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AGRICULTURAL DUALISM AND BRAZILIAN DEVELOPMENT

This research clearly demonstrated the disparities in agricultural growth between groups of farmers in Brazil, especially in the wheat region, and noted the broader interregional disparities which historically existed and appear to be even more accentuated in recent years. This process of growth has contributed to increased dualism in Brazilian agriculture: highly capitalized mechanized farms with low labor/land ratios, and under capitalized traditional small farms using large amounts of labor and little new technology. The dilemma appears to be the classic one of growth versus distributive equity, a theme of increasing importance in developing countries. As noted above, the policies affecting Brazilian agriculture to the greatest extent in the post World War II period are associated into two major sub-periods of development strategies in the country: the first characterized by general neglect and occasional discrimination against agriculture, especially in the 1947-61 period of intense import substitution industrialization, resulted in agricultural growth largely along the extensive margin; the second, beginning in the mid-1960's and continuing to the present, represents a period in which policies have been aimed at agricultural modernization and expanded traditional and nontraditional exports. In the first period, the objectives for agriculture were limited primarily to producing an adeuqate supply of reasonably priced food for urban wage earners and secondarily, generate foreign exchange to finance the importation of the industrial raw materials and capital goods. The assistance granted to agriculture consisted largely of improving extension and marketing services. Since the mid-1960's much greater emphasis has been given to modernization, and accelerating the growth of output and exportation. Emphasis on research increased in the early 1970's. Generally Brazil has been quite successful in meeting its economic objectives. In fact, the high growth rates since 1968 have caused people to speak of the "economic miracle" and make comparisons with countries like Japan. This euphoria may be a bit premature, particularly in view of current energy problems, but clearly the performance has been exceptional in the past few years, in large part due to expert decision making. The emphasis, at least in agriculture, however, has been largely on growth rather than growth with equity. Given the state of the economy when the military took power in 1964, it is easy to understand this orientation. But it is also necessary to call attention to the potential structural problems arising from this approach which may hamper future economic growth and development. The experience of other countries has demonstrated the difficulty in achieving equity, in spite of good intentions, once great inequities have arisen. Perhaps some loss in growth rate occurs when increased equity is pursued, but the results of this and other research, which suggest relatively constant returns to scale in agriculture over a wide range of output levels, imply that the losses might not be that great. If more broadly based growth is desired, the challenge to policy makers is clear and complex. It requires a fundamental rethinking of how millions of Brazilian farmers respond to policies. The tendency has been to view policy making as essentially a "top-down" activity with relatively little feedback about the dynamics of policy impacts. The observed inequalities in resource use, income and growth logically result. A growth-with-equity strategy would have to take into account the heterogeneity of farms and farmer response. Policy making would then involve identifying groups of farmers that are relatively more homogeneous and developing a specific set of policy incentives for each group. The recent efforts of the quasi-public national agricultural research institute (EMBRAPA) to develop region and crop specific technological packages is a promising attempt clearly in the right direction. The scientists and technicians of this institution are to be commended for this

initiative and their appreciation of the complexities of the agricultural development process. Another clear implication of this research is the crucial role which product and factor pricing has on the pattern of farm growth. Brazilian policy makers have consistently espoused the role of the market in allocating resources, yet continuously intervene in the market process in order to influence prices for some specific objective. Generally such intervention has been directed towards increasing the use of certain inputs, expanding output of selected products, or reducing consumer prices. The resulting distortions have helped meet the objectives, at least in the short-run, but have also contributed to resource misallocation and an unequal pattern of participation in the growth process by various groups of farmers. These inefficiencies and inequities could well frustrate future broad based rapid growth. Furthermore, the slow growth in effective demand of the marginalized segment of the rural population may frustrate the continued growth of the industrial sector. Solely removing pricing distortions, as important as that may be, may not constitute, however, the necessary and sufficient conditions for broader based agricultural development. Structural change needs to be attacked simultaneously. This research has shown how differential resource endowments and access to resources and policy incentives contributes to uneven farm growth. Land reform, credit for land purchases, effective land taxation, and improvements in the land market may be necessary to form the basis for more equitable growth where agricultural production is still largely a function of combining land with labor. More yield increasing technologies are also required so that increases in income are not restricted just to enterprise changes or mechanization. Rural education, now lamentably inadequate, must be improved and universalized so that farmers are better prepared to seek out and understand new information as well as provide a more productive source of labor when they choose urban employment. Extension workers must be provided with a larger stock of technological alternatives and must be freed of a myraid of administrative functions and a bias to concentrate their efforts on large farms. Lastly, signs are beginning to appear in Brazil that the past emphasis on the macro approach to the study of agricultural problems is waning and a new interest is emerging in the study of the microeconomics of the agricultural sector. The research reported in this volume has made a small dent in this vast uncharted field. Hopefully it will encourage some of the extremely talented young Brazilian men and women now studying at home and abroad to delve into the problems faced by farms and rural markets which have only been touched upon here. Studies related to such problems as the determinants of consumption and savings, creation of employment, returns from new technology, bottlenecks in input and product markets, impact of inflation and income distribution, exchange rate and other trade policy influences on agricultural trade, and financial market contributions to capital allocation and savings accumulation represent a few of the most crucial items in a long list of research priorities. Of immediate importance is the initiation of a nationwide system for the collection of farm level time series data absolutely essential to effective economic research. This research and the rapidly growing literature on economic and agricultural growth and development in Brazil show that the sleeping giant of the southern hemisphere awoke with a start in the latter half of the twentieth century and shows great potential for becoming a commanding influence in the economy and politics of Latin America. It holds untapped and underutilized agricultural resources that could become one of the important breadbaskets to help feed the hungry world. By achieving high growth rates for several years, it has demonstrated a capability to effectively draw some of these resources into production. But if it is to

realize its true economic potential and maintain long term high growth rates, it must begin to more effectively harness its most valuable resource, a resource largely overlooked in recent years - the growing quantity and quality of its peoples. When that occurs, we can justifiably refer to the "Brazilian Economic Miracle."

FINAL REPORT

June, 1975

FARM GROWTH IN BRAZIL

CHAPTER FIVE

The Ohio State University Research Team

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PREFACE

In 1969 the U.S. Agency for International Development through its Technical Assistance Bureau contracted with the Research Foundation of The Ohio State University to conduct an "Analysis of Capital Formation and Technological Innovation at the Farm Level in LDC's," (hereafter referred to as the Capital Formation Project). USAID financial support covered the period July 1, 1969 through October 31, 1974.

Responsibility for the Capital Formation Project rested with the faculty of the Department of Agricultural Economics and Rural Sociology. Norman Rask was the research team leader throughout the life of the project. Richard Meyer served in Brazil as Project Chief of Party coordinating the extensive primary data collection and preliminary analysis efforts. Upon return to Columbus, he served as a member of the research team and with Norman Rask coordinated the writing of this monograph which constitutes the final report of the project. Members of the research team, responsible for specific areas of project research included Dale Adams, David Francis, Terry Glover, Donald Larson and Inderjit Singh.

The principal project objectives were: (1) To investigate and describe capital formation and utilization at the farm level, including the impact of technological change on the need for capital and on the capital formation process, and (2) To evaluate the implications and impact of selected policies designed to stimulate capital formation. Research was initiated in Brazil and was limited to that country when conditions prevented expanding the research to India as originally planned.

The farm firm was the principal unit of analysis for the investigation and was viewed as the primary building block in the chain of production and marketing firms involved in development of the agricultural sector. The research procedure was to discover, measure and better understand the impact on farm firm decisions of major changes in government programs, world market conditions, and new technology. Such analysis required extensive farm level data and little existed in Brazil. As a result, collaborative research arrangements were established with several Brazilian institutions. The institutions were selected because of their knowledge of particular agricultural regions and expertise to assist in designing survey instruments and in collecting the data through personal interviews with farmers.

Utilization of the research results and improvement of local research capabilities were also important considerations. Thus during the course of the research, several efforts were made to communicate and interpret preliminary results for several Brazilian agencies and professionals and the local USAID Mission through seminars, meetings, and informal contacts. Furthermore, students and faculty at each of the collaborating institutions were involved in questionnaire design, sampling, interviewing, data manipulation and analysis, and in all cases a set of data was retained by the local institution as part of data banks that were being developed.

In any project of this scope many individuals play key roles and many institutions make significant contributions. We would like to mention some of those without whom the research could not have been initiated or conducted. In USAID/Washington Dr. Erven Long was an

instrumental force in the project's inception and provided counsel throughout its duration. Members of the USAID/Washington Technical Assistance Bureau who assisted were: Dr. Douglas Caton, Dr. Larry Witt, Dr. Arthur Coutu, Dr. Harold Jensen and Dr. Lehman Fletcher. In the USAID Mission to Brazil, William Ellis, Mission Director; Michael N. Galli, Deputy Chief of ARDO; William Rodgers, Chief of ARDO; Dr. Harlan Davis, Agricultural Economist; Ralph Miller, Deputy Chief USAID/PASA; Dr. Stanley Krause, Agricultural Economist; and David Cohen, Program Office; as well as several other members of ARDO and the USAID staff provided much appreciated in-country support and administrative backstopping.

The Central Bank and the Ministry of Agriculture served as official contact with the Brazilian government and provided encouragement for the initial studies. In particular Ary Burger, Director of the Central Bank provided valuable assistance. The Instituto de Estudos e Pesquisas Economicas da Universidade Federal do Rio Grande do Sul was the first institution to conduct a survey under the Project. We owe a great deal to the foresight and effort of Mauricio Filchtiner, Director and Eli de Moraes Souza, Chief of the Agricultural Economics and Rural Sociology Section, in getting that survey underway and to several other staff and students that so successfully completed subsequent surveys and analysis on the data collected in that state. Closely related to this first effort, a survey was conducted in the state of Santa Catarina in conjunction with the Instituto de Pesquisas e Estudos Economicos da Universidade Federal de Santa Catarina with Carlos Jose Gevaerd playing an important role in that work. An old friend and distinguished col-

league, Paulo F. Cidade de Araujo, was instrumental in assisting with the research that was conducted in Ribeirao Preto in the state of Sao Paulo in 1970. Several other staff members and students in the Departamento de Ciencias Sociais Aplicadas of the Escola Superior de Agricultura "Luiz de Queiroz," including Joaquim J. de Camargo Engler who later became head of the department, were very supportive of the several economic and sociological studies conducted in Sao Paulo, and were patient and much appreciated counselors and hosts to the several OSU staff that resided in and passed through Piracicaba. The research conducted in the state of Minas Gerais owed much to Helio Tollini, then Director of the Instituto de Economia Rural, Universidade de Minas Gerais in Vicosa; H. Evan Drummond, Ph.D. student at Purdue University; and Julian H. Atkinson, Chief of Party of the Purdue-Vicosa Institution Building Project.

While analysis of the data collected in these four states moved forward, the USAID Mission contracted with Ohio State University to provide support to the newly created Escritorio de Analise Economica e Politica Agricola of the Ministry of Agriculture. The first director of that office, Francisco Vera Filho, and his successor, Alberto Veiga, along with Iby Pedroso organized a survey in the state of Ceara which collected data similar to the type collected in the four other states and made it available to the Project. Faustino de Albuquerque Sobrinho of the Universidade Federal do Ceara and Roger Fox of the University of Arizona - Ceara Institution Building Contract were instrumental in making local arrangements. The Banco do Nordeste contributed resources and staff to that survey as well.

Special appreciation is also extended to the many interviewers and drivers in each survey region that spent long, hot, dusty hours locating and interviewing farmers. The Brazilian farmers we interviewed displayed great patience and excellent cooperation by completing long interviews as accurately and thoroughly as possible. To them we extend special thanks.

The research that went into this report involved many staff and students at both OSU and several of the institutions just mentioned. The training of graduate students was an integral aspect of the Project, both in the U.S. and Brazilian Universities and will no doubt remain one of its chief benefits long after the findings of this research become outdated.

Clearly, the research findings summarized in this report emanate from a successful team effort. However, it is appropriate to recognize explicitly those individuals most directly responsible for major parts of the report.

Chapter 2	Douglas Graham
Chapter 3	Richard Meyer
Chapter 4	Norman Rask and Richard Meyer
Chapter 5	Norman Rask
Chapter 6	Terry Glover
Chapter 7	Donald Larson and Richard Meyer
Chapter 8	David Francis
Chapter 9	Donald Larson
Chapter 10	Dale Adams
Chapter 11	Inderjit Singh and Choong Yong Ahn

Chapters 1 & 12 Group Effort

In addition, significant contributions to the Project were made by several other OSU faculty members, in particular Bernard Erven, John Sitterley, Francis Walker and Kelso Wessel. Kelso Wessel was a member of the OSU Institution Building Project at ESALQ, Piracicaba, during the initial phase of data collection in the state of São Paulo. He worked with Brazilian faculty and graduate students on questionnaire construction, survey design, and supervision of some of the interviewing.

Mrs. June Blind and Ms. Malinda Brenner shared most of the typing of the final version and were ably assisted by several other secretaries in the department on earlier drafts. Ms. Barbara Durman, and Mrs. Margie Butz were responsible for data organization and storage. Mark Hinnebusch did much of the computer programming during the latter part of the Project. The Statistics Laboratory helped with figures, tables and overload typing, while Ms. Marilyn Chute served as a most capable administrative assistant throughout the life of the Project.

While more than forty graduate students have assisted with the processing and analysis of data and many have used portions of the data for their own M.S. theses and Ph.D. dissertations, 9 individuals who were then Ph.D. candidates, deserve special recognition for contributions to the overall Project: John Stitzlein, William Nelson, Gerald Nehman, Hagop Kayayan and Solon Guerrero each spent a year or more in Brazil assisting with data collection and processing; Roger Baur and Choong Yong Ahn assisted with data processing and analysis in Columbus. Joaquim J. de Camargo Engler and Iby Pedroso worked with their respective institutions in data collection and used part of the data for their dissertations.

We would also like to express appreciation to G. Edward Schuh and Pan A. Yotopoulos for highly useful detailed comments each made on an earlier draft of this report. J. K. McDermott also contributed a helpful reaction as did several people in Brazil during a round of seminars conducted in October, 1974. Of course, the authors assume sole responsibility for the contents. The views and opinions expressed do not necessarily represent the views of any persons or institutions in Brazil or the U.S. that collaborated with the Project.

David Boyne
Project Supervisor

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CHAPTER 5

FARM LEVEL CAPITAL INVESTMENT PATTERNS SOUTHERN BRAZIL 1960-1969

INTRODUCTION

The focus of this chapter is on the process of farm level capital investments made on farms in Southern Brazil during the decade of the 1960's. The wheat region as defined in Chapter 4 serves as the data source.[1/] Over 800 farmers were interviewed in 1970 and the basic information on prior capital investments was collected on a recall basis at that time. A detailed current (1970) resource inventory and annual cash flow statement was also obtained. These three general forms of capital use data appear in the following analysis.

The general model of farm level growth presented in Chapter I provides the framework for investigating the process of capital investment on these farms. Basically, this model considers farm level capital investment decisions as conditioned by many factors both internal and external to the farm firm. These factors may exert either a positive or negative influence on the decision to invest in farm level productive capital.

1/ The wheat region serves especially well for this analysis since dynamic policy induced changes in capital investment and technological change coincided with the 1960-1969 study period. A similar study was conducted with data from the Ribeirao Preto region of Sao Paulo (data set VI). The same dynamic processes noted in the wheat region were also observed in the Sao Paulo region, but at an earlier date, [see 2, 5].

Three broad categories have been identified: 1) the basic investment climate of the farm firm as constrained by its particular resource endowment, production possibilities,[2/] consumption needs and financial resources, 2) the influence of markets outside the farm firm that determine input and output prices, and 3) policies, such as price supports, acting through the market or policies such as credit which directly influence investment behavior by enhancing or retracting investment opportunities. Ultimately each of these factors is expressed at the farm firm decision level in terms of profitability of investment alternatives and availability of financial resources to undertake the investment.

Each of the above factors was important in determining the type and process of farm level capital investments in Southern Brazil during the decade of the 60's. Public policy, operating largely through the marketing system and affecting a broad range of farm resource situations was particularly instrumental in directing this process.

The policy centered around a high support wheat price and was re-enforced by special wheat production credit and mechanization investment credit, both at low real interest rates.[3/] Wheat is produced primarily in the southern three states of Brazil, with the major production occurring on the plateau in the state of Rio Grande do Sul. Three basic farm enterprise and resource situations are encountered in the wheat producing

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2/ See Chapter 6 for an analysis of the farm production processes.

3/ The wheat support price was high relative to other competing enterprises, notably beef, however, as Schuh has correctly pointed out, this high domestic price was partially mitigated by an overvalued exchange rate especially in the early 1960's.

region and are represented by project data dets I, II, and III.[4/] The first, the Eastern Escarpment subregion is a diversified small farm agriculture in the mountainous areas of the region. In these areas wheat is produced as a secondary cash crop with primary emphasis on corn and hogs; small, hilly farms with large family labor supplies traditionally have found a more optimum resource use in the crop-livestock combination than in a cash crop such as wheat. The second major area, the Central Plateau subregion is characterized by a broad spectrum of farm sizes and types with a significant change to larger mechanized wheat and soybean farms. The third area, the Western Rangeland subregion, is characteristic of the change from extensive range land cattle production to mechanized wheat production.

The general purpose of this chapter is to evaluate the capital investment patterns on farms in these three subregions during this period of six to eight years of very favorable government-policies toward farm level capital investment. First, the current (1969) farm capital structure for each subregion is presented. Secondly, the process of capital investment over the 1960-1969 time period is evaluated. This includes the nature, timing, sequence and source of capital investments made. Finally, the income flow and resource transfers for the 1969 production year are documented.

4/ For a more detailed description of each subregion see Chapter 4.

FARM CAPITAL STRUCTURE - 1969

The current capital structure on farms in the subregions studied represent the cumulative result of annual investment decisions over a period of time, in this case, an investment climate influenced strongly by public policy. Subsequent sections of this chapter will investigate the dynamics of this process.

Farms are grouped by subregion, farm size and farm type. The components of capital measured are: 1) fixed capital including land, buildings, machinery, and livestock, and 2) operating capital including crop, livestock, machinery, labor and other operating expenses.

Schuh [7, p. 162], in reporting on the structure of farm capital in Brazil, noted that in Southern Brazil as a region three-fourths of the fixed capital was in the form of land and buildings in 1940. However, by 1965 this percentage was reduced to 63. Over this time period, machinery had increased from 5 to 16 percent of the total capital and livestock had decreased slightly from 20 to 14 percent. These trends have continued. In 1970, similar general relationships are apparent in the study area.[5/] First, land and buildings are the most important part of the resource base on most farms, ranging from about 80 percent for the livestock farms in the Central Plateau to less than 20 percent on large crop farms in the Western Rangeland (Table 5-1). Buildings are a declining portion of this amount as farm size increases. For the small farms in most situations, approximately equal values are

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5/ The present study includes operating expenses as part of the capital structure. This item would have to be excluded to make direct percentages comparison with the Schuh study.

TABLE 5-1
Percentage Distribution of Farm Capital by Form of Capital, Subregion, Farm Type, and Farm Size - 1969

Subregion Farm Size and Type	No. of Observations	Form of Capital: Operating Costs	Livestock	Machinery	Buildings	Land
		(Percent of total capital)				
Eastern Escarpment						
Small crop farms	109	5	13	10	36	36
Medium crop farms	17	4	11	11	36	38
Small mixed farms	217	6	17	10	34	33
Medium mixed farms	35	4	17	7	25	47
Central Plateau						
Small crop farms	36	7	8	20	18	47
Medium crop farms	64	14	7	18	19	42
Large crop farms	77	27	2	39	12	26
Very large crop farms	34	19	4	27	9	41
Small mixed farms	10	4	9	5	33	49
Medium mixed farms	20	6	13	10	24	47
Livestock farms	13	1	9	7	10	73
Western Rangeland						
Large crop farms	21	28	4	49	6	13
Very large crop farms	52	20	11	34	11	24
Large livestock farms	46	2	24	4	14	56
Very large livestock farms	50	4	32	7	10	47

Source: Appendix Table 5-1.

placed on land and buildings, while larger farms approach a ten to one land to building value ratio.

Machinery investment is closely related to farm size and type. On small and livestock farms it accounts generally for 10 percent or less of total investment. On large crop farms it may exceed 40 percent, while smaller and larger crop farms, for somewhat different reasons invest less heavily in machinery than do large crop farms. It is likely that small farms, because of abundant labor resources, and the larger farms, because of less intensive land use (higher percentage of pasture land), use machinery less intensively. Investment in operating capital follows closely the investment pattern for machinery.

Since major components of operating capital are associated with the adoption of chemical and bilogical technology (fertilizer, improved seed, etc.) and mechanical technology (fuel, repairs, etc.) it is expected that crop farms (when compared with livestock farms) would have a larger proportion of their total investment in operating capital. This is true except for the Eastern Escarpment subregion, where little mechanical technology is used on these small mountainous farms and land use patterns are similar among farm types. In the Central Plateau, the difference in use of operating capital between livestock and crop farms is about tenfold, while in the Western Rangeland the difference factor is about sevenfold. Most of the difference is attributed to the crop farms' use of larger quantities of fertilizer and greater

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5/ The present study includes operating expenses as part of the capital structure. This item would have to be excluded to make direct percentages comparison with the Schuh study.

machinery expenses associated with their larger machinery investment. Operating capital accounts for about five percent or less of invested capital in the Eastern Escarpment and on livestock farms generally. It increases to about 25 percent on large crop farms in the Western Rangeland.

Maximum intensification of nonreal estate capital investment has clearly been focused on crop farms, and again within farm sizes, on the large crop farms (Table 5-2). This raises an interesting question from a policy viewpoint. It would suggest that in areas of mechanized agriculture a greater intensification of agricultural production is possible where farm sizes are concentrated in the 50-200 hectare range, presumably a size where all production resources and management are more optimally related to each other for wheat production. Thus it may not be possible to stimulate capital intensification to a maximum degree where very large farms predominate. In this case many farms would continue to use some land resources extensively.

FARM LEVEL CAPITAL INVESTMENT AND ITS FINANCING - 1960-1969

The previous section described investment levels in various forms of farm capital as they existed in 1969. Capital composition at one point in time, however, does not accurately reflect the expenditures over time for a particular capital item, since some depreciate faster than others and thus are replaced at more frequent intervals.

This section focuses on the dynamics by which the fixed capital investments were attained. Absolute amounts of farm expenditures for land, land and building improvements and machinery over the previous

TABLE 5-2

Farm Capital Composition Per Hectare of Agricultural Land* by Subregion, Farm Size, and Farm Type, Southern Brazil - 1969

Region Farm Size and Type	No. of Obser-vations	Capital Composition			
		Buildings	Machinery	Livestock	Operating Capital
		(cruzeiros per hectare)			
Eastern Escarpment					
Small crop farms	109	670	187	233	95
Medium crop farms	17	484	144	146	53
Small mixed farms	217	647	177	324	121
Medium mixed farms	35	321	90	213	55
Central Plateau					
Small crop farms	36	452	493	204	178
Medium crop farms	64	236	219	94	176
Large crop farms	77	172	562	34	312
Very large crop farms	34	89	281	47	192
Small mixed farms	10	844	116	222	112
Medium mixed farms	20	338	132	183	84
Livestock farms	13	139	101	132	19
Western Rangeland					
Large crop farms	21	55	496	44	280
Very large crop farms	52	72	235	76	134
Large livestock farms	46	106	29	182	12
Very large livestock farms	50	50	34	162	22

Source: Appendix Table 5-1.

*Agriculture land equals cultivated and pasture land.

decade and the sources from which they were financed are examined. Data were not available on changes in operating capital; however those components of operating capital that represent technological change are examined in a subsequent section.

Several conceptual problems arise when the investment behavior of individual farmers is related to capital formation over time in the agricultural sector. Land investments are particularly important. From a policy perspective, we are usually looking at the farmer's allocation of investment funds to various forms of capital that will allow more intensive use of the existing land and labor resources. Changes in tenure (farm size and ownership) are generally not explicitly considered in policy unless serious resource imbalances are evident or incentives are impeded by existing tenure structures. However, the individual farmer in making investment decisions does consider a broad range of investment alternatives including additions to his land base.

Thus, while the nonland capital investments (net of depreciation) are generally considered as additions to the capital stock in the agricultural sector, land acquisitions (purchases and/or rentals) are considered transfers between individuals and do not represent increases in the aggregate capital stock. On the other hand, land acquisition represents a logical choice for individual farmers who are building up their productive capital base and is an alternative use of owned or rented capital funds. Land base expansion may or may not be accompanied by capital investments at the intensive margin. Where profitable alternatives have been exhausted at the intensive margin and non-farm investment possibilities do not exist, then land can become an outlet for excess funds. In this

case land prices would increase and much of the production surplus would accrue to land ownership.[6/]

Since we are concerned here with the impact of public policy on farm level allocation of resources, land transactions must be included as a form of investment representing the farmer's conscious choice over alternative nonland capital uses such as fertilizer, machinery, or improvements. Credit, savings, and unpaid labor investment represent the various means by which capital investments and land expenditures can be financed. The use of a particular credit source can be strongly influenced by public policy, especially credit which is often extended on special terms for certain capital inputs. Policies such as commodity support prices can also promote profitable situations for certain farm types both by increasing farm cash reserves and by providing an incentive to make investments from these cash reserves. Similarly, investments in research or the availability of new production technology could also promote profitable situations.

Accumulative capital expenditures for purchases and improvements during the past decade and their sources of financing as well as land renting are first analyzed by examining interregional differences, and then examining intraregional differences between farm sizes and types. To facilitate comparisons, group averages are presented on a per hectare basis. All values are expressed in 1969 cruzeiros per hectare of land operated.

6/ As will be shown subsequently, significant resource transfers have occurred between land owners and renters in this region.

Comparisons Between Subregions

Comparisons of investment expenditures in various forms of capital across agricultural subregions demonstrates several points. First, the highest level of on farm investment activity during the past decade has occurred where there are the largest number of crop farms, Central Plateau (Table 5-3). Investments in this subregion have been about twice as great as in the Eastern Escarpment and Western Rangeland, where a more mixed agriculture predominates.

Machinery purchases have been the single most important use for investment funds between 1960 and 1969. In the subregions where policy has induced heavy mechanization of crop farms (Central Plateau and Western Rangeland) one-half to two-thirds of the total investment outlays during this period have been for machinery. The exception is the Eastern Escarpment, where over one-half of the investment in the last ten years has been made in improvements. This is an area where topography limits mechanization and land consolidation, and thus efforts to increase production are largely limited to improvements in the existing resource base.

Land purchases have accounted for between one-fifth and one-fourth of the total capital investments in the three subregions. The Central Plateau, where mechanization has been accompanied by land consolidation, has experienced the greatest intensity of land purchases.

Savings have been the most important source of funds for investment, supplying between 50 and 70 percent of all funds. This is particularly true for land, which has been almost exclusively financed by savings. Between 30 and 50 percent of the funds for investments during the 1960's

TABLE 5-3

Accumulative Ten Year Capital Investment Outlays by Cruzeiros Per Average Hectare Operated* and Percent According to Source of Financing and Type of Capital in Each Agricultural Subregion, Southern Brazil, 1960-1969

Type of Investment and Source of Financing	Eastern Escarpment		Central Plateau		Western Rangeland	
	Cr$/Ha.	Percent	Cr$/Ha.	Percent	Cr$/Ha.	Percent
Land Purchases						
Unpaid Labor	—	—	—	—	—	—
Credit	16	4.7	14	2.3	4	1.9
Savings	55	16.0	109	18.4	50	23.4
Subtotal--Land	71	20.7	123	20.7	54	25.3
Machinery Purchases						
Unpaid Labor	—	—	—	—	—	—
Credit	32	9.3	253	42.7	73	34.1
Savings	53	15.5	141	23.8	27	12.6
Subtotal--Machinery	85	24.8	394	66.5	100	46.7
Land & Building Improvements						
Unpaid Labor	16	4.7	4	.7	—	—
Credit	56	16.3	13	2.2	12	5.6
Savings	115	33.5	59	9.9	48	22.4
Subtotals--Improvements	187	54.5	76	12.8	60	28.0
All Investments						
Unpaid Labor	16	4.7	4	.7	—	—
Credit	104	30.3	280	47.2	89	41.6
Savings	223	65.0	309	52.1	125	58.4
Total	343	100.0	593	100.0	214	100.0
Number of Farms	378		255		169	

* Values of all capital investment for the ten year period were adjusted to 1969 cruzeiro equivalents and summed. This sum was then divided by the annual average number of hectares operated (owned and rented) over the ten year period to give the accumulative capital investment per hectare.

has come from credit sources and in those regions where crop farms predominate over three quarters of the credit has been used to purchase machinery.

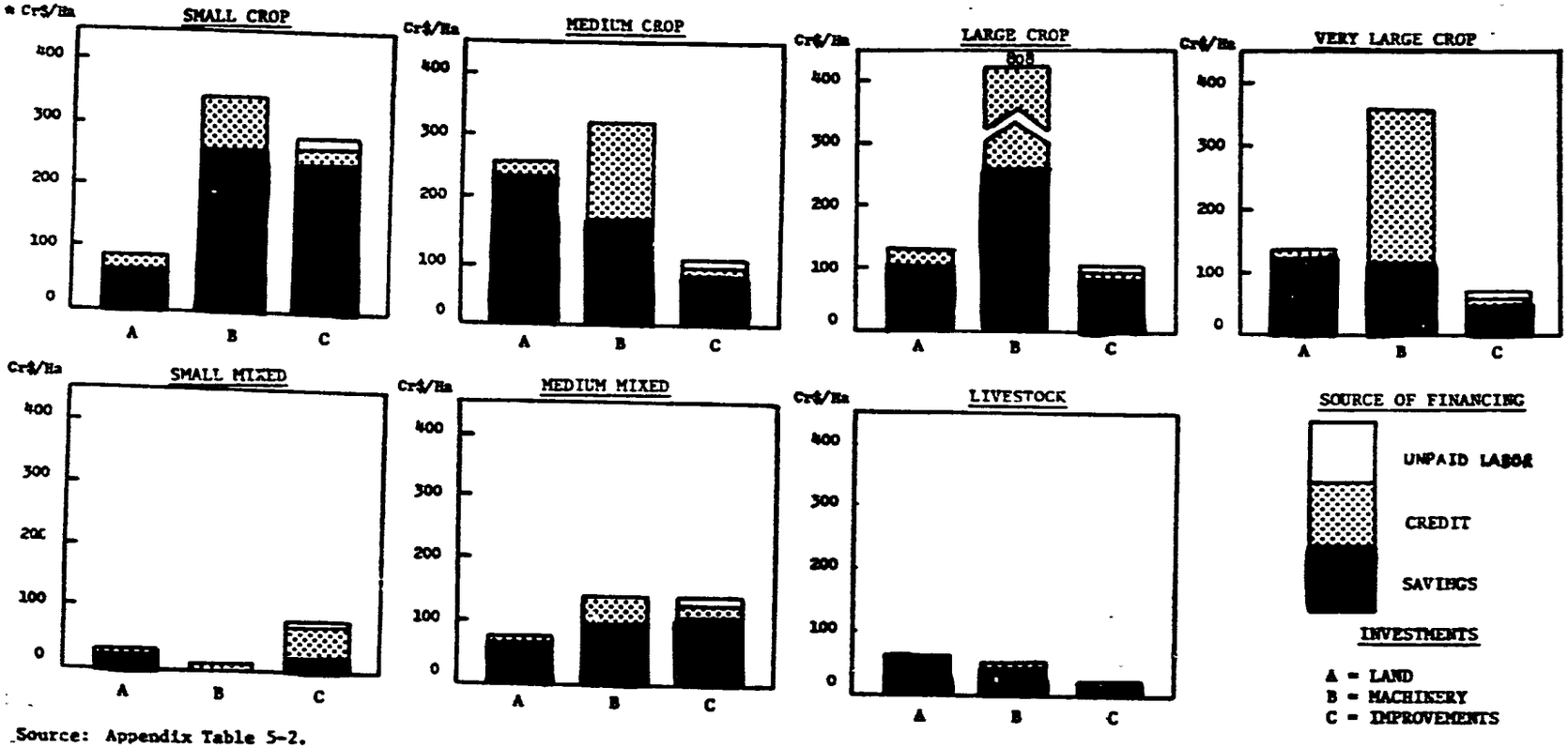
Unpaid labor investment accounts for only about five percent of the total financing, and although it is not very important in any of the regions, it is more important in the Eastern Escarpment where there are numerous small farms with abundant family labor.

Comparisons Within Subregions

Farms in the Eastern Escarpment subregions showed little farm size or type differences in their investment patterns during the past decade. In the Central Plateau there is a wide variety of farm types and sizes (Figure 5-1). Thus, in this region, a fairly comprehensive comparison is possible. In the Western Rangeland subregion, the focus is on farm type differences (Figure 5-2). This analysis , therefore, will focus on the Central Plateau, with the Western Rangeland serving to support and contrast with the results noted in the Central Plateau.

In the past ten years, dramatic changes have occurred in both subregions. Many of the cattle ranchers have either sold or rented their land to crop farmers who utilized government subsidized credit to purchase machinery and adopt new technology practices in order to produce wheat on a larger land base. Some cattle ranchers have moved directly into crop farming. In some instances small crop farms have been combined into larger units capable of supporting mechanization. The bulk of the credit has gone to medium, large, and very large crop farms which have used the credit mainly for the purchase of additional

FIGURE 5.1 — Accumulative Capital Investment Outlays Per Average Hectare Operated According to Type of Capital, Source of Financing, and Farm-Size-Type, Central Plateau Sub-region, Southern Brazil, 1960-1969

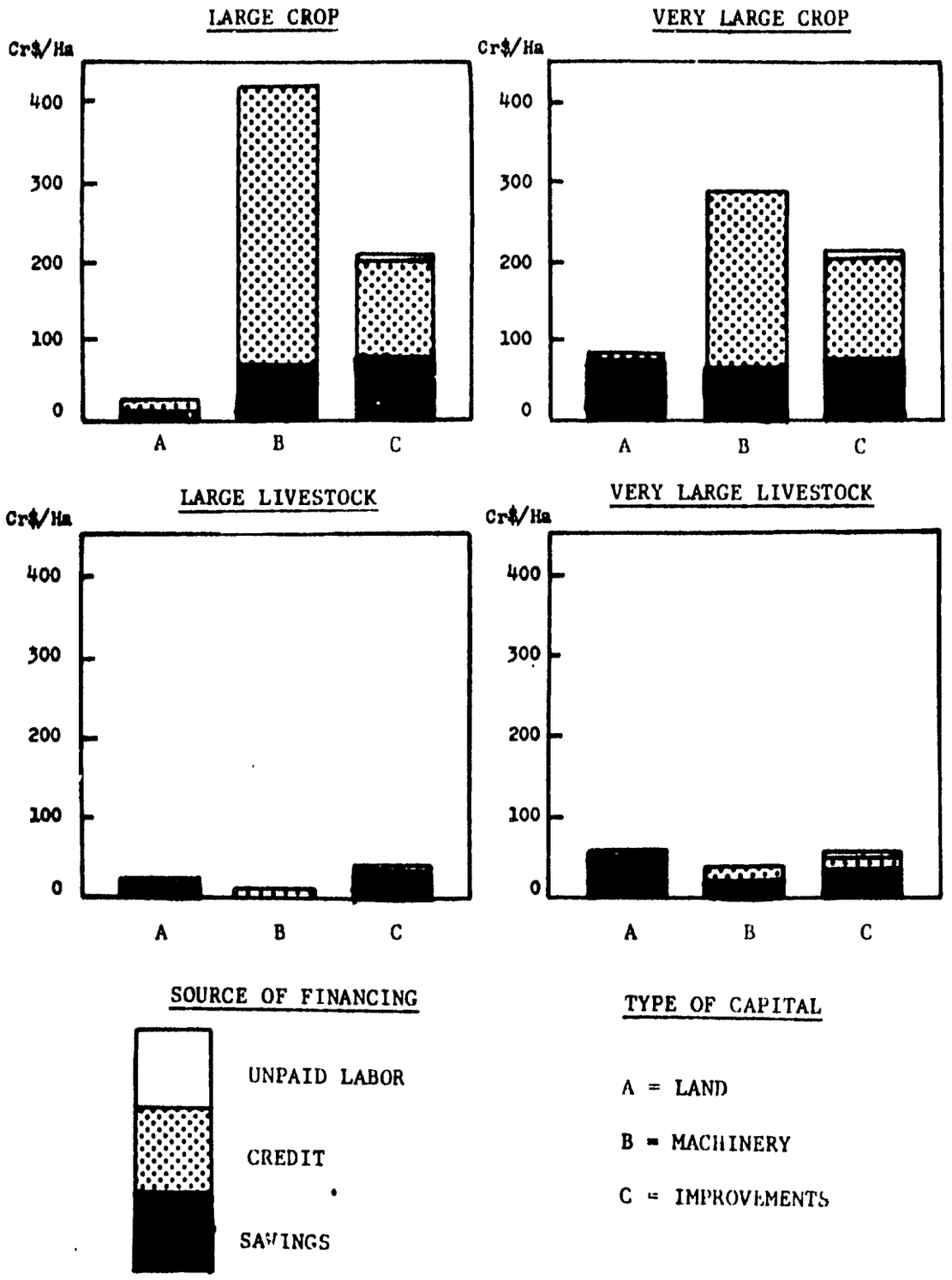


Source: Appendix Table 5-2.

* Values of all capital investment for the ten year period were adjusted to 1969 cruzeiro equivalents and summed. This sum was then divided by the annual average number of hectares operated over the ten year period to give the accumulative capital investment per hectare.

FIGURE 5-2

Accumulative Ten Year Capital Investment Outlays by Cruzeiros Per Average Hectare Operated and Percent According to Source of Financing, Type of Capital, and Farm Size-Type, Western Rangeland Subregion, Southern Brazil, 1969



Source: Appendix Table 5-3.

machinery. Over 75 percent of the total investment on large farms in the Central Plateau and almost two-thirds in the Western Rangeland in the past ten years has been in machinery (Appendix Tables 5-2 and 5-3). On the other hand, livestock, mixed, and small crop farms have invested less in machinery and have utilized fewer cruzeiros of credit than have the other farms in the same region.

Land purchases have been less important, ranging from 13 percent of total investments made on the small crop farms to 50 percent on the livestock farms in the Central Plateau. The land purchases have been financed almost exclusively by internal savings.

Improvements have been an important investment on the mixed farms and the small crop farms, particularly on the small mixed farms where 80 percent of their investment during the past ten years has gone into improvements in land and buildings. This would indicate that those farms that are not in a position to increase farm size through land consolidation or to extensively mechanize, have sought to remain competitive by improving their existing resource base. Also it indicates that even if largely excluded from the government incentive system, smaller farms have made capital investments from savings.

A plausible reason for a lower total investment per hectare on the very large crop farms in comparison to the large crop farms is that the very large crop farms are so large that the management constraint prevents all of the land from being farmed intensively, resulting in a

lower per hectare investment.[7/]

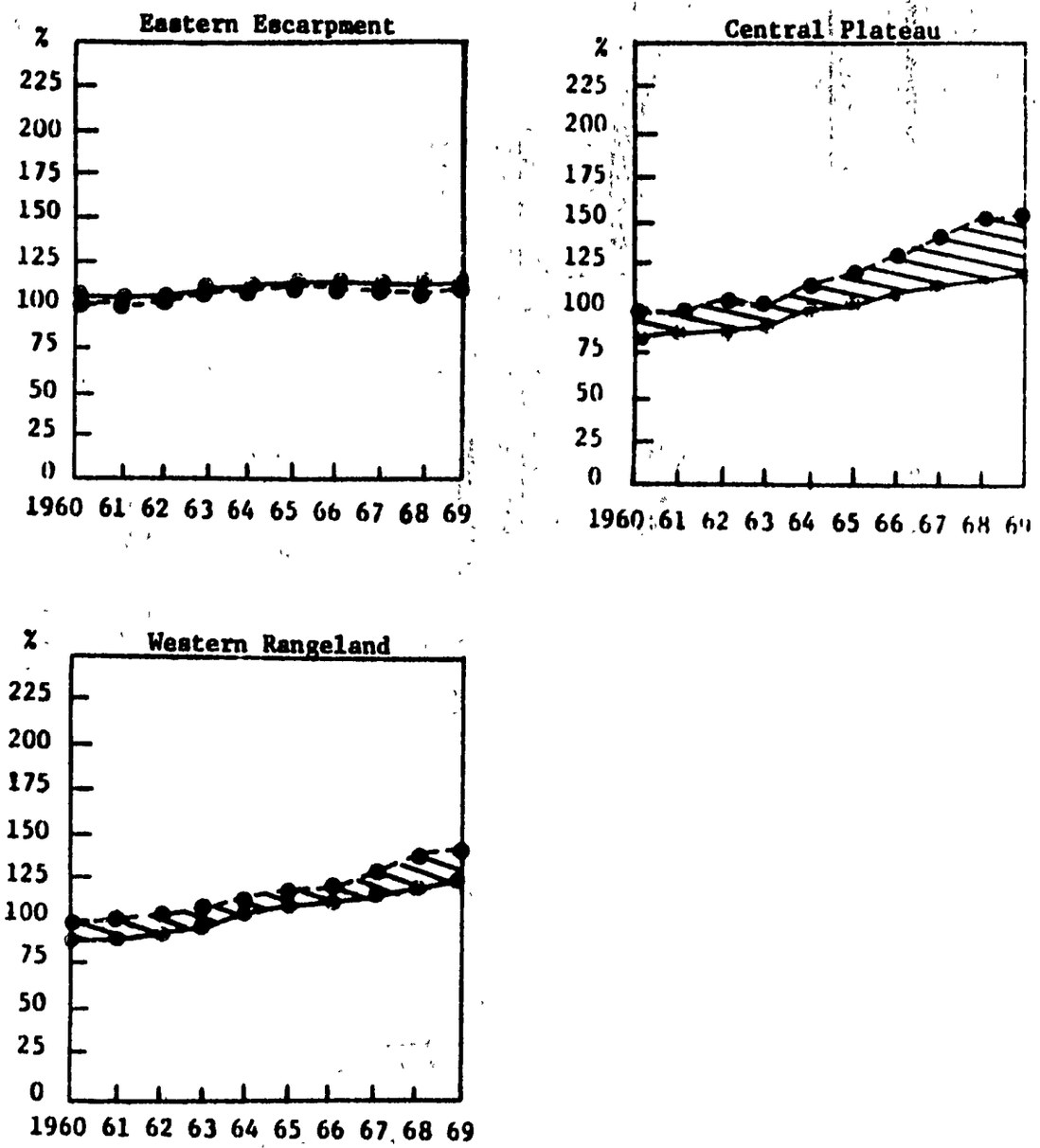
Land Renting

Just as the farmer can borrow the money to purchase machinery, or borrow the machinery through leases, the farmer can also borrow land by renting it and thus increase his land base. This alternative has been used quite extensively in Southern Brazil to gain operational control of a large land area. In this section, changes in the amount of land controlled (owned plus rented in minus rented out) over the ten-year period 1960-1969 are analyzed. There has been very little change in the quantity of land owned or rented during the past ten years on the surveyed farms in the Eastern Excarpment (Figure 5-3). In contrast, there have been substantial changes in land tenure on farms in the other two subregions. In addition to land purchases, some farmers have substantially increased their land resource by renting (Figures 5-4 and 5-5) and (Appendix Tables 5-4 and 5-5).

Farm type and size are important indicators of the direction of land control changes. For example, large and very large crop farms have gained control over a substantially larger land resource base through both land purchases and land rentals during the period of analysis. The large crop farms in both subregions (Central Plateau and Western Rangeland) for example, increased land controlled by over 80 percent during this period. Renting and land purchases contributed equally to this increase.

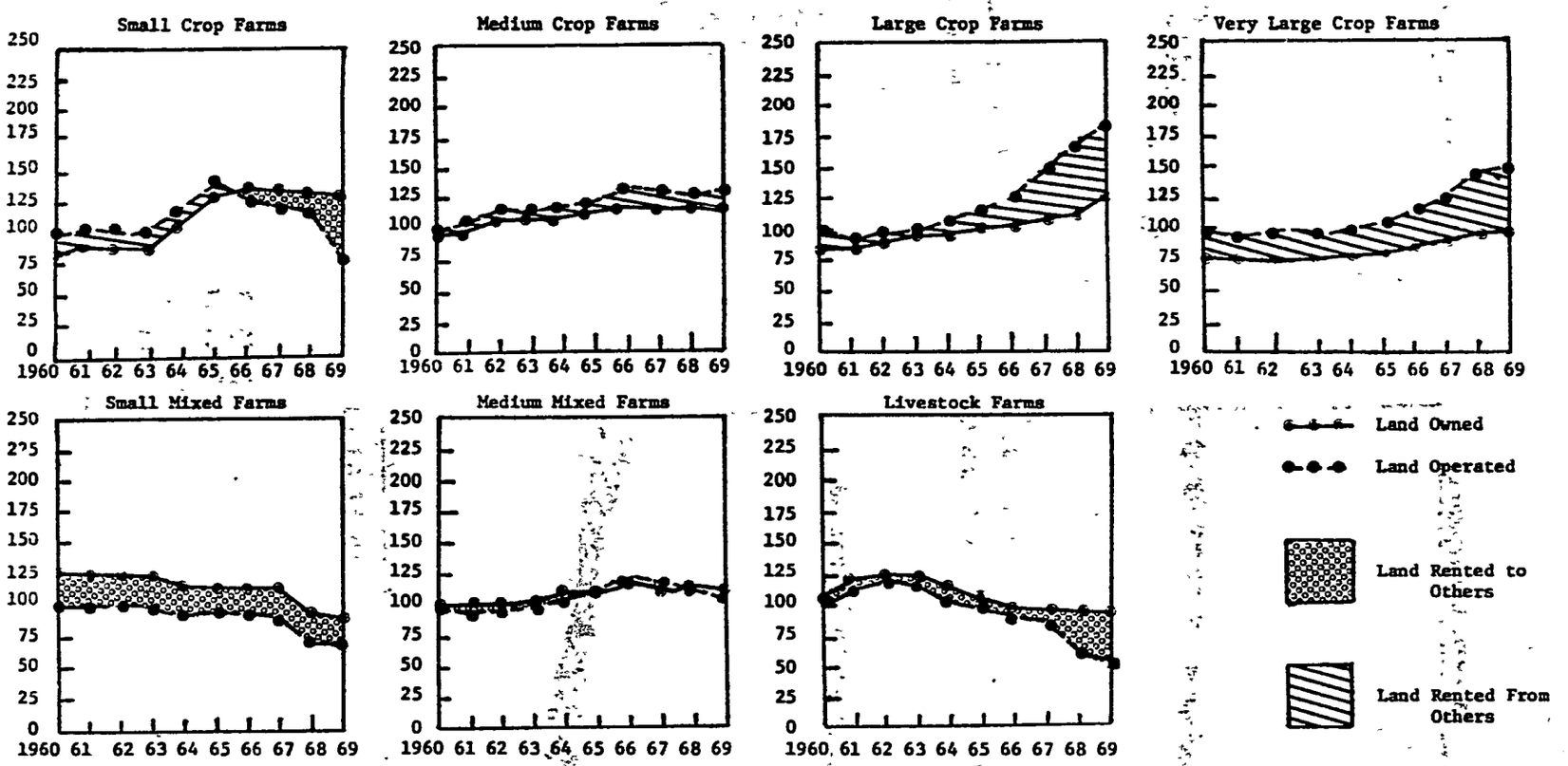
7/ For example the ratio of cultivated to total land area was .78 for the large farms but only .55 for the very large farms.

FIGURE 5-3
Annual Index of Land Owned and Operated, Three Subregions, Southern Brazil, 1960-1969 a/



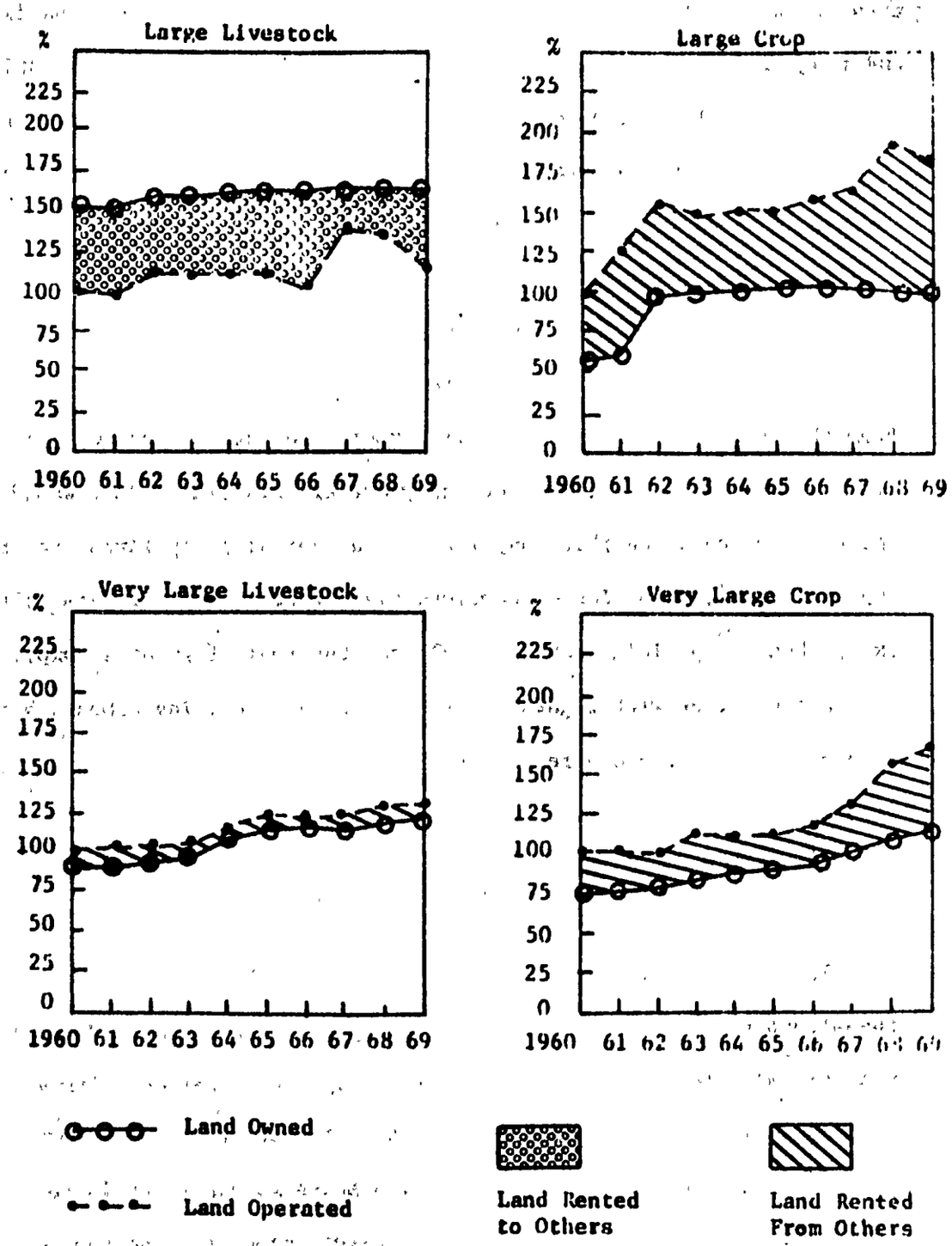
a/ Base: 100 = land operated in 1960.

FIGURE 5-4 -- Annual Index of Land Owned and Operated by Farm Size and Type, Central Plateau Subregion, Southern Brazil, 1960-69[a]



[a] Base: 100 = land operated in 1960.
[b] For absolute values of land operated see Appendix Table 5-4.

FIGURE 5-5
Annual Index of Land Owned and Operated by Farm Size and Type
Western Rangeland Subregion, Southern Brazil, 1960-1969[a]



[a] Base: 100 = land operated in 1960.

[b] For absolute values of land operated see Appendix Table 5-5.

On very large farms the increase was greater than 50 percent. The increased incidence of renting out of land among the small mixed, small crop, and range livestock farms would suggest that this is one means by which control of the land resource has migrated from the small to larger crop farms and from livestock to crop farms. Even in the Western Rangeland subregion, where land is not a production constraint, greater concentration of land control has occurred.

The other avenue of increasing the land base is by purchases. It might be expected that the larger farms would have acquired their land from the small farms, but the small farmers who were interviewed have not made significant sales of property during this time. This would encourage speculation that many incremental purchases by larger farms represent the liquidation of complete small farm units. If this is the case, then the policies have not only put the small farm at a comparative disadvantage with regard to credit and machinery investment, but have also put a severe stress on the survival of small farm agriculture itself.

PATTERNS OF CAPITAL INVESTMENT AND TECHNOLOGICAL CHANGE - 1960-1969

Two measures are used to study the sequential aspects of capital investment and technological change during the past decade. Machinery was the major form of capital investment, especially for crop farms. Therefore, annual investments in machinery are used to study investment patterns. The annual value of the investments is expressed in constant 1969 cruzeiros per hectare operated to permit comparison across both years and size classifications. To remove extreme variation, a three year moving average was used.

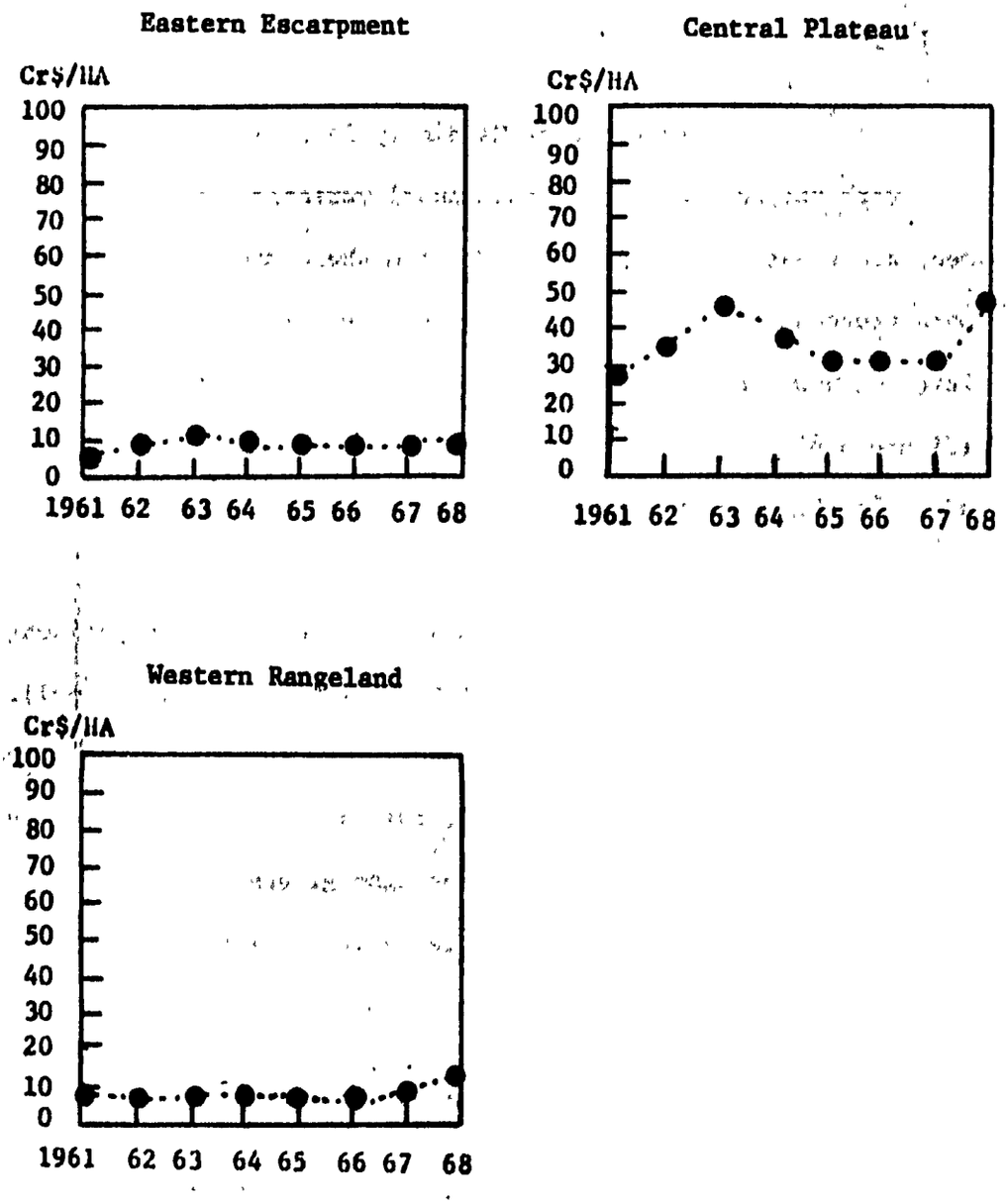
Second, to study the adoption of new technology (other than mechanical), the annual accumulative percent of farms using each of several improved crop practices is calculated. Selected crop practices include the use of fertilizer, improved seed, insecticide, and soil analysis.

Patterns of Machinery Investment

Both the absolute level and annual variation in machinery investment are greater in the Central Plateau where mechanization has been more prounounced. In this subregion, there was a sharp increase in level of new machinery investment until 1963, followed by a decline (Figure 5-6). A second surge of investment occurred later in the decade. In the other two subregions machinery investment levels have been low and relatively stable.

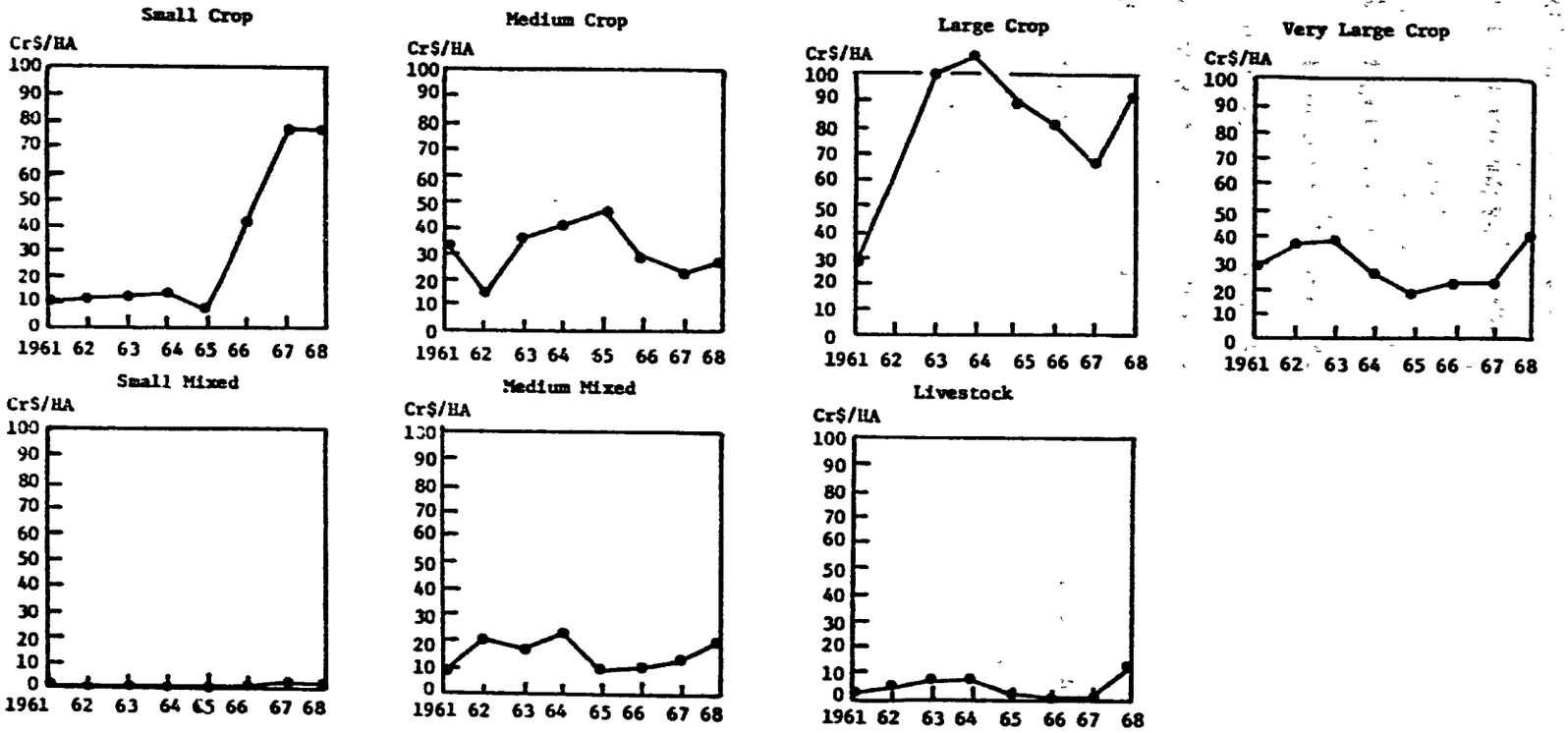
Three significant differences are apparent when comparisons are made by size and enterprise in the Central Plateau (Figure 5-7). First, crop farms have made substantially more investment than have livestock farms. Secondly within crop farms, the large crop farms are investing much more intensively than the other size groups. Finally, among crop farms there is a definite sequence in the intensity peaks of investment intensity in the 1962-63 period. Smaller size groups reached peaks at successively later dates; the large crop farms in 1964, the medium crop farms in 1965, and the small crop farms in 1967-68. However, by this time (1967-68) the large and very large crop farms were already beginning a second peak of machinery investment activity.

FIGURE 5-6
Comparison of Annual Machinery
Investment* Per Hectare of Land Operated for
Each Subregion, Southern Brazil, 1960-69



*Calculated as a three year moving average using 1969 constant prices.

FIGURE 5-7 -- Annual Machinery Investment* Per Hectare of Land Operated by Farm Size and Type, Central Plateau Subregion Southern Brazil, 1961-68



*Calculated as a three moving average using 1969 constant prices.

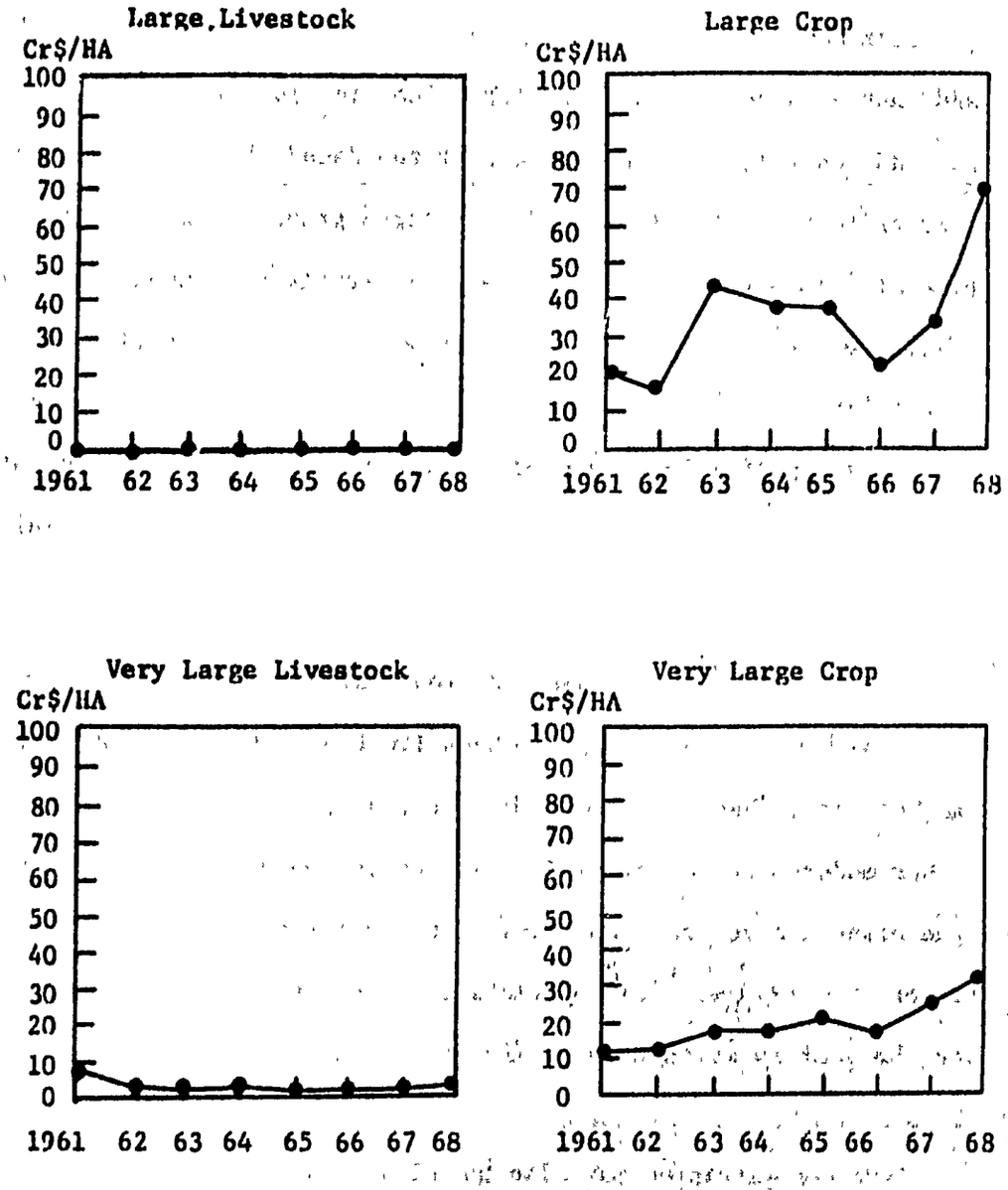
In the Western Rangeland, crop farms invested much more heavily in machinery than have livestock farms and large crop farms are again investing most intensively. Peaks in investment again occur in 1963 and 1968 (Figure 5-8).

These results lead to several conclusions concerning the impact of policy on the timing and intensity of capital investments. The greater level of investment on crop farms, particularly large crop farms, is consistent with the thrust of policy (wheat incentives and special credit for mechanization) and the resource endowment on large farms that allows a more rational use of mechanical technology. On the other hand, the sequencing of investment that appears to favor larger farms, when combined with previous findings on the dynamics of land control and acquisition, both provide a plausible explanation for investment concentration on large farms and are cause for concern about distributive equity in agricultural growth.

One possible explanation for the observed size sequence is that larger farms not only possess the production resource base that most easily accommodates mechanization, but also are in a knowledge and risk bearing environment that will allow earlier awareness and acceptance of attractive incentives. Also, larger farmers are more likely to be part of the socio-political power structure and thus receive earlier and more favorable consideration by banks and others involved in administering government programs [2]. This would be especially true where limited amounts of concessional credit are available (see Chapter 10).

Two explanations are suggested for the second surge of investment activity for machinery acquisition noted in the 1967-68 period. First,

FIGURE 5-8 -- Annual Machinery Investment Per Hectare of Land Operated By Farm Size and Type, Western Rangeland Subregion Southern Brazil, 1961-1968



*Calculated as a three moving average using 1969 constant prices.

renewed emphasis was given to the special credit program (more funds and more attractive terms). A more significant possibility, however, is apparent when one considers the pattern of land expansion experienced by the large and very large farms, especially during the latter part of the decade. It would seem that the earlier investment peaks (1963-64) represented an initial response to favorable government policies and that subsequent years of high prices led to the observed pressure on land control, which by the end of the decade had increased average size of farms in the large and very large groups by greater than 50 percent. This would naturally have necessitated a second investment effort to adequately mechanize the new land area controlled by the larger farms.[8/] Thus, the re-enforcing effect of favorable product prices and financing of inputs resulted in considerable concentration of productive resource and continued dominate participation in special government incentives by the large crop farms.

Improved Crop Practices

Government credit has not been limited to the encouragement of mechanization but has also been directed toward stimulating the use of other modern technological inputs such as improved seed, fertilizer, and plant protection chemicals. Time series data on operating expenses other than 1969 were not available. Information was obtained, however, on the year in which each farmer initiated the use of specific practices.

8/ Farm mechanization may also have been enhanced by labor legislation in the mid-1960's which encouraged farmers to reduce labor use.

The method used to measure change in use of crop technology, then, is the accumulating percent of farms initiating use of a crop practice in each of the years 1960-69. This measure indicates the magnitude but not the intensity of use. Also, it does not mean that each farmer continued to use the practices every year following adoption.

The use of modern technology has increased rapidly over the past decade, and as was true with the machinery and land control patterns discussed earlier, the larger farms have adopted the modern technology first and at a faster rate than smaller farms in the same and other regions.

In the Central Plateau, the use of most crop practices has grown at about the same rate (from about 30 percent of the farms in 1960 to 90 percent in 1969) (Table 5-4). It would appear that wheat price guarantees and ample credit along with the greater incomes generated by price supports have allowed the farmers to adopt a more expensive cropping practice like fertilizer concurrently with the less expensive crop practices. In the Eastern Escarpment this has not been true. In the subregion the less expensive crop practices such as improved seed and insecticides were more readily adopted than expensive forms such as fertilizer which achieved only one-half the adoption rate of improved seed. A lack of credit and/or personal resources could have been a deterrent to more rapid adoption.

The conversion of range livestock farms to crop farms is a more recent occurrence in the Western Rangeland subregion and therefore the level of adoption for some of the inputs is not comparable with the other regions. Government programs have been active here as well,

TABLE 5-4

Accumulative Adoption Percentages for Specified Technological Practices
Wheat Region, Southern Brazil - 1960-1969

Subregion Farm Type and Size and Practice Adopted	Year Practice Was First Used									
	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
	(Accumulative percentage of adopters)									
Eastern Escarpment										
Fertilizer	5	6	7	7	10	12	14	18	23	36
Improved seed	12	14	18	21	27	37	43	51	56	62
Insecticide	17	17	20	22	26	31	32	33	37	41
Soil analysis	1	1	1	2	2	6	7	7	7	8
Central Plateau										
Fertilizer	29	32	34	42	54	63	72	78	86	92
Improved seed	30	33	42	47	56	68	78	83	88	92
Insecticide	31	34	38	42	48	53	62	71	76	80
Soil analysis	1	1	2	2	3	3	6	10	20	51
Western Rangeland										
Fertilizer	3	4	6	8	14	20	25	31	39	48
Improved seed	5	5	6	9	11	18	24	30	40	52
Insecticide	1	1	2	4	6	8	12	15	22	31

and the number of farmers using fertilizer has equaled or exceeded the number using other crop production inputs, indicating no financial or risk barrier to its adoption and use in this subregion. Soil analysis is a recent practice first introduced in the regions about 1965. This explains the lack of use during the early years.

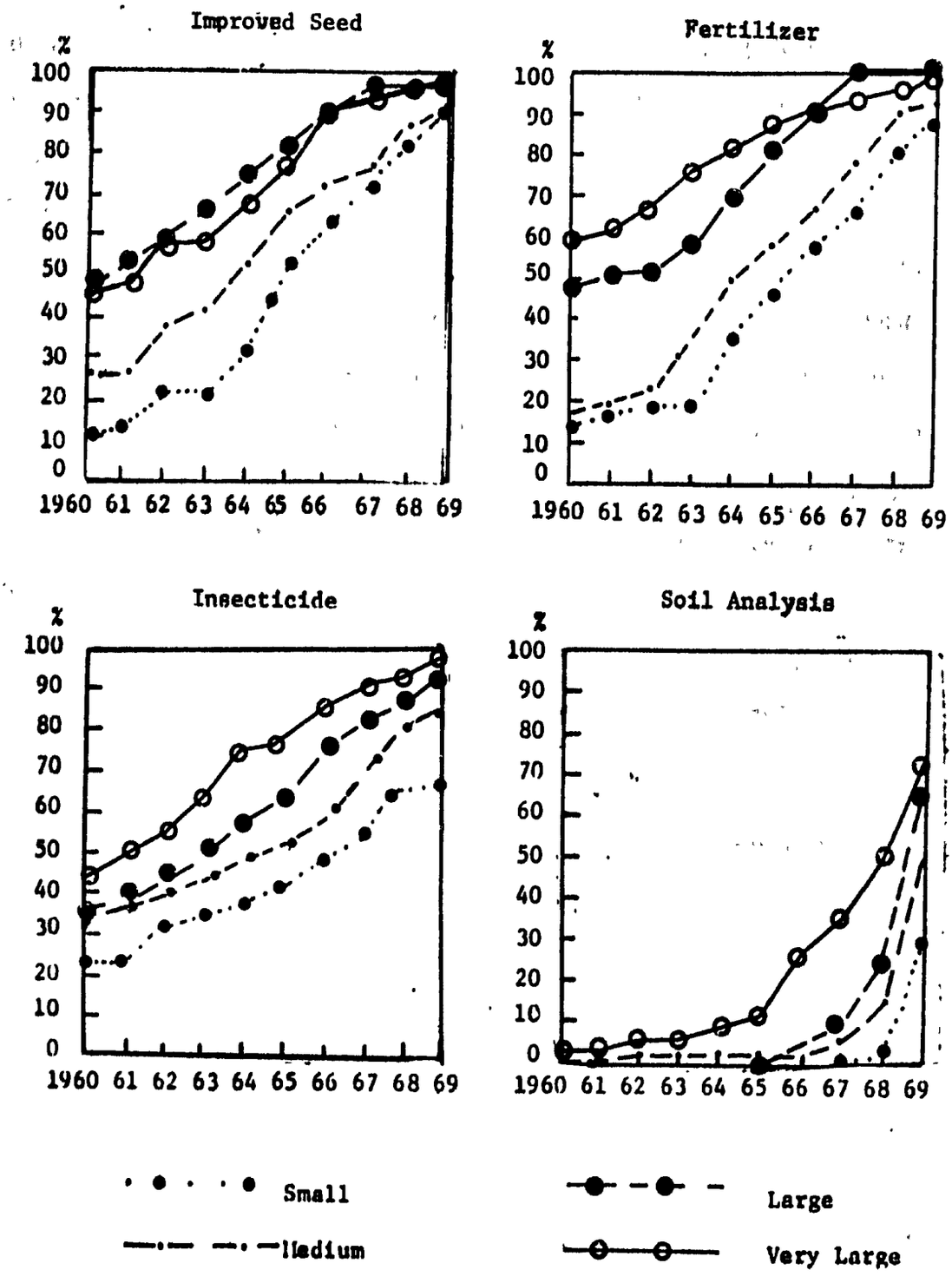
As noted earlier, the practices chosen, as well as the thrust of use on crop farms by farm size, we note a pattern similar to that observed in machinery investment, (Figure 5-9). That is, larger farms tend to begin use at an earlier date and to reach maximum user levels sooner. For example, in the Central Plateau 50 percent of the very large farms were using fertilizer in 1960. By 1967, 100 percent were users. Large farms reached 100 percent use by 1969, while by this time medium and small farms were at 90 and 80 percent, respectively. Similar size patterns, though at different use levels, are apparent in the other subregion and with other crop practices.

INCOME FLOW AND RESOURCE TRANSFER

The previous sections have examined the form and manner in which capital investment have been made over the past decade. Significant differences between regions, farm types and farm sizes have been observed. This section looks at the 1969/70 income flow and resource transfer among farms and between farms and nonagricultural activities.

A farm family has many alternative uses for its productive resources and the income generated by both farm and non-farm activities. If on-farm production activities are very profitable it is likely that owned resources will be concentrated there and borrowed or rented

FIGURE 5-9 -- Percentage of Crop Farms Using Specified Crop Practices by Farm Size and Year of Initial Use Central Plateau Subregion, Southern Brazil, 1960-69



resources as well as generated income will be invested in an attempt to increase farm productive capacity. On the other hand if returns are low, one would expect resources to flow away from farm activities toward consumption and non-farm investment.

The previous analysis of investment patterns on farms during the decade of the 60's indicated that a considerable amount of investment capital had flowed toward large crop farms. The annual cash flow patterns for 1969/70 agricultural year confirm that this process is continuing (Table 5-5, 5-6, and Appendix Table 5-1). Crop farms for example experience 5 to 9 times larger net cash flows per hectare from production activities than do livestock farms (Central Plateau and Western Rangeland). This is re-enforced by both intra-farm and off-farm resource transfers. Most non-crop farms in both of these sub-regions receive more net cash flow from the rental of farm resources (land, labor and machinery) to other farmers than they do from farm production activities. In this case the crop farmers have a negative cash flow for rents indicating they are supplementing owned resources with rental of outside capital. Credit use is also higher on crop farms as well as direct investment in capital items. The lack of attractive alternatives on non-crop farms in the Central Plateau is further indicated by the large transfer of funds to off-farm uses. Policy incentives have undoubtedly contributed greatly to the different investment climate for each farm type and thus to the observed resource transfers.

TABLE 5-5: Annual Cash Flows[1] Per Hectare of Agricultural Land, By Subregion, Farm Size and Farm Type - Southern Brazil - 1969

Subregion Farm Size and Type	Cash Inflow							Cash Outflow							
	Production Sales	Capital Sales	Rental Income			New Credit	Non-farm Income	Prod. Opert. Costs	Capital Purchases	Rental Expenses			Credit Repayment	Non-farm	Cash Living Expenses
			Land	Mech.	Labor					Land	Mech.	Labor			
	(cruzeiros per hectare)														
Eastern Escarpment															
Small crop farms	254	8	—	—	23	74	12	81	111	5	2	12	33	15	182
Medium crop farms	147	4	5	1	10	28	3	44	45	—	1	8	13	1	99
Small mixed farms	301	18	4	2	20	76	13	113	117	—	—	20	27	14	163
Medium mixed farms	152	—	1	—	6	29	6	46	50	—	—	9	9	5	80
Central Plateau															
Small crop farms	325	5	26	—	25	76	33	148	59	20	21	11	49	34	177
Medium crop farms	291	14	3	4	3	134	7	150	84	19	28	5	97	10	84
Large crop farms	422	22	1	13	13	299	4	228	218	22	10	13	196	8	55
Very large crop farms	319	40	1	2	8	176	8	171	155	14	1	16	137	21	26
Small mixed farms	184	82	38	—	23	319	73	93	59	2	3	16	52	296	174
Medium mixed farms	158	10	8	7	44	75	2	71	37	8	2	14	48	56	132
Livestock farms	40	5	30	3	3	54	16	15	49	—	1	4	3	51	29
Western Rangeland															
Large crop farms	394	11	3	11	7	332	7	183	132	43	19	43	268	1	94
Very large crop farms	260	6	4	3	5	145	6	109	90	29	5	20	104	7	28
Large livestock farms	26	9	47	—	16	10	1	9	15	—	—	5	6	5	47
Very large livestock farms	47	1	11	—	2	16	1	14	27	3	—	7	10	2	12

Source: Appendix Table 5-1.

[1]Land, and labor payments or receipts made in kind were valued at average prices and included in this table as a cash transaction. Separate cash and kind values are retained in the Appendix Tables 5-1.

TABLE 5-6: Annual Net Cash Flows[1/] Per Hectare of Agricultural Land, By Region, Farm Size and Farm Type, Southern Brazil, 1969

Subregion Farm Size and Type	Number of Farms	Source of Cash Flow Activities					
		Production	Fixed Capital	Rent[2]	Non-Farm	Credit	Cash Family Living
		(cruzeiros per hectare)					
Eastern Escarpment							
Small crop farms	109	173	-103	4	-3	41	-182
Medium crop farms	17	103	-41	-2	+2	15	-99
Small mixed farms	217	188	-99	6	-1	49	-163
Medium mixed farms	35	106	-50	-2	+1	20	-80
Central Plateau							
Small crop farms	36	177	-54	-1	-1	27	-177
Medium crop farms	64	141	-70	-42	-3	37	-84
Large crop farms	77	194	-196	-18	-4	103	-55
Very large crop farms	34	148	-115	-20	-13	39	-26
Small mixed farms	10	91	23	40	-223	267	-174
Medium mixed farms	20	87	-27	35	-54	27	-132
Livestock farms	13	25	-44	31	-35	51	-29
Western Rangeland							
Large crop farms	21	211	-121	-84	6	64	-94
Very large crop farms	52	151	-84	-42	-1	41	-28
Large livestock farms	46	17	-6	48	-4	4	-47
Very large livestock farms	50	33	-26	3	-1	6	-12

1/Each category equals inflows minus outflows

Production = Crop and livestock sales minus cash operating expenses (not including labor)

Capital = Land, and machinery sales minus land, machinery and livestock purchases

Rent = Land, machinery and labor (off farm wages) rental income minus land, machinery and labor (hired labor wages) rental expenses

Non-farm = Receipts minus expenditures from non-farm business and investments (off farm wages included in rent above)

Credit = Total new credit received minus principal payments made.

2/Rent values include both cash and kind payments and receipts

Source table: 5-5

SUMMARY

There have been substantial differences in the manner in which farms of specific sizes and types have participated in the capital growth process. Actually in some cases there appears to be substantial resource transfers between farms. This is especially true in the subregion where heterogenity in farm sizes and types was prevalent.

For example, the results indicate that large farms and crop farms, particularly in the Central Plateau subregion have a greater percent of their total investment in machinery and operating expenses than do the smaller and non-crop farms. This is also true on a per hectare basis.

This same pattern is evident in the investment expenditures over time in which a majority of the investment value during the past decade has gone into machinery, with most of the machinery investment being made by the large crop farms using credit. Land purchases have been less important and financed mainly by savings. The larger farms have also gained control over a larger resource base by bidding away land control from the small farms by both renting and purchasing additional land.

The large crop farms not only had a higher level of machinery investment but they also started sooner than the smaller farms of the same type. In addition, the larger farms also led the way in adopting new crop production technology.

Within the larger farm sizes, however, intensity of capital investment declines as farm size increases. That is, the most intensive capitalization occurs on farms in the 50.0 to 200.0 hectare range, while

farms larger than this invest less capital per hectare of land. It is probable that the very large farms may have too much land under one management unit to adequately farm all of it intensively. From a policy standpoint, it would probably be easier to get a greater intensification of agricultural production in areas of moderate farm size. Thus, it may not be possible to stimulate capital intensification to a maximum degree where very large farms predominate. In this later case, many farms would continue to use some land resources extensively.

The Eastern Escarpment, a sub-region of more homogenous farm sizes (mostly small farms) with diversified agricultural enterprise has not experienced the substantial differences noted above. Modest levels of investment and technological change have occurred and have been largely financed from savings.

This suggests that small farms as part of a bimodal size distribution in a region undergoing rapid growth (Central Plateau) may be at a relative disadvantage to small farms within a more unimodal size distribution (Eastern Escarpment) even though overall regional growth is much slower in the latter situation.[9/]

Impact of Public Policy on Farm Level Capital Growth

The above description of farm level capital and technological changes has not explicitly incorporated a public policy component. However, there is a clear linkage between farm level capital investment patterns and the nature of public policies during this time period.

9/ For a fuller treatment of this concept see [4].

This section interprets the farm level investment patterns in light of the policies used in Southern Brazil during the 1960's to stimulate agricultural production. Earlier, it was mentioned that policies are generally reflected in farm level investment decisions through their impact on the profitability of particular investment alternatives and in the relaxing of financial constraints.

Brazilian policies to increase agricultural production have been oriented toward subsidization of capital-intensive modern technological inputs and price supports. In particular, the Brazilian government has provided credit, often at negative real rates of interest, for machinery and fertilizers and strongly supported the price of wheat relative to other competing enterprise products.

These policies have substantially altered the economic environment faced by farmers in Southern Brazil by encouraging mechanization and the adoption of new technology which in turn has had important secondary effects on the agricultural production units. In the Central Plateau the large farms have rented and/or purchased additional land while small farms have experienced a decrease in land control. In the Western Rangeland the changes in land tenure have been associated with changes in enterprises, with the large cattle farms either selling or renting their land out while the crop farms who have planted wheat have increased farm size through purchase and renting. These changes have been accentuated by a low level of productivity for land intensive capital (see chapers 6-7) and large cash surpluses generated by high support prices and ample credit supplies.

It would appear that a majority of the subsidized credit provided

by government during the past ten years has been absorbed by the large crop farms to purchase machinery and finance operating expenses in order to grow more wheat. In turn, increased wheat acreage at supported prices generated a larger cash flow for the larger farms which could be used to purchase more machinery and land.

Timing appears to have been critical in this process, as larger farms moved into mechanized wheat production first. High levels of financing for both machinery acquisition and operating expenses undoubtedly left the considerable personal resources generated from the high wheat price supports available as savings for additional investment. With machinery acquisition and operating funds covered by credit, these savings were naturally available for further expansion at the extensive margin. The resulting pressure on land purchase prices and rents placed a high opportunity cost on owning and operating land. It is apparent that small crop and livestock farms found it more profitable to sell or rent part of their land resources than to continue farming them. Undoubtedly, the continued demand for special government credit by farmers expanding their resource base in part restricted participation by a broader spectrum of farmers.

One could also hypothesize, at least on the credit side, that supply allocation in the face of this heavy deamand was also a factor in limiting the degree of participation in special programs. That is, if large farmer demand for credit was sufficient to exhaust supplies, it would be natural for the banks to prefer lending the bulk of their funds in larger, less risky loans. Also, with larger loans the cost of servicing is less (see Chapter 11).

Finally, the substantial resource transfers that have occurred from farm operators to owners of land, would suggest that perhaps the policies were in excess of that needed to bring about the capital growth and enterprise changes and that some leakage of funds to nonagricultural uses was occurring.

The question remains, however, as to whether these policies have also resulted in serious misallocation of farm production resources. It is clear that normal market mechanisms have been altered. The degree to which access to special incentives has been limited to particular individuals and farm situations would suggest that misallocation of resources could have resulted. Several questions are suggested by this possibility. First, have resources flowed toward their most productive use? In a related manner has restricted access to credit limited the growth possibilities for smaller farms? Second, do sufficient economies of scale or size exist to provide economic justification for the rapid increase in farm size, or is this merely the result of favorable policies that have titlted in the direction of farm size expansion? What has been the impact of rapid mechanization on farm labor employment and visa versa? These and other questions are examined in the following chapters.

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APPENDIX TABLE 5-1

FARM RESOURCE AND FINANCIAL SUMMARY DATA, BY REGION, FARM SIZE AND FARM TYPE
BRAZIL, 1969-70 1/

Region	SOUTHERN BRAZIL		
Sub-region	Central Plateau - Mechanized Wheat and Soybeans		
Farm Type	Mixed - Crop and Livestock		Livestock
Farm Characteristics / Size	Small	Medium	All
Number of Observations 2/	10	20	13
		(Hectares)	
Land Ownership			
Land Owned	26.1	43.9	330.5
Land Operated	18.4	42.5	224.2
Land Use			
Cultivated			
Irrigated	----	----	.1
Non-irrigated	7.7	18.4	8.8
Improved pasture	.2	1.8	15.4
Natural pasture	2.6	13.2	133.7
Area in Crops 3/			
Corn	3.3	7.8	2.6
Soybeans	1.8	5.1	2.9
Wheat	1.0	3.8	1.8
Rice	.3	.8	.5
Cotton	---	---	---
Sugarcane	---	---	---
Coffee	---	---	---
Other 4/	.6	2.0	.7
		(Man Equivalent)	
Labor Use			
Family Labor	1.5	2.2	1.1
Adult	1.4	1.7	1.0
Child	.1	.5	.1
Hired Labor	.1	.2	.5
Permanent	---	.1	.4
Temporary	.1	.1	.1
		(Cruzeiros)	
Farm Capital			
Land Owned 5/	13.029	21,865	164,781
Buildings	8,860	11,300	22,023
Mechanized Equipment	431	1,924	9,945
Non-mechanized Equip.	582	738	649
Trucks and Auto	200	1,750	5,328
Production Livestock	1,861	5,323	19,884
Work Livestock	465	793	902

APPENDIX TABLE 5-1 -- Continued

FARM RESOURCE AND FINANCIAL SUMMARY DATA, BY REGION, FARM SIZE AND FARM TYPE

BRAZIL, 1969-70 1/

Farm Characteristic \ Region / Sub-region / Type / Size	SOUTHERN BRAZIL		
	Central Plateau - Mechanized Wheat and Soybeans		
	Mixed - Crop and Livestock		Livestock
	Small	Medium	All
	(Cruzeiros)		
Farm Expenses			
Operating Expenses			
Crop Expenses			
Fertilizer	166	394	169
Lime	180	33	---
Seeds	27	142	62
Insecticides	32	51	12
Other	0	12	9
Machinery Expenses			
Fuel and Oil	---	170	468
Machinery Rent	35	77	109
Other	---	242	100
Livestock Expenses	161	836	652
Hired Labor Expenses	163	292	560
Cash Land Rent	---	60	---
Other Farm Expenses	411	504	888
Capital Purchases			
Livestock	184	321	3,945
Machinery	6	711	3,332
Land and Buildings	428	206	452
Other Expenses			
Debt Repayment	546	1,601	524
Non-Farm	3,104	1,876	8,104
Family Cash Living Exp.	1,831	4,396	4,647
Non-Cash Expenses			
Rental Payments in Kind	17	191	16
Hired Labor Perquisite	-----	167	127
Farm Receipts			
Crop Sales	382	1,610	1,069
Livestock Sales	1338	3,502	9,009
Other Farm Income	215	160	220
Capital Sales	860	350	786
Rental Income			
Land	----	158	2,841
Machinery	----	228	465
Labor	237	1,484	495
Other Receipts			
Non-Farm	770	60	2,584
New Credit	3,348	2,508	8,558
Non-Cash Receipts			
Farm Family Perquisite	1,165	1,482	1,048
Rental Payments in Kind	394	113	1,887

APPENDIX TABLE 5-1 -- Continued
FARM RESOURCE AND FINANCIAL SUMMARY DATA, BY REGION, FARM SIZE AND FARM TYPE
BRAZIL, 1969-70 1/

Region	SOUTHERN BRAZIL			
Sub-region	Central Plateau - Mechanized Wheat and Soybeans			
Farm Type	Annual Crops			
Farm Characteristic / Size	Small	Medium	Large	Very Large
Number of Observations	36	64	77	34
2/		(Hectares)		
Land Ownership				
Land Owned	27 9	33.4	76.3	363.3
Land Operated	17.4	37.8	115.9	536.1
Land Use				
Cultivated				
Irrigated	----	.1	.3	.9
Non-irrigated	9.3	25.2	89.8	293.6
Improved pasture	----	.4	.9	31.9
Natural pasture	2.5	5.8	9.5	109.2
Area in Crops 3/				
Corn	3.2	7.3	9.8	20.2
Soybeans	5.2	12.2	49.6	137.9
Wheat	4.0	13.2	68.6	229.9
Rice	.2	.4	.3	.8
Cotton	---	---	---	----
Sugarcane	---	---	---	----
Coffee	---	---	---	-----
Other	.4	.9	1.2	16.2
4/		(Man Equivalent)		
Labor Use				
Family Labor	2.0	2.8	2.7	1.5
Adult	1.7	2.3	2.3	1.4
Child	.3	.5	.4	.1
Hired Labor	.1	.1	.7	3.6
Permanent	---	---	.4	2.7
Temporary	.1	.1	.3	.9
		(Cruzeiros)		
Farm Capital				
Land Owned 5/	13,893	16,649	38,256	182,290
Buildings	5,336	7,442	17,278	38.750
Mechanized Equipment	3,382	5,123	48,223	104,533
Non-mechanized Equip.	419	884	779	1,336
Trucks and Auto	2,020	903	7,486	16,577
Production Livestock	1,937	2,846	3,069	19,937
Work Livestock	465	711	376	603

APPENDIX TABLE 5-1 -- Continued
FARM RESOURCE AND FINANCIAL SUMMARY DATA, BY REGION, FARM SIZE AND FARM TYPE
BRAZIL, 1969-70 1/

Region / Sub-region / Farm Type / Characteristic \ Size	SOUTHERN BRAZIL			
	Central Plateau - Mechanized Wheat and Soybeans			
	Annual Crops			
	Small	Medium	Large	Very Large
	(Cruzeiros)			
Farm Expenses				
Operating Expenses				
Crop Expenses				
Fertilizer	535	1,547	7,487	23,960
Lime	51	115	1,064	4,245
Seeds	259	887	4,750	13,451
Insecticides	48	122	738	3,081
Other	56	23	84	376
Machinery Expenses				
Fuel and Oil	161	407	2,843	11,663
Machinery Rent	248	869	980	492
Other	138	532	2,592	8,287
Livestock Expenses	205	339	475	948
Hired Labor Expenses	100	134	1,233	6,656
Cash Land Rent	2	61	684	2,119
Other Farm Expenses	298	496	2,921	8,474
Capital Purchases				
Livestock	91	178	206	1,065
Machinery	216	1,653	18,226	42,646
Land and Buildings	386	829	3,523	23,824
Other Expenses				
Debt Repayment	582	3,053	19,730	59,878
Non-Farm	405	328	805	9,142
Family Cash Living Exp.	2,093	2,660	5,566	11,268
Non-Cash Expenses				
Rental Payments in Kind	234	532	1,505	3,863
Hired Labor Perquisite	25	39	34	454
Farm Receipts				
Crop Sales	2,697	8,021	40,248	134,595
Livestock Sales	902	1,043	1,615	4,360
Other Farm Income	234	105	589	159
Capital Sales	64	436	2,220	17,309
Rental Income				
Land	233	33	106	415
Machinery	2	140	1,303	736
Labor	296	102	1,341	3,607
Other Receipts				
Non-Farm	393	216	400	3,676
New Credit	894	4,214	30,059	76,616
Non- Cash Receipts				
Farm Family Perquisite	1,328	1,571	1,761	1,293
Rental Payments in Kind	69	72	14	-----

APPENDIX TABLE 5-1 -- Continued

FARM RESOURCE AND FINANCIAL SUMMARY DATA, BY REGION, FARM SIZE AND FARM TYPE

BRAZIL, 1969-70 1/

Region	SOUTHERN BRAZIL			
Sub-region	Eastern Escarpment - (Small Farms - Mountains)			
Farm Type	Annual Crop		Mixed-Crop-Livestock	
Characteristic / Size	Small	Medium	Small	Medium
Number of Observations	109	17	217	35
2/		(Hectares)		
Land Ownership				
Land Owned	20.7	44.4	19.5	53.9
Land Operated	21.3	44.0	18.8	51.2
Land Use				
Cultivated				
Irrigated	1.2	1.2	.1	----
Non-irrigated	6.0	14.9	7.3	14.0
Improved pasture	.3	1.2	.2	.6
Natural pasture	2.7	10.2	2.7	15.2
Area in Crops 3/				
Corn	2.2	5.1	3.3	6.0
Soybeans	.3	1.2	1.1	.8
Wheat	.4	.9	.5	1.4
Rice	1.3	1.5	.1	.4
Cotton	---	---	---	---
Sugarcane	---	---	---	---
Coffee	---	---	---	---
Other	1.2	3.5	1.4	2.2
4/		(Man Equivalent)		
Labor Use				
Family Labor	2.5	3.3	2.3	3.0
Adult	2.0	2.6	1.9	2.4
Child	.5	.7	.4	.6
Hired Labor	.1	.3	.1	.0
Permanent	---	---	---	.1
Temporary	.1	.3	.1	.1
		(Cruzeiros)		
Farm Capital				
Land Owned 5/	6,701	14,435	6,348	17,486
Buildings	6,831	13,323	6,662	9,557
Mechanized Equipment	810	2,880	687	704
Non-mechanized Equip.	596	840	526	522
Trucks and Auto	499	235	612	1,443
Production Livestock	1,994	3,340	2,854	5,460
Work Livestock	382	674	481	873

APPENDIX TABLE 5-1 -- Continued
FARM RESOURCE AND FINANCIAL SUMMARY DATA, BY REGION, FARM SIZE AND FARM TYPE
BRAZIL, 1969-70 1/

Region	SOUTHERN BRAZIL			
Sub-region	Eastern Escarpment - (Small Farms - Mountains)			
Farm Type	Annual Crop		Mixed-Crop-Livestock	
Characteristic / Size	Small	Medium	Small	Medium
	(Cruzeiros)			
Farm Expenses				
Operating Expenses				
Crop Expenses				
Fertilizer	52	188	28	31
Lime	6	8	7	8
Seeds	31	52	42	46
Insecticides	26	107	10	5
Other	12	46	8	6
Machinery Expenses				
Fuel and Oil	54	166	67	102
Machinery Rent	19	32	8	7
Other	97	140	83	177
Livestock Expenses	107	185	656	557
Hired Labor Expenses	95	197	79	257
Cash Land Rent	27	---	3	---
Other Farm Expenses	442	329	258	435
Capital Purchases				
Livestock	221	245	318	241
Machinery	180	161	428	545
Land and Buildings	731	825	463	699
Other Expenses				
Debt Repayment	338	361	281	279
Non-Farm	151	21	145	149
Family Cash Living Exp.	1,859	2,730	1,678	2,390
Non-Cash Expenses				
Rental Payments in Kind	23	-----	3	-----
Hired Labor Perquisite	28	11	32	25
Farm Receipts				
Crop Sales	1,865	2,780	399	377
Livestock Sales	637	1,033	2,599	3,535
Other Farm Income	93	239	105	608
Capital Sales	85	120	182	12
Rental Income				
Land	3	11	27	26
Machinery	3	18	18	---
Labor	237	279	206	191
Other Receipts				
Non-Farm	127	89	132	167
New Credit	757	768	781	855
Non-Cash Receipts				
Farm Family Perquisite	1,123	1,426	980	1,482
Rental Payments in Kind	-----	118	10	-----

APPENDIX TABLE 5-1 -- Continued

FARM RESOURCE AND FINANCIAL SUMMARY DATA, BY REGION, FARM SIZE AND FARM TYPE
BRAZIL, 1969-70 1/

Farm Characteristic / Region	SOUTHERN BRAZIL		
Sub-region	Coastal Plain - Irrigated Rice-Corn		
Type	Annual Crop		
Size	Small	Medium	Large
Number of Observations 2/	43	46	10
		(Hectares)	
Land Ownership			
Land Owned	26.1	50.3	117.8
Land Operated	25.1	50.0	112.8
Land Use			
Cultivated			
Irrigated	5.2	12.1	30.6
Non-irrigated	5.8	10.9	35.4
Improved pasture	.3	----	1.1
Natural pasture	3.3	8.2	28.2
Area in Crops 3/			
Corn	3.5	6.4	2.4
Soybeans	---	---	---
Wheat	---	---	.1
Rice	5.2	11.9	28.0
Cotton	---	---	---
Sugarcane	---	---	---
Coffee	---	---	---
Other 4/	1.8	2.4	1.0
		(Man Equivalent)	
Labor Use			
Family Labor	1.8	2.6	3.2
Adult	1.4	2.1	2.7
Child	.4	.5	.5
Hired Labor	.2	.4	1.8
Permanent	---	---	1.0
Temporary	.2	.4	.8
		(Cruzeiros)	
Farm Capital			
Land Owned 5/	18,259.	35,370.	82,118.
Buildings	8,384	13,000	26,600
Mechanized Equipment	3,569	14,905	28,705
Non-mechanized Equip.	606	745	931
Trucks and Auto	81	1,539	6,350
Production Livestock	1,898	3,614	6,104
Work Livestock	502	570	1,035

APPENDIX TABLE 5-1 -- Continued
FARM RESOURCE AND FINANCIAL SUMMARY DATA, BY REGION, FARM SIZE AND FARM TYPE
BRAZIL, 1969-70 1/

Farm Characteristic \ Region / Sub-region / Type / Size	SOUTHERN BRAZIL		
	Coastal Plain - Irrigated Rice-Corn		
	Annual Crop		
	Small	Medium	Large
		(Cruzeiros)	
Farm Expenses			
Operating Expenses			
Crop Expenses			
Fertilizer	131	158	537
Lime	55	184	462
Seeds	146	259	282
Insecticides	62	89	248
Other	38	147	64
Machinery Expenses			
Fuel and Oil	165	547	2,014
Machinery Rent	278	231	118
Other	167	628	1,298
Livestock Expenses	122	142	252
Hired Labor Expenses	338	592	2,533
Cash Land Rent	---	24	-----
Other Farm Expenses	562	1,199	2,819
Capital Purchases			
Livestock	466	519	543
Machinery	1,373	4,753	14,599
Land and Buildings	1,554	1,093	5,150
Other Expenses			
Debt Repayment	995	1,849	3,755
Non-Farm	305	1,137	330
Family Cash Living Exp.	2,601	4,255	6,252
Non-Cash Expenses			
Rental Payments in Kind	296	471	814
Hired Labor Perquisite	262	109	114
Farm Receipts			
Crop Sales	3,265	6,740	15,123
Livestock Sales	1,402	2,030	2,022
Other Farm Income	23	301	870
Capital Sales	808	871	1,280
Rental Income			
Land	123	116	505
Machinery	88	279	243
Labor	193	---	24
Other Receipts			
Non-Farm	167	70	2,060
New Credit	3,248	6,332	16,459
Non-Cash Receipts			
Farm Family Perquisite	1,136	1,563	2,084
Rental Payments in Kind	------	-----	-----

APPENDIX TABLE 5-1 -- Continued
FARM RESOURCE AND FINANCIAL SUMMARY DATA, BY REGION, FARM SIZE AND FARM TYPE
BRAZIL, 1969-70 1/

Region / Sub-region / Farm Type / Characteristic / Size	SOUTHERN BRAZIL			
	Western Rangeland - Mechanized Wheat and Cattle			
	Annual Crops		Mixed Crop and Livestock	
	Large	Very Large	Large	Very Large
Number of Observations	21	52	46	50
2/			(Hectares)	
Land Ownership				
Land Owned	48.6	509.0	220.5	1133.2
Land Operated	121.0	746.1	136.8	1150.8
Land Use				
Cultivated				
Irrigated	22.7	42.3	.1	7.8
Non-irrigated	64.5	287.4	2.5	27.4
Improved pasture	.6	17.2	.3	19.9
Natural pasture	18.9	334.8	113.6	999.9
Area in Crops 3/				
Corn	2.1	11.0	1.8	5.9
Soybeans	1.0	6.4	------	.6
Wheat	61.8	272.4	.7	21.5
Rice	22.1	40.2	.1	7.8
Cotton	----	------	------	----
Sugarcane	----	------	------	----
Coffee	----	------	------	----
Other	14.0	53.2	1.1	10.3
4/			(Man Equivalent)	
Labor Use				
Family Labor	1.6	1.7	1.5	1.3
Adult	1.5	1.6	1.4	1.2
Child	.1	.1	.1	.1
Hired Labor	2.1	5.7	.2	2.8
Permanent	1.0	3.6	.1	2.2
Temporary	1.1	2.1	.1	.6
			(Cruzeiros)	
Farm Capital				
Land Owned 5/	13,688	114,148	49,541	253,747
Buildings	5,886	49,322	12,398	53,172
Mechanized Equipment	45,948	135,804	341	23,525
Non-mechanized Equip.	1,184	2,691	549	1,345
Trucks and Auto	5,790	21,922	2,500	10,825
Production Livestock	4,325	49,601	19,771	166,518
Work Livestock	381	1,904	1,484	4,525

APPENDIX TABLE 5-1 -- Continued
FARM RESOURCE AND FINANCIAL SUMMARY DATA, BY REGION, FARM SIZE AND FARM TYPE
BRAZIL, 1969-70 1/

Region / Sub-region / Farm Type / Characteristic / Size	SOUTHERN BRAZIL			
	Western Rangeland - Mechanized Wheat and Cattle			
	Annual Crops		Mixed Crop and Livestock	
	Large	Very Large	Large	Very Large
	(Cruzeiros)			
Farm Expenses				
Operating Expenses				
Crop Expenses				
Fertilizer	5,822	18,838	52	2,068
Lime	-----	1,357	--	42
Seeds	4,452	15,565	31	1,310
Insecticides	453	2,102	12	219
Other	1,526	57	1	3
Machinery Expenses				
Fuel and Oil	5,817	20,993	161	3,288
Machinery Rent	2,009	3,538	22	233
Other	4,312	11,006	145	1,817
Livestock Expenses	243	1,484	363	3,230
Hired Labor Expenses	3,738	10,018	285	5,849
Cash Land Rent	350	3,495	9	2,203
Other Farm Expenses	1,180	3,037	296	3,015
Capital Purchases				
Livestock	245	11,956	710	8,972
Machinery	13,545	40,839	541	12,446
Land and Buildings	2,292	8,280	533	7,094
Other Expenses				
Debt Repayment	28,553	70,654	656	10,108
Non-Farm	123	4,710	620	1,784
Family Cash Living Exp.	10,002	19,050	5,512	12,502
Non-Cash Expenses				
Rental Payments in Kind	4,220	16,590	-----	1,015
Hired Labor Perquisite	529	3,715	313	1,790
Farm Receipts				
Crop Sales	40,743	158,865	325	16,651
Livestock Sales	1,167	18,419	2,513	31,609
Other Farm Income	143	8	175	1,119
Capital Sales	1,214	3,780	1,076	1,418
Rental Income				
Land	57	1,000	804	1,645
Machinery	1,190	1,896	-----	140
Labor	795	3,229	1,881	2,372
Other Receipts				
Non-Farm	771	3,950	82	517
New Credit	35,405	98,958	1,121	16,606
Non-Cash Receipts				
Farm Family Perquisite	1,039	2,456	1,812	3,213
Rental Payments in Kind	214	2,008	4,617	9,531

APPENDIX TABLE 5-1 -- Continued
FARM RESOURCE AND FINANCIAL SUMMARY DATA, BY REGION, FARM SIZE AND FARM TYPE
BRAZIL, 1969-70 1/

Farm Characteristic \ Region / Sub-region / Farm Type / Size	SOUTHEASTERN BRAZIL			
	Perennial Crop			
	Small	Medium	Large	Very Large
Number of Observations 2/	16	22	28	14
		(Hectares)		
Land Ownership				
Land Owned	15.4	32.5	94.5	348.6
Land Operated	16.5	36.4	103.7	407.8
Land Use				
Cultivated				
Irrigated	----	.9	5.4	-----
Non-irrigated	12.8	24.6	71.8	260.3
Improved pasture	.5	3.1	7.5	14.0
Natural pasture	1.6	2.1	12.8	68.6
Area in Crops 3/				
Corn	1.4	3.1	5.2	17.5
Soybeans	---	.1	.4	----
Wheat	---	---	----	----
Rice	1.8	3.5	4.4	29.1
Cotton	---	.1	.3	9.4
Sugarcane	7.5	16.1	57.7	215.4
Coffee	2.7	3.6	3.3	11.8
Other 4/	2.1	2.2	3.9	2.2
		(Man Equivalent)		
Labor Use				
Family Labor	1.8	2.6	1.8	3.3
Adult	1.7	2.4	1.7	3.3
Child	.1	.2	.1	0.0
Hired Labor	.6	2.2	7.2	28.8
Permanent	.2	.9	2.4	15.0
Temporary	.6	1.3	4.8	13.8
		(Cruzeiros)		
Farm Capital				
Land Owned 5/	26,406	51,383	163,293	582,507
Buildings	7,879	18,703	38,171	187,961
Mechanized Equipment	1,064	7,092	93,821	132,853
Non-mechanized Equip.	856	579	835	890
Trucks and Auto	3,829	9,189	44,775	70,714
Production Livestock	1,023	2,268	4,919	16,212
Work Livestock	316	461	855	1,312

APPENDIX TABLE 5-1 -- Continued
FARM RESOURCE AND FINANCIAL SUMMARY DATA, BY REGION, FARM SIZE AND FARM TYPE
BRAZIL, 1969-70 1/

Region / Sub-region / Farm Type / Characteristic / Size	SOUTHEASTERN BRAZIL			
	Perennial Crop			
	Small	Medium	Large	Very Large
	(Cruzeiros)			
Farm Expenses				
Operating Expenses				
Crop Expenses				
Fertilizer	932	1,976	5,903	23,524
Lime	34	251	396	1,555
Seeds	201	520	741	1,736
Insecticides	40	196	609	3,117
Other	35	26	73	34
Machinery Expenses				
Fuel and Oil	747	2,709	3,857	17,000
Machinery Rent	204	621	2,208	1,398
Other	170	1,104	2,467	9,857
Livestock Expenses	117	207	741	2,142
Hired Labor Expenses	1,356	4,101	14,107	63,479
Cash Land Rent	2	134	935	2,000
Other Farm Expenses	439	2,077	2,065	10,135
Capital Purchases				
Livestock	135	622	232	680
Machinery	1,725	3,919	5,722	21,663
Land and Buildings	3,362	20,245	3,125	66,190
Other Expenses				
Debt Repayment	930	1,643	6,828	17,935
Non-Farm	1,652	822	3,843	38,414
Family Cash Living Exp.	5,512	7,571	14,564	26,277
Non-Cash Expenses				
Rental Payments in Kind	101	11	227	840
Hired Labor Perquisite	749	236	688	3,155
Farm Receipts				
Crop Sales	6,994	14,989	49,776	216,002
Livestock Sales	221	837	2,071	6,893
Other Farm Income	-----	------	-----	------
Capital Sales	3,022	307	297	213
Rental Income				
Land	73	2,045	893	---
Machinery	--	1,255	502	1,757
Labor	210	361	640	284
Other Receipts				
Non-Farm	2,335	1,027	7,157	53,553
New Credit	2,127	4,584	10,687	46,374
Non-Cash Receipts				
Farm Family Perquisite	1,034	1,089	859	2,485
Rental Payments in Kind	-----	-----	70	-----

APPENDIX TABLE 5-1 -- Continued

FARM RESOURCE AND FINANCIAL SUMMARY DATA, BY REGION, FARM SIZE AND FARM TYPE

BRAZIL, 1969-70 1/

Farm Characteristic \ Region / Sub-region / Type / Size	SOUTHEASTERN BRAZIL			
	Annual Crop			
	Small	Medium	Large	Very Large
Number of Observations 2/	27	41	76	57
Land Ownership		(Hectares)		
Land Owned	20.2	38.6	124.5	552.3
Land Operated	20.3	39.1	134.2	598.6
Land Use				
Cultivated				
Irrigated	.3	.7	2.9	.2
Non-irrigated	11.1	26.7	77.3	290.7
Improved pasture	1.4	2.2	18.6	168.9
Natural pasture	.5	3.0	16.0	90.1
Area in Crops 3/				
Corn	5.0	8.9	27.4	85.8
Soybeans	.2	2.6	7.0	40.7
Wheat	---	---	---	---
Rice	1.6	3.9	14.0	42.4
Cotton	2.1	4.1	14.4	67.2
Sugarcane	.4	.9	2.1	2.9
Coffee	.3	1.5	4.0	16.2
Other 4/	2.3	5.4	5.1	10.3
Labor Use		(Man Equivalent)		
Family Labor	1.5	2.4	2.1	1.8
Adult	1.4	2.2	1.9	1.8
Child	.1	.1	.2	0.0
Hired Labor	.6	1.6	6.0	21.8
Permanent	.5	.5	2.7	11.4
Temporary	.1	1.0	3.2	10.8
Farm Capital		(Cruzeiros)		
Land Owned 5/	27,463	50,783	154,498	652,782
Buildings	3,281	14,646	40,537	93,700
Mechanized Equipment	892	6,566	47,329	125,470
Non-mechanized Equip.	474	756	759	2,211
Trucks and Auto	1,458	5,718	6,991	24,384
Production Livestock	745	2,882	13,225	51,703
Work Livestock	524	570	877	2,285

APPENDIX TABLE 5-1 -- Continued
FARM RESOURCE AND FINANCIAL SUMMARY DATA, BY REGION, FARM SIZE AND FARM TYPE
BRAZIL, 1969-70 1/

Region / Sub-region / Farm Type / Farm Characteristic / Size	SOUTHEASTERN BRAZIL			
	Annual Crop			
	Small	Medium	Large	Very Large
	(Cruzeiros)			
Farm Expenses				
Operating Expenses				
Crop Expenses				
Fertilizer	587	1,986	5,856	25,402
Lime	98	133	635	2,500
Seeds	152	635	1,382	5,365
Insecticides	192	500	1,853	11,980
Other	25	107	173	938
Machinery Expenses				
Fuel and Oil	72	962	3,564	12,478
Machinery Rent	365	940	1,188	2,663
Other	114	639	2,397	9,827
Livestock Expenses	14	269	1,329	5,149
Hired Labor Expenses	517	2,875	12,035	49,356
Cash Land Rent	9	150	637	4,482
Other Farm Expenses	268	894	3,215	19,380
Capital Purchases				
Livestock	120	234	1,357	9,096
Machinery	174	4,106	11,144	30,308
Land and Buildings	2,014	1,400	9,175	33,685
Other Expenses				
Debt Repayment	871	2,354	12,333	57,946
Non-Farm	770	963	2,451	9,311
Family Cash Living Exp.	3,420	4,889	9,601	16,518
Non-Cash Expenses				
Rental Payments in Kind	123	229	907	439
Hired Labor Perquisite	728	439	2,361	8,861
Farm Receipts				
Crop Sales	4,701	13,943	43,291	167,084
Livestock Sales	245	848	6,812	26,035
Other Farm Income	-----	-----	-----	-----
Capital Sales	54	214	289	827
Rental Income				
Land	17	104	407	8,224
Machinery	39	455	1,822	3,269
Labor	225	133	194	118
Other Receipts				
Non-Farm	323	2,120	1,792	6,856
New Credit	847	4,788	24,166	102,904
Non-Cash Receipts				
Farm Family Perquisite	315	656	971	1,478
Rental Payments in Kind	---	---	166	683

APPENDIX TABLE 5-1 -- Continued
FARM RESOURCE AND FINANCIAL SUMMARY DATA, BY REGION, FARM SIZE AND FARM TYPE
BRAZIL, 1969-70 1/

Region / Sub-region / Farm Type / Size / Characteristic	SOUTHEASTERN BRAZIL			
	Livestock	Mixed Crop and Livestock		
	All	Medium	Large	Very Large
Number of Observations	15	9	34	41
2/		(Hectares)		
Land Ownership				
Land Owned	258.1	40.7	169.8	623.6
Land Operated	304.4	43.1	163.7	427.9
Land Use				
Cultivated				
Irrigated	1.5	1.3	-----	5.1
Non-irrigated	46.7	11.4	28.7	36.5
Improved pasture	1.9	13.1	98.7	461.2
Natural pasture	238.3	3.6	27.6	62.0
Area in Crops 3/				
Corn	22.4	6.7	11.8	45.9
Soybeans	----	---	.3	3.6
Wheat	----	---	----	----
Rice	12.2	2.1	7.4	21.6
Cotton	.5	---	.3	9.7
Sugarcane	1.0	.3	.6	1.0
Coffee	11.4	.8	3.6	6.3
Other	3.8	.3	.5	7.2
4/		(Man Equivalent)		
Labor Use				
Family Labor	1.8	1.8	1.4	1.4
Adult	1.6	1.5	1.3	1.4
Child	.2	.3	.1	---
Hired Labor	1.3	.5	2.4	5.4
Permanent	.4	.2	1.7	3.4
Temporary	.9	.3	.7	10.2
		(Cruzeiros)		
Farm Capital				
Land Owned 5/	285,117	43,025	169,602	612,808
Buildings	27,373	14,927	25,369	102,854
Mechanized Equipment	9,315	4,749	11,681	124,186
Non-mechanized Equip	927	245	872	574
Trucks and Autos	6,702	4,854	5,509	30,744
Production Livestock	41,205	8,571	28,855	209,717
Work Livestock	1,314	419	1,353	2,588

APPENDIX TABLE 5-1 -- Continued
FARM RESOURCE AND FINANCIAL SUMMARY DATA, BY REGION, FARM SIZE AND FARM TYPE
BRAZIL, 1969-70 1/

Region / Sub-region / Farm Type / Characteristic / Size	SOUTHEASTERN BRAZIL			
	Livestock	Mixed Crop and Livestock		
	All	Medium	Large	Very Large
		(Cruzeiros)		
Farm Expenses				
Operating Expenses				
Crop Expenses				
Fertilizer	5,145	468	1,299	6,030
Lime	928	233	113	627
Seeds	775	98	596	4,049
Insecticides	56	52	199	1,810
Other	52	---	72	261
Machinery Expenses				
Fuel and Oil	1,256	918	2,006	4,936
Machinery Rent	485	200	791	1,707
Other	1,300	607	1,037	1,973
Livestock Expenses	6,133	1,971	2,193	7,491
Hired Labor Expenses	9,702	923	4,041	17,593
Cash Land Rent	132	111	159	3,434
Other Farm Expenses	2,037	748	1,748	5,245
Capital Purchases				
Livestock	8,251	1,046	4,514	43,394
Machinery	6,899	2,272	6,292	21,697
Land and Buildings	10,218	1,709	6,608	44,128
Other Expenses				
Debt Repayment	5,100	1,221	3,320	13,696
Non-Farm	2,000	62	1,324	13,744
Family Cash Living Exp.	10,756	3,683	10,328	11,615
Non-Cash Expenses				
Rental Payments in Kind	-----	-----	88	1,586
Hired Labor Perquisite	4,977	139	1,566	7,310
Farm Receipts				
Crop Sales	26,460	2,608	8,296	35,171
Livestock Sales	21,716	7,031	17,671	116,855
Other Farm Income	-----	-----	------	------
Capital Sales	779	-----	594	357
Rental Income				
Land	141	-----	612	1,145
Machinery	---	1,000	1,145	468
Labor	---	60	268	279
Other Receipts				
Non-Farm	1,735	7,200	5,595	6,692
New Credit	15,739	4,161	9,530	40,444
Non-Cash Receipts				
Farm Family Perquisite	907	676	1,032	1,206
Rental Payments in Kind	17	101	213	658

Footnotes Appendix Table 5-1

1/ For a description of each region, and the criterion for determining farm size and type category, see Chapter 4.

2/ One hectare equals 2.47 acres.

3/ Area in crops may exceed cultivated area in regions where double cropping is practiced. This is particularly true for wheat and soybeans.

4/ One man equivalent is defined as one full time adult worker or 300 days of part time labor. The family labor input is adjusted for sex and age of family members.

5/ On farms where land renting occurs the value of land owned either over or under estimates the land contribution to the production process.

APPENDIX TABLE 5-2

Accumulative Ten Year Capital Investment Outlays by Cruzeiros Per Average Hectare* Operated and Percent According to Source of Financing, Type of Capital, and Farm Size-Type, Central Plateau Subregion, Southern Brazil, 1969

Type of Investment and Source of Financing	Farm Size and Type					
	Livestock		Small Mixed		Medium Mixed	
	Cr$/Ha.	Percent	Cr$/Ha.	Percent	Cr$/Ha.	Percent
Land Purchases						
Unpaid Labor	--	--	--	--	--	--
Credit	0	0.0	4	4.3	4	1.2
Savings	61	49.2	11	11.7	66	19.1
Subtotal--Land	61	49.2	15	16.0	70	20.3
Machinery Purchases						
Unpaid Labor	--	--	--	--	--	--
Credit	7	5.6	4	4.3	43	12.5
Savings	43	34.7	0	0.0	96	27.8
Subtotal--Machinery	50	40.3	4	4.3	139	40.3
Land & Building Improvements						
Unpaid Labor	1	.8	6	6.4	9	2.6
Credit	0	0.0	48	51.0	20	5.8
Savings	12	9.7	21	22.2	107	31.0
Subtotal--Improvements	13	10.5	75	80.6	136	39.4
All Investments						
Unpaid Labor	1	.8	6	6.4	9	2.6
Credit	7	5.6	56	59.6	67	19.4
Savings	116	93.6	32	34.0	269	78.0
Total	124	100.0	94	100.0	345	100.0
Number of Farms	11		19		11	

* Values of all capital investment for the ten year period were adjusted to 1969 cruzeiro equivalents and summed. This sum was then divided by the annual average number of hectares operated over the ten year period to give the accumulative capital investment per hectare.

APPENDIX TABLE 5-2 — Continued

Type of Investment and Source of Financing	Farm Size and Type							
	Small Crop		Medium Crop		Large Crop		Very Large Crop	
	Cr$/Ha.	Percent	Cr$/Ha.	Percent	Cr$/Ha.	Percent	Cr$/Ha.	Percent
Land Purchases								
Unpaid Labor	--	--	--	--	--	--	--	--
Credit	23	3.3	19	2.8	25	2.4	12	2.2
Savings	67	9.5	239	35.2	102	9.9	120	21.7
Subtotal--Land	90	12.8	258	38.0	127	12.3	132	23.9
Machinery Purchases								
Unpaid Labor	--	--	--	--	--	--	--	--
Credit	81	11.5	156	23.0	550	53.1	239	43.3
Savings	259	36.7	164	24.1	258	24.9	117	21.2
Subtotal--Machinery	340	48.2	320	47.1	808	78.0	356	64.5
Land & Building Improvements								
Unpaid Labor	17	2.4	10	1.5	5	.5	1	.2
Credit	20	2.8	11	1.6	10	1.0	17	3.1
Savings	239	33.8	80	11.8	85	8.2	46	8.3
Subtotal--Improvements	276	39.0	101	14.9	100	9.7	64	11.6
All Investments								
Unpaid Labor	17	2.4	10	1.5	5	.5	1	.2
Credit	124	17.6	186	27.4	585	56.5	268	48.6
Savings	565	80.0	483	71.1	445	43.0	283	51.2
Total	706	100.0	679	100.0	1,035	100.0	552	100.0
Number of Farms	36		64		80		34	

APPENDIX TABLE 5-3

Accumulative Ten Year Capital Investment Outlays by Cruzeiros Per Average Hectare* Operated and Percent According to Source of Financing, Type of Capital, and Farm Size-Type, Western Rangeland Subregion, Southern Brazil, 1969

Type of Investment and Source of Financing	Farm Size and Type							
	Large Livestock		Very Large Livestock		Large Crop		Very Large Crop	
	Cr$/Ha.	Percent	Cr$/Ha.	Percent	Cr$/Ha.	Percent	Cr$/Ha.	Percent
Land Purchases								
Unpaid Labor	--	--	--	--	--	--	--	--
Credit	1	1.9	3	2.2	16	2.5	8	1.7
Savings	20	37.0	51	37.5	11	1.7	77	16.2
Subtotal--Land	21	38.9	54	39.7	27	4.2	85	17.9
Machinery Purchases								
Unpaid Labor	--	--	--	--	--	--	--	--
Credit	2	3.7	17	12.5	349	53.5	222	46.8
Savings	0	0.0	16	11.8	70	10.7	67	14.2
Subtotal--Machinery	2	3.7	33	24.3	419	64.2	289	61.0
Land & Building Improvements								
Unpaid Labor	1	1.9	1	.7	4	.6	1	.2
Credit	4	7.4	9	6.6	122	18.7	13	2.7
Savings	26	48.1	39	28.7	80	12.3	86	18.1
Subtotal--Improvements	31	57.4	49	36.0	206	31.6	100	21.1
All Investments								
Unpaid Labor	1	1.8	1	.8	4	.6	1	.2
Credit	7	13.0	29	21.3	487	74.7	243	51.3
Savings	46	85.2	106	77.9	161	24.7	230	48.5
Total	54	100.0	136	100.0	652	100.0	474	100.0
Number of Farms	43		49		22		55	

* Values of all capital investment for the ten year period were adjusted to 1969 cruzeiro equivalents and summed. This sum was then divided by the annual average number of hectares operated over the ten year period to give the accumulative capital investment per hectare.

APPENDIX TABLE 5-4
Land Ownership and Rental Changes by Farm Size and Type
Central Plateau Subregion, Southern Brazil, 1960-69

Farm Size and Type	Year		Net Change 1960-69	
	1960	1969	Ha.	Percent
Small Mixed				
Land Owned	33.8	23.9	-9.9	-36.8
Land Rented[a]	-6.9	-5.3	1.6	5.9
Land Operated	26.9	18.6	-8.3	-30.9
Small Crop				
Land Owned	18.3	27.9	9.6	45.7
Land Rented[a]	2.7	-10.6	-13.3	-63.3
Land Operated	21.0	17.3	-3.3	-17.6
Medium Mixed				
Land Owned	37.3	41.9	4.6	12.3
Land Rented[a]	0.0	-2.2	-2.2	-5.9
Land Operated	37.3	39.7	2.4	6.4
Medium Crop				
Land Owned	27.7	33.4	5.7	20.1
Land Rented[a]	.7	4.5	3.8	13.4
Land Operated	28.4	37.9	9.5	33.5
Large Crop				
Land Owned	52.1	76.4	24.3	39.9
Land Rented[a]	8.8	36.1	27.3	44.8
Land Operated	60.9	112.5	51.6	84.7
Very Large Crop				
Land Owned	281.9	363.3	81.4	22.4
Land Rented[a]	80.6	186.7	106.1	29.3
Land Operated	362.5	550.0	187.5	51.7
Livestock				
Land Owned	206.1	185.9	-20.2	-10.3
Land Rented[a]	-10.8	-72.4	-61.6	-31.5
Land Operated	195.3	113.5	-81.8	-41.8

[a] Net land rented equals hectares rented from others minus hectares rented to others.

APPENDIX TABLE 5-5: Land Ownership and Rental Changes by Farm Size and Type, Western Rangeland Subregion Southern Brazil, 1960-1969

Farm Size and Type	Year		Net Change 1960-69	
	1960	1969	Ha.	Percent
Large Crop				
Land Owned	38.7	65.5	26.8	40.3
Land Rented[a]	27.9	55.5	27.6	41.4
Land Operated	66.6	121.0	54.4	81.7
Very Large Crop				
Land Owned	331.2	512.5	181.3	39.8
Land Rented[a]	124.1	233.6	109.5	24.1
Land Operated	455.3	746.1	290.8	63.9
Large Livestock				
Land Owned	176.3	189.5	13.2	11.3
Land Rented[a]	-59.9	-52.7	7.2	6.2
Land Operated	116.4	136.8	20.4	17.5
Very Large Livestock				
Land Owned	809.2	1075.1	265.9	29.6
Land Rented[a/]	88.6	75.7	-12.9	-1.4
Land Operated	897.8	1150.8	253.0	28.2

a/ Net land rented equals hectares rented from others minus hectares rented to others.