BEHAVIORAL and social scientists to an increasing degree have begun to question the value of theory predicated upon the existence of an omniscient and single-directed rational being, such as Economic Man, as relevant to man's behavior. Alongside classical normative theory, behavioral concepts and generalizations have been proposed, some of which offer promise of wide applicability. One such system of behavioral concepts, the principle of bounded rationality, has been selected to assist in this analysis of variations in economic behavior. Extended to the spatial dimension, these concepts have relevance in the interpretation of the behavior of the population under study, a sample of Middle Sweden's farmers.

As usually stated, the concept Economic Man is a normative one, an invention descriptive only of the types of decisions which would or should be made under the assumptions of economic rationality. As a rational being, Economic Man is free from the multiplicity of goals and imperfect knowledge which introduce complexity into our own decision behavior. Economic Man has a single profit goal, omniscient powers of perception, reasoning, and computation, and is blessed with perfect predictive abilities. For these reasons his behavior may be studied in a controlled environment, his strategies may be anticipated, and the outcome of his actions can be known with perfect surety. Economic Man organizes himself and his activities in space so as to optimize utility.

The assumptions implicit in the Economic Man concept, perfect knowledge of alternative courses of action and their consequences and the single desire to optimize utility or productivity, must be relaxed in a behavioral analysis. Similarly, they must be relaxed in the analysis of a geographic region. Allowance must be made for man's finite abilities to perceive and store information, to compute optimal solutions, and to predict the outcome of future events, even if profit were his only goal. More likely, however, his goals are multidimensional and optimization is not a relevant criterion.

An essential first step in this investigation, therefore, involves establishing that the sample population does not behave as Economic Man and does not achieve the fruits of his rational actions, i.e., optimum productivity from a given set of resources. Measurements may be applied to determine to what degree the normative assumptions err in their characterization of actual behavior. A second objective is to demonstrate that the decision process has a spatial dimension, that some of the elements affecting decision behavior may be expected to differ spatially among a population. The overall objective, of course, is to be able to substitute a workable spatial and behavioral model of the decision process for the untenable structure of classical theory.

There is little about the theoretical framework or approach used in this analysis which is not equally applicable to the decision process of the firm in manufacturing, or in any situation in which it is suspected that decision behavior is affected by factors which vary spatially. A farming population was selected for study because the results and consequences of its decision behavior are more easily observable on the landscape. Unlike large-scale manufacturing, the decision making in farming is dispersed spatially among many producers. The diffusion of market and technical information to a dispersed group of producers may be expected to reveal a greater degree of distributional unevenness and lag than would be the case with urban-concentrated firms.

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1 This paper is a partial report of research undertaken at Uppsala University and the Royal Agricultural College in Sweden under the sponsorship of the Foreign Field Research Program of the NAS-NRC and the Social Science Research Council. A more complete description of procedures and findings may be found in the author's Ph.D. dissertation, "Decision-Making in Middle Sweden's Farming—A Spatial Behavioral Analysis," University of Wisconsin (1963), available from University Microfilms, Ann Arbor, Michigan.

The dependence of farming upon physical conditions such as the stability of patterns of weather, for example, creates a source of uncertainty for producers which clearly has a spatial dimension. Lastly, farmers' decision behavior may be expected to reflect a wider range of goals with respect to profit and security, from market orientation to pure self-sufficiency. Competitive forces in most other economic sectors act more quickly in driving out nonmaximizing producers.

The individual farmer, just as the industrial manager, must periodically make decisions with respect to the allocation of available resources among alternative uses. The farmer, functioning as a manager, must periodically decide how his land, labor, and capital will be used, what will be the crop-livestock combinations, the investments in machinery, and the other operating necessities. His goals with respect to income may vary anywhere from mere survival to optimization. The information available to the farmer most likely does not include all of the relevant facts about costs and technology, and it cannot include knowledge of future events which will affect the consequences of his decisions. Within this environment of uncertainty, the farmer must make choices and must bear the burden of outcomes. All farmers are faced with similar problems but actual decisions vary because farmers have different goals, different levels of knowledge, and vary in their aversion to risk and uncertainty. These differences and variations have a spatial dimension and are not randomly distributed among the population.

**THE SAMPLE POPULATION**

Rapid changes are taking place in Sweden's agriculture and the focus of this dynamism is centered especially in the more urbanized and industrialized central portions of the country. Here, ten per cent of the farms have been abandoned since 1956, and the survivors have been steadily moving in the direction of greater farming specialization and intensification. Although the tempo of change is very rapid, the recent events have been documented with characteristic Swedish thoroughness, a factor of significance for both the normative and behavioral analyses.

The portion of Sweden included within Middle Sweden as defined for this investigation corresponds approximately to the zone known as Mellansverigebut has been confined to the full eight central counties (Fig. 1). The essential criterion used to delimit the counties to be included was based upon balancing the desire for diversity of farming situations with the need for restricting the coverage to manageable proportions for field investigation. Consequent upon the selection process the area, to which we shall refer as Middle Sweden, includes a significant amount of diversity among its 68,000 farmers. The area is also sufficiently limited so that by means of an appropriately designed sample the major dimensions of surface variation could be observed. The names of the eight counties are indicated in Figure 1 along with the abbreviated letter designation used by the Swedish Central Bureau of Statistics. The letters B, C, D, E, R, S, T, and U are used to refer to the separate counties.

In this analysis, the areal surface of Middle Sweden's farming is the population. The purpose of the sample design is to survey the spatial properties of the decision behavior of Middle Sweden's farming population. To carry out this objective, a systematic sample was designed. Forty-five sampling units of 211 square kilometers (81.4 square miles) were selected from a hexagonal network and constitute a twelve per cent sample of: 1) the surface of Middle Sweden, 2) its arable land and, 3) farmers. The sample population consists of a variety of farm situation types in terms of size, economy, site, and settlement characteristics.

**THE NORMATIVE AND BEHAVIORAL ANALYSES**

In a behavioral analysis, allowance is provided for the entire continuum of human responses from optimization to that minimum of adaptation which may be essential for survival. Economic Man has a position at one extreme of the continuum. His position is predetermined in any situation in which the

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existence of an optimum may be demonstrated. The existence of a continuum provides an opportunity to explore the problem of determining the relative position of individuals on its scale.

The format of matched comparison serves as a suitable analytic framework for our discussion of the decision process. The decision behavior of the population under study is compared with that of the matched control, Economic Man, who has the same supply of resources but is equipped with the necessary knowledge and foreknowledge to achieve his goal of optimization. The factors of interest are the individual’s goals or objectives and his level of knowledge which may be observed by means of a matching variable.

Performance levels in farming may be assessed according to a wide variety of criteria, only two of which were utilized in this analysis, organization and technology. Farm organization refers to the group of management decisions involving allocation of available resources among alternative activities. We shall define technology as the level of knowledge and application of crop and husbandry procedures. Finite farm resources of land, labor, capital, and building facilities must somehow be combined to produce desired outputs at a given level of technology. For each farm situation, with its finite set of resources, there exists, in addition to the actual organization and technology followed by the individual farmer, an optimum counterpart which may be determined. Emphasis is reserved here for the gap between the organization of resources on the actual farms, their technology, and the optimum technologic level and organization of the same resources, as measured by the dif-

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4 Capital, as employed in this study, refers to working capital, assets in liquid or semiliquid form (which can be translated into liquid assets within one crop season), e.g., cash on hand, value of livestock, and crops planted. The working capital values are calculated by subtracting from total assets the real estate value of farm property, buildings, and long-term inventory items such as machinery and tools. Therefore, working capital measures the assets available to the farmer for direct use in enterprise selection.
ferences in resulting labor productivity. The productivity which the individual receives is matched with the optimum returns which the same resources would yield to Economic Man through optimum organization and technology. The degree to which the departures are clustered spatially is a reflection of the systematic distribution of factors affecting decision behavior. The focus is reserved here for these spatial attributes of the decision process.

Three spatial distributions are involved with respect to labor productivity, that resulting from: 1) the actual technology and organization of farm resources; 2) the optimum or potential technology and organization of the same resources; and 3) the gap between the actual and potential distributions. The optimum or potential productivity values were determined by means of a linear programming analysis for seventeen representative farm situations, and values interpolated for the remaining 533 farms of a systematic subsample (the JEU sample) through regression estima-

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Figure 2.

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Further details of the linear programming model and findings may be found in the author’s Ph.D. dissertation, op. cit., Appendix III, and in the mimeographed reports of Professor Lennart Hjelm and his assistants at the Royal Agricultural College, Uppsala. Details of the techniques of linear programming as applied to agriculture are discussed in: E. O. Heady and W. Candler, Linear Programming Methods (Ames, Iowa: The Iowa State University Press, 1958).

The sampling design followed the format of “multiphase sampling,” wherein information collected in each phase is used for stratification in the next phase, and there is opportunity provided for feedback.

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Labour productivity refers to net labor returns to the farm family per equivalent man-hour after a deduction of five per cent interest return on investment. Optimum technical levels were determined from estimates of potential regional yield levels for crops and milk as reported in: Proceedings of the 1960 Agricultural Investigation (Uppsala: Department of Agricultural Economics, Royal Agricultural College, March 3, 1962). To achieve the potential yields, the farmer would find it necessary to fertilize according to a plan based upon a soil survey of his arable land, and selective breeding and proper feed mixture for dairy cattle would be necessary as well.

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tion. Linear programming, a mathematical technique permitting simultaneous consideration of many possible alternative organizational plans, specifies the most profitable plan consistent with available resources and the input–output relationships for the alternative enterprises. The range of possible enterprises included various crop and livestock combinations as well as forestry and afforestation of arable and pastureland, off-farm employment, and off-farm investment. The linear programming procedure involves balancing the alternative enterprises according to their relative contribution to net returns and their use of the potential of sampling quality control. In this investigation, Agricultural Census cards (1956) for the 68,000 farmers of Middle Sweden provided information to permit a twelve per cent systematic sample of 8,000 farmers and a check for representativeness. The 8,000 sample permitted further stratification into 550, with checks also provided for referring to the larger sample and parent population. For purposes of the linear programming analysis, the 550 JEU farms were stratified into seventeen groupings in terms of input–output relationships and resource categories, with tests designed also to check the effectiveness of the groupings and the interpolation procedure, the results of which form the basis for Map 3. The JEU farms participate in a government-financed, long-term study of farm economics which is sponsored by the Royal Board of Agriculture in Stockholm. The farms are selected according to a plan which aims for representativeness regionally as well as in terms of type of farming, level of technology, and other conditions. Of the participating farms, 550 are located within the forty-five sample units in Middle Sweden, and they had taken part in the study continuously from 1956 to 1960. The 550 subsample farms (to which we refer as the JEU sample) are aggregated by the forty-five sample units to simplify the cartographic presentation of distributions. The distributions are based, therefore, upon a one per cent sample biased toward the better farmers, it is suspected, because of their practice of maintaining bookkeeping records.

The regression interpolation was accomplished by means of the BGB Multiple Regression Program for the Control Data Corp. 1604 Computer, Social Systems Research Institute, University of Wisconsin.
the resource limitations, i.e., the potential productivity which the individual farmer could attain if his goal were optimization and his knowledge perfect.

The surface of actual productivity (Fig. 2) reflects the consequences of the outcome of the technology and organization followed by the subsample farmers during the 1956-1959 period. Given their finite supply of resources, their individual goals, and their levels of knowledge and foreknowledge, the actual productivity reflects the net return to their labor. Even in the zones of highest average productivity, as in R and northern S, the values fall considerably short of parity level with industrial workers' earnings.

The surface of potential productivity (Fig. 3) represents the theoretical limits of labor income with the present distribution of resources, i.e., the distribution of income if farm organization and technology were optimal. Any further increase in productivity would require additional resources. The major determinant of the potential levels is the ratio of the supply of capital to land and labor resources. Where the ratios are low, as in southern T, the poor structural balance limits labor productivity. The potential levels are highest in the northerly zone of Middle Sweden and in R where 4.00 Swedish Kroner (U.S. $0.80) an hour may be earned within present resource limitations. The distribution of potential productivity is closely related to the structural variations in Middle Sweden's farms. Well-structured farms, in terms of the capital ratio, have higher potential levels because the need is not so great to organize resources so as to consume excess labor. When it is considered that the potential values indicated represent the optimum that may be achieved in the short run, it must be concluded that labor income on the sample farms is severely restricted, to an extent which varies spatially, by present structure and shortages of capital resources. This limit or ceiling appears especially noteworthy when one considers that nowhere in

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The four-year period, 1956-1959, rather typical in terms of weather and market fluctuations, was used as the base for both the optimum and actual productivity calculations.
Middle Sweden do even these potential values approach parity with the general income level in Sweden. The variations in the distribution are an indication of the varying degree of structural or resource maladjustment. Potential is merely a measure of available farm resources equated in terms of their income-producing possibilities. Clearly, income on Middle Sweden's farms is restricted by shortages of labor-conserving capital.

Imposed upon the structural maladjustment is the additional gap between the income that is realized and the potential income. We have combined the two distributions into a single ratio of actual to potential income (Fig. 4) to illustrate the extent and the variations in the gap from place to place. The sample population attains a lower productivity than their resources permit. The surface, to which we shall refer as the Productivity Index or PI surface, represents essentially the human element in farming, the consequences of the decision behavior of Middle Sweden's farmers with the resource differences removed. The gap as it varies spatially reflects the departure of the decision behavior of our sample population from that of Economic Man and the degree to which the normative assumptions of optimization, and perfect knowledge must be relaxed in the behavioral analysis. The presence of variations in the PI surface leads one to suspect that there are significant spatial variations in the goals and knowledge levels of the population, and that the decision process has a spatial dimension.

For convenience, the PI surface may be stratified into reasonably homogeneous regions. An analysis of variance test of the distribution of PI values suggested the presence of five separate core areas with more or less distinct boundaries, suitable for a fivefold regional breakdown of the PI surface (Fig. 5). The objective in the regionalization was to minimize the ratio of variance within contiguous regions to that between regions by grouping the forty-five sample units. Although the distributions reflected in Figures 2, 3, and 4 represent the mean values for the 550 farms aggregated by the forty-five sample zones, the regionalization in Figure 5 is based upon the distribution of variance within the sample zones as well.

10 The objective in the regionalization was to minimize the ratio of variance within contiguous regions to that between regions by grouping the forty-five sample units. Although the distributions reflected in Figures 2, 3, and 4 represent the mean values for the 550 farms aggregated by the forty-five sample zones, the regionalization in Figure 5 is based upon the distribution of variance within the sample zones as well.
regional means vary from 58.6 to 72.9 per cent (Region 5 as opposed to Region 1) but as one may infer from the standard deviations, the intraregional differences between farms are considerable.

The two regions with the highest average values of PI (Regions 1 and 2) are as different in terms of physical environment, farm structure and organization, and locational situation as is possible within Middle Sweden. Region 2 is an island of intensive farming and dense agricultural settlement. Region 1 is very sparsely settled with agriculture confined to areas where there occur outcrops of nonmo-rainal soils, such as silty clays and light sands in the narrow river valleys and lakeshores. Similarly, with respect to the other regions, the rank order does not appear to be justifiable from the point of view of physical resources. These have been held largely constant or removed in the calculation of the PI values, so that the variations between the farmers themselves might be perceived and examined as a nonrandom but systematic distribution in the spatial dimension.

The five regions are delineated by the single criterion of PI value. This ratio, however, is a composite index reflecting nearness to or departure from economic rationality. Thus, although the regionalization classifies areas according to a single dependent variable, we know that the classification extends to the explanatory variables also. In Regions 1 and 2, for example, not only are the average PI values relatively higher but because they are higher, then, of necessity, one would expect to find decision behavior more closely approaching that of Economic Man. We would expect to find that resources are more knowledgeably combined and integrated so as to achieve higher profits. On the other hand, the lower average values of PI in Regions 4 and 5 would be an indication that decision behavior was less directed toward maximum profits, and that farm organization and technology were hampered to a relatively greater extent by imperfect knowledge. Thus, the regions reflect a degree of internal homogeneity with respect to the dependent variable, the PI values, as well as the independent variables, knowledge, and goals. The variance between regions reflects also differences with respect to both dependent and independent variables.

**GOAL ORIENTATION**

"Comparison now has to be drawn no longer to test the theory, but to test reality." The evidence presented would seem to suggest that reality is rational. The hypothesis which was examined proposed that Middle Sweden’s farmers do not achieve profit maximization and that productivity is not limited only by the amount and combination of resources. Testing of the hypothesis for a sample population revealed that the average farmer achieved only two-thirds of the potential productivity which his resources would allow. With productivity not at the optimum level, then it may be assumed that one or both of the prerequisites for economic rationality (perfect knowledge and optimizing behavior) are absent.

The alternative concepts of the “optimizer” and the “satisficer” are a central issue in this investigation in terms of their respective value as explanatory guides to the goal orientation of our sample population. To a certain extent the optimizer concept has been introduced into economic geography by the tacit assumption that men organize themselves, their production, and their consumption in space so as to maximize utility or revenue. Whenever the analyst projects his knowledge of the best or most efficient location of economic activities into an explanation of the actual distribution of phenomena and finds correspondence, he assumes, even though tacitly, that man is rational and that his objective reality corresponds with the subjective reality of the actor being observed.

Whereas the profit motive is present in every production decision in the sense that producers may be expected not to seek losses,
maximization may not be so universal. The controversy between the Rationalists and their critics revolves more around the possible shortcomings of theory based upon the assumption of maximization than on the importance of the profit motive in economic decisions.\footnote{14}

Simon and others attack the Rationalists' position that the decision maker ranks all sets of possible alternatives from the most preferred to the least preferred in terms of consequences and then selects the specific alternative which leads to the preferred set of consequences:

Most human decision-making, whether individual or organizational, is concerned with the discovery and selection of satisfactory alternatives; only in exceptional cases is it concerned with the discovery and selection of optimal alternatives.\footnote{15} To optimize requires processes several orders of magnitude more complex than those required to satisfice.\footnote{16}

The appeal of the satisficer concept or the principle of bounded rationality is clear. Based upon sound empirical investigations by social psychologists of actual economic behavior, it requires nothing which is beyond the capacity of the human organism. The decision maker merely classifies the various alternatives in his subjective environment as to their expected outcomes, whether satisfactory or unsatisfactory. If the elements of the set of satisfactory outcomes can be ranked, then the least satisfactory outcome of this set may be referred to as the level-of-aspiration adopted by the decision maker for that problem. His search is complete and the action is taken. The theory suggests that aspiration levels tend to adjust to the attainable, to past achievement levels, and to levels achieved by other individuals with whom he compares himself.\footnote{17}

To some extent, the departures reflected in the PI surface may be attributable to the irrelevancy of the optimization yardstick employed in its construction. There is greater justification for regarding the satisficer concept as more descriptively accurate of the goal orientation of Middle Sweden's farmers than the optimizing criterion. The sample population is more concerned with alternatives which are good enough than in finding optimum solutions. The objective optimum solutions, as revealed by the linear programming analysis, are not perceived by the decision makers, who appear instead to have aspiration levels which they have a reasonable expectation of achieving, such as reasonable profits.

The satisficer model is not easily verifiable, for there is no simple way of determining the aspiration levels of individuals. Regional variations do exist, in the degree to which the farmers are commercially oriented, which are expressed by their lags in shifting with market changes. It may be argued, however, that the lag in response is attributable not to any lack of motivation but may be traced rather to imperfect knowledge which obviates the possibility of maximization. It is debatable, therefore, as to whether we have an optimizing population with imperfect knowledge or a population with goals other than pure profit maximization. Certainly, the distinction matters little and to some extent is arbitrary, for goal orientation and level of knowledge are typically causally interrelated. Limited investigation of this argument revealed that non-economic considerations appear also to influence the decision behavior of the sample population, especially with respect to work preferences.

**KNOWLEDGE SITUATION**

The assumption of omniscience implicit in the concept of Economic Man is not tenable with respect to the decision environment of Middle Sweden’s farmers. Limited to finite ability to reason and compute, to perceive alternatives, and to realize goals, optimization may not be expected. The variations in the PI surface partially reflect these limitations as well as the effects of the uneven flow of information upon which the effectiveness of decisions is based. Information about prices, production methods, and technological changes diffuses through spatial channels which discriminate between producers and create variations in knowledge situations. The emphasis given here to the communication process and the flow of information reflects the conviction that the individual's experience alone is insufficient to carry on productive agriculture. Productivity as a concept may be considered as an innovation diffused from group values.

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\footnote{16} March and Simon, *op. cit.*, p. 140.

\footnote{17} March and Simon, *op. cit.*, pp. 182–83.
Unlike the industrial firms who undertake the search for information on their own, the farm firm is usually somewhat isolated from the source of communicable information. The farmer is largely reliant for the information he needs upon the efficiency of a communication system which he is seldom able to control. The information comes to him largely without expense, in contrast to the situation of the industrial firm, but the lag in the transfer from expert to user is considerably greater, and perception and acceptance of the information are hardly automatic.

To a very great extent, information about recommended farm practices, new agricultural machinery, new seed varieties, expected costs, and market prices originate for Middle Sweden's farmers among institutions in the Stockholm-Uppsala area. Although information is disseminated in a rapid and reasonably efficient manner, the communication process affects farmers unequally and this unevenness is significant spatially.

The diffusion process proceeds by steps, from the experts in the core zone of Stockholm-Uppsala to the disseminating organizations' central offices, then to the local county offices which are situated typically in the county's leading city. This initial process takes place rather rapidly without significant differences from one county to another in Middle Sweden. The transmission then proceeds in stepwise fashion, directed at first to the larger farmers and those situated within the major agricultural districts of each county. An intra-county diffusion process is set in motion which involves filtering and imitation through the farmers' ranks so that considerable lag intervenes until small farmers who are isolated are made aware of new information. Farm size, membership in the farmers' organizations, and location with respect to other farmers all apparently influence the network of communication over the surface. The uneven spatial distribution of farmers according to farm size, membership, and proximity to other farmers is proposed as the primary determinants of the uneven flow of information and the variations in knowledge levels. These governing rules for the communication process may be incorporated within a simulation model in order to estimate stochastically the spatial variations in the supply of information at a given time.

The demand for information may be considered as well as the spatial supply process by assuming, for example, that in the areas of highest potential productivity (Fig. 3) the innovation of rationality would have started earliest, developed fastest, and be least restricted by a ceiling. The communication stream would be fastest in the areas of highest potential productivity (responding to the greater demand for information) and the spatial lag would be greatest where the relative advantages of shifting in the direction of rationality were least (where there is less demand for information). The distribution of opportunities, as revealed by the surface of potential productivity, is suggested as the major determinant governing the demand for information.

It is not sufficient, therefore, merely to substitute the behavioral concepts of finite ability to perceive and absorb information for the untenable assumption of omniscience in characterizing the knowledge situation of Middle Sweden's farmers. Spatial biases exist in the communication channels which enable farmers in some areas to receive information more rapidly and thus to have access to larger funds of knowledge upon which to base their decisions.

**THE ENVIRONMENT OF UNCERTAINTY**

In the discussion of communication channels, it had been assumed that knowledge was essentially available to be disseminated and that knowledge levels were dependent upon the intensity of diffusion. The decision maker is limited further, however, to ex ante information and must bear the consequences for the gap in his knowledge about future events.

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18 The diffusion of information process which is described in this section is an inductive and extremely concise statement generalized from interviews with the sample farmers and the agricultural extension administrators. A description of the analysis and the simulation design which was used to predict the velocity of information flow may be found in the author's Ph.D. dissertation, op. cit.

In addition to the objective uncertainty which occurs because of unpredictable change and variations, notice must be taken also of the uncertainty apparent to individual decision makers which may be considerably different. The uncertainty environment to which the decision maker reacts is dependent not only upon the inherent instability of phenomena but upon the state of knowledge concerning this instability. Uncertainty has a spatial dimension, therefore, not only because the inherent stability of phenomena may differ from place to place, but also because communication channels diffuse information unevenly in space, and because perception varies.

The farmers of Middle Sweden must make decisions in an uncertain environment. These decisions appear with respect to crop and livestock combinations, production techniques, and other practices which affect farm income and survival. The consequences of their decisions during the 1956 to 1959 period are reflected in their productivity distribution for those years (Fig. 2). Most likely, with ex post information, their decision behavior would have been significantly different.

Five types of potential sources of objective uncertainty may be identified which are relevant for Middle Sweden's farmers. Uncertainty may be introduced through instability in: 1) personal factors, e.g., farmers' health and ability to work; 2) institutional arrangements, e.g., government policy, landlord-tenant relationships; 3) technological changes; 4) market structure; 5) physical factors, e.g., weather, blight, and other environmental variables. These potential sources of uncertainty have been reduced systematically, however, through social insurance, legal tenant contracts, and long-term government price policies in the agricultural sector. Only yield variability arising from weather uncertainty remains as the most significant unknown in the planning environment of Middle Sweden's farmers, and its impact is spatially differentiated. Climatological records for the past are an insufficient tool for predicting weather accurately enough to insure optimal selection from among cropping alternatives. Wide and irregular fluctuations of output occur in Middle Sweden's farming which cannot be controlled or predicted. Resources are committed and expended at the beginning of a crop season when output is uncertain and will not be known for months. The period under investigation, 1956 to 1960, was, in aggregate, quite normal for Middle Sweden. Some farmers had ideal weather and good yields but for many others, the cost of uncertainty was wasted effort, expenditures, and unstable income.

Coefficients of yield variations \( \left( \frac{\sigma}{M} \cdot 100 \right) \) have been determined for feed grains (barley, oats, and mixed grains) and winter bread grains (wheat and rye), to illustrate their respective degree of variability during the period 1921 to 1960. The fact that little correlation exists between the yield variability of the different crops may be used to advantage by farmers in deciding upon suitable crop combination and rotational systems. Reducing uncertainty through diversification and complementarity are strategies that are extensively followed by Middle Sweden's farmers. In addition, the correspondence is generally very high between yield variability and crop emphasis. In the areas of relatively higher risk for feed grains, emphasis is shifted to crops subject to comparatively less local variability, as hay.

The separate coefficients of variation for the crop groups have been combined into one measure and weighted by prices (1960), average yields, and the acreage devoted to the individual crops (Figs. 8 and 9). The average percentage departure in crop revenue that may be expected each year may be interpreted from Figure 8. In the high risk zone in the northeast coastal area, for example, total crop revenue may be expected each year to depart by ± twenty-five per cent from the average. Immediately to the north, the average variation is only ± fifteen per cent. The difference may be traced to several causes. The areas differ little in terms of variability for individual crops

\[\text{Data were derived from the primary tables of: Ministry of Agriculture, Permanent skördeskadestydd (Permanent Protection Against Crop Damage), S.O.U. 1958:5 (Stockholm, 1958), and the yield variability tables maintained by the Agricultural Division of the Central Bureau of Statistics, Stockholm.}\]
but in the high risk area a greater proportion of the acreage is devoted to higher risk crops and average yields are higher. The risk is relatively lower in the northwest because yields are normally low for most crops and much of the arable land is planted in lower risk hay. If greater emphasis were given to winter grains, a much higher degree of variability could be expected.

A relatively similar distribution pattern results when the expected variability is translated into a measure of average revenue departure per hectare of arable land (Fig. 9). In the central plains area of E, farmers may expect a normal variation of ± 150 Swedish Kroner per hectare (U.S. $12.00 per acre) each year. An average farm there with thirty hectares of arable land (seventy-four acres) should anticipate that revenue from crops will vary an average of U.S. $900 yearly from the long-term average unless broad diversification is followed. The revenue per hectare varies less in most other areas of Middle Sweden, for less emphasis is given to wheat, oleiferous plants, and other risky crops. The typical farmers in E appear to prefer cultivating the more lucrative crops despite the risk. Greater stability in income is apparently considered more desirable by those in central S.

The uncertainty resulting from unpredictable weather variations is an extremely significant factor in Middle Sweden's agriculture. Even with the present pattern of diversification, farmers must expect their revenue from crops to vary between fifteen and twenty-five per cent from the average. The factor that appears to account to the greatest extent for the spatial variations in this distribution is the emphasis given to individual crops and combinations in the rotation plan, the environment of uncertainty which the individual decision makers determine for themselves.

Spatial inequalities exist at any given time in the extent of foreknowledge possessed by the farmers of Middle Sweden, owing in part
to the inequalities in information diffusion. Foresight is more easily achieved in areas subject to less unpredictable change but knowledge of the methods which are available to reduce its amplitude plays a significant role as well. The communication channels which disseminate information bring news about the technical and economic measures which may lead to greater control over the unknowns. Therefore, we may expect to find that, in the areas of more intense interaction and communication, farmers are better acquainted with the risks involved with alternative enterprises and the means by which uncertainty may be reduced to acceptable risk levels.

The presence of uncertainty eliminates the possibility of profit maximization. Even if the intention is to optimize, imperfect knowledge prevents its realization. The existence of risk and uncertainty about the consequences of alternative courses of action makes it necessary for the decision maker to consider not only the desirability of outcomes but also their probability of occurrence. Courses of action must be determined, the outcomes of which are both sufficiently certain and desirable to satisfy the decision maker. The quest for income stability is apparently at least as important to Middle Sweden's farmers as the pure profit motive. We are aware that in a behavioral investigation the assumption of perfect knowledge must give way to knowledge continuum. Similarly, recognizing that individuals vary in their aversion to risk and uncertainty, the mechanical optimizer must now yield to a utility continuum.

Attitudes toward risk and uncertainty are not easily observable. Theoretically it should be possible to analyze the cropping and other decisions made by Middle Sweden's farmers and determine their respective positions on the continuum scale. This type of evidence is revealing but hardly sufficient alone. Instead, we shall attempt an indirect procedure by

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**Fig. 7.** The yield variability of winter bread grains. (Data drawn from *Permanent skördeskadeskydd* [Permanent Protection against Crop Damage], Statens offentliga utredningar 1958:5, Ministry of Agriculture, Stockholm.)
Fig. 8. The variability of crop yields. (Data drawn from *Permanent skördeskadskydd* [Permanent Protection against Crop Damage], Statens offentliga utredningar 1958:5, Ministry of Agriculture, Stockholm.)

analyzing factors which are hypothesized as causally related to position along the continuum.

Research by social psychologists and others has revealed that certain personal and situational characteristics are related to individuals' attitudes toward risk aversion. Age, for example, has been found to be a particularly important variable. It has been consistently confirmed in these investigations that older people tend to a greater extent to select courses of action which involve lower degrees of risk. In Middle Sweden, a selective migration has all but emptied certain rural areas of young farmers. Therefore, one would expect, if position on the utility continuum were dependent purely upon the age distribution of farmers, that a very definite regional hierarchy on the continuum scale could be expected. This is the sense in which the existence of spatial variations in goal structure is implied. Aspiration levels are difficult to measure and assess but their major dimensions may be perceived through knowledge of factors which affect their formulation.

Factors other than age play decisive roles in the satisficing scale and several have spatial distributions which are nonrandom. Equity position influences the ability to take chances and still survive. Size of family may be expected to influence attitudes toward stability and security. Farmers who are located in areas subject to periodically destructive weather conditions, such as early frost, might tend to select those alternatives which minimize risk. Other factors undoubtedly affect the type of compromise which farmers select, such as amount of available working capital, farm scale, opportunities for efficient diversification or shifting, the time preference in consumption, institutional restrictions in the capital and marketing systems, the time sequence of poor

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22 Walker, op. cit.
years in the past, and personal attitudes toward conservatism or gambling. Some farmers require a certain income to insure the survival of their farm, and they accept the risks necessary to achieve this level. For others who may be considering a change of occupation, nothing less than income parity with nonfarm workers is sufficient. Thus, although income goals themselves may not be revealed through simple measurement, some aspects of their distribution among Middle Sweden's farmers may be revealed through analysis of the distribution of some of the factors mentioned above.

Various alternatives are available to farmers who wish to temper their desire for profit with a measure of security. When uncertainty may be reduced to definite risk probability, maximization at least of expected income is possible. Techniques have been determined for calculating maximum incomes at various risk levels. Even when absolute uncertainty is present and goals are defined in terms of maximum–minimum incomes or other security levels, it is still possible to specify procedures for selecting the best means for realizing these goals.

The risk-programming and game-theory procedures are still normative and are inadequate to characterize the response of Middle Sweden's farmers to uncertainty. For our purposes, the satisficer type of approach appears more appropriate. The farmers of Middle Sweden do not necessarily select the best

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23 For a discussion of these and other factors, see: Proceedings from the Research Conference on Risk and Uncertainty in Agriculture (Fargo: North Dakota Agricultural Experiment Station Bulletin 400, 1955).

Farmers, as other decision makers, may postpone the making of decisions until further information is available. Some of the farmers delay entering into new lines of production until prices appear to be stabilized over a period of time. Many decisions in farming cannot be postponed beyond a very limited date, such as planting or harvesting dates. The retailer and manufacturer may rely upon the constant feedback of information and may make relatively short-run decisions. Farmers must commit large proportions of their resources at one time and have little opportunity of shifting crops, for example, when more weather information becomes available.

The more common means used to avert or diminish risk and uncertainty involve diversification, shifting, and flexibility. Maintaining a cash or semiliquid reserve with which to meet sudden emergencies allows for a degree of flexibility but only at the expense of profits in the short run. Shifting may involve transference from a risky crop to one which gives more stable yields, or the farmer may leave farming entirely and shift to a more certain occupation. Through diversification, a combination of enterprises may be selected which reduces the risks that may be associated with specialization.\(^{26}\) Diversification may succeed in reducing the total variability in returns to a level which is less than the variability of the separate enterprises.

Specialization, even in dairying, is accompanied by considerable risk, and in hay production the risk is much higher, but when the two enterprises are combined, the total income variation is considerably less than either alone (Table 1). Similarly, the lucrative production of rape seed may be undertaken at a comparatively low risk level when combined, for example, with wheat and potato cultivation. By means of diversification, farmers may balance potential profits against potential risk to find a suitable combination of enterprises. Diversification, as with respect to the other measures, may bring about a greater level of stability but at the expense of efficiency or profit. Uncertainty and risk have a cost which detracts from opportunities.


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Table 1.—Diversification and Income Variability

<table>
<thead>
<tr>
<th>Enterprise</th>
<th>Income variation as a percentage of gross income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk cows</td>
<td>21</td>
</tr>
<tr>
<td>Hay</td>
<td>51</td>
</tr>
<tr>
<td>Hay and feed grains</td>
<td>30</td>
</tr>
<tr>
<td>Milk cows and hay</td>
<td>14</td>
</tr>
<tr>
<td>Milk cows, hay, and feed grains</td>
<td>13</td>
</tr>
<tr>
<td>Rape seed</td>
<td>47</td>
</tr>
<tr>
<td>Wheat</td>
<td>38</td>
</tr>
<tr>
<td>Potatoes</td>
<td>42</td>
</tr>
<tr>
<td>Rapaseed and wheat</td>
<td>30</td>
</tr>
<tr>
<td>Wheat and potatoes</td>
<td>33</td>
</tr>
<tr>
<td>Rapeseed, wheat, and potatoes</td>
<td>23</td>
</tr>
</tbody>
</table>

The departures reflected in the PI surface, as well as the spatial variations, may be partly understood through knowledge of the uncertainty-environment to which Middle Sweden’s farmers react, and through the means they have created to provide a controlled environment of relative stability.

**INDICATORS OF KNOWLEDGE AND GOALS**

Essentially, the groups of components which determine the income or productivity of the sample population have been accounted for:

1. the set of farm resources which define the potential or limits of productivity;
2. the goals which define the selection from alternative courses of action according to the desirability of their expected outcome;
3. the knowledge which defines the awareness and perception of alternatives and their consequences;
4. the inherent instability of the farm situation which is defined by the uncertainty of its environment. These components acting in combination account for the variations in the PI surface.

The objective in the empirical analysis is to uncover some of the major indicators of goals and knowledge, measures by which these factors may be perceived. Factors such as age, education and training, technical knowledge, equity ratio, and tenancy may perhaps all be related to the farmers’ attainment levels but it was strongly suspected that resource flexibility largely explains the differences between farmers. Earlier it had been proposed that the most critical element in defining the potential productivity was the balance between resources, especially with respect to capital. The greater is the ratio of working capital to the supply of land and labor resources, the higher is the potential productivity which the farmer can receive. Conceivably, the supply of working capital not only defines the productivity which is possible in the short run but also materially affects how closely actual productivity approaches the optimum on the sample farms.

A supply of working capital permits the farmer to remain flexible, to survive short-term income fluctuations, and to shift rapidly between enterprises. Working capital is invested in such items as fertilizer, seed, and concentrated fodder, any of which may be substituted for quantities of farm land and labor.

A multiple linear regression model was formulated to reflect the proposed hypothesis relating capital intensity to the Productivity Index values. The equation includes the PI values as the dependent variable and five independent variables which reflect the quantity of farm resources:

\[ Y = a_0 + b_{1.2345}X_1 + b_{2.1345}X_2 + \ldots + b_{5.1234}X_5 + E \]

where \( Y \) = the Productivity Index, the ratio of actual to optimum productivity, measured in per cent

\( X_1 \) = arable land, hectares

\( X_2 \) = forest land, hectares

\( X_3 \) = capital, Swedish Kroner in hundreds

\( X_4 \) = labor supply, hours in hundreds

\( X_5 \) = Calculated optimum productivity, Swedish Kroner per man-hour.

Arable and forest land and labor are expected to exert a negative influence on the Productivity Index when considered alone and capital to exert a strong positive influence. The fifth independent variable is the optimum productivity calculation for each farm which was derived from the linear programming solutions and which occurs as the denominator of the PI ratio. The optimum value has been included because it represents a suitable estimate of the overall balance between resources for each farm as well as reflecting, perhaps, the demand for information. The objective of the regression model was to estimate the relative effectiveness of resource combinations as indicators of the farmers’ knowledge levels and income goals.

**Composite Analysis**

The equation was estimated initially for all 550 sample farms, the sample surface of Middle Sweden, considered as one unit. The coefficients of simple correlation, partial correlation, and multiple correlation are indicated in Table 2, along with the stepwise regression27

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27 The stepwise regression computations were performed with the BIMD 09 computer program (BIMD Computer Programs Manual, Division of Biostatistics, University of California, Los Angeles, 1961) on a CDC 1604 computer (Numerical Analysis Laboratory, University of Wisconsin, Madison).
coefficients and their standard errors. The hypothesis relating variations in the PI surface to the supply of capital is strongly supported. With the interrelated effects of the other variables removed, the coefficient for capital rises from 0.54 (the simple coefficient, $r_{y3}$) to 0.74 (the partial coefficient, $r_{y3.12345}$). With respect to arable land, forest land, and labor supply, the coefficients indicate negative association with the dependent variable.

The stepwise procedure is illustrated with respect to the regression coefficients. In step 1, the capital variable, $X_3$, was introduced because it had the largest partial correlation coefficient (0.74) of the five independent variables. At that point, the regression coefficient was 0.63 (indicating that with the addition of 100 Swedish Kroner [*$20*$] of working capital, the average increase in the Productivity Index is 0.63 per cent per man-hour).

In step 2 the arable land variable, $X_1$, enters as the next most significant variable ($r_{y1.2345} = -0.57$). Its entering regression coefficient is -1.39 and this variable is significant at the ninety-nine per cent level also. With the interrelationship between arable land and capital allowed for, the addition of one hectare of arable land (2.471 acres) has the average effect of lowering the Productivity Index by 1.39 per cent. Note how the coefficient for capital rises to 0.94 when the observed relationship between arable land and capital is held constant. From the two regression coefficients, it may be seen that with the addition of one hectare of arable land, 148 Swedish Kroner ($30) of capital (i.e., 1.39/0.94 x 100) must be added to maintain the same Productivity Index value. In the final step, after all the variables have been entered, the coefficient for arable land has become more negative and that of capital, more positive.

The analysis has indicated, empirically for the sample farms, the very significant association of working capital to the Productivity Index. Unless resources of arable land, forest land, and labor are accompanied by considerable amounts of capital, actual productivity falls far short of the potential productivity which the resources permit. The farmers who maintain a balance of resources which includes a relatively high ratio of capital to other resources come closer to realizing the potential for their farms.

**Regional Analysis**

Passing on from the general view of the sample surface to the analysis for the five regions (Fig. 5), significant contrasts in the coefficients may be noticed.\(^{28}\) In Table 3, the

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\(^{28}\) The covariance assumptions with respect to parallax of the separate regression surfaces and nonsignificant differences in variance between regions were not fulfilled.
coefficients determined by estimation of the separate regional equations are indicated.

In Region 1, the north and northwestern section of Middle Sweden where the average sample farm has only seventeen hectares of arable land but forty-three hectares of land in forest, the net effect of capital is more critical in defining how closely actual productivity approaches the potential levels than in any of the other regions. The explanation for the generally high levels of attainment in this region may be understood through the prevailing tendency toward flexibility by maintaining relatively large amounts of liquid or semiliquid assets relative to the supply of arable land and labor.

On the farms of Region 2, the supply of capital per farm is larger than in the other regions of Middle Sweden and this factor apparently accounts for the relatively higher Productivity Index values achieved here. Region 2 is confined largely to the fertile plains areas of $E$ and $R$, yet the average performance level in terms of productivity was no higher here than in the zone of forest farms of Region 1. As has been indicated, the contrast between the two regions in resources and farm situations is about as great as may be found within Middle Sweden. The Region 2 farms have typically the most productive soils, the highest yields, and relatively the largest supplies of working capital. The farms in Region 1 and in Region 2 are similar to the extent that in both types of farm situations a balance between resources has been achieved which is relatively more conducive to productive farm operation than in the other regions of Middle Sweden.

Capital levels are lower in Region 3 even though average acreages of arable land are higher and considerable additional labor is available. These factors contribute to the explanation of why lower levels of productivity are achieved here. Agriculture is less intensive, less capital is available for fertilization, yields are lower, and less productive use is made of the labor supply.

The regression results reveal a similar situation in Region 4, which includes the more forested zones fringing Region 2. Capital is in short supply and the ratio of the supply of capital to the acreage of arable land is the most critical factor in defining how closely actual productivity approaches the optimum levels.

Region 5, representing the central zone of Middle Sweden, includes the farms which achieved the lowest PI values on the average. The ratio of capital to resources of arable and forest land is lowest here, and this factor accounts to a considerable extent for the lower productivity levels. Long-term investments, as in land, buildings, and equipment reach their highest level in this region and the interest on this invested capital consumes, there-
fore, a large proportion of gross revenue, leaving little for labor income.

The regression and correlation analyses indicated that a large proportion of the variations in the PI surface may be accounted for by the variations in capital intensity on Middle Sweden's farms. Together, the five resource variables accounted for seventy-two per cent of the variation in PI values with all the sample farms considered together, and varied between seventy-five and eighty-nine per cent of variance explained in the separate regional analyses. The critical need for capital is apparently so strong as to overshadow the effect of socioeconomic variables. Capital largely defines the productivity which is possible on the sample farms, and defines the actual productivity which is achieved as well.

Reexamination of the Regression Model

To an extent which still remains unknown, a portion of the interregional differences in the Productivity Index may be explained by the differences in capital supply and intensity between the farms in the different regions. To determine whether significant differences still remain between regions, a further test was made by estimating the regression equation again, this time, however, with four dummy regional variables included as $X_6$, $X_7$, $X_8$, and $X_9$ representing Regions 1, 2, 3, and 4, respectively.

Estimation of the new equation gave the following results:

$$Y = 47.51 - 1.48X_1^{**} - 0.14X_2^{**} + 0.99X_3^{**} - 0.09X_4 + 0.63X_5^{**} + 2.80X_6 - 3.31X_7 + 4.47X_8 - 3.90X_9 + E$$

** = significant at ninety-nine per cent level
* = significant at ninety-five per cent level

and partial correlation coefficients for the regional variables:

- $r_{6,12...9} = +0.06$ Region 1
- $r_{7,12...9} = -0.08$ Region 2
- $r_{8,12...9} = +0.10$ Region 3
- $r_{9,12...8} = -0.09$ Region 4

and a coefficient of multiple determination ($R^2$) = 0.75.

As may be noted from the solutions, two of the regional variables emerged as significantly related to the dependent variable (at the ninety-five per cent level of significance). The farms of Regions 3 and 4 are significantly different from those in Region 5 in a respect not accounted for by the other independent variables. In addition, Regions 1 and 3 are significantly different from Regions 2 and 4. For reasons which are unknown, the presence of a farm in Region 1 is an indication that the average Productivity Index is 2.80 per cent above that of the average farm in Region 5 with, of course, all other factors held constant. In Region 2 the net effect is 3.31 per cent lower than Region 5, and so on. Following through with this procedure, it appears that an unknown variable or group of variables is responsible for the interregional differences and accounts for the ranking in terms of net addition to the PI value in the order: Region 3, Region 1, Region 5, Region 2, Region 4. This is the rank order of the regression coefficients for the dummy regional variables. The ranking provides a supplementary guide in the selection of new independent variables which may explain the residual differences between the regions and account for the rank order.

Reexamination of factors suspected to account for the residual regional effect noted above indicated the strong possibility that yield variability, mentioned earlier, would provide the solution. The spatial distribution of normal variability in yields (Fig. 6) corresponds closely with the residual variance of the final equation and it was determined that little intercorrelation exists between this risk variable and the resource variables included within the equation.

Solution of the regression equation for the entire sample surface with the added variable

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had the anticipated result that the dummy variables became nonsignificant. Yield variability did account for the regional effect and it should be added that with the inclusion of this variable, the same proportion of variance was explained, i.e., \( R^2 = 0.73 \). The other regression coefficients remained unchanged with the addition of the risk variable. Yield variability is negatively associated with the Productivity Index.

To a large extent, the variability between regions in the PI scale was accounted for by the six variables included within the revised equation. The regression equations for the regions provide descriptions of the relations between the dependent variable and the five independent variables when the subsets of relatively more homogeneous farms are examined separately. We have said very little thus far about the internal homogeneity of the five regions, however, and our analysis may not be considered complete until a check has been made. In each of the five regions, therefore, the \( Y-Y_r \) residuals from the respective regional equations were plotted for the individual farms in the forty-five sample areas.\(^{30}\)

In terms of the distribution of residuals for the farms within the sample areas, autocorrelation was still present. In some of the sample units, the majority of farms still had residuals that were predominantly positive or predominantly negative. The most obvious characteristic of the distribution of the positive and negative sample units was their location with respect to the core of their respective region. The farms in the fringe sample units most often had residual PI values which were transitional between the values at the core of their region and that of the neighboring region. It was proposed, therefore, that the autocorrelation of residuals on the surface may be attributed partially to the lack of complete homogeneity within the regions, especially with respect to the differences between core and fringe sections. It had not been expected that the boundaries between the regions would be abrupt, and these findings tended to verify the contention that the change in relationship between the variables over the surface is transitional. A further test of the regression equations with a new independent variable designed to measure distance from the regional core zone confirmed the observation about the clustering and the spatial autocorrelation was accounted for. A subsequent plot of the new residuals revealed no systematic spatial clustering. It may be concluded, therefore, that the variations in the PI surface have been accounted for empirically by the six independent variables plus the distance factor.

The objective of the empirical analysis was to pinpoint and isolate indicators of the knowledge level and goal orientation of Middle Sweden's farmers. Based upon the contention that, whereas the variations in the PI surface are logically (according to the model) attributable to variations in farmers' level of knowledge and goals with respect to income, these factors are sufficiently elusive and difficult to measure that more concrete variables would be desirable as indicators. The empirical analysis has indicated preeminence of capital intensity as a guide to understanding the spatial variations in farming technology and organization.\(^{31}\)

**SUMMARY**

It has been necessary to relax all of the assumptions of economic rationality in order to interpret the spatial variations in the labor productivity achieved by Middle Sweden's farmers. As a group, the sample population does not achieve profit maximization, nor are its goals directed solely to that objective. Perfect knowledge is denied by the existence of unpredictable change and lag in the communication and perception of information. The decision behavior reflects not only the objective alternatives which are available, but also man's awareness of these alternatives and the consequences of their outcomes, his degree of aversion to risk and uncertainty, and his system of values.

\(^{30}\) The objective of this procedure was to test for spatial autocorrelation, to determine the extent to which the residual variance was clustered spatially. Plotting the residuals permits us to observe the applicability of the single regional equation in describing the relationship between variables uniformly over the surface in that region.

\(^{31}\) Rationality in farming is, thus, a cumulative learning process. Most essential is the accumulation of a capital surplus from year to year which is plowed back into current production rather than invested in land, building facilities, and equipment.
The concept of the spatial satisficer appears more descriptively accurate of the behavioral pattern of the sample population than the normative concept of Economic Man. The individual is adaptively or intendedly rational rather than omnisciently rational. Alternatives are considered which are conspicuous (i.e., about which he has received information). To avoid uncertainty, he attempts to emphasize short-run reactions to information feedback and to arrange a negotiated environment.\textsuperscript{32}

If the distribution of the individual farmers is considered and allowances are made for spatial lags in the communication process, variations in aspiration levels, in the inherent instability of planning environments, and in attitudes toward the avoidance of risk, then the spatial variations in farming activities, productivity, and income may be more clearly understood.

The framework of matched comparison between Middle Sweden's farmers and Economic Man was designed with several purposes in mind. The initial objective was to demonstrate the inappropriateness of the rational model in explaining the variations in productivity. A secondary purpose was to locate regions of "maladjustment" or "disequilibrium" where resource restrictions or organizational and technical gaps limit the attainment of income parity. The primary emphasis, however, has been devoted to the third objective, to substitute for economic rationality and its assumptions of optimizing behavior and omniscience, a more descriptive behavioral theory which allows for a range of decisions behavior and spatial variations in decision environments.

\textsuperscript{32} Cyert and March, \textit{op. cit.}, pp. 99–127.