TOWARD AN IDEA OF AGRICULTURAL ECONOMICS: A CRITIQUE ON THE IDEA OF THE APPLIED ECONOMICS OF AGRICULTURE

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I. Is Agricultural Economics Dead?

"There is no such thing as agricultural economics—there is only economics applied to the problems of agriculture" (Kelso 1965, p. 16). The "'real' agricultural economists have become extinct" (Castle 1970, p. 832). Using John Dewy's criteria of doubts, conflicts and confusion, there clearly is a problem, i.e., the "survival" and "identity" problem, in agricultural economics amenable to a critical review.

In recent years much concern has been expressed about the profession. Is agricultural economics an independent scientific discipline apart from the so-called general economics? As an academic profession is it legitimate and relevant? What sort of a science is agricultural economics? Is research in agricultural economics relevant to the practical problems of the rural-agricultural economy? What are significant agricultural problems to be dealt with by agricultural economists?

Many agricultural economists have also expressed their concerns about reorienting research problem areas and, subsequently, their profession itself. Some have argued that agricultural economists should either (1) attach themselves more systematically to general economics, or (2) expand the scope of their subject matter and adopt a "multi-disciplinary approach." These suggested areas of expansion include resource-environmental economics, institutional economics, and rural economics.

Why have so many prominant scholars of the profession so often stressed a reorientation of this so-called scientific discipline? Why do some critics assert that there is no such thing as agricultural economics? Why have agricultural economists as a group of academic professionals been so much concerned with orientation—or reorientation? The following quotation from Buchanan is quite suggestive: "There does exist doubt and fear, at least on the part of some, concerning the long term viability of the subdiscipline's status" (1969, p. 1028). Clearly, there is some concern among agricultural economists about the future of agricultural economics as an independent and relevant scientific discipline.

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In this problem situation, agricultural economics and agricultural economists are suffering from what is called the survival problem caused by the identity crisis. The term "identity" in Webster's Seventh New Collegiate Dictionary (1972, p. 413) means "sameness of essential or generic characters in different instances." What are the generic characters which describe the group of academic professions, agricultural economists? How do they identify themselves today?

Probably the majority of agricultural economists identify themselves as either "applied economists" or simply "economists," without paying much attention to the importance of the adjective "agricultural." Some others may prefer to be called "rural social scientists," or recently, "resource economists." Further, the applied economists of agriculture believe that they are economists, rather than "agricultural economists," because they employ economic principles and theories in studying rural-agrarian problems. By the economic principles they mean the principles of the orthodox economics which is characterized by the classical and the neoclassical-Keynesian economics. In this context, applied economists assert: "Agricultural economics does not have a unique body of theory and methods. Agricultural economics research involves the application of economic theory and appropriate (usually quantitative) methods to problems arising in or related to the agricultural sector" (Fox and Johnson 1969, p. xi).

Therefore, the applied economists of agriculture turn their attention to the identification of a unique set of "agricultural problems" as their relevant research problem areas. In other words, they believe that agricultural economics can be established as a subdiscipline of economics by defining a set of unique rural-agrarian problems as subject matter. This mental habit of agricultural economists causes what is called "identity crisis."

As a consequence of this identity crisis, the scientific community of agricultural economics must face the survival problem. This is the case simply because the future survival of agricultural economics depends upon whether there exists a set of relevant and legitimate rural-agrarian problems. Under the fear of exhausting relevant research problems and the questioning of their legitimacy, agricultural economists must inevitably redirect and redefine research problems areas to fit the accepted definition of agricultural economics. This is implied in the present definition of agricultural economics. The presently accepted definition may be stated: Agricultural economics is a field of applied economics. Its task is problem-solving empirical research done via applying economic theory to the problems arising in or related to the agricultural economy.

In other words, clearly the present survival problem of agricultural economics has resulted, in principle, from the identity crisis identifying agricultural economists with applied economists or economists under the accepted definition of agricultural economics. The belief that agricultural economics can be established as an applied field of economics by defining unique research problem areas is the very source of these problems. This

is because of agricultural economists' habit of applying only neoclassical economic theories to agricultural problems, which conflicts with the need to move their discipline into the solutions of new and neglected problems of agriculture, and to maintain the important role to be played by them. This conflict causes agricultural economists to question the validity of the present definition of their discipline and their identity. Until they can overcome this important problem, there will be uncertainty about identity, and their future as a profession will be in danger.

How have agricultural economists come to take the definition for granted? What is wrong with this definition? How can the present survival and identity problems can be overcome? These are the questions which this paper takes up as its starting-point.

II. The Paradigm Shift in the Idea of Agricultural Economics and Its Consequences

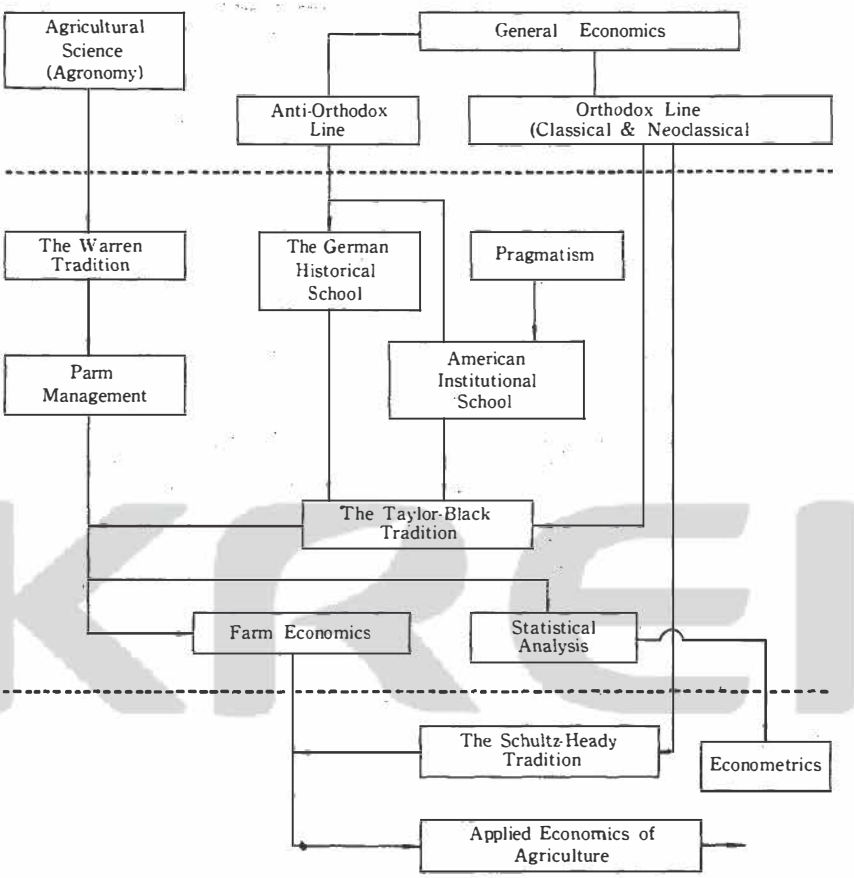
One way of understanding the present problem situation in agricultural economics more clearly is to review in a historical context how agricultural economists have formulated their views of the idea of their discipline. The term "idea" indicates the meaning of agricultural economics as a science. That is, the idea of agricultural economics is primarily concerned with what agricultural economists mean by the "science" of agricultural economics. As the following discussion will indicate, the presently adopted definition of agricultural economics is a result of what may be called the paradigm shift in the idea of agricultural economics during the 1940's and 1950's. The paradigm shift was initiated as an effort to solve what I propose to call the "Schultz Dilemma" in this paper. This problem, in turn, emerged from the problem situation of the early agricultural economists' view of the idea of agricultural economics during the 1920's and 1930's. Therefore, a brief review of the rise and development of agricultural economics is in order, as depicted in Figure 1.

1. The Taylor-Black Tradition

Generally speaking, during the 1920's and the 1930's Henry C. Taylor and John D. Black made a great contribution to formulating the idea of agricultural economics as an independent scientific discipline. In principle, both Taylor and Black held that the newly emerging scientific discipline, agricultural economics, would be both an independent theoreticals cience as well as an applied science.

Taylor, agreeing with the idea of the French agricultural economist, Estine Jouzier (Taylor 1952, p. 92), asserted that agricultural economics should be considered as a science from a theoretical point of view and as an art or an applied science from a practical point of view. According to Jouzier, as a science, agricultural economics treats the principles and

Figure 1 The Origin and Growth of Agricultural Economics in The United States, 1900–1977



basic laws which underlie the coordination of all partsof the farm operation (land, labor, equipment, and the various lines of production) in a manner that enables the farmer to secure maximum net profit, and as an art, agricultural economics applies such principles to a given farm. Although Taylor agreed with Jouzier's idea of agricultural economics, he argued that Jouzier's scope of agricultural economics was too limited. Instead, Taylor suggested that agricultural economics deals not only with the principles which underlie agricultural production, but also with all other economic forces and conditions affecting the "farmer's share in the national dividend and . . . the relative well-being of the agricultural population" (1919, p. 7). In this sense, Taylor classified three major subjects of agricultural economics as (1) economics of production in terms of problems of choice; (2) economics of marketing; (3) economics of maintaining and improving the position of farmers.

In contrast, Black suggested that "agricultural economics is both a pure science of the specialized type, and an applied science like engineering" (1959, p. 665). what Black meant by the term "specialized pure-science" was science which deals with general principles, such as the principle of diminishing return, as they applied to agriculture. On the other hand, Black defined the term "applied science" as "the employment of the principles of a science in the performance of tasks" (Ibid., p. 665). By giving this definition, Black asserted that "agricultural economics is much broader than can be included under the term applied . . . " (Ibid.). For Black, agricultural economics research is concerned not only with solving problems that are both particular and practical, but also with the testing and refining of the general principles of agricultural economics in the conditions of agriculture.

Black also distinguished two types of research: the "specialized pure-science type" and the "remedial applied-science type" (Ibid., p.667). Under this distinction, Black argued that one important obstacle to the development of agricultural economics as a specialized pure-science is "the pressure under which so many agricultural economists are placed to do applied economics works of the second sort" (Ibid., p. 665).

Taylor and Black also held that agricultural economics as a pure theoretical science based its theoretical foundations upon a "coordination" of all relevant scientific knowledge, i.e., the physical and biological principles of agriculture as well as those of economics. In this sense, they considered both agricultural science and economics as the two most relevant sister scientific disciplines to agricultural economics. In fact, Black's specialized type of pure science of agricultural economics emphasized this coordination as the foundation of theories of agricultural economics.

In other words, for them agricultural economics was not an applied sub-discipline of economics. Instead, economics was only one of the fields relevant for the study of agricultural economics. Although they clearly admitted the importance of economic principles, they did not take economic theories themselves as theories of agricultural economics. Indeed, they may agree with following argument of Forster: " . . . the farmer in making his decisions is not affected or motivated solely by economic conditions which are so important to the urban industrial enterprise. It is for this reason that the analysis borrowed from or based upon purely urban business enterprise has not been in the past or is not likely to be in the future especially effective when applied to farming" (1940, p. 124).

Many early farm economists shared this view and believed that the economic structure of the agricultural sector differed from that of the non-agricultural sector, although they recognized the interdependence between the two. They were critical of the mechanical application of economic principles and theories to the study of agricultural problems, in spite of the fact that they emphasized the application of certain relevant economic principles, i.e., the principle of diminishing returns and the law of supply

and demand.

2. The Emergence of the Schultz Dilemma

In contrast, generally speaking, the new generations of agricultural economists during the 1930's and the 1940's were preoccupied with "economics" rather than with "agricultural economics." They soon discovered that there existed a gap between their viewpoints and those of the existing farm economists of the Taylor-Black tradition concerning the idea of agricultural economics.

During the late 1930's and the early 1940's, Theodore W. Schultz offered a number of systematic criticisms. He argued not only against the limited use of economic theory, but also against the general belief in the possibility of agricultural economics being an independent theoretical science, as well as an applied science apart from economics.

In 1939, Schultz criticized the limitation of the methodological theses underlying the Scope and Methods series published under the editorship of Black. In his review, Schultz argued that "symtom of the immaturity of economics is the wide gap which separate theory and research" (1939, p. 705). He asked, "Why is it that of this large and actively engaged professional group, not many individuals are making use of modern economic techniques in their empirical studies?" (1940, p. 64). He argued that "all too little has been done to bring the two together" (1939, p. 705).

That is to say, Schultz conceived the existing gap between the fact-finding empirical research of the early farm economists and their limited use of the well-established body of neoclassical economic theory as a problem to be solved. In this sense, I propose here to refer to what Schultz viewed as the problem as the "Schultz Dilemma." This dilemma may be stated as follows: What is the proper relationship of agricultural economics research to economic theory? The nature of this dilemma concerns a determination of the proper idea of agricultural economics in its relation to the so-called "general economics." In this sense, the Schultz Dilemma became the central problem of the idea of agricultural economics during the 1940's.

As part of this problem, Schultz argued that "to speak of farm management, marketing, or any similar compartment of study as being both pure science and applied science is not very helpful. On the contrary, it is quite confusing" (1939, p. 713). He objected to the Taylor-Black distinction between the pure or theoretical and the applied agricultural economics. Instead, he emphasized that "we need to understand more clearly the nature of economic theory and of empirical research" (1940, p. 64). In other words, Schultz contended that the Taylor-Black idea of agricultural economics as being an independent theoretical scientific discipline is simply a result of confusing the relationship between theory and empirical research. Schultz also objected to the idea of coordinating all relevant scientific knowledge, not just economic theory, for the theoretical foundation of agricultural economics. Therefore, he stated that "the coordination of the strictly intel-

lectual aspects is probably best accomplished by an economic orietnation'' (1939, p. 714).

In short, as an idea shared by most of the new entrants into the field of agricultural economics, the Schultz Dilemma raised doubts about the general view of the early farm economists of the Taylor-Black tradition concerning: (1) the possibility of a pure theoretical and applied agricultural economics: (2) the idea of coordination of theories from relevant disciplines for the theoretical foundations of agricultural economics; (3) the limited use of the existing economic theories. Nevertheless, their most fundamental concern was with the unsatisfactory state of agricultural economics in relation to general economics.

Then, how did they attempt to solve the Schultz Dilemma? That is, what was their alternative view on the idea of agricultural economics in relation to that of economics?

3. The Schultz-Heady Tradition

Theodore W. Schultz and Earl O. Heady were the two major contributors to the solution of the Schultz Dilemma and, therefore, to the establishment of the new view of the idea of agricultural economics during the 1940's and the 1950's. Their view was constructed within the context of the methodological viewpoints suggested by Alfred Marshall, A. C. Pigou, Frank H. Knight, and Lionel Robbins. In principle, Schultz and Heady adopted the general economists' dichotomy of theoretical (or pure) and applied (or practical) economics, and confined agricultural economics to to the latter.

a. Theodore W. Schultz on the Idea of Agricultural Economics

In order to give a definite relationship between economic theory and agricultural economics research, Schultz had to distinguish two types of research: (1) theoretical research designed to test and advance the theoretical framework of economics: (2) applied research designed to apply economic theory.

According to Schultz, the first type of theoretical research can be further distinguished into theoretical analysis and empirical research. He stated that the primary task of theoretical analysis is (1) ''to make explicit what is implicit in the presuppositions of economics'', and (2) ''to bring the results into harmony with one another'' (1939, p. 715). That is, for Schultz, this type of theoretical analysis is highly abstract and logical in character. However, he held that the logical conclusions of theoretical analysis must be tested empirically. Therefore, he emphasized the roles of the second type of theoretical analysis, the empirical tests.

Schultz explained that empirical research is (1) ''to determine how accurately and with what precision the presuppositions of economics describe the reality they represent,'' (2) ''to provide supplementary and secondary postulates,'' and (3) ''to test the significance of each in understanding a

given economic problem." Therefore, Schultz suggested that "it would . . . be highly appropriate for research to try to ascertain how valid the basic presuppositions of economic theory really are." Schultz concluded that "theoretical economics is not a priori in character as is mathematics and pure logic; instead, it is fundamentally empirical as is theoretical physics or as is the abstract structure of any science" (1939, pp. 715–176).

Clearly, unlike the generally accepted view of the methodology of economics,[1] Schultz adopted the "realistic" view on the one hand, and "hypothetico-deductivism" of Knight,[2] rather than "a priori deductivism" on the other. Therefore, Schultz admitted that the fundamental presuppositions or postulates of economic theory are not a priori but hypothetical truths. Their empirical validity must be tested in reality because they are intended to describe certain aspects of the real world.

According to Schultz, there is another type of research applying the established body of economic theory to the solutions of practical problems in reality. The primary task of this applied research is "to explain specific economic activity with the view to control." This is what Schultz called "prescriptive problem-solving research" or applied research (1939, p. 716).

Furthermore, in order to apply economic theory to agriculture, Schultz must test whether the presuppositions of economic theory are significant in the reality of agricultural economy. He believed that it is possible to derive various testable hypotheses about the economic behavior of farmers, the nature of farm products, production processes, and the economic organization of agriculture based upon the existing body of neoclassical economics. As a result of testing hypotheses against obesrvation, he maintained that "eventually a fairly well-established collection of hypotheses can come into being and can form an integrated core of theory that begins to explain the group of phenomena being studied" (Jones 1952, p. 443). This approach constitutes the empirical phase of theoretical research. Jones called this approach in agricultural economics the Schultzian approach. This approach may be characterized as theory-oriented empirical research as emphasized by those agricultural economists of the Schultz-Heady tradition.

Under the above methodological viewpoint, however, Schultz delimited the idea of agricultural economics as follows: "I shall assume our task to be problem-solving; that is, research, and the approach to be primarily empirical in nature. Also I shall assume that we are not tool makers but that we are (or at best should be) using the best tools available" (1940, p. 61).

[1] The generally accepted view of the methodology of economics during the late 1930's and the early 1940's was "instrumentalism" combined with "a priori deductivism" and/or "conventionalism." Most orthodox economists believed that a system of economic theory is a mere set of definitions or instruments for economic analysis (instrumentalism), rather than a description of the real world (realism), and that some fundamental principles of economic theory are not only human conventions (conventionalism) but also a system of a priori truths following deductive reasoning (a priori deductivism).

[2] The "hypothetico-deductivism" of Knight is his early view explained in his *Risk, Profit and Uncertainty*.

Schultz clearly confined the idea of agricultural economics, or more correctly, agricultural economics research, primarily either to the empirical phase of theoretical research involved in formulating and testing hypotheses, or to applied research solving practical problems of agriculture. In both cases, Schultz emphasized that the well-established body of economic theory serve as a set of analytical tools given to agricultural economists.

In fact, Schultz also adopted Pigou's dichotomy of tool-making and tool-using (Pigou 1931, pp. 2–4). In other words, at the level of theoretical research Schultz adopted the realistic view of economic theory as a description of reality. However, at the level of agricultural economics research, Schultz, applying the instrumentalistic concept of economic theory, contended that an established body of economic theory becomes analytical tools or instruments which should be applied by agricultural economists. There is little to indicate Schultz realized how his view of hypothetico-deductivism combined with realism differs from instrumentalsim in the foundation of epistemology and methodology. Nevertheless, Schultz inconsistently adopted the instrumentalistic concept of theory, while retaining the realistic view.

In other words, Schultz solved the Schultz Dilemma simply by delimiting agricultural economics to the subdiscipline of economics. He narrowed the scope of agricultural economics into the field of applied empirical research. For Schultz, the proper relationship between agricultural economics and the so-called general economics was the former's surbordination to the latter.

b. Earl O. Heady on the Idea of Agricultural Economics

Schultz's idea of agricultural economics received more rigorous treatment by Earl O. Heady. In a sense, Heady provided the definite turning point in the history of the development of agricultural economics. Through his articles and his most important book, *Economics of Agricultural Production and Resource Use*, published in 1952, Heady contributed to the methodology of applied economics of agriculture. More specifically, Heady introduced what might be called the "doctrine of (uncritical) reductionism" based upon the assumption of the "oneness of economic principles." By formulating this doctrine, Heady justified Schultz's idea of agricultural economics as an applied field of economics.

What is called the doctrine of (uncritical) reductionism Heady explained in the following statement: "Agricultural economics is simply economics applied to agriculture. It draws upon economic theory for its basic laws and analytical models. Few if any laws have emerged from empirical research in agriculture which were not already explained by or implied in the logic of economic theory" (1949, p. 837). This statement suggests that all the economic principles of agriculture derived or capable of being derived from agricultural economics research, if there are any, can be reduced to economic principles formulated in the existing body of neoclassical econ-

omics. That is to say that both the agricultural and the non-agricultural economy are governed basically by the same economic principles.

Heady's doctrine of reductionism is essentially based upon his belief in the oneness of economic principles, which in turn appears to be based upon the methodological viewpoints of Lionel Robbins, including his definition of economics. In agreement with Robbins, Heady asserted that economics is a science of choice and decision-making. In this context, Heady adopted Robbins' famous dichotomy of "ends" and "means," as well as the fundamental economic principles of maximization and economization. Heady further distinguished "ends" into "intermediate" and the "ultimate" ends. According to him, intermediate ends are actually means for the attainment of ultimate ends. "In terms of economics," said Heady, "the ultimate objective refers to maximization of satisfaction or welfare." Although he recognized that "ends are determined by the values of individuals and groups," and that they represent the decisions of people with respect to "what is right" or "what ought to be," Heady simply took the economic principles of maximization for granted as a given set of ultimate ends in agricultural economics (Heady 1952, pp. 3–6).

Within the framework, Heady argued that on the one hand, economic problems of agriculture can be defined "in the conceptual manner whereby an optimum use of resources can be pictured mentally." On the other hand, they can be defined in the concept of "ideal type" of resource use. In other words, "economic problems are almost always defined relative to ends and goals. On the one hand, the conditions of economics which define a maximum or a minimum can be used to specify problems. Given the end which is to be maximized (farm profit, family satisfaction, or national production efficiency), a problem exists if the optimum or maximum condition has not been attained" (Ibid., p. 9).

According to Heady, there are largely two types of economic problems: (1) the problem of choice of production, or resource allocation; and (2) the problem of consumption, or income allocation. However, for Heady, both problems are, in principle, "concerned with the allocation of income or product between different alternatives over a period of time" (Ibid., p. 6). Therefore, both problems are included in the problems of choice. As a result, according to Heady, "the 'oneness' of economic principle in its application to all resources, all products, all economic units grows out of the fact that the problems involved are always those of choice between alternatives . . . " (Ibid., p. 7).

In this context, Heady believed that all the economic problems of agriculture are essentially problems of choice, and, therefore, the pure logic of choice in neoclassical economics can be applicable "to the use of capital, labor, land and management resources in the farming industry," and to the production of units of all magnitutes including agricultural economy (Ibid., p. 4 and 7).

Heady went further by saying that "economics involves very few basic

principles, laws, or relationships. The individual who has knowledge of those applicable to production also has knowledge of those which apply to consumption, and vice versa; each relationship in one of these major problem areas has its counterpart in the other area." That is, an "economic principle is simple and universal. Knowledge of a few basic concepts provides tools for handling a wide range of problems" (Ibid., pp. 6–7). In this relation, Heady expressed his view on the nature of economic theory as follows: "The laws or theorems of economics are a deductive set of propositions derived by the rules of logic from basic propositions called assumptions or postulates" (1949, p. 842). Further, "the logic of economic postulates is obviously valid and needs no empirical verification even though it be possible" (Ibid., p. 840). Heady, like many other Schultzian agricultural economists, took the existing system of neoclassical economic principles as a given valid theoretical system as well as a set of analytical tools for the applied research of agricultural economics. In this context, Heady argued that although "applied economists often attempt to search out a 'different' or 'unique' set of principles to describe their subject matter or justify their field of specialization . . . . There is no unique principle . . ." (1952, p. 7).

In short, Heady, like Schultz, delimited the field of agricultural economics to an applied field of economics based upon his two fundamental assumptions of the doctrine of (uncritical) reductionism and the oneness of economic principle. Furthermore, two assumptions of Heady were derived basically from his belief in the validity of the definition of economics provided by Robbins and in the universal validity and applicability of the pure logic of choice and the principle of economization of neoclasical economics. However, unlike Schultz, Heady inclined more toward an a priori deductivistic view of economic theory, rather than a hypothetico-deductivistic view, by adopting the view of a priori self-evident economic principles. Therefore, Heady in a sense emphasized the dogmatic acceptance and application of neoclassical economic theory to agricultural economics research.

III. A Critique on the Idea of the Applied Economics of Agriculture

The presently accepted definition of agricultural economics delimiting it narrowly to an applied field of economics is responsible for the identity crisis which in turn creates the survival problem of agricultural economics. The present dogmatic belief in the validity of neoclassical economic theory and its mechanical application to the agricultural economy is a prejudiced and unscientific approach rather than an objective and scientific approach.

1. Some Uncritical Assumptions

All the above criticisms are based upon the realization that the present

definition of agricultural economics is founded upon two fundamental mistaken assumptions: the first one is the assumption that a scientific discipline can be established by defining its unique subject matter or research problem area, and the second is the assumption of the oneness of economic principle and what is called the doctrine of "uncritical reductionism," in contradistinction to that of "critical reductionism."

The first assumption is mistaken simply because it does not correspond to facts. That is to say, as John S. Mill stated, "the definition of a science has almost invariably not proceded, but followed, the creation of the science itself" (1844, p. 120). According to Karl R. Popper, the belief that any scientific discipline is distinguishable by its unique subject matter may be "a residue from the time when one believed that a theory had to proceed from a definition of its own subject matter" (1968, p. 67). Popper further argues: "But subject matter, or kinds of things, do not . . . constitute a basis for distinguishing discipline. Disciplines are distinguished partly for historical reasons and reasons of administrative convenience . . . , and partly because the theories which we construct to solve our problems have a tendency to grow into a unified system. But all this classification and distinction is a comparatively unimportant and superficial affair. *We are not students of some subject matter but students of problems.* And problems may cut right across the borders of any subject matter or discipline" (Ibid.).

Further, if any scientific discipline can be established and develop its theory only after having conclusively sufficient definition of its subject matter, and if there is no such definable unique subject matter, then, there can be no scientific discipline which distinguishes it from others. In a sense, this difficulty in defining a unique set of agricultural problems is precisely the situation of agricultural economics reflected in the survival problem.

However, the history of the development of agricultural economics shows that it is not an authoritative definition of agricultural economics but a historical accident, i.e., the world-wide agricultural depression during the late nineteenth and the early twentieth centuries, which brought agricultural economics into a scientific discipline of social science. In other words, the emergence of this discipline is the result of the problem situation and, subsequently, certain peoples' efforts to explain and to solve the problems by the construction of hypotheses, proposals, arguments, etc. In light of this situation, the following statement of Popper is worthwhile to quote: "I am quite ready to admit that many problems, even if their solution involves the most diverse disciplines, nevertheless, 'belong' in some sense to one or another of the traditional disciplines . . . . this is because each of them arises out of a characteristic of the tradition of the discipline in question. It arises out of the discussion of some theory, or out of empirical tests bearing upon a theory; and theories, as opposed to subject matter, may constitute a discipline . . . " (1968, p. 67).

In this context, the term "agricultural economics" itself may be considered simply as a convenient name designating a group of scientists, in-

cluding their research and the results of their scientific activity, whose prime interests are to explain and solve agricultural problems. However, it is not the unique characteristics of agricultural problems but those of theories, hypotheses, arguments and criticisms that characterize agricultural economics as a scientific discipline.

Therefore, the problem of the relevancy and legitimacy of agricultural problems is a relatively unimportant problem because there cannot be such legitimate and unique problems which provide the justification for the independent existence of agricultural economics. All the problems of the agricultural economy are interrelated with social, political, economical, and physical or natural problems. Therefore, the tradition of dealing with those complex and inter-related problems, theoretically and technologically, gives a minimum assurance for the independent existence with autonomy of agricultural economics.

Unfortunately, however, most applied economists of the Schultz-Heady tradition adopted the mistaken assumption, and asked what agricultural problems uniquely characterize agricultural economics as a scientific discipline. The question led them to a serious consequence which completely denies the autonomy of agricultural economics itself. That is, because of their precoccupation with the neoclassical economic theory they seemed to find that there are no such unique agricultural problems. For them, all economic problems of agriculture are the same as general economic problems in terms of the problem of choice, optimization, disequilibrium, etc., and, therefore, they concluded that there is no justifiable excuse for agricultural economics being an independent scientific discipline separated from economics. At best, it can be, or should be, an applied field of economics utilizing the same theories and models of neoclassical economics. This attitude has been further strengthened by the other assumptions of the oneness of economic principles, the doctrine of uncritical reductionism, and the dogmatic belief in the neoclassical economic theory.

The doctrine of reductionism itself is logically tenable if and only if there exists in fact the oneness of economic principles. In addition, this oneness can be accepted if the agricultural economy as well as the non-agricultural economy in fact are governed by the same economic principles. Further, if we succeed in reducing all agricultural economic principles to the more general universal economic principles, e.g., to neoclassical economic principles, it would be a great contribution not only to agricultural economics but also to economics in general. In this sense, it should be emphasized that a scientific theory always has a tendency to grow into simpler, more general and universal theories than before, and from these a great number of hypotheses can be deduced logically. This attitude may be termed "critical reductionism," in contradistinction to "uncritical reductionism." Uncritical reductionism, as expressed by Heady, is simply a linguistic assumption that all the agricultural economic principles, if there are any, can be reduced to the general principles of neoclassical economics

without demonstrating such reduction empirically.

In order to show the possibility of genuine reduction in the first place, there must be a valid set of agricultural economic principles and general economic principles. However, this is not enough. The reduction of an agricultural economic principle to the general economic principle must be demonstrated. Without this empirical or logical demonstration, the mere linguistic assumption is at best a hypothetical proposition which is subjected to critical demonstrations.

However, one of the serious consequences of this linguistic reductionism was what Heady called the oneness of economic principles. In other words, based upon the doctrine of uncritical reductionism the applied economists of the Schultz-Heady tradition suggested a proposal that all economic principles are the same and universal. Therefore, the neoclassical economic principles are those of agricultural economics. Subsequently, these economists encouraged the adoption of the neoclassical economic theory, including its mechanical application, as the theory of agricultural economics. They even emphasized that the main task of agricultural economists as scientists is not to develop theories and hypotheses but to apply the existing set of analytical tools of neoclassical economic theory.

Unfortunately, the applied agricultural economists adopted both hypotheses—the doctrine of uncritical reductionism and the oneness of economic principles—as if they are valid in reality. They assumed the two hypotheses to be two fundamental premises for agricultural economics. In this context, they were able to define agricultural economics as an applied field of economics, or more correctly, an applied field of neoclassical economics. In short, they imposed the neoclassical economic framework on farmers, farm production, farm resources, and farm economists. They evaluated the performance of the agricultural economy based upon the neoclassical criterion of value judgment. They went even further and formulated various policy proposals in order to realize the ideal of neoclassical economic theory in terms of the reality of agriculture.

In conclusion, the present definition of agricultural economics adopted by the majority of agricultural economists under the influence of the Schultz-Heady tradition is based upon mistaken and logically untenable assumptions. The definition simply contributed to agricultural economists' dogmatism concerning the validity of neoclassical economic principles. This dogmatic and prejudiced attitude in turn served as mental barriers restricting agricultural economists' creative imaginations.

2. The Psychological Aspects of the Schultz Dilemma

The above criticism allows us to clarify the present problem situation of agricultural economics, which is to determine whether the survival and identity problem is real and logically genuine. An answer to the question is quite clear. Both the survival and the identity problem are not real and genuine problems, but artificial, or at best psychological, problems because

both problems are raised by the present definition of agricultural economics, which in turn is formulated based upon mistaken assumptions. Therefore, the present problems of agricultural economics can only be solved by "methodological decision," i.e., a decision not to adopt the present dogmatic definition but to accept a critical attitude instead.

However, there is still another problem involved in the Schultz Dilemma which is largely psychological rather than logical. The problem concerns the use of the name "economics." Some may argue that because agricultural economists use the same name "economics." there must be a certain relation between economics and agricultural economics. In other words, the use of name "economics" raises the psychological problem of the Schultz Dilemma.

However, economics is simply a name for a scientific community which has a rich and long tradition extending from the classical economics to the modern neoclassical-Keynesian economics. The use of the name economics in agricultural economics is a matter of borrowing the name. As shown in the history of the development of agricultural economics, this scientific community was once known as "farm managmeent" or "farm economics" in order to distinguish this particular discipline. The name "economics" is simply a name nothing more or less. In a logical sense, therefore, it is evidence of psychological confusion to assert that because agricultural economists use the same name, agricultural economics must apply the same principles of neoclassical economics, or that agricultural economics is an applied field of neoclassical economics. Further, there is no reason in a logical sense to believe that the proper relations between agricultural economics and neoclassical economics means the subordination of agricultural economics to neoclassical economics. But these psychological problems cannot be overcome by any logical or rational means. At best, they can be solved only by a methodological decision, as suggested earlier. Otherwise there is no alternative.

There is another psychological confusion in the applied economists' reasoning. They argue that agricultural economics today does not have its own unique system of theories, but it applies theories of neoclassical economics. This fact may be true at the present stage of the development of agricultural economics. Further, this fact was often used by applied economists as a means of justifying their belief that agricultural economics is an applied field of economics. However, this line of reasoning of the applied economists is logically untenable simply because they are responsible for the dogmatic acceptance and mechanical application of neoclassical economic theories as the theoretical foundation of agricultural economics. In a sense, as a result of their efforts, the present scientific community of agricultural economics may be retarding the development of its own system of theories by establishing a mental barrier of dogmatism and uncritical attitude in viewing neoclassical economic theory. In other words, the applied economists emphasized the application of neoclassical economic theory, and

now they argue that the fact of the widespread use of neoclassical economic theory in agricultural economics justifies their assertation that agricultural economics is an applied field of economics. This kind of circular reasoning is the very source of the mental barrier keeping agricultural economists in dogmatism, and agricultural economics a scientific discipline irrelevant and irresponsive to the real world problems of agricultural economy.

IV. Toward an Idea of Agricultural Economics

What, therefore, is an alternative idea of agricultural economics? In other words, what sort of a science is agricultural economics? Is it a science, or an art, or both? Is it simply an applied field of so-called economics? What do agricultural economists mean by the "science" of agricultural economics? These questions lead us to the question of the meaning of science in general and of agricultural economics in particular. In searching for an answer to the above questions, this paper introduces Popper's view on the idea (or aim) and criterion of science.

1. The Idea of Science

What does Popper mean by "science" and "scientific knowledge"? How does he formulate the aim of science? In principle, Popper holds that the aim of science is to discover a "true description of the world, or of some of its aspects, and true explanation of observable facts" (1968, p. 114). But such descriptions or explanations, i.e., theories, are man's creations, and their truth or falsity only can be decided by attempts to falsify, rather than to verify, them. Therefore, only those theories which can be tested or refuted belong to science. That is, "scientific knowledge," distinguished from all other forms of human knowledge including metaphysics, must be testable or falsifiable. For this reason, Popper proposes that "the criterion of the scientific status of a theory is its falsifiability, or refutability, or testability" (1968, p. 37).

For a clear understanding of Popper's concept of "science," two meanings of science must be distinguished: (1) science-as-product, and (2) science-as-process. According to Richard Rudner, "science-as-process" refers to "the activities or workings of scientists of scientific institutes, i.e., to experimenting, observing, reasoning, reading, organizing research projects, etc.," whereas "science-as-product" represents a product or "a result of these activities or processes,... a corpus of *statements* purporting to describe one or another aspect of the universe and embodying what counts as our scientific knowledge" (1966, p. 8). In this sense, the first meaning may be described by the term "scientific activity," and the second by "scientific knowledge."

In short, scientific knowledge is the product of man's psychological and subjective scientific activity. In this sense, the term science usually means scientific knowledge only. Popper's view of science, therefore, can be sum-

marized as follows: science in terms of scientific knowledge is one of the greatest creations of the human mind.

However, the more important thing which characterizes science is scientific activity itself, for thesimple reason that it is engaged in the process of producing scientific knowledge and advancing it. That is, scientific activity is a special type of human action purposely directed to searching for truth. However, the personal or psychological process of constructing (or discovering) new ideas or theories must be distinguished from the inter-subjective process of advancing or critically examining proposed ideas or theories. This process of examining theories as products is in principle governed by a certain set of methodological rules. In this sense, the inter-subjective process of theory examination may be described as an objective process.

Scientific activity is a goal-directed, conscious human activity mainly performed by the so-called "professional scientists." Their goal is to search for truth. Popper characterizes scientists as those who have "humbly devoted themselves to the search for truth, to the growth of our knowledge; men whose life consisted in an advance of bold ideas" (1974, p. 977). Although scientists "can never claim to have attained truth," Popper says, "the striving for knowledge and the search for truth are still the strongest motives of scientific discovery" (1968, p. 278). And this can be done only by bold conjectures and the severest criticisms.

Popper further distinguishes two types of science into (1) theoretical science and (2) technological (or engineering) science. The fundamental aim of theoretical science is to explain and predict natural and/or social events with help of hypothetical theories and models, and natural and/or sociological laws. Its aim is to test these theories, models, and laws logically and empirically. In contrast, there is a technological or engineering approach. Its prime interest is to solve practical problems of the real world by proposing various proposals based upon theories, models, and laws. That is, theoretical science is solving theoretical problems by proposing "propositions" which are subjected to the test of truth or falsity, whereas technological science proposes policy "proposals" which can be criticized, but whose acceptance or rejection is more or less dependent upon man's decisions and his moral standards.

2. Toward an Idea of Agricultural Economics

What sort of a science is agricultural economics? As implied in the previous discussion, the main thesis of this paper is simply this: Agricultural economics is a theoretical as well as technological (or practical) discipline of social science. As a theoretical discipline, agricultural economics attempts to discover (or construct or postulate) its theories, models, hypotheses, etc. In doing this, the aim of the scientific inquiry is to search for truth, and, therefore, to contribute to the growth of the scientific knowledge of agriculture. The process is a never-ending one. As scientists agricultural economists constantly face old and new problems of agriculture. In order to solve

them, they are engaged in constructing theoretical solutions, in testing, criticizing, and improving them.

A great number of theoretical problems of agriculture are waiting for agricultural economists' creativeness, inventiveness, and imagination. For instance, some of the problems are as follows: Why is it unavoidable to sacrifice farmers in the process of economic development? Why cannot agricultural productivity be increased without reducing the number of farmers employed in agricultural production? If the development of agricultural technology is the main force generating disequilibrium in farming, why are the farmers in constant need of new and advanced technology? In other words, cannot agricultural production be increased without involving the "vicious technological treadmill"? If the farmers are responsive to market price change, then, under chronically unfavorable market price conditions, why are farmers still employed in the farming enterprise? Why doesn't an increase in agricultural productivity accompany, proportionately, the increase in farm income? Theoretical solutions to any of the above problems are not only important for a clear understanding of the functioning of the agricultural economy and farmers' economic behavior, but also have practical implications for farmers' welfare. Furthermore, in solving those problems agricultural economists may employ the existing body of neoclassical economic theory, including all other relevant scientific theories, as a starting point for an inquiry into agricultural economic theory. They can learn many useful ideas and receive insights from other scientific disciplines in developing their hypothetical conjectures about the agricultural economy.

In this context, the "method of analogy" may be suggested as a critical approach involving the application of scientific theories of other disciplines, including neoclassical economics. This method more specifically involves three steps: (1) a selection of relevant theories developed in scientific disciplines other than agricultural economics; (2) a construction of a hypothetical "analogical model" corresponding to the original theory; (3) a test of the constructed analogical model in the conditions of agricultural economy. In this case, the original theory, e.g., the neoclassical economic theory, can serve as a "theoretical model" for constructing an "analogical model" of agricultural economics. The correspondence between the original theoretical model and the constructed analogical model is the logical or formal resemblance under the assumption that in reality the corresponding relationship may exist in terms of the structural or substantial resemblance as suggested in the original theoretical model. In other words, it is assumed that when an economic principle holds in the industrial-urban economy it may hold also in the rural-agricultural economy. However, the validity of a constructed analogical model is not a matter of assumption but a matter of empirical testing. The analogical model must be subjected to empirical tests and its truth or falsity must be critically determined. The construction of the analogical model itself is an important step toward the discovery

of agricultural economic principles in the sense that any falsification of this constructed model may raise certain critical questions such as why a neoclassical economic principle not does work in the agricultural economy This method of analogy is closely related to what has been called critical reductionism. The method of analogy may be one way of demonstrating empirically that a critical reduction of an agricultural economic principle is in fact a principle of neoclassical economics.

In contrast, a clear case of the method of analogy uncritically employed in agricultural economics may be found in Heady. According to Heady's farm-firm analogy, the answer to the question "why should we call a farm a firm?" is simply that it allows us to apply the profit maximization principle and other related neoclassical economic theories to the farming business. The empirical validity of such a constructed farm-firm analogy essentially depends upon whether there exists such structural identity between the farm and the firm in the real world of agricultural economy. The farm-firm analogy is not a matter of logical exercise, or assumption, but a serious empirical hypothesis to be tested critically.

In this context, probably one of the most important theoretical works to be done in agricultural economics is to subject all the taken-for-granted neoclassical economic theories and models to critical tests in the conditions of agriculture. In relation to this, the following remark of Taylor still has certain insight: "There are many . . . false doctrines which clear thinking will shatter. At the present time some of these false doctrines are being used to keep the farmer from securing a fair share of the national income. Their users should be challenged. The facts are still clear, but opponents of justice for the farmer are befogging the issue by the false theories. Farm economists should test every hypothesis stated or unstated which lies behind every theory which is paraded in public" (1929, p. 367).

As a technological discipline, agricultural economics attempts to solve the practical problems of the agricultural economy by proposing and evaluating various policy proposals and programs. In this process, technological agricultural economists apply accepted theories of agricultural economics. In this sense, technological agricultural economics is an applied field of theoretical agricultural economics. However, this distinction between theoretical and technological agricultural economics is not exclusive and complete. In practice, they are mutually interrelated to help each other. However, one clear distinction is that theoretical agricultural economics is primarily interested in proposing and revising or improving "propositions," whereas technological agricultural economics is primarily interested in proposing "proposals." That is, the fundaental aim of theoretical agricultural economics is to search for truth and for objective knowledge which bears practical implications. In contrast, technological agricultural economics is to solve, or to help to solve, practical problems in the real world.

In conclusion, agricultural economics cannot be established as a

scientific discipline by defining a unique subject matter, but it may be characterized by its scientific traditions, such as the problems, discussions, hypotheses, theories and models produced by agricultural economists. In other words, such traditions may give an answer to the following question: What sort of a science is agricultural economics? The scientific tradition of agricultural economics, although it is not long and rich in comparison to that of economics, is still growing and will strengthen agricultural economists' theoretical competence and practical fruitfulness. Furthermore, one of the most contrasting methodological traditions between agricultural economics and economics is that the former always retained to a greater or lesser degree the empirical tradition which is so weak in economics. In addition, agricultural economics also emerged as a scientific discipline under the influence of the critical attitudes of the German Historical School and of the American Institutional School. The old critical and empirical tradition of the Taylor-Black tradition of agricultural economics must be clearly recognized and acknowledged because this tradition is the very scientific spirit which guards agricultural economists from unscientific dogmatism.

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