per dollar of subsidy. An increase in subsidy does not increase cash flow in the same proportion because a larger portion of subsidy payments are maintained in the NISA/VAISA program accounts.

Stability in the cash flow is increased under all programs compared to the cash flow without a safety net. Results of the historical simulation indicate that NISA(2%) is the most cost

effective in reducing cash flow variability by reducing standard error by $1.60 per dollar of subsidy. Cost effectiveness is reduced under VAISA(4%) to $1.18 per dollar of subsidy because farmer contributions are larger and the payouts are less focused than under NISA(2%). NTSP is the least cost effective by reducing standard error by $0.50 per dollar of subsidy.

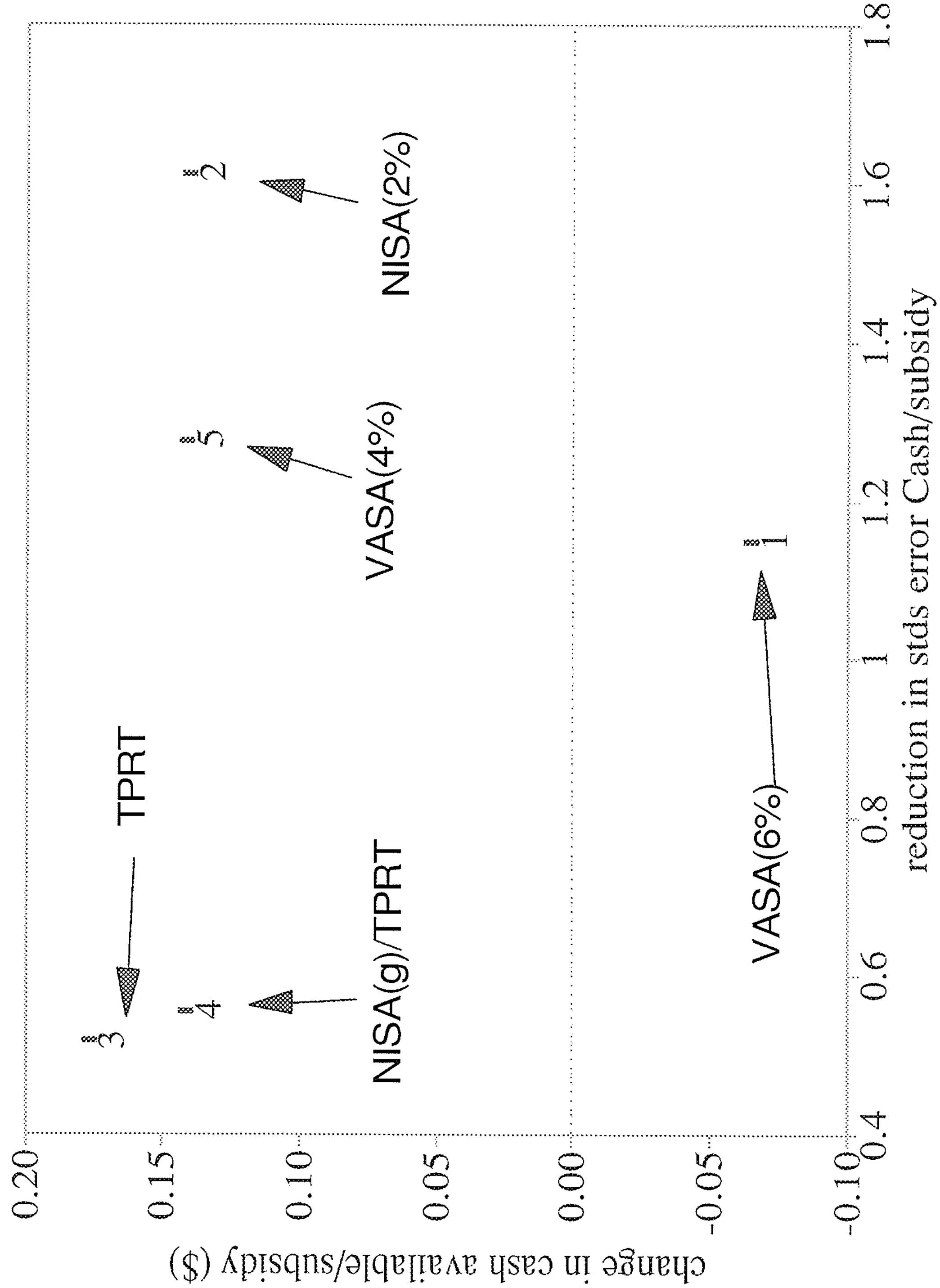


Figure 3.4 Change in annual cash flow between stabilization and no program (hog farm)

3.1.2.4 Comparison of farm income

Table 3.1 indicates that NTSP generates the largest farm income with an annual average of $32,729. This is followed by VAISA(6%), VAISA(4%) and NISA(2%) with $22,665, $20,950 and $20,373 respectively. The same producer model without a safety net realized an average annual income of $17,358 or 18 percent less than under NISA or VAISA.

When the variability of income is measured by the standard error it indicates that NTSP creates the most income stability during the simulation period with a standard error of $22,355. Under NISA and VAISA, the variability of income is reduced by only 2 percent relative to no program. The largest standard error of income ($37,236) is obtained when the farm model has no safety net.

The following is an analysis of the cost effectiveness of subsidy payments in achieving a larger and more stable farm income relative to a farm operation without a safety net. In Figure 3.5, the x-axis represents the increase of stability in farm income per dollar of subsidy relative to a NSN case. As the standard error becomes smaller relative to the standard error under NSN (more positive value in the x-axis), the stability increases. The y-axis represents the increase in the average farm income relative to the NSN case per dollar of subsidy. Under NISA/VAISA, subsidy payments are more cost effective in increasing income (average of $1.30 per dollar of subsidy) than under NTSP and NISA(g)/NTSP ($1.16 per dollar of subsidy).

Results of the cost effectiveness in reducing the income variability are opposite to those in terms of increasing the level of income. The largest increase in stability of farm income per dollar of subsidy is obtained under NTSP and NISA(g)/NTSP. The NISA/VAISA type programs reduced the income standard error by between forty to fifty cents per dollar of subsidy, which is only half as effective as NTSP.

3.1.2.5 Comparison of the change in wealth

Change in wealth over 13 years is simulated to occur in terms of the 1992 balance in the personal bank account, the NISA/VAISA program accounts, and the difference between accumulated depreciation and capital purchases between 1980 and 1992. In absolute terms, the model farm has about the wealth at the end of the 13 year period when under NTSP with a net loss of $1,642 since 1980. The level of accumulated wealth is a function of the simulated income realized under each stabilization program. The farm model generates a debt at the end of the simulation period. An added debt of $95,121 is generated under VAISA(6%). Under VAISA(4%) and NISA(2%) the model generates an added debt of $120,240 and $126,060, respectively. Without a safety net the farm model is worth $169,577 less than in 1980.

The cost effectiveness of subsidy payments in changing the net worth is estimated as the ratio of the difference between the change in model farm net worth with stabilization and no program divided by the total level of subsidy paid. As shown in Figure 3.6, NTSP is the program that provides the largest income transfer to the producer but is the least cost effective in increasing accumulated wealth relative to the money transferred. This occurs because part of the subsidy reduces the average pooled prices through the countervail duty on exports plus more of the subsidy is consumed by the household. The cost effectiveness of subsidy is increased under NISA and VAISA, to an average of $1.33 per dollar of subsidy.

3.1.2.6 Comparable performance

The historical simulation results indicate that a hog producer registered in NTSP realizes in absolute terms, a larger and more stable gross margin, cash flow, and income and the largest accumulated wealth by the end of 1992. The substitution of NISA and VAISA programs for NTSP requires an increase in the level of subsidy to achieve a comparable level of financial welfare attained under NTSP for the model hog farm. In order to provide a comparable level of financial support, a NISA matching government contribution of 9 percent of net sales and VAISA matching government contribution of 15 percent of gross margin are required to generate results similar to the performance of the hog operation under NTSP. The transfer of income under VAISA(15%) and NISA(9%) shows the model hog farm with a similar gross margin and income to NTSP, but with 21 percent and 20 percent lower subsidy than under NTSP (see Table 3.1). However, VAISA(15%) and NISA(9%) achieve a gross margin and net income that is 36 percent more volatile than under NTSP. Added contributions to the NISA and VAISA accounts allow the model farm to accumulate a net increase in wealth of $36,165 and $44,016, respectively, at the end of 13 years. The results of added contributions to NISA/VAISA suggests that more income stabilization is not achieved, instead the farm accumulates more wealth.

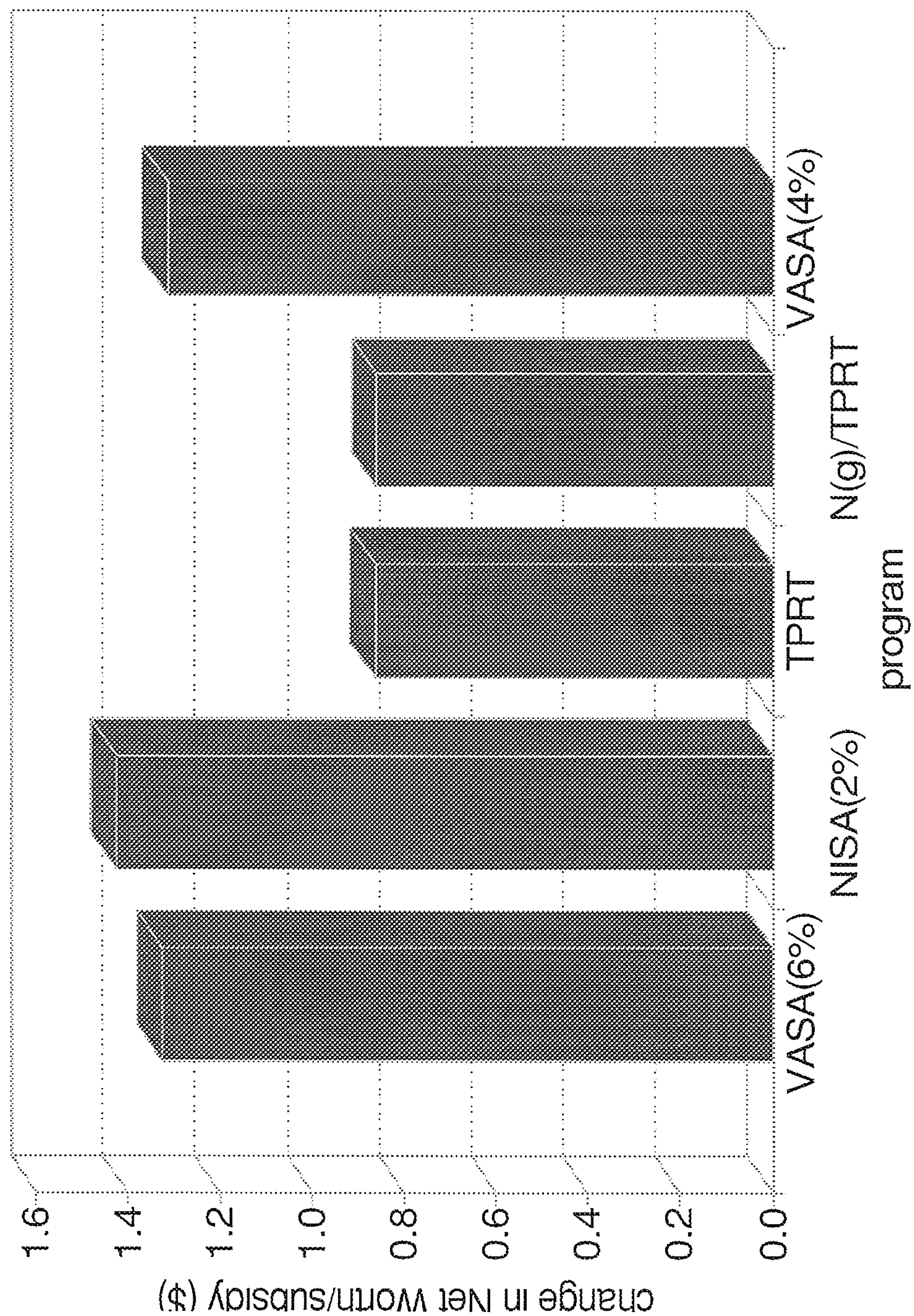


Figure 3.6 Change in wealth between stabilization and no program (hog farm)

3.1.3 No safety net - grain farm

A grain operation without safety net is used as a baseline scenario.

3.1.3.1 Wealth

The wealth generated by the grain farm is analyzed in terms of the change in accumulated wealth over 13 years in the farm business. Wealth accrued as current, intermediate and fixed assets is categorized in the following form:

i) Personal bank account: This is employed by the farmer to credit or debit cash surpluses or deficits during the time of business operation. Beginning in January, 1980, the personal bank account started with zero balance. By December, 1992, the simulation generated a debt in the personal bank account of $92,843. As explained below, this debt occurs primarily because of deficiency in the cash flow for most years after 1985.

ii) Machinery, building and land: The value of machinery and buildings at January 1992 was $234,835 and the value of 720 acres of land was $471,948. Each calendar year, the model farm incurs a capital expenditure similar or lower than accumulated annual depreciation. Simulation results indicate that on December 1992, value of machinery and equipment assets were $87,674. This is a notable drop from $234,835 in January, 1980. In other words, $147,161 of machinery is needed to be replaced. Value of land is assumed to remain constant throughout the simulation period.

iii) Inventory: This is composed of grain owned at January, 1980, at a value of $12,705. By December, 1992, the similar inventory was valued at $12,687.

iv) Combined change in wealth: The model farm generates a net loss in wealth of $239,995 from 1980 to 1992. This loss in wealth is made up of $92,834 from the personal bank account and $147,161 of net capital requirements.

3.1.3.2 Gross margin

Gross margin is the difference between commodity receipts and operating expenses. The grain farm generates an annual (calendar year) average gross margin of $60,731. It varies from $99,618 in 1983 to $21,311 in 1989. Simulation results indicate that gross margin has a standard error of $21,177. The variability of gross margin is explained principally by the historical fluctuations in grain and oilseed crop sales (Figure 3.7).

3.1.3.3 Cash flow

Cash flow is an important indicator of the ability of the farm business to cover debt payments, household expenditures and capital purchases. A deficit in cash flow, obliges the model to borrow from the personal bank account. In 13 years of operation, the model grain farm without any a government assistance generated an annual average deficit cash flow of $7,141. The largest deposit, $8,476, was simulated to occur in 1983 and the largest new operating loan of $36,967 occurred in 1989. From 1987 to 1992, the model grain farm experienced a deficit cash flow. The standard error of cash flow is $16,882.

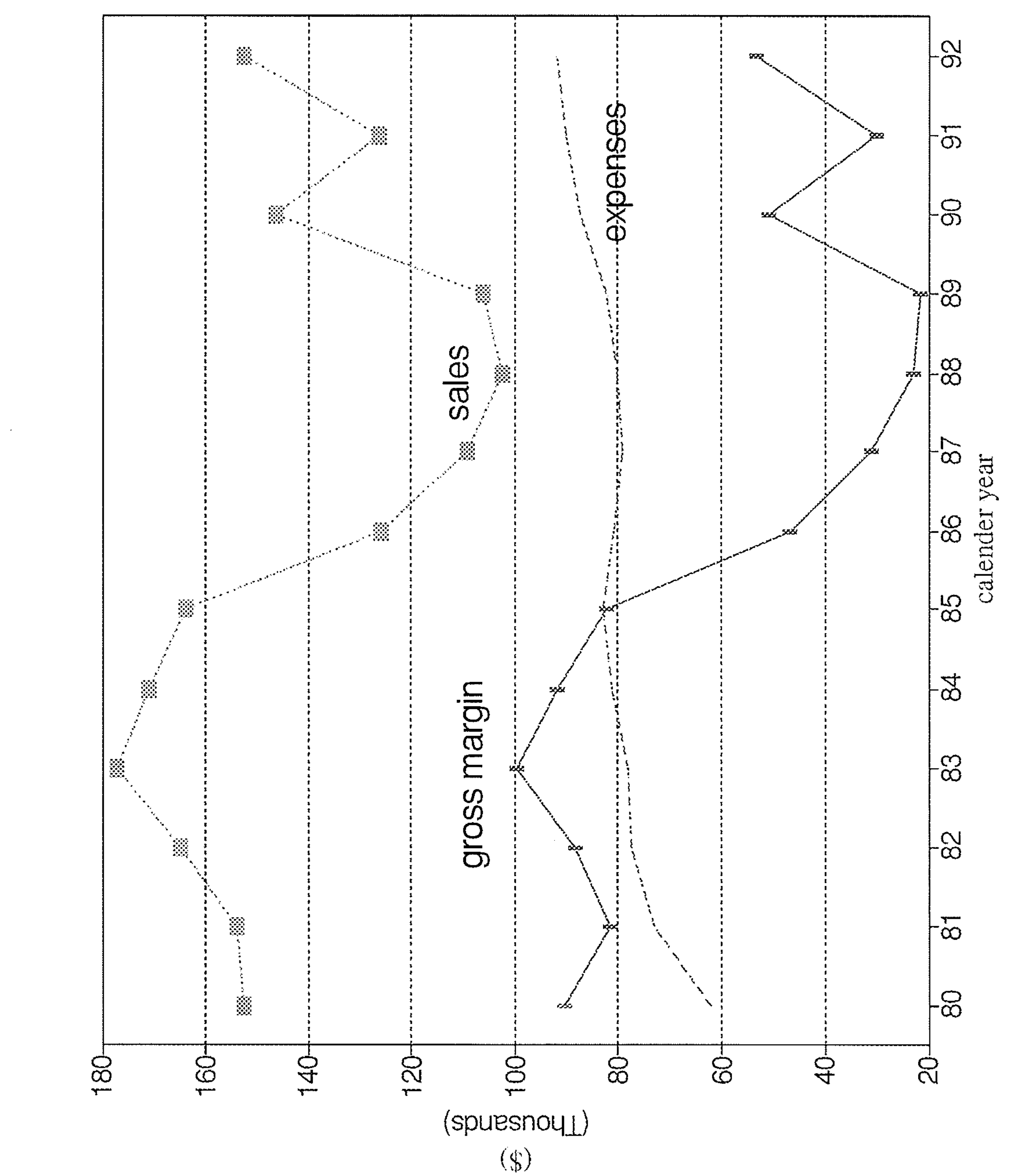


Figure 3.7 Indicators of gross margin variability for a grain farm without government program

3.1.3.4 Farm income

The farm income is the difference between commodity receipts and commodity purchases, operating expenses, debt, rent and depreciation. The model grain farm without any government programs, generated an annual average net income of $17,164. Negative incomes were estimated in 1986, 1988, 1989 and 1991. Grain and oilseed sales have the largest effect on the level and variability of farm income.

3.1.4 Stabilization programs - grain farm

The analysis of the model grain farm with stabilization programs is done similar to the hog farm. Characteristics of VAISA and NISA programs remain unchanged when applied to a model grain farm. Safety net programs strictly related to grain operations are Crop Insurance (CI), Revenue Insurance (RI) and Gross Revenue Insurance Plan (GRIP). The stabilization programs analyzed are GRIP, crop insurance, revenue insurance, VAISA with a 6 percent matching contribution and NISA with a 2 percent matching contribution. The combination of GRIP with VAISA and NISA, and C.I. with VAISA are also considered. The required matching contributions in order to make NISA/VAISA comparable to GRIP in terms of income, gross margin and wealth generated are also analyzed. Table 3.2 summarizes the simulated financial performance of the model grain farm when it participates in the aforementioned programs.

3.1.4.1 Level of subsidy (1980 - 1992)

Subsidies consist of the premiums paid by the government, and contributions to the NISA and VAISA accounts plus an interest bonus of 3 percent. Simulation results for the grain

Table 3.2 Grain farm simulation results under stabilization and no program (1980-1992)

($/year)

	No Sty Net	NISA (2%)	NISA (4%)	VASA (6%)	VAS (8%)	GRIP	CI	RI
average subsidy	0	3090	6198	4341	5872	9952	703	9249
average Gross Margin	60731	66217	70792	68479	70789	70755	61708	70439
std error GM	29177	28337	27583	28978	28804	24824	26828	24863
average Cash Flow	-7141	-2592	-503	-1344	-631	-1855	-5293	-1333
std error CF	16882	9233	6975	7777	7398	11214	16199	11014
average Farm Income	17164	22650	27225	24912	27222	27188	18141	26873
std error Farm Income	29216	28423	27710	29071	28936	24367	26404	24974
change wealth (,000 $)	-239	-175	-115	-147	-118	-93	-216	-115

No Sty Net = No Safety Net

operation show that level of subsidy varies substantially among programs (see Table 3.2). Under GRIP, the grain producer receives the largest annual average subsidy of $9,952 which is an equivalent to $8.30 per acre. Annual subsidies under GRIP are made up of $703 for crop insurance and $9,249 for revenue insurance (see Figure 3.8). VAISA(6%) and NISA(2%) reduces the subsidy to an annual average of $4,341 and $3,090 respectively. This is equivalent to a subsidy of $3.6 per acre for VAISA(6%) and $2.56 per acre for NISA(2%). The combined programs of GRIP with VAISA(6%) and NISA(2%) increase the subsidy levels to an annual average of $15,078 and $13,513, respectively. VAISA(6%) combined with C.I. generates an average subsidy of $5,021 annually. Contributions to NISA and VAISA accounts are estimated from net sales and gross margin after indemnities and premiums under GRIP and crop insurance occur.

3.1.4.2 Comparison of gross margin

Reflecting the level of subsidy provided under GRIP, the grain farm generates the largest annual average gross margin of $70,755 under GRIP. It is equivalent to a gross margin of $58.96 per acre. Revenue insurance and crop insurance by themselves generate an average gross margin of $70,439 and $61,708, respectively. A model farm registered to VAISA(6%) and NISA(2%), respectively generate an average gross margin of $68,479 equivalent to $57.1 per acre and $66,217, equivalent to $55.1 per acre.

The simulation results also show the capacity of each program to increase the stability of gross margin measured in terms of its standard error. Stability of gross margin is increased when the model farm includes a safety net program. Table 3.2 shows that revenue insurance and GRIP creates the most stability in the GM with standard errors of \$24,863 and \$24,824 respectively. Crop insurance alone increases stability by 8 percent relative to no program. The standard errors of GM for VAISA(6%) and NISA(2%) indicate that these programs are less effective in stabilizing gross margin with only 1 percent and 3 percent improvement over no program.

The cost effectiveness of subsidy payments[13] in changing the level and stability of the gross margin relative to no safety net is obtained from the historical simulation (Figure 3.9). Unlike the performance of each program in absolute terms, a subsidy received through VAISA(6%) and NISA(2%) is relatively more cost effective, with over \$1.70 increase in gross margin per dollar of subsidy. This large increase in gross margin per dollar of subsidy reflects the reduction in interest payments, since the model farm typically incurs a shortfall in revenue. The cost effectiveness of increasing GM per dollar of subsidy is reduced substantially under GRIP and R.I., to slightly above one dollar. Cost effectiveness of a subsidy through crop insurance increases to \$1.40 per dollar of subsidy. When NISA(2%) and VAISA(6%) are combined with GRIP, the effectiveness of a subsidy under NISA and VAISA are reduced by 60 percent. Results on the effectiveness of subsidy under each program in reducing variability (standard error) of GM under each program relative to no safety net are in the neighbourhood of \$0.40

[13] Cost effectiveness of subsidy payments is measured in two forms: first, as the difference between gross margin with stabilization and no program over the level of subsidy, and second, as the difference between the standard error of gross margin with stabilization and no program over the level of subsidy. It represents the net change of level of gross margin and change in stability of gross margin per dollar of subsidy payment.

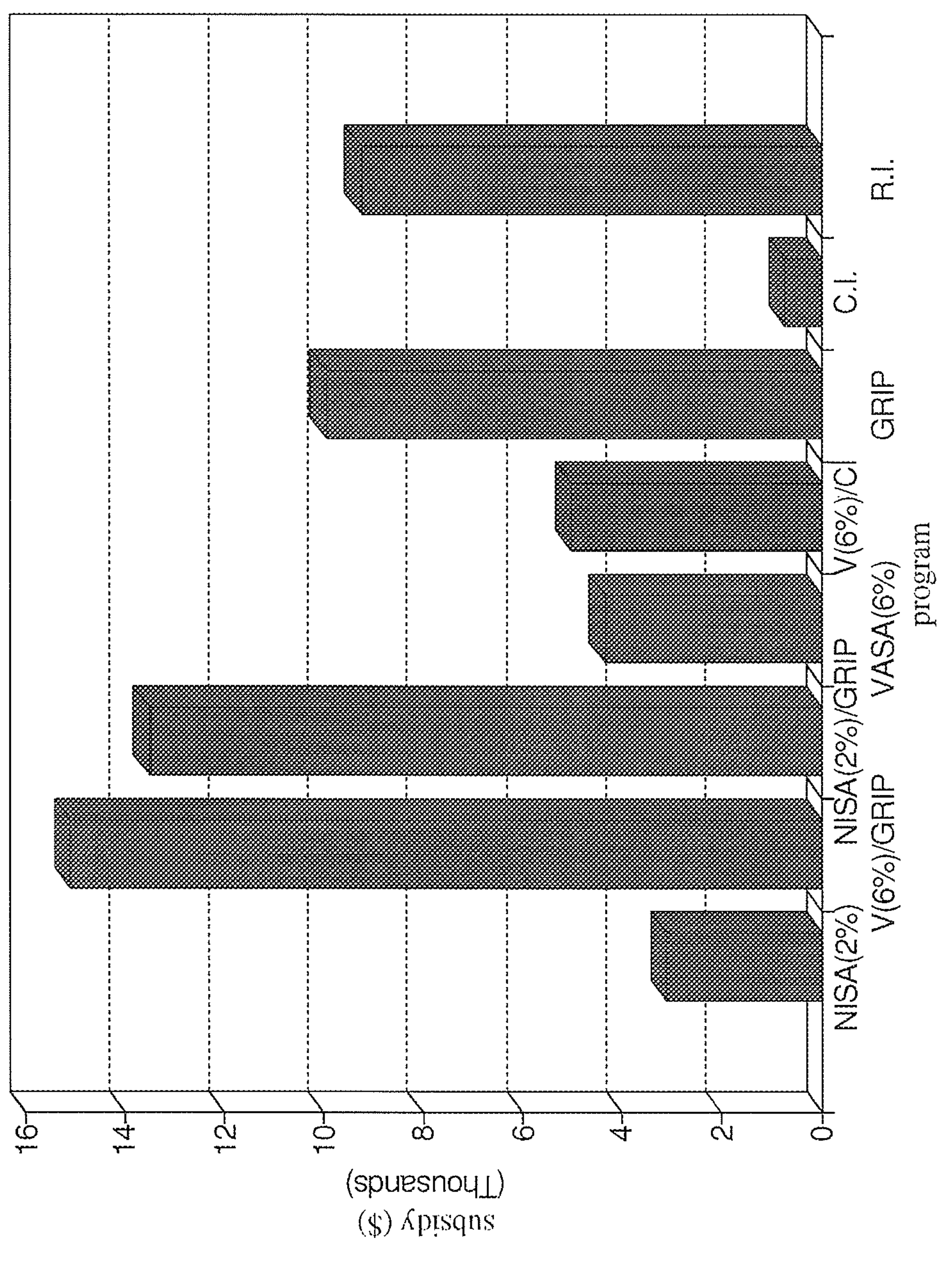


Figure 3.8 Average annual subsidy received by the grain farm model

per dollar of subsidy, with the exception of crop insurance which reduces variability of GM relative to no safety net by $3.00 per dollar of subsidy. Crop insurance provided only one payment to the model farm, in 1989 following a drought reduced yield in 1988.

3.1.4.3 Comparison of cash flow

Historical simulation results indicate that cash flows with and without stabilization programs were in a deficit position since 1986. The only exception was 1989 when the model farm received a single payout from crop insurance that offset cash outflows in that particular year. Deficits in cash flow are covered by withdrawing funds from the personal bank account. The largest annual average cash flow deficit of $7,141, equivalent to $9.92 per acre, is simulated when the model farm does not register in a safety net program. This deficit in cash flow reduces as the subsidy received increases, reaching $1,333 under revenue insurance (see Table 3.2).

Results on the variability of cash flow measured by the standard error, show that cash flow has least variability under revenue insurance with a standard error $11,014. When compared to no government program, crop insurance by itself and GRIP reduce variability of cash flow relative to no program by 4 percent and 33 percent, respectively. VAISA and NISA add 54 percent and 45 percent more stability than no program, respectively.

The following is an analysis of the cost effectiveness of subsidy payments in achieving both a larger and more stable cash flow, relative to a farm operation not enrolled in a safety net program. The simulation results indicate that crop insurance is

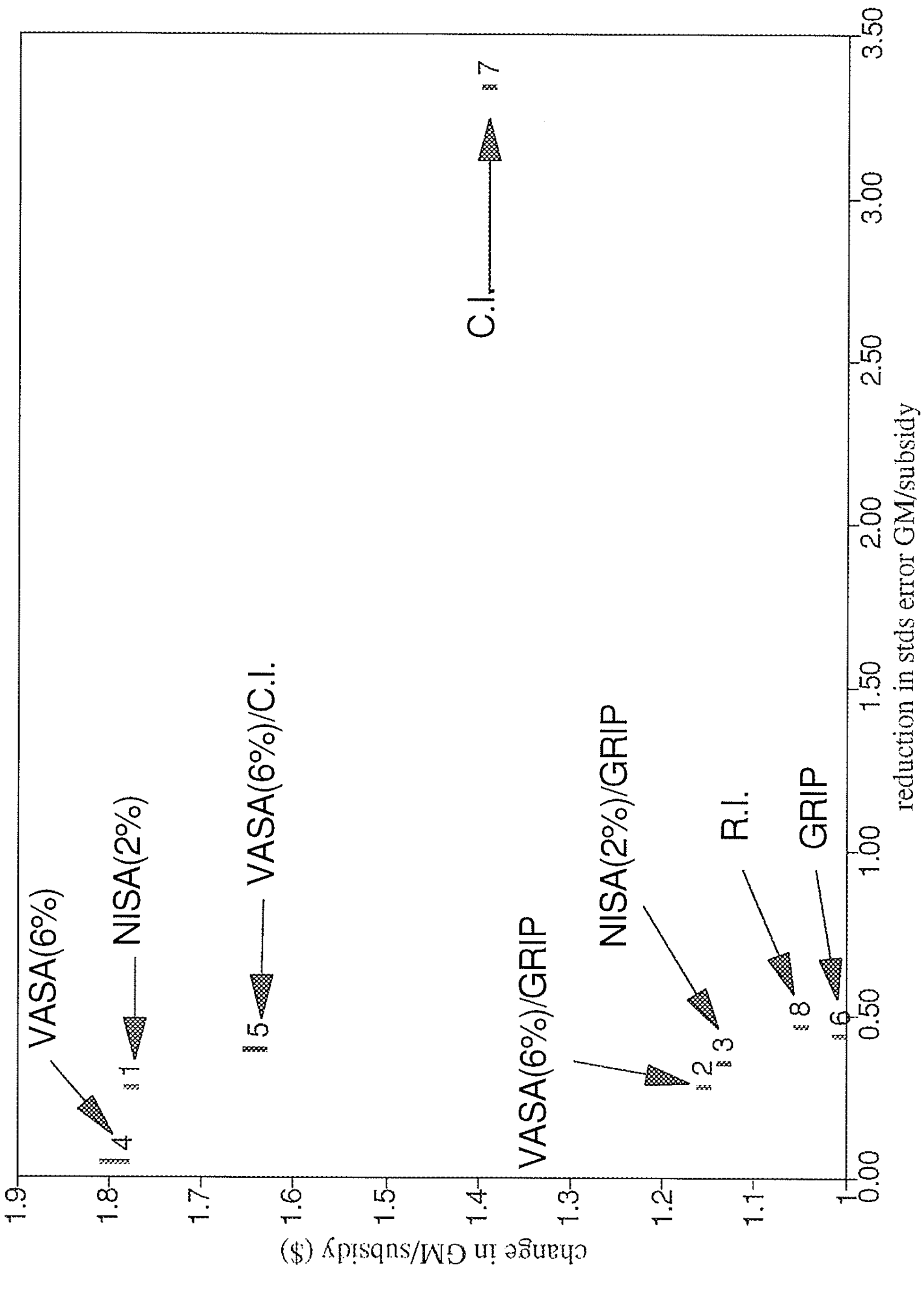


Figure 3.9 Change in annual gross margin between stabilization and no program (grain farm)

most cost effective in augmenting net cash flow with $2.57 per dollar increase per dollar of subsidy (Figure 3.10). When crop insurance is combined with revenue insurance to become GRIP, the cost effectiveness is reduced by 80 percent to $0.51 increase in cash flow per dollar spent. Under VAISA(6%) and NISA(2%) the respective cash flow increased by $1.34 and $1.47 per dollar of subsidy received. The effectiveness of VAISA(6%) in increasing cash flow is reduced to $1.05 per dollar of subsidy when combined with crop insurance.

NISA(2%) is the most cost effective in increasing cash flow stability, as it reduces the standard error by $2.49 per dollar of subsidy. It is followed by VAISA(6%) and VAISA(6%)/CI with $2.10 and $1.94, respectively. Under other program combinations, the cost effectiveness of increasing stability in cash flow varies from a reduction of $0.53 to $0.84 per dollar transferred (see Figure 3.10).

3.1.4.4 Comparison of farm income

Given the subsidy received under each program, the model grain farm generates the largest average farm income ($27,188) under GRIP, which is equivalent to $22.66 per acre. This is a 58 percent increase over $17,164, the average farm income without any program. Model farm incomes simulated under the programs of C.I. and R.I. were $18,141 and $26,873, respectively. VAISA(6%) and NISA(2%) generated an annual average income of $24,912 and $22,650, respectively. Table 3.2 indicates that when GRIP is combined with VAISA(6%) or NISA(2%) the joint programs increase income by 100

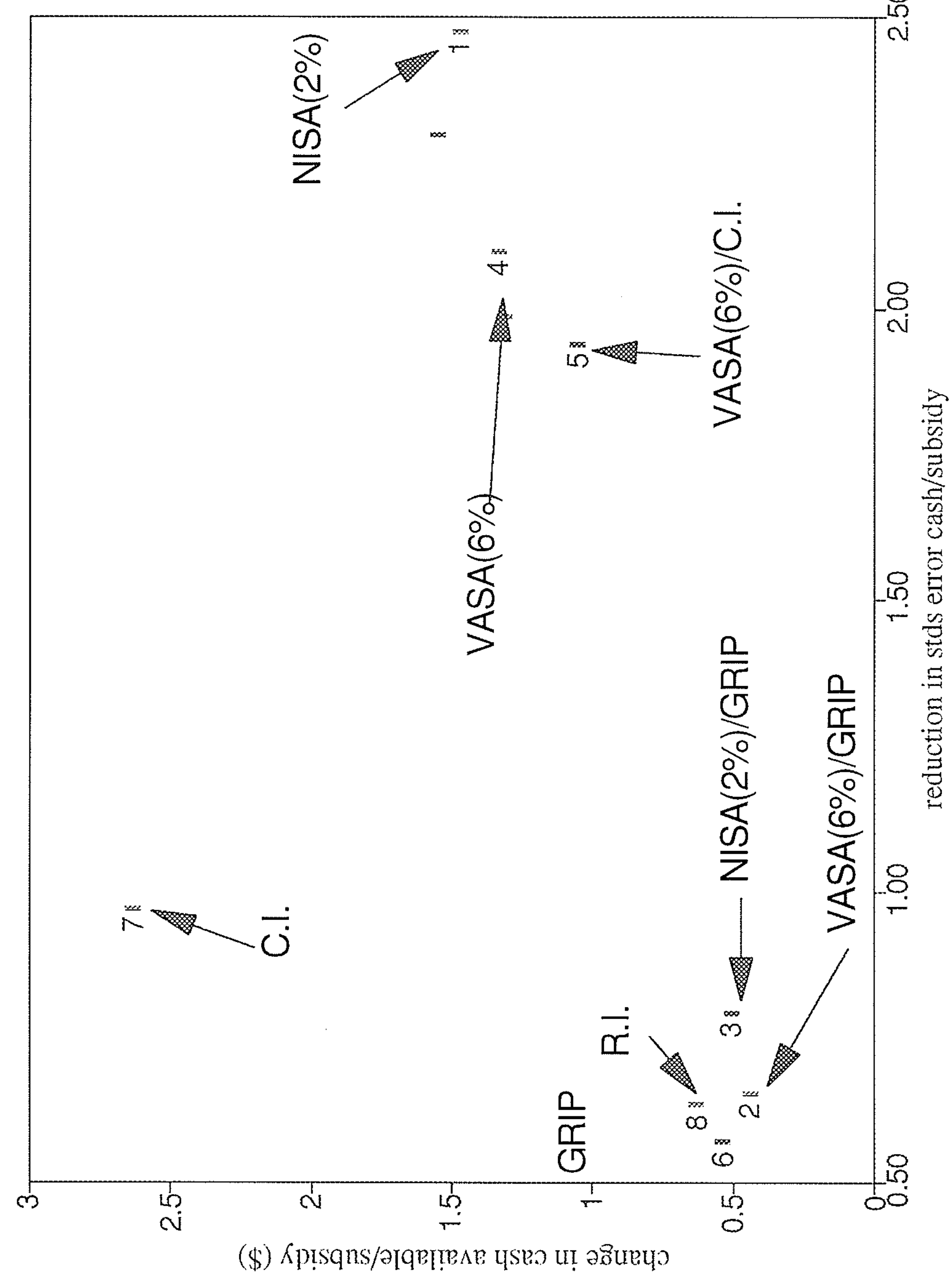


Figure 3.10 Change in annual cash flow between stabilization and no program (grain farm)

percent and 89 percent over income simulated without any program.

Variability of farm income during the simulation period is reduced by all safety net programs relative to income variation in the absence of any safety net programs. GRIP generates the most stability in farm income with standard error of $24,367. This is a 16 percent reduction in the standard error simulated without a program.

The following is an analysis of the cost effectiveness of subsidy payments in achieving both a larger and more stable farm income relative to a farm operation without a safety net program. In Figure 3.11, the x-axis represents the increase of stability in farm income per dollar of subsidy relative to a NSN case. As the standard error becomes smaller relative to the standard error under NSN (more positive value in the x-axis), the stability increases. The y-axis represents the increase in the average farm income relative to the NSN case per dollar of subsidy. Among the individual programs, crop insurance is more cost effective in stabilizing income with $4 reduction in variability per dollar of subsidy. The remaining stabilization programs are very similar in terms of simulated reduction in income variability. Each program decreases the income variation from year to year, by approximately one dollar per dollar of subsidy. In terms of income augmented the GRIP and revenue insurance programs were the least effective as they added a dollar per dollar transferred. NISA/VAISA programs increased model farm income by $1.80 per dollar transferred. Crop insurance, while the most effective program in terms of income stabilization increased farm income by $1.40 per dollar transferred.

3.1.4.5 Comparison of a change in wealth

A change in wealth over the 13 years is measured in terms of the ending balance in the personal bank and NISA/VAISA program accounts, less the net capital requirements at the end of 1992. If the model farm did not replace aging equipment but accumulated money in the bank account, there may not be an increase in wealth. In the case of the model grain farm it not only has more current debt in 1992, it also has no replacement of depreciated equipment. The reduced wealth varies from $92,987 under GRIP to $239,995 when no program support occurs. The loss of wealth is primarily accounted for by not replacing equipment. The model farm without a stabilization program does not replace any equipment between 1985 and 1992. In addition, its operating loan grows to nearly $93,000 by the end of 1992. Each model farm simulation with the various stabilization programs ended up with an operating loan they did not have in 1980. Furthermore, the model farm simulation ranged between four and eight years behind in replacement of machinery and buildings.

The cost effectiveness of subsidy payments in changing the farm wealth is estimated as the ratio of the difference between wealth with stabilization and with no program over the subsidy payments. In a period from 1980 to 1992, crop insurance represented the most cost effective subsidy in terms of increasing wealth per dollar of subsidy (Figure 3.12). Under GRIP and revenue insurance cost effectiveness drops to $1.15 and $1.04 per dollar of subsidy, respectively. Subsidy through VAISA(6%) and

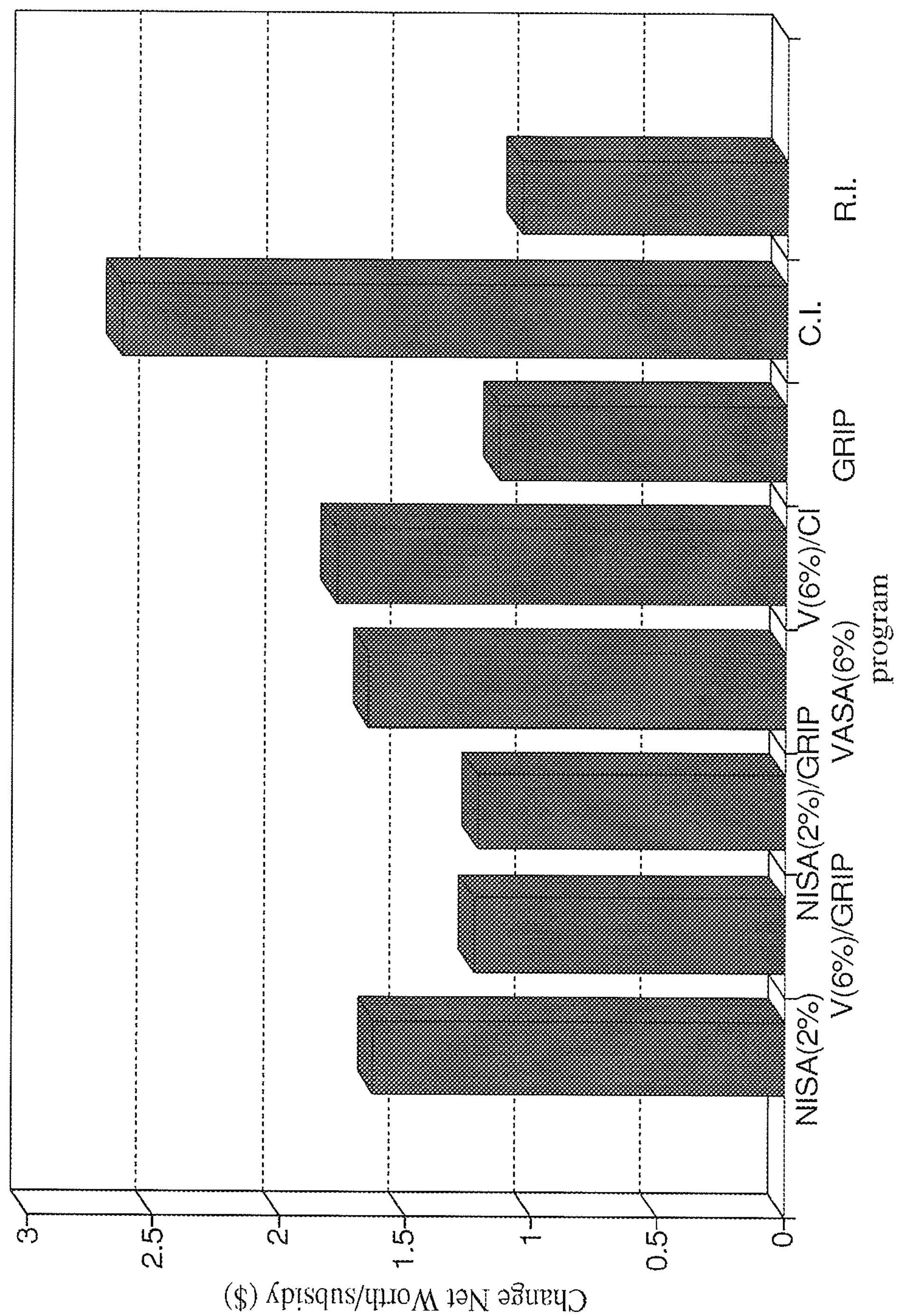


Figure 3.12 Change in wealth between stabilization and no program (grain farm)

NISA(2%) permits the producer to increase net wealth by $1.61 per dollar of subsidy. In all cases, the increase in wealth means the model farm had less debt or was able to replace more equipment than the farm simulation without any stabilization program.

3.1.4.6 Comparable performance

The 1980-1992 simulation results indicate that a grain producer registered in a GRIP type program realized in absolute terms, the largest and relatively more stable gross margin, net cash flow, income and the smallest increase in debt when compared to other stabilization programs. Not surprisingly, the level of subsidies simulated were also higher for GRIP type programs. Higher level of subsidies under NISA and VAISA programs are required in order for these programs to achieve a comparable financial performance as was simulated under GRIP.

Two higher levels of subsidy were simulated for NISA and VAISA. When the NISA and VAISA matching government contributions are increased to 4 percent of net sales and is 8 percent of gross margin, respectively, the simulated results are close to the financial performance achieved under GRIP. The transfer of income under VAISA(8%) and NISA(4%) permits the model grain farm to achieve a similar gross margin and income to that provided under GRIP with 41 percent and 38 percent less subsidy than GRIP (see table 3.2). VAISA(8%) and NISA(4%) do not appreciably reduce the year to year variability of gross margin on farm income below levels achieved with lower contribution levels. Cash flow variability was, however, reduced substantially. Increasing the matching contributions to 4 and 8 percent under NISA and VAISA, reduces accumulated debt at the end of the simulation period relative to initial NISA and VAISA programs, by 60 percent and 86 percent, respectively, however, they remain 25 percent larger than the deficit under GRIP.

3.1.5 No safety net - farrow to finish and grain operation combined

The analysis of the combined farm model merges the model for the farrow to finish hog and grain operations. The stabilization programs implemented in the combined farm are NISA, with a matching contribution of 2 percent and 8 percent, VAISA, with a matching contribution of 6 percent and 15 percent, and a combination of GRIP, NTSP and NISA grains (N(g)/G/T) held at the same time. Matching contributions are increased for NISA and VAISA to approximate levels of farm income and gross margin available through the existing programs N(g)/G/T. Additionally, NISA and VAISA are combined with crop insurance. Table 3.3 summarizes the financial results of the merged farm.

3.1.5.1 Wealth

The wealth simulated by the merged model farm is analyzed in terms of how it changed between 1980 and 1992. Wealth is accrued as current, intermediate and fixed assets categorized in the following groups:

i) Personal bank account: The personal bank account is employed by the model to credit or debit cash surpluses or deficits at the end of each calendar year. At January, 1980, the personal bank account started with zero balance. By December, 1992, the simulation generated an operating debt of $54,844 for the merged farm with no government program. This debt occurs primarily because of a deficit in the cash flow for years 1981, 1988, 1989 and 1992.

ii) Machinery, buildings and land: The value of machinery and buildings at January, 1992, was $636,235, and the value of 720 acres of land $472,759. Each calendar year, the model farm incurs a capital expenditure to totally or partially replace the accumulated depreciation on the expenditure is postponed until financial circumstances warrant replacing some capital. The simulation results indicate that on December 1992, the book value of machinery and equipment was $682,163 but the net capital requirement was $302,298. In other words, $302,228 of equipment purchase had been postponed. Value of land is assumed to remain constant throughout the simulation period.

iii) Inventory: The value of inventory, composed of hogs, grain and feed owned on January, 1980, was $30,929. By December, 1992, the simulated value was $31,591.

iv) Combined change in wealth: The model farm generates a net loss in wealth of $306,759 from 1980 to 1992. This loss in wealth is made up of $54,844 from the personal bank account and $251,915 of net capital requirements.

3.1.5.2 Gross margin

Gross margin is the difference between commodity receipts and operating expenses. The merged model farm generates an annual (calendar year) average gross margin of $130,932. It varies from $198,317 in 1986 to $37,161 in 1989 (Figure 3.13). The standard

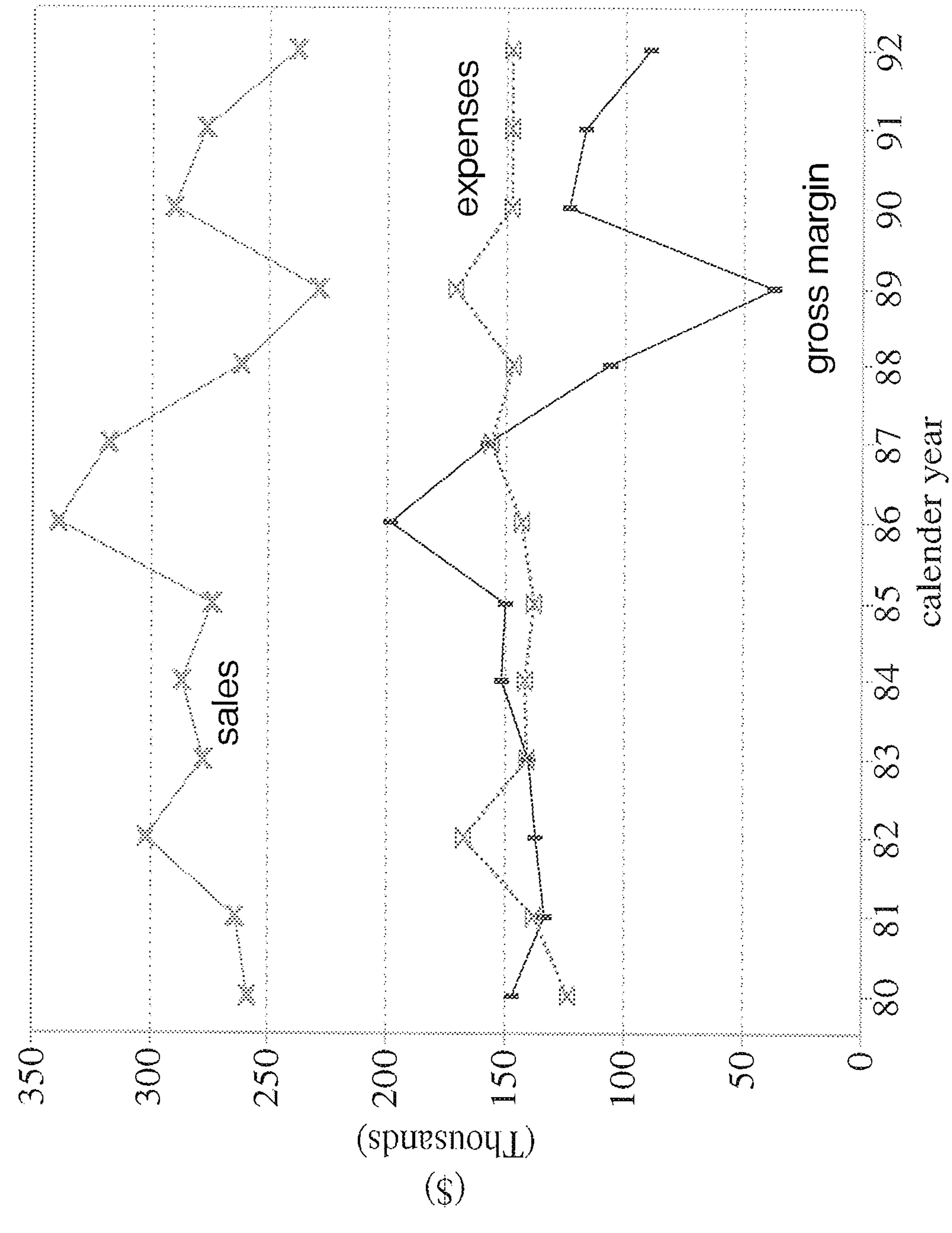


Figure 3.13 Indicators of gross margin variability for a hog-grain farm without program

error of the gross margin is $38,231. The variability of gross margin is explained principally by historical variation in commodity sales.

3.1.5.3 Cash flow

Cash flow is an important indicator of the ability of the farm business to meet debt payments, rent, household expenditures and capital purchases. A deficit on the cash flow requires the model farm to borrow from the personal bank account. In 13 years of simulation, the model farrow to

finish hog-grain farm generated an annual average deficit cash flow of $4,219 when no safety net program was included (see Figure 3.3). The largest deposit was simulated to occur in 1986 with $15,197 and the largest operating loan of $72,963 occurred in 1989. From 1980 to 1988, the combined farm model experienced a positive net cash flow. The standard error of the net cash flow is $21,988.

3.1.5.4 Farm income

The farm income is the difference between commodity receipts and commodity purchases, operating expenses, debt payments, rent and depreciation. The merged model farm without any government program generated an annual average income of $39,106. Losses were simulated to occur in 1989 while the largest income occurred in 1986. Commodity receipts have the largest effect on variability of farm income.

Table 3.3 Combined farm simulation results under stabilization and no program (1980-1992)

($/year)

	No Sty Net	NISA (2%)	NISA (8%)	VASA (6%)	VASA (15%)	N(g)/G/T[1]
average subsidy	0	5519	24396	9551	24153	24449
average Gross Margin	130932	138959	155133	146504	154942	159907
std error GM	38231	35440	18181	25743	18852	18518
average Cash Flow	-4219	-1885	-2898	-735	-5145	1450
std error CF	21998	7653	12167	11289	14699	5960
average Farm Income	39106	47133	63307	54678	63116	68081
std error Farm Income	39822	36656	18655	26915	19279	18658
change wealth ($)	-306759	- 190162	239092	-68652	236462	28843

(1) A combination of NISA(grain), GRIP and NTSP.
No Sty Net = No Safety Net

3.1.6 Stabilization programs - farrow to finish and grain operation

Simulated financial indicators for the various government programs are presented in Table 3.3. A discuss of each of the respective indicators follows.

3.1.6.1 Level of subsidy (1980 - 1992)

In absolute terms, average annual subsidy payments vary from $5,519 under NISA(2%) to $24,449 under the combination of N(g)/G/T. Annual subsidy payments under VAISA(6%) were simulated to be $9,551 (Figure 3.14). In order to make NISA and VAISA financially comparable to N(g)/G/T, the matching contributions were increased to 8 percent of net sales under NISA and 15 percent of gross margin under VAISA. The new matching contribution increases the annual average subsidy under NISA and VAISA to $24,396 and $24,153 respectively.

3.1.6.2 Comparison of gross margin

The merged model farm simulates the largest annual average gross margin of $159,907 when it includes the combination of N(g)/G/T, which is 24 percent over the gross margin without any program. Table 3.3 shows that gross margin is reduced to $146,504 under VAISA(6%) and to $138,959 under NISA(2%). Increasing the matching contribution under NISA and VAISA to 8 percent and 15 percent, respectively, simulates an annual average gross margin of $155,133 and $154,942, respectively. This is 19 percent larger than the gross margin realized without any

government program.

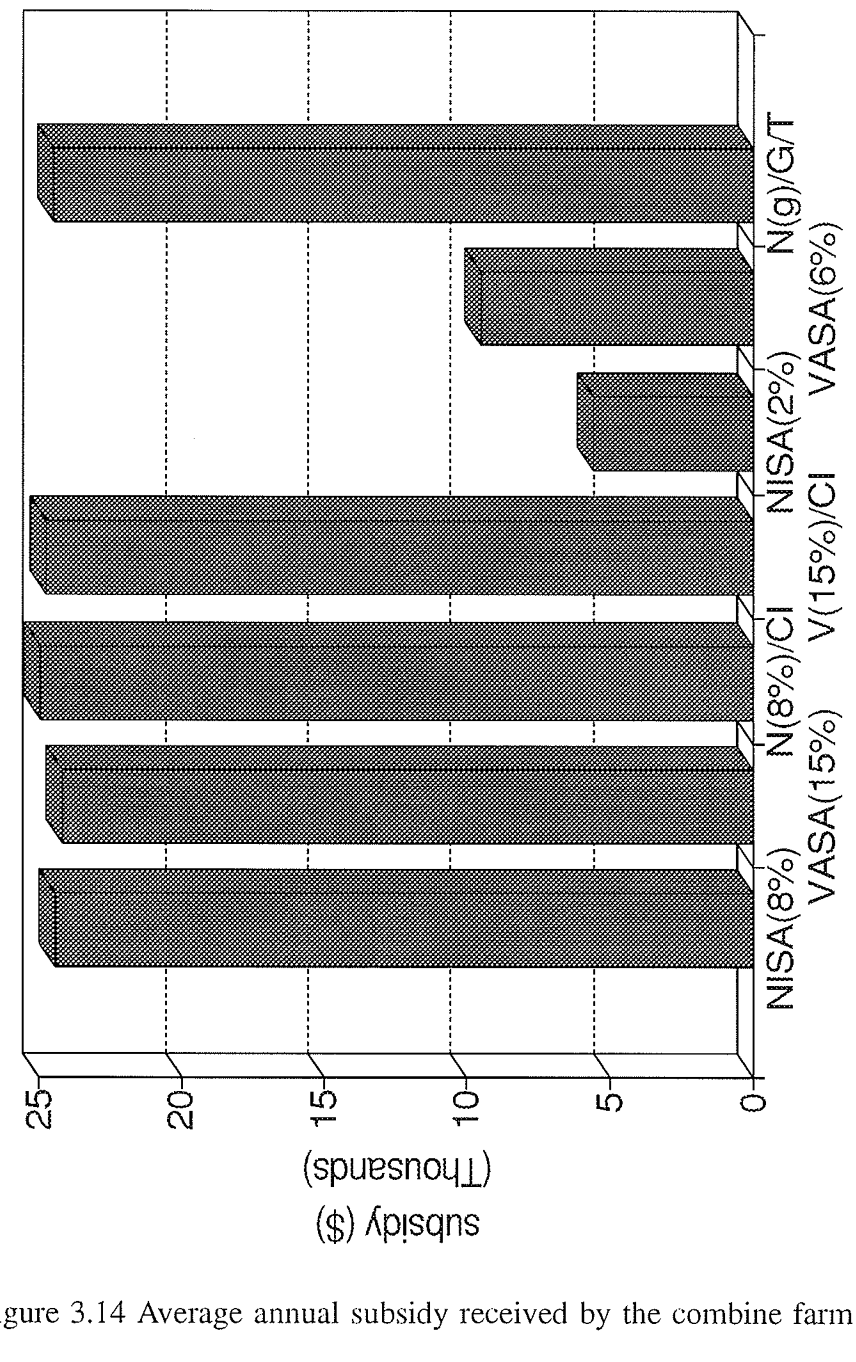


Figure 3.14 Average annual subsidy received by the combine farm

The stability of gross margin measured by the standard error increases when the merged model includes a stabilization program. More stability in gross margin is achieved under N(g)/G/T with standard error of $18,518. Table 3.3 shows that the stability in the gross margin under VAISA(6%) and NISA(2%) is $25,743 and $35,440, respectively. VAISA(6%) and NISA(2%) increases stability of gross margin relative to no program by 31 percent and 8 percent, respectively. Under NISA(8%) and VAISA(15%), the stability of gross margin is increased to levels which are comparable to N(g)/G/T.

The cost effectiveness of subsidy payments[14] in changing the level and stability of the gross margin relative to no program is obtained from the historical simulation (Figure 3.15). VAISA(6%) and NISA(2%) are the most cost effective programs, as they increase the gross margin more per dollar transferred. When matching contributions are increased to 8 percent for NISA and 15 percent for VAISA, the cost effectiveness of subsidy payments in changing gross margin is reduced to $1 per dollar of subsidy. This occurs because a larger proportion of subsidy is saved in NISA/VAISA accounts and is not triggered to stabilize gross margin. Under N(g)/G/T, gross margin increases by $1.27 per dollar of subsidy. These results show that cost effectiveness of increasing gross margin is reduced as level of subsidy is increased under NISA and VAISA.

In terms of stabilizing the gross margin, VAISA(6%) is the most cost effective in reducing the variability of gross margin per dollar transferred of diversified farm to $1.29. The NISA(2%) was only half as effective, as the standard error dropped to $0.54 per

[14] Cost effectiveness of subsidy payments is measured in two forms: first, as the difference between gross margin with stabilization and no program over the level of subsidy; and second, as the difference between the standard error of gross margin with stabilization and no program. It represents the net change of level of gross margin and change in stability of gross margin per dollar of subsidy payment.

dollar of subsidy. The cost effectiveness of increasing stability of gross margin under NISA(8%) and VAISA(15%) is similar to N(g)/G/T, with $0.83 per dollar more stable per dollar of subsidy.

3.1.6.3 Comparison of cash flow

Historical simulation results indicate that the merged model farm generates an annual average cash deficit of $1,885 under NISA(2%) and $735 under VAISA(6%). When matching contributions are increased to 8 percent in NISA and 15 percent in VAISA, the average cash flow deficit increases to $2,898 and $5,145, respectively. Individual contributions are cash outflows, and larger contributions increase the cash flow deficits. Under N(g)/G/T, the producer generates an average surplus cash flow of $1,450 because under GRIP and NTSP, program indemnities are sufficient to offset cash outflows. The surplus becomes savings which are credited to the personal bank account.

The analysis of the cost effectiveness of subsidy payments in achieving a larger and more stable cash flows relative to a farm operation without a safety net (Figure 3.16) indicates that NISA(2%) generates the largest increase in cash flow with $0.65 per dollar of subsidy, followed by VAISA(6%) with $0.42 per dollar of subsidy. Increasing individual contribution in NISA/VAISA accounts reduces cost effectiveness to $0.05 per dollar of subsidy under NISA(8%) and to minus $0.04 per dollar of subsidy under VAISA(15%). The ineffectiveness of the higher contribution levels in stabilizing cash flow is linked to the assumption that farmers will maximize their NISA and VAISA account contributions as long as matching government money is involved. This may involve borrowing from the personal bank account. When the withdrawal trigger is not

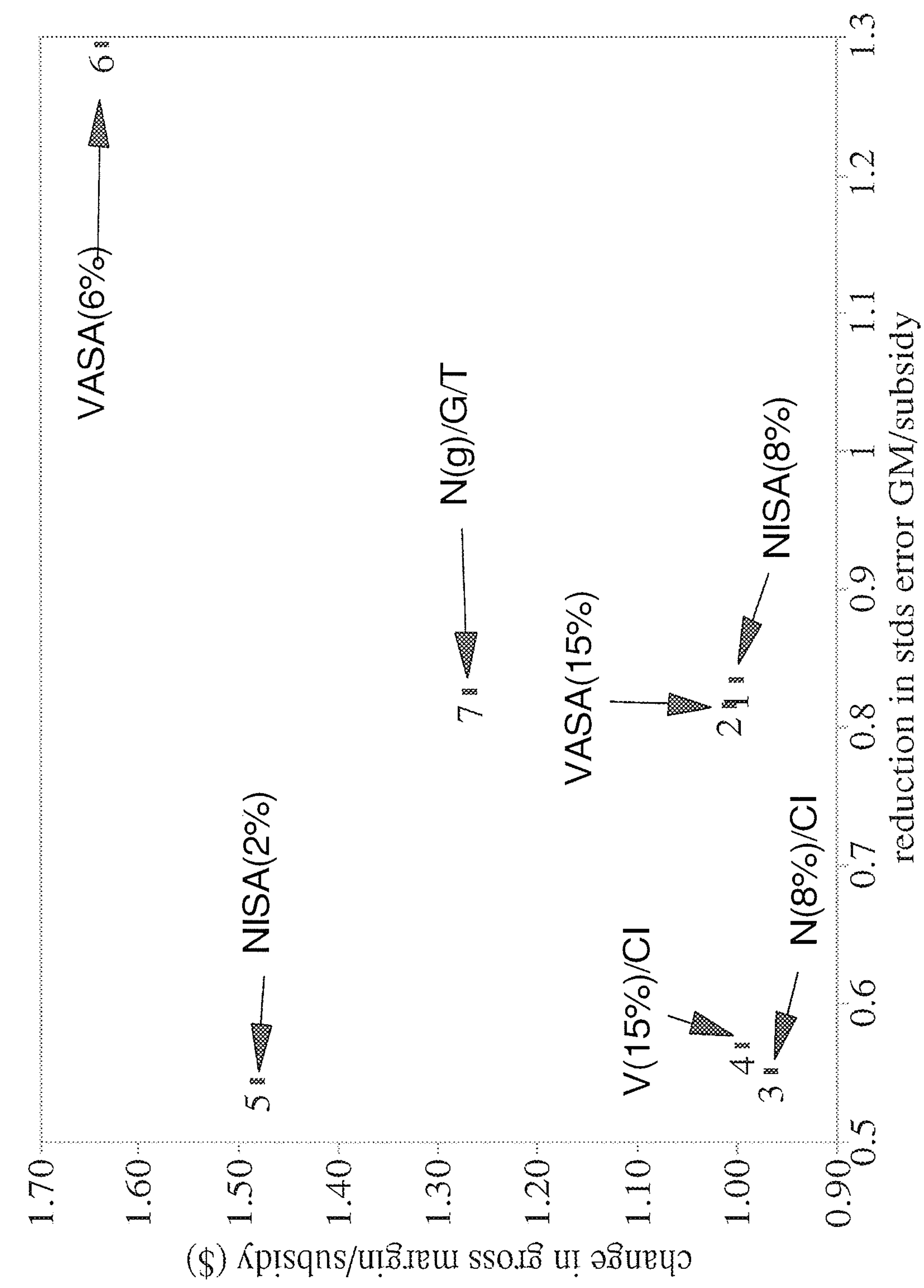


Figure 3.15 Change in annual gross margin between stabilization and no program (combine farm)

changed the monies tend to built up in NISA/VAISA accounts. Wealth is added and stability is reduced.

In terms of stability, a subsidy under NISA(2%) is the most cost effective in reducing cash flow variability with $2.58 reduction in the year to year instability per dollar of subsidy. This cost effectiveness is reduced as the level of subsidy increases. Under VAISA(15%), cost effectiveness of subsidy in reducing the standard error drops to $0.40 reduction in year to year instability per dollar of subsidy.

3.1.6.4 Comparison of farm income

The model farm under N(g)/G/T generates the largest average annual farm income of $68,081 for the period 1980-1992. Table 3.3 shows that under NISA(2%) and VAISA(6%) the average farm income drops to $47,133 and $54,678, respectively, but exceeds the no program income of $39,106 per year. A higher level of subsidy of NISA and VAISA is required to provide similar levels of support to N(g)/G/T. A farm income of $63,307 is simulated under NISA(8%) and $63,116 under VAISA(15%).

The simulation results indicate that the stability of farm income increases as larger subsidies are transferred to the model farm. The standard error is reduced from $39,882 with no program to $36,656 under NISA(2%) to $18,658 under N(g)/G/T. The instability of farm income under NISA(8%) and VAISA(15%) is on average 52 percent lower than the variability achieved without program.

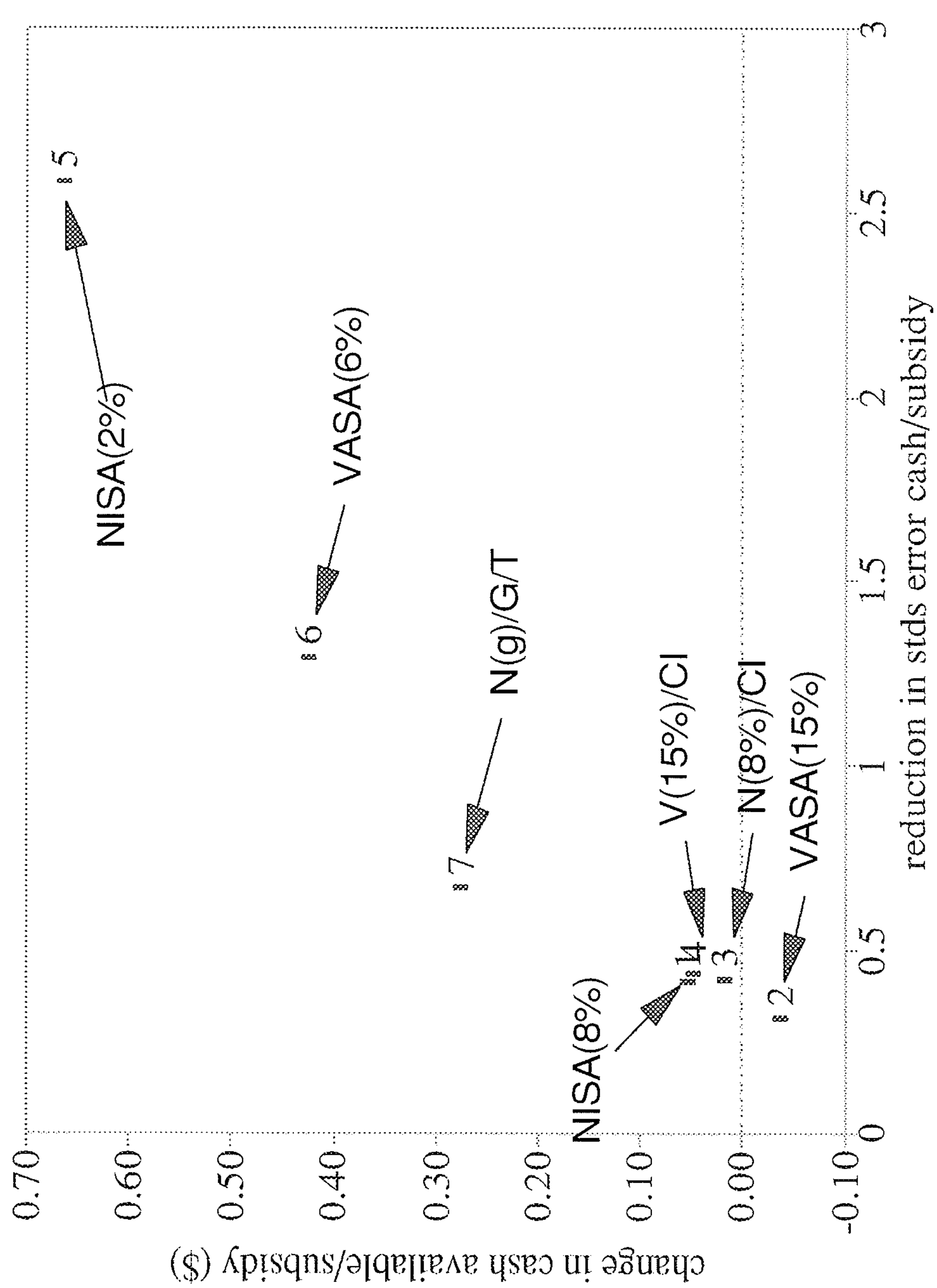


Figure 3.16 Change in annual cash flow between stabilization and no program (combine farm)

The cost effectiveness of a subsidy in achieving a larger as well as a more stable farm income relative to no government program is displayed in Figure 3.17. The x-axis represents the increase in the stability of farm income per dollar of subsidy. As the standard error becomes smaller relative to the standard error under no program (more positive value in the x-axis), the stability increases. The y-axis represents the increase in the average farm income relative to the no program for every dollar of subsidy. The most cost effective program simulated to increase farm income is VAISA(6%) with $1.64 increase per dollar of subsidy. This is followed by NISA(2%) with $1.48 increase per dollar of subsidy. The cost effectiveness under N(g)/G/T is recorded at $1.27 per dollar increase in income per dollar of subsidy. The simulated results indicate that increasing level of contribution in NISA and VAISA programs does not increase farm income at the same rate because a larger portion of subsidy is saved.

N(g)/G/T is the most cost effective set of programs in reducing year to year variation of farm income with $1.42 reduction per dollar of subsidy. It is followed by VAISA(6%) with $1.34.

3.1.6.5 Change in wealth

A merged model farm without safety net programs shows a net change in wealth deficit of $306,759. This is divided into $54,844 from the personal bank account and $251,915 of postponed machinery and equipment purchases. When the producer is registered to NISA(2%) and VAISA(6%), loss in wealth is reduced to $190,162 and $68,652 respectively. The combination of N(g)/G/T simulated a positive net worth of $28,843 over the 13 years. Wealth under NISA(8%) and VAISA(15%) increases dramatically to

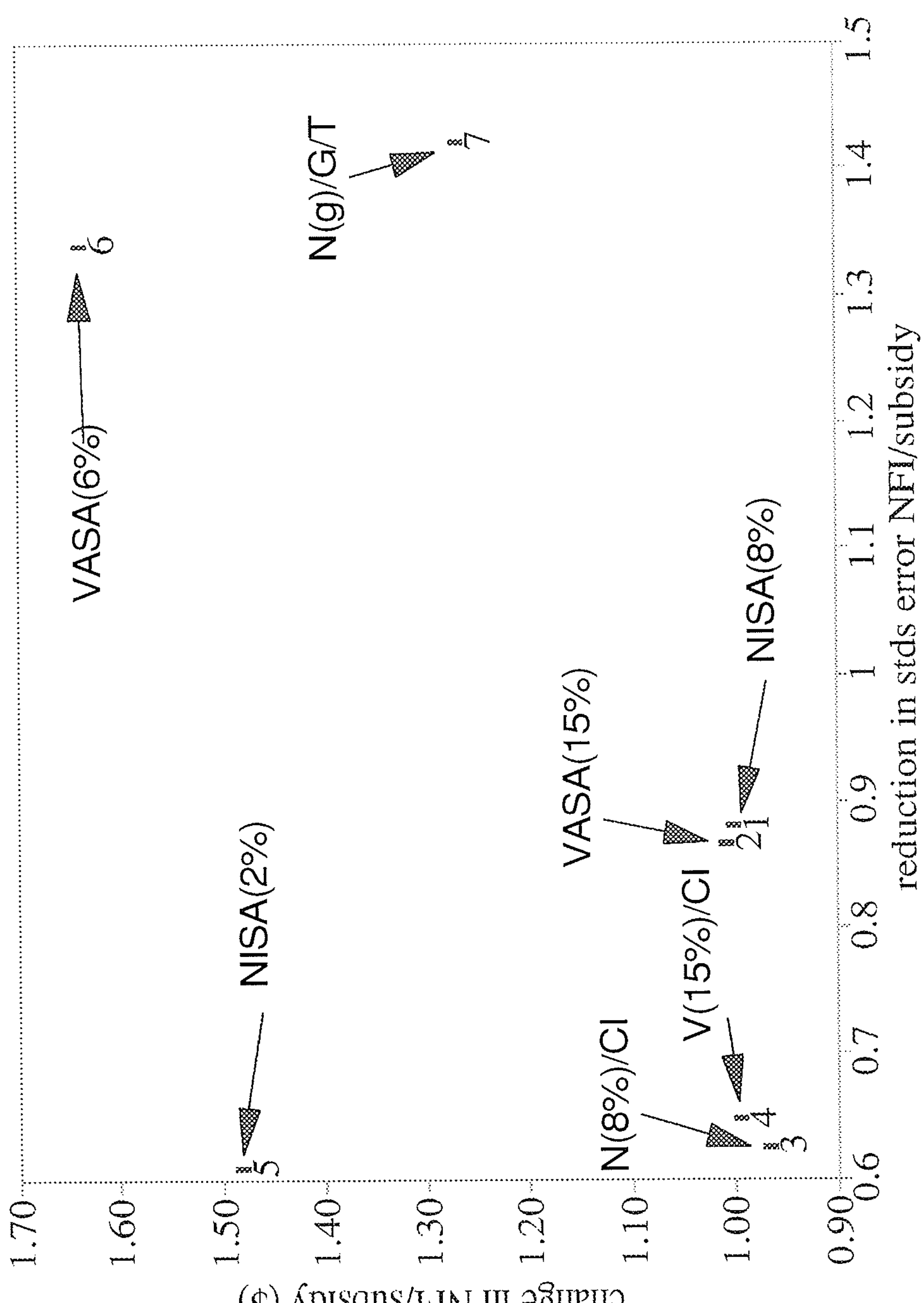


Figure 3.17 Change in annual farm income between stabilization and no program (combine farm)

$239,092 and $236,462 respectively. A merged farm operation under NISA(8%) and VAISA(15%), with an equivalent level of subsidy provided through N(g)/G/T, allows the model farm to increase wealth because NISA and VAISA programs encourage saving a larger portion of farm revenue in program accounts. In addition, some of the GRIP and NTSP money are lost to countervailing duties and program inefficiencies. Results indicate the model farm acquires more farm equipment or accumulates wealth and reduces debt, when registered in stabilization a program as compared to no program.

The cost effectiveness of a subsidy in changing wealth is estimated as the ratio of the difference between the net worth with stabilization and no program divided by the subsidy payments. As shown in Figure 3.18, a subsidy under VAISA(6%) is the most cost effective program, increasing wealth by $1.91 per dollar of subsidy. N(g)/G/T with the largest subsidy, is the least cost effective in increasing net worth, with $1.10 per dollar of subsidy. Cost effectiveness of the remaining programs with is reduced to about $1.70 per dollar of subsidy. In all cases, the model farm's wealth increases more than the subsidy because the simulated records results in less interest paid on a small operating debt and/or more interest credited to current and stabilization accounts.

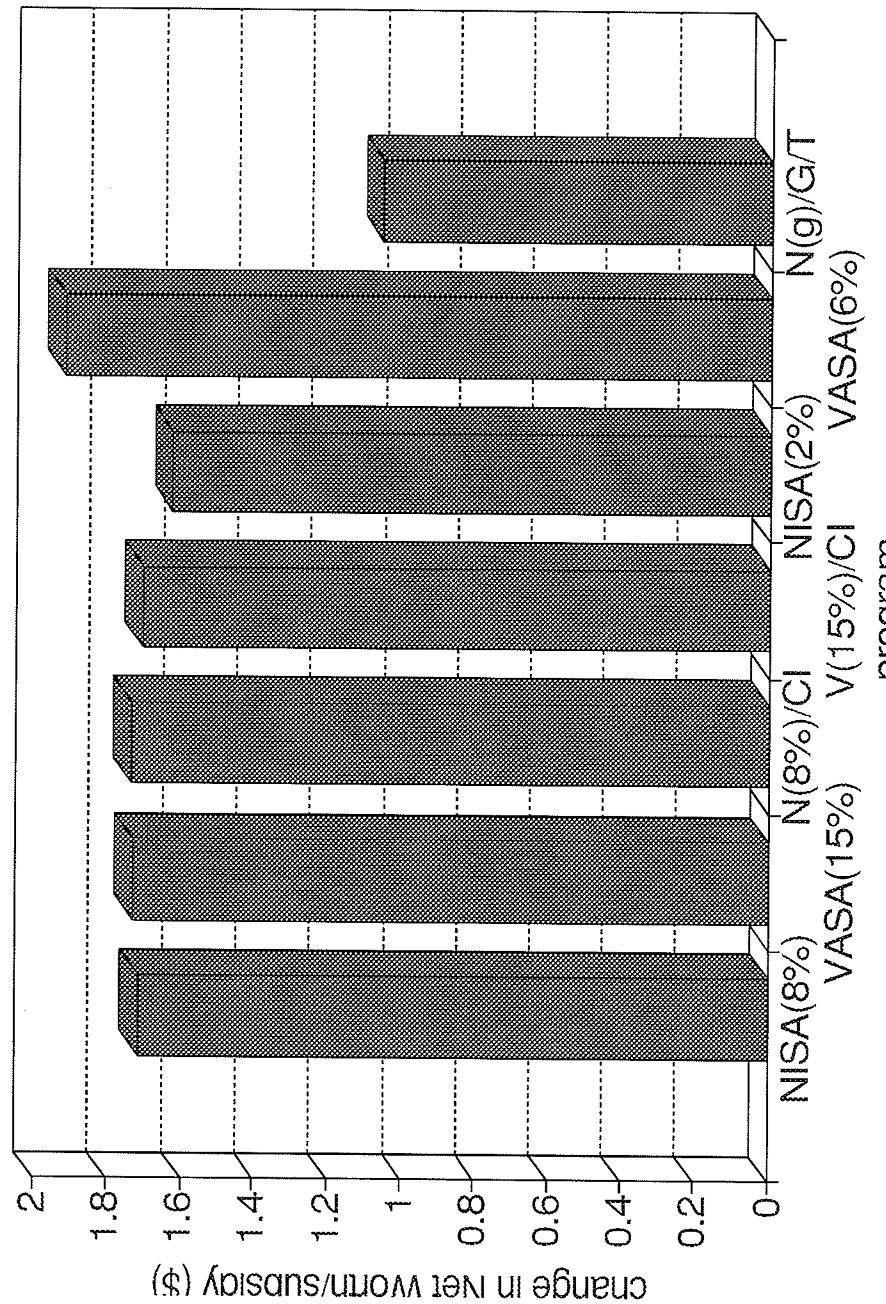


Figure 3.18 Change in wealth between stabilization and no program (combine farm)

Chapter 4 Summary, Conclusions and Policy Implications

4.1 Summary

This study assess the impacts of stabilization programs by simulating the financial performance of a farm operation in Manitoba. The analysis replicates historical production and market conditions over the period 1980 - 1992. The assessment is made by comparing the financial effects of various stabilization programs to a situation where the farm does not participate in any program. The financial indicators include the gross margin, cash flow, farm income and net worth of a farm business. The assessment includes an analysis of the effectiveness of subsidy payments in terms of making the farm business financially better off relative to no program. The programs analyzed are NTSP in the hog and merged farm model, GRIP, crop insurance and revenue insurance in the grain and merged farm model, and NISA and VAISA in each of the farm models.

4.2 Conclusions

The analysis and evaluation of the simulation models leads to the following observations and conclusions.

4.2.1 Farrow to finish hog farm

For the period 1980 to 1992 for the specialized farrow to finish hog farm operation generates the largest annual average gross margin and farm income is generated under NTSP. Not surprisingly, NTSP provides the largest average annual subsidy payments ($14,987). The subsidies more than offset the lower pooled hog prices received by Manitoba farmers. Manitoba sells live hogs to local packers, other provinces and the United States. A countervailing duty imposed by the U.S. since 1985 was only shown NTSP to reduce the net export price, as sales to domestic buyers were not affected. Therefore, the NTSP simultaneous resulted in lower average pooled market prices positively affected by the level of exports. Between 1980 and 1992 the simulated effect of countervailing duties resulted in the hog farm receiving $2,508 less per year or $0.93 per hog. The NTSP subsidy was estimated to contribute $6.80 per hog. No countervail duties were assumed for exports under NISA and VAISA. The premiums collected from the governments and farm did not quite offset payouts and by December, 1992, the model farm contributed $12,845 to the program deficit. Subsidy payments under NISA(2%) and VAISA(4%) increases the farm's gross margin relative to no program by 4.4 percent and 7.8 percent respectively, and farm income rose by 17 percent and 30 percent, respectively. The model hog farm continued to be a net borrower from the personal bank account to the amount of $8,491 for NISA(2%) and $16,431 for VAISA(6%). Increasing matching contributions to 9 percent in NISA and 15 percent in VAISA, increases average gross margin and farm income to equivalent levels simulated under NTSP, with 20 percent and 21 percent less government money than in NTSP. Stability of gross margin and farm income under NISA(15%) and VAISA(9%) are, however, 30 percent lower than under NTSP. The increase in subsidy under NISA(15%) and VAISA(9%) permits the producer to accumulate more wealth after 13 years of operation to $36,165 and $44,016, respectively, compared to a debt of $1,642 under NTSP.

The annual cash flow in the hog operation remains positive only under NTSP because payouts are large enough to cover any potential deficit. Under NISA and VAISA, the deficit in the cash flow occurs partially because of individual contributions to NISA/VAISA accounts, but primarily due to a more restricted trigger mechanism releasing funds and funding available when compared to NTSP.

Subsidies under NISA(2%) and VAISA(6%) are 10 percent more cost effective in increasing gross margin and farm income relative to NTSP. This cost effectiveness is reduced when matching contributions into NISA/VAISA accounts increases because a larger portion of the subsidy is saved in program accounts. Subsidies under NTSP are 50 percent more cost effective in reducing variability of gross margin and farm income than any of the income safety net programs.

4.2.2 Grain farm

When the specialized grain farm model is enrolled in GRIP between 1980 and 1992, the farm model generates the largest annual average gross margin ($70,755) and farm income ($27,188). GRIP also provides the largest annual average subsidy of $9,952. When GRIP is combined with NISA or VAISA the level of subsidy increases along with gross margin and net income.

Over the 13 years the grain operation averages a deficit in cash flow regardless of the stabilization program. In fact, every year after 1985 registered a short fall. The largest average deficit of $7,141 is generated when the grain producer is not registered in a program.

In terms of the change in wealth over the 13 years of operation, the grain farm is worth less in 1992 than in 1980, regardless of the stabilization program. The accumulated loss in wealth varies from $92,987 under GRIP to $239,995 when there is no safety net.

Subsidies under NISA(2%) and VAISA(6%) are more effective in increasing net worth than GRIP. The cost effectiveness of crop insurance in raising wealth and income outperforms other programs because of its low subsidy payments.

Increasing the matching contribution of NISA and VAISA to 4 percent and 8 percent respectively, generates similar average gross margins and farm incomes to those reached under GRIP, however, the cost to the government is 40 percent less than under GRIP.

The marginal increases in gross margin and farm income under NISA(2%) and VAISA(6%) is larger than under GRIP per dollar of subsidy. In fact, a dollar of subsidy under NISA(2%) and VAISA(6%) increases gross margin and farm income by $1.80 as compared to $1.00 for GRIP. This marginal effect is reduced when matching contributions increase because a larger portion of the subsidy is saved.

4.2.3 Farrow to finish hog - grain farm

The farm model of the merged farrow to finish hog operation and grain operation receives the largest average subsidy ($24,449) when registered in current programs of NISA(grain), GRIP and NTSP, as well as the largest average gross margin and farm income of $159,907 and $68,081, respectively.

Average cash flow under NISA(2%) and VAISA(6%) tends to be negative because of limited funds in the NISA/VAISA accounts and limitations of trigger mechanism to withdraw funds when cash flow is negative.

Under NISA(2%) and VAISA(6%) the model farm is not able to add to its wealth in 13 years of simulation. It is only under the combination N(g)/GRIP/NTSP simulation that the model farm experiences a positive change in wealth ($28,843) over the 13 year period. Increasing the matching contribution to 8 percent in NISA and 15 percent in VAISA permits the model farm to receive an average subsidy equivalent to that of GRIP, and farm accumulate wealth of $239,092 under NISA(8%) and $236,462 under VAISA(15%).

NISA(2%) and VAISA(6%) are more cost effective in changing gross margin and farm income relative to N(g)/G/T. This cost effectiveness is reduced as matching contributions increase because a larger portion of the subsidy received is kept in the form of savings.

Historical simulation results indicate that production diversification increases stability of the farm operation. As seen in Table 4.1, the model farm simulated without any government program substantially reduces the coefficient of variation in gross margin and farm income when the production of hogs and grains are combined. However, as indicated by Heady (1952), income variability can be decreased through diversification only if prices, production and costs are negatively correlated. The hog model suggests this industry is more variable than grain but when the two industries are combined the relative variation is nearly halved. Operation with stabilization programs (NTSP for hogs, GRIP for grains, and a combination for the merged farm) all have lower coefficients of variation than operation without such program. It is noteworthy, in the case of the model grain and hog farm, that the relative variability in gross margin and income is nearly the same when the specialized (grain and hog) farms participates in commodity specific stabilization programs as when they were merged with no government support. The stabilization programs allowed the farm business to remain specialized with income variation equivalent to diversifying either the grain or hog farming operations. Besides adding to the income of the specialized farm the NTSP and GRIP programs diminish the need to diversify in order to stabilize income.

Table 4.1 Coefficient of variation between a specialized and merged farm operation with & without government program

No government program

	hog farm	grain farm	combine farm
gross margin	0.55	0.48	0.29
farm income	2.14	1.70	1.02

Commodity specific stabilization

	tripartite	GRIP	tripartite/GRIP
gross margin	0.26	0.35	0.11
farm income	0.68	1.12	0.26

The nature of the farrow to finish hog operation requires a large investment in inventory (feed and herd), relative to a grain operation which purchases only seed. As shown in Table 4.2, the average net sales for the hog farm is 16 percent lower than net sales for the grain farm. When operating expenses are subtracted, gross margin for the hog farm is 9 percent higher than the grain farm. Under VAISA, the hog operation has a capacity to deposit a larger contribution than under NISA. On the other hand, the grain operation has a lower capacity to contribute to the program account if a value added income stabilization account was adapted.

Conclusions common to each of the farm operations considered in the study are:

1. The incentive to accumulate wealth increases as matching contributions under NISA and VAISA increases.
2. The cash flow is lowered when matching contributions increases because of the added incentive to deposit funds in the stabilization account.
3. More efficient and diversified farm operations (farms that generate larger receipts with a given operating expenses) will benefit more from VAISA than from NISA.
4. In a specialized farm operation, similar levels of subsidy under NISA and VAISA relative to NTSP or GRIP does not generate comparable stability in gross margin and farm income.
5. As the farm business diversifies, the ability of NISA and VAISA to increase stability of gross margin and farm income to the level of stability achieved under NTSP and GRIP increases.

Table 4.2 Simulation results on potential contributions to NISA/VAISA accounts

(annual average $)

		hog farm	grain farm	merged
	net sales	112,794	133,143	246,372
	gross margin	69,269	60,731	131,611
contributions	NISA(2%)	2,256	2,663	5,100
	VASA(4%)	2,771	2,429	--
	VASA(6%)	4,156	3,644	7,900

4.3 Limitations of the study

The results of this study are restricted to a particular farm operation located in the Red River Valley, in Manitoba. Prediction may not be representative of other regions. Since the farm simulates historical events, the results reflect particular market and production events that occurred between 1980 to 1992.

Another limitation of this study is the way revenue generated in a particular crop year was distributed in the corresponding calendar year. It is proportionally distributed to the length of the crop year that corresponds to the calendar year. This arbitrary conversion restricts the capacity of farm producers to responds to price fluctuation. For instance, if a producer considers that prices are relatively low, he or she may consider selling all crop in the next calendar year.

Area seeded of each crop assumed constant throughout the simulation period restricts farmer responds to price expectations, limiting the performance of the farm operation.

The performance of the farm operations under the scenarios analyzed in this study is conditioned by the limitation of the simulation models indicated above. However, this does not undermine the analysis and conclusions of the study, because the farm models under each stabilization program perform under similar conditions so as to make the comparative analysis possible.

4.4 Policy implications

In the short term, NTSP and GRIP provide a level of stability and farm revenues not matched by other programs, but at a large cost to taxpayers. In the long term, stabilization programs such as NISA and VAISA have fewer problems with moral hazard and transfer efficiency problems than programs such as NTSP and GRIP because the former programs enable the a farmer to accumulate wealth that can be part of a retirement plan. Additionally, as indicated by Moschini and Meilke (1992) subsidy to producers through NTSP is easily identified as countervailable since it provides a deficiency payment whenever the market price falls below the floor price. Subsidy under NISA and VAISA is less obvious to be countervailable because the subsidy is not focussed on in a particular product, rather, it is a function of the overall performance of the farm enterprise.

The eventual substitution of NISA and VAISA for NTSP and GRIP will depend on the level of matching contribution allowed in the program account, on the efficiency of production in each enterprise and the level of production diversification of the farm business. Under these circumstances, the importance of management skills increases to provide efficient allocation of resources based on market information.

REFERENCES

Agriculture Canada. "Livestock Market Review". Agriculture Canada, 1991.

Anderson, Jock R., Dillon, John L., and Hardaker, Brian. "Agricultural Decision Analysis". The Iowa State University Press, 1977.

Benson, Bruce L., Faminow, Merle D., Marquis, Milton H., and Sauer, Douglas G. "Intra-National Effects of a Countervailing Duty on the U.S./Canadian Hog Market". Department of Agricultural Economics and Farm Management, University of Manitoba, 1993.

Blandford, David, Carter, Colin A., and Piggott, Roley. "North-South Grain Markets and Trade Policies". Westview Press, Inc, 1993.

Browerman, Bruce L. and O'Conell, Richard T., "Time Series Forecasting; Unified Concepts and Computer Implementation". Duxbury Press, Boston,1987.

Cloutier, A. Pierre and Macmillan, David. "Current Financial Difficulties in Canada Agriculture" Economic Council of Canada. Discussion paper No 310, 1986.

Gilson, J.C., and Saint-Louis, R. "Policy Issues and Alternatives Facing the Canadian Hog Industry". Agriculture Canada and Canadian Pork Council, 1986.

Gilson, J.C., "World Agricultural Changes; Implications for Canada" C.D. Howe Institute, 1989.

Goodwin, Barry K. and Ortalo-Magne, F. "The Capitalization of Wheat Subsidies into Agricultural Land Values". Canadian Journal of Agricultural Economics. Volume 40, pp. 37-54, 1992.

Farm Credit Corporation. "Farm survey". Research Division. 1980.

Heady, Earl O. "Diversification in Resource allocation and Minimization of Income Variability". Journal of Farm Economics, Volume 34, pp 482-496, 1952.

Hopkin, John A., Barry, Peter J. and Baker, C.B. "Financial Management in Agriculture". The Interstate Printers and Publishers, Inc., 1973.

Jobin, Jacques. "Farm Income Instability on the Prairie." Economic Council of Canada. Discussion paper No 273. December, 1984.

Martin, Larry J. and Goddard, Ellen W.. :The Economics of Canadian Hog Stabilization Programs and U.S. Countervailing Imports duties". Department of Agricultural Economics and Business, Ontario Agricultural College, University of Guelph, 1987.

Meilke, Karl, D. and Weersink, Alfons. " An Analysis of the Effects of Government Payments to Grain and Oilseeds Producers on Cropping Decisions". Agriculture Canada, Policy Branch, 1991.

Kay, Ronald, D. "Farm Management: Planning, Control, and Implementation". McGraw-Hill Book Company. Second Edition, 1986.

King, Joseph and Narayanan, Shankar. "Gross Revenue Insurance Plan/Net income Stabilization Account vs. Western Grain Stabilization Program - An Ex-Post Economic Evaluation for a Representative Prairie Grain and Oilseed Farm (1987-1990)". Canadian Journal of Agricultural Economics. Volume 20, pp. 533-545, 1992.

Loyns, R.M.A., Boyd, M.S., and Carter, C.A.. "Hedging Canadian Grains and Oilseeds". Department of Agricultural Economics and Farm Management, University of Manitoba, June, 1992.

Manitoba Agriculture, "Manitoba Agriculture Yearbook". Economic Branch, Policy and Economics Division, Manitoba Agriculture, 1991 and 1992.

Manitoba Agriculture. "Manitoba Livestock Industry Profiles". Economics and Market Analysis, 1992.

Martin, Larry. "Economic Intervention in the Beef and Hog Sectors." Economic Council of Canada. Technical report No. E/11, 1981.

McGarry, Michael J., and Schmitz, Andrew. "The World Grain Trade: Grain Marketing, Institutions, and Policies". Westview Press Inc., 1992.

Meilke, K.D. and Terpstra, M. "Measuring the Transfer Efficiency of Canadian Hog Stabilization Programs". Department of Agricultural Economics and Business, University of Guelph, February, 1993.

Moschini, Giancarlo, and Meilke, Karl D. "Production Subsidy and Countervailing Duties in Vertically Related Markets: The Hog-Pork Case Between Canada and the United States". American Journal of Agricultural Economics, Volume 74, No 4, November, 1992.

Perkins, P., Sniekers, P. and J. Geldard, "Commercial Link Between Australian and U.S. Wheat Prices". Quarterly Review of Rural Economy 6(4), November, pp. 321-329, 1984.

Short Cameron. "Dairy Policy Simulation and Evolution". Agricultural Canada, working paper 3/86, 1986.

Snedecor, George W., and Cochran, William G. "Statistical Methods". The Iowa State University Press, 1967.

Statistics Canada. "Family Expenditure in Canada". Statistics Canada, 1978.

Turvey, G. Calum. "An Economic Analysis of Alternative Farm Revenue Insurance Policies". Canadian Journal of Agricultural Economics. Volume 40, Pp 403-426, 1992.

Van Kooten,G.C., Spriggs, John and Schmitz, Andrew. "The Impact of Canadian Commodity Stabilization Programs on Risk Reduction and the Supply of Agricultural Commodities". Agriculture Canada, Working paper 2/89, 1989.

Webber, C. A., Graham, J. D. and MacGregor, R.J.. "A Regional Analysis of Direct Government Assistance Programs in Canada and Their Impact on Beef and Hog Sectors". Agricultural Canada, working paper 6/88, 1988.

Yap, M.T. "Seasonal Price and Marketing Variations in the Livestock Industry.". Agriculture Canada, Working paper 17/86, 1986.

APPENDIX A

ESTIMATION OF THE EFFECT OF CVD ON MANITOBA HOG PRICES

Hogs produced in Manitoba are sold domestically to meat packers, or exported to United States and other provinces. The average price received by producers is a function of the distribution of hog sales among these markets. As indicated in equation A.1, the share of each market determines the average price received by farmers.

$$\bar{P} = P^{d} * S_{m} + P^{e} * S_{us} + P^{d} * S_{c} \qquad \textbf{A.1}$$

Where:
S_m = Share of hog production sold in Manitoba
S_{us} = Share of hog production sold in United States
S_c = Share of hog production sold in other provinces
P^d = Domestic price of hogs to Canadian packing plants (\$/ckg)
P^e = U.S. price of hogs (export price)
$\bar{P}$ = average pooled price (\$/ckg)

Prices of hogs sold outside the province are reduced by transportation costs and the countervailing duty (CVD) when exported to the United States. Equation A.2 implements transportation cost and CVD in the determination of hog prices.

$$\bar{P} = P^{d} * (1 - S_{us} - S_{c}) + (P^{e} - t_{us} - cvd) * S_{us} + (P^{d} - t_{c}) * S_{c} \qquad \textbf{A.2}$$

Where:
cvd = countervailing duty (\$/ckg)
t_{us} = Transport cost to United States (\$/ckg)
t_c = Transport cost to other provinces (\$/ckg)

The transport cost represents the average price paid by the provincial marketing board for shipping hogs from Manitoba to Sioux City, Iowa. Equation A.3 is obtained after mathematical manipulation of equation A.2.

$$\bar{P} = P^{d} * (1 - S_{us}) + (P^{e} - t_{us} - cvd) * S_{us} + t_{c} * S_{c} \qquad \textbf{A.3}$$

Average price for domestic hog (P^{d}) can be determined from equation A.3. This relationship is expressed in equation A.4.

$$P^{d} = \frac{\bar{P} - (P^{e} - t_{us} - cvd) * S_{us} + t_{c} * S_{c}}{(1 - S_{us})} \qquad \textbf{A.4}$$

The relationship of prices paid by domestic packing plants is hypothesized in equation A.5. The functional form (equation A.5) is estimated using ordinary least squares (OLS). Autocorrelation is corrected and no serious multicollinearity is observed.

$$P^{d} = f(P^{e}, cvd, S_{d+c}) \qquad \textbf{A.5}$$

Econometric results indicate that only US hog prices and the share of domestic sales of hogs are statistically significant in determining hog prices received by Manitoba producers for sales to local packing plants. Countervailing duty is not statistically significant in explaining the price paid by local packing plants and, therefore, was dropped from the equation. This does not implies that Manitoba hog producers did not receive a lower pooled price because of countervail, as the pooled price would decline according to the number of hogs exported to the United States.

Prices paid by local packers for hogs sold in Alberta and Saskatchewan also were tied closely to the U.S. price. In turn, the countervailing duty reduced the prices paid by local buyers between $0.32 ckg and $0.39 ckg for every dollar of duty collected at the U.S. border. As in the case of the Manitoba estimators, the local packers in Alberta and Saskatchewan paid a premium relative to the U.S. market when they required more than 96.7 percent and 96.1 percent of the total supply of hogs. In Manitoba, a premium relative to the United States alternative existed whenever the local packers bought more than 97.7 percent of the hogs sold.

The question raised by the statistical analysis of the prices paid by local meat packers is why were prices paid by Manitoba processors not reduced by the countervail when Saskatchewan and Alberta prices dropped. Concurrent to the countervailing duty, the Manitoba pork industry added another packing plant but the effect of this development should be reflected in the variable representing the share of hog sales to the domestic users. Economic theory imply and studies by Mielke (1993) that the prices received by Canadian hog producers dropped when the countervailing duty occurred. The Mielke analysis was undertaken on quarterly data for Eastern and Western Canada by defining price to be the average pooled prices paid to hog producers; the price variable included a reduction in revenues because of the countervailing duties paid on exported hogs. Estimates of the countervail price effects for hogs purchased by domestic buyers are much lower in the provincial model (Tables A.1 to A.3) than the Meilke study. This could be expected because the provincial dependent price variables only reflects domestic hog sales. However, since the post countervailing exports dropped substantially, the inclusion of the duty payments in the pooled average price in the Meilke analysis would only account for part of the differential countervail effect. The upshot of the differential countervail effect suggests hog producers in the Prairie provinces were able to realize a larger share of the NTSP subsidy. The NTSP subsidy is primarily responsible for the size of the countervail duty. To the extent that average hog prices from sales of both domestic and export markets decline by less than the countervail, then total receipts from hog sales and subsidies are higher with the NTSP stabilization program.

Table A.1 Econometric results for Manitoba (1977 to 1992)

	US price ($/ckg)	CVD ($/ckg)	Man. share (%)	constant ($/ckg)
coefficient	0.9983	-0.1876	59.478	-58.095
std. error	0.0133	0.1181	12.58	12.58
t-ratio	74.87	-1.588	4.727	-4.618

$R^2 = 0.9939$ $\bar{R}^2 = 0.9938$

Sum of squared errors = 6701.6 192 observations

Mean dependent variable = 73.73 ($/ckg)

Durbin-Watson = 2.0699

The estimators imply the prices paid by local processors for Manitoba hogs moved dollar for dollar with the U.S. price but the premium or discount depended upon the available supply. For example, if a shortage of live hogs resulted in local packers purchasing all the available supply, a premium of $1.38/ckg was paid over the U.S. price. On the other hand, if only 90 percent of the supply could be used by local packers then the price paid was a $4.56/ckg below the equivalent U.S. price. The model estimates suggest that when 2.3 percent of Manitoba hogs were shipped to the United States, neither a premium nor a discount was paid by local packers. Between 1897 and 1992 monthly exports ranged from 3 percent to over 25 percent of all sales. For the period, 89 percent of all Manitoba sales were to local packers and the estimates imply that, on average, the prices paid were below the United States equivalent.

Table A.2Econometric results for Saskatchewan (1977 to 1992)

	US price ($/ckg)	CVD ($/ckg)	Sask. share (%)	constant ($/ckg)
coefficient	0.9561	-0.3220	67.559	-64.939
std. error	0.0135	0.1308	25.31	25.00
t-ratio	70.68	-2.461	2.670	-2.598

R^2 = 0.9952 $\bar{R}^2$ = 0.9951

Sum of squared errors = 5158.9 192 observations

Mean dependent variable = 73.87 ($/ckg)

Durbin-Watson = 2.3080

Table A.3 Econometric results for Alberta (1977 to 1992)

	US price ($/ckg)	CVD ($/ckg)	Alt. share (%)	constant ($/ckg)
coefficient	0.9720	-0.3919	60.047	-58.149
std. error	0.0133	0.1389	15.13	15.09
t-ratio	72.94	-2.822	3.970	-3.854

R^2 = 0.9930 $\bar{R}^2$ = 0.9929

Sum of squared errors = 7618.8 192 observations

Mean dependent variable = 73.228 ($/ckg)

Durbin-Watson = 2.0747