Journal of the Korean Geographical Society, Vol. 33, Special Edition, 1998 (697~707)

The Regional Human Ecosystem and Cultural Adaptation in Rural Korea

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Abstract : Existing theories about causal relationships between population change and resource management are classified into three categories: population-based, technology-based, market-based theories. These three single-factor theories only partially explain the ecological complexity of the real world which an empirical researcher faces. The critical review of these theories suggests the proposition that all three elements(population, technology, market) must be embodied in a single explanatory framework. The regional human ecosystem, coupled with cultural adaptation, provides such a conceptual framework for the historical understanding of interrelationships between human culture and environment. The assumption here is that any one of the single factors may be a causal factor at any time in the transformation of the regional human ecosystem and in the change of cultural adaptation.

The regional human ecosystem in rural Korea is an ecological system consisting of four components(population, agriculture, market, institution). The change in a specific component may instigate re-adjustments through cultural adaptation of systemic relationships between this element and the others, and then, of systemic relationships among all four components. Cultural adaptation is defined as the continuous modification of behavioral patterns in response to changing environments by means of selective retention of behavior that confers increased adaptedness upon the members of the society. The strategies of cultural adaptation available to farmers in Korea have been the choice of population control including migration. Institution has also been a principal agent in cultural adaptation and thus transformation of the regional human ecosystem in rural Korea.

Key Words : population-based theory, technology-based theory, market-based theory, rural Korea, the regional human ecosystem, cultural adaptation, adaptive strategy

요약 : 인간과 환경과의 관계의 역사적 변천을 인구변화와 자원관리의 측면에서 분석하는 기존 관점은 인구기초이론, 기술기초이론, 시장기초이론 등으로 분류된다. 이러한 관점은 어느 한가지 변수를 독립 변수로 가정하는 입장을 취하므로 흔히 '단일요소이론'이라고 불리며, 제각기 장점이 있기는 하지만 현실 세계의 복합성을 단지 부분적으로 설명하는데 그치는 문제점을 내포하고 있다. 현실세계의 모든 사건은 개방된 체계 속에서 발생하기 때문에, 모든 사건은 단선적인 인과관계로 파악될 수 없을 만큼 서로 복합하게 얽혀 있다. 이에 대하여 문화생태이론은 단일요소이론의 그러한 한계를 극복하고 현실세계의 복합성을 분석할 수 있는 개념과 방법을 제시하고 있다. 문화생태이론은 실로 인간과 환경과의 관계가 역사적으로 변천해 온 과정을 탐구하는데 적합한 개념과 방법을 장점으로 내세우는 새로운 관점이라 할 수 있다.

문화생태이론은 인구, 기술, 시장, 제도 등 요소의 중요성이 시간과 장소에 따라 다를 수 있다는 가정 하에서 어떠한 요소라도 어느 한 장소와 시점에서 인간과 환경과의 관계의 변화를 주도할 수 있다고 기대한다. 한국 농촌의 인간과 환경과의 관계를 탐구함에 있어서 활성되어야 할 문화생태이론의 기초적인 개념은 '지역인간생태계'의 '문화적 적응'이다. 한국 농촌의 지역인간생태계는 그 특성상 인구, 농업, 시장, 제도로 구성되어 있다고 볼 수 있다. 문화적 적응이란 변화하는 환경 속에서 사회구성원들의 환경에 대한 적응도를 높일 수 있는 행동양식을 새로이 선택하는 행위를 일컫는다. 한국 농촌에서는 적응전략이란 농업의 집약화와 상업화 또는 산아제한과 인구이동이라는 측면에서 분석될 수 있을 것이다. 생존, 기술, 취락형태, 토지이용, 무역이나 교역 등은 적응전략을 분석하는데 간접적인 자료를 제공해 줄 것이다.

주요어 : 인구기초이론, 기술기초이론, 시장기초이론, 한국 농촌, 지역인간생태계, 문화적 적응, 적응 전략.

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1. Introduction

Adaptation, in particular cultural adaptation, is defined as the continuous modification of behavioral patterns in response to a change in the physical environment or a change in internal stimuli, such as demography, economics, and organization. In the discipline of cultural ecology, it was suggested that the concept of adaptation provides criteria for the analysis of historical process and cultural change. But, dealing with time and geographical scale has proved difficult in cultural ecology in geography and anthropology. In part, this explains the absence of a well-developed conceptual framework which encompasses the ecological complexity of contemporary societies. In addition to cultural adaptation, the regional human ecosystem is a concept best suited to the study of historical and cultural change of man-environment relationships.

In this paper, it is proposed that cultural adaptation and the regional human ecosystem constitute a conceptual framework which can be applicable to the study of rural Korea. As compared with numerous single-factor theories that presuppose population, technology and market as the principal factors, these two concepts provide the theoretical framework of analysis that recognizes the complex interactions among environmental and cultural variables. In the real world, changes occur in an open system and so therefore a multitude of events. In the critical review of single-factor theories the pitfalls of the 'other-things-being-equal' proposition are stressed in the historical and empirical research about rural Korea.

2. Single-Factor Theories

Existing theories about causal relationships between population change and resource management are classified into three categories, depending on assumption about the principal independent variable. These are population-based, technology-based, and market-based theories.

1) Population-based Theories

Population-based theories assume that the provision of family goods, not maximization of profit, is the prime concern of a majority of farmers. Chayanov(1966) argues that one of the primary determinants of the farmer's behavior is the effective use of the family labor to avoid hired labor. The amount of the labor product is mainly determined by the size and composition of the working family and by degree of self-exploitation, through which a specific equilibrium between family satisfaction and the drudgery of labor itself is maintained(Chayanov, 1966, 5).

Intensification, under these circumstances, can take place without change in the market situation. Pressure from a growth in family size beyond the carrying capacity of the cultivated area can lead to intensification(Chayanov, 1966, 8). Every family has its own age structure and growth rate which conditions the amount of labor available as well as the demand for consumption. When the labor force increases as family age and size increase, families which once sowed small area tend to expand their sown area and to increase their labor intensity

Boserup(1965), Barlett(1976), and others have also stressed the importance of population growth as an explanatory factor in agrarian change over time. Indeed, Boserup inverts the Malthusian theory. She postulates that societies whose populations have reached the limits of productivity under an existing agricultural system will develop more intensive methods of agriculture(Boserup, 1965, 117-118).

A Corollary to this theory is that adoption of more intensive technologies of production occurs in order to relieve population pressure on resources at a given lower level of intensity. Cultivators, then,

will often resist intensification until they are forced to adopt more productive methods of cultivation because of population pressure on the resource base(Barlett, 1976, 125).

Boserup assumes that with each increase in output per unit of land, output per unit of labor is more likely to decline rather than increase. In sum, population-based theories hold that population growth is an independent variable whereas technology is a variable dependent upon population growth.

2) Technology-based Theories

In contrast, technology-based theories, or in a sense, resource-based theories, hold that the population of any given area is dependent upon its technological capacity to extract resource given a constant consumption standard. The population ceiling is determined by the carrying capacity of the agricultural system at a specific subsistence level[1]. This assumption stems from a Malthusian long-term historical perspective in which population growth is determined by technological improvement which increase a consumption premium[2]. Successive technological improvements lead to consumption surpluses above preexisting minimum levels.

Population size, then, increase when there is a consumption premium; it decreases when there is a consumption gap. Population expansion without a consumption premium, Malthus maintains, would have brought into play 'Malthusian checks' like wars, epidemics and famines, which have historically held population growth in check (Wrigley, 1969, 33). Population stagnation, in this view, can only be broken by the technological advance of raising labor productivity above the minimum standard of caloric consumption. The level of technology imposes an absolute upper limit on population size.

Kuznet(1966) notes that population change during the modern era of growth is a technological phenomenon. The high and accelerating rate of population growth in the modern era is the result of a reduction in the death rate, which was induced by advances in medical science and health. Elvin(1973), a proponent of the controversial high-level equilibrium trap model in premodern china, argues diminishing returns by the late eighteenth century in that country[3]. He believes that a mysterious and hidden upper bound to technological change during the agrarian epoch can only be broken by modern science and technology.

Between 1000 and 1800 in china, as the land frontier closed, it was the ingenuity of Chinese technological adaptation which allowed the population to expand slowly and continuously. During the second half of nineteenth century, however, the ability of Chinese agricultural technology to support increasing population had reached its limit. Elvin(1973) also supports this idea. In his view, the optimum condition in Qing China when population produced maximum economic welfare was reached between 1750 and 1775, after which population growth slowed(Ho, 1959, 270).

3) Market-based Theories

Market-based theories disagree with the view that farmers pursue principles of least effort or maximum output per labor input in order to maintain a minimum consumption or subsistence level. These theories assume that farmers are profit-maximizers who seek to improve their standard of consumption and living. Heinrich von Thünen was one of the first to emphasize market accessibility as a determining influence on the degree of intensity of agricultural input and thus the level of population density[4]. Heinrich von Thunen's theory implies that even when capital or land is scarce, favorable market conditions may cause a higher intensity of land use even without population pressure, because earnings from selling commercial crops and their processed goods are higher than those from cultivating subsistence crops. Under an

unfavorable market situation, however, labor intensive crops usually produce a smaller labor payment than do more labor-extensive crops. Commercialization of farming, therefore, would lead to an increase of population density.

Myers and others(1972) suggest that the commercialization of agriculture in China accommodated a certain degree of overcrowding. In early modern China, positive market conditions enabled farmers to adopt new cropping patterns, to engage in crop specialization, and to apply more labor to the production of certain cash crops with very little change in farming technology. In other words, without peace, stability, and a sustained government program to promote technological change, commercialization of agriculture alone permitted the Chinese agricultural system to support a larger rural population without changing rural living standards. Small farmers specializing in one or two cash crops purchased much of their food needs in the market place. The impetus to adopt new cropping patterns requiring more labor was not population pressure on the land, but the incentive to increase market surplus(Myers, 1972, 173).

Keidel's work in South Korea supports this view. Here, The spatial variation of farm product and farm productivity in South Korea has been closely associated with accessibility to urban market since the 1960s(Keidel III, 1981, 173-176). Traditional agricultural areas like rural Korea have been outstripped in terms of agricultural productivity by areas close to growing urban centers.

3. A Comparison of Population-based, Technology-based, and Market-based Theories

These three single-factor theories only partially explain the ecological complexity of the real world which an empirical researcher faces in studying a modern agricultural society. For instance, population-based theories, most notably championed by Boserup, appear to be relevant only to pre-industrial societies. They exclude from basic consideration farmers who are profit maximizers with access to technological input.

In pre-industrial societies, Boserup argues, the only available response to population pressure is intensification, an increase in the frequency of cropping. This idea is too restrictive to be used in the study of modern agricultural societies where intensification is one of a number of possible responses to population pressure. The frequency of cropping is not a precise measure in regions such as in rural Korea where multiple cropping is already widespread and other methods of intensification such as fertilization are available. Moreover, intensification is not the only response from farmers where population pressure can be relieved by out-migration.

Environmental constraints on innovations are also inadequately dealt with in Boserup's theory. In the lowland ecozone of rural Korea, for example, massive in-migration was possible once modern water-control technology was introduced. This was also true in the lowland areas where wet-rice farming is practiced in Taiwan, Vietnam, Thailand and Burma[5].

Furthermore, while implying that spatial variations in the intensity of land use principally reflect variations in population pressure, it does not seriously consider variations in the accessibility of markets. Since the beginnings of modernization, farmers in many regions throughout the world have been increasingly dependent upon market conditions. In summary, population-based theories are better suited to the study of pre-industrial societies where over time farmers can adapt to the population pressure without any significant access to open markets.

Technology-based theories also fail to recognize

the full variety of adaptive strategies available to farmers. They rule out the possibility that farmers may practice birth control to maintain their standard of consumption or living before they are caught in a 'Malthusian check'. Technology-based theories assume that the only motivation for birth control is to maintain the minimum level of consumption. Such an assumption may well suit long-term global trends from a macroscopic perspective. But it has been proved that even under a constant level of technology, farmers can support a growth in population by greater participation in marketing or by more elaboration on their labor skills.

In Tokugawa Japan, for example, the slow growth of population in this pre-industrial society may have been caused not by desperate peasants resorting to infanticide under agricultural impoverishment, but by prosperous peasants who prohibited additional children to maintain their standard of living and their status within village society(Hanley & Yamamura, 1977, 36). Hanley and Yamamura(1977) suggest that the impact of Malthusian checks such as wars, epidemics and famines on population growth may have been overemphasized. They also point out that in Tokugawa, many farmers used a variety of seed types in order to reduce the risk of yield fluctuations, to distribute labor more efficiently throughout the year, and to plant seeds which were best suited to the local soils(Hanley & Yamamura, 1977, 99).

Market-based theories are inadequate to deal with societies where farmers are not fully incorporated into the market system. It is widely recognized that a nearly complete organization of environments in market terms is achieved only in modern and capitalist markets(Polanyi, 1957, 56-57 & 178-191). In pre-industrial societies, by contrast, production is often confined to kinship units, and subsistence farming predominates(Dalton, 1967, 33). Exchange and consumption are deeply embedded in family and village. Agricultural production may be rooted in social relations, particularly in societies like pre-modern Korea where unqual partable inheritance was the rule.

4. Toward a Unified Theory of Population Change and Resource Management

The critical review of existing single-factor theories suggests the proposition that all three elements--population, technology, and market--must be embodied in a single explanatory framework if adaptive change is to be understood. The regional human ecosystem, coupled with cultural adaptation, provides such a conceptual framework for the historical and empirical analysis of interrelationships between population change and resource management. The assumption here is that any one of the single factors may be a causal factor at any time in the transformation of the regional human ecosystem and in the change of cultural adaptation.

New basic questions arise concerning under what circumstances a certain element is more likely to initiate the adaptive processes that readjust the systemic interrelationship among elements. In rural Korea, for example, when do farmers decide to stay and intensify their land use, to out-migrate, or to practice population control in face of population pressure and why? When do farmers decide to specialize on labor-intensive crops for market rather than to diversify labor-extensive crops for subsistence, and why? When do farmers continue to have more children instead of reducing the number of births, and why? Finally, what kinds of methods or indices can be used to investigate and answer these questions?

In the study of rural Korea, consisting of many already complex regional human ecosystems even prior to modernization, it seems clear that

institution, in addition to population, technology and market, should be included as a component in the regional human ecosystem. As early as the eighteenth century under the Yi Dynasty, national and local policies of city formation, taxation, and commercial growth played an important role in farmers' adaptive choices and preferences. The well-woven system of periodic markets, the family ideals of unequal partable inheritance and family continuity through male lineage, independent family farming, and private rights of property ownership provides institutional constraints and incentives for choices of adaptive strategies clearly different from those of other countries.

Through time, public policy has become a more active agent in the institutionalization of cultural adaptation. The colonial policy of developing large-scale irrigation projects, for example, created a sophisticated irrigation bureaucracy and landlordism, within which farmers had to select their own adaptive strategies. The Japanese colonial government also introduced artificial cross-breeding programs in the selection of seeds. In the Korean Republican period, farmers became freeholders through land reform. They owned barely enough land to be self-sufficient. The drive for industrialization, initiated by the government, expedited urban dominance in the local as well as national economy. In this brief review of history, it can be easily assumed that in rural Korea, choices of adaptive strategy have been made under constraints generated from organizations and their rules, procedures and policies.

The concept of institution, however, has been rarely mentioned and utilized in cultural ecology, notwithstanding, organization, particularly sustenance organization, has been treated as one of the four principal components of the so-called *ecological complex*(Duncan, 1959: 678-716)[6]. Wagner(1975) proposes that the role of human beings operating institutionally to change or maintain their environments should become a primary concern of cultural ecology. He bases this proposition on the belief that most human behavior derives its significance from its institutional context. In order to better the understanding of the ecological complexities of modern, urban situations, Cohen(1976) also draws attention to an institutionalized process, involving social relationship among participants, against technological competition. Bennett recently argued that if anthropologists wish to adequately deal with contemporary environment problems, they will be required to use the concept of institution or develop their own version of it(Moran, 1984, 295). In light of such an inherent shortcoming in contemporary cultural ecology, there should be some attempts to develop the concept of institutionalization to aid in the analysis of cultural adaptation in rural Korea.

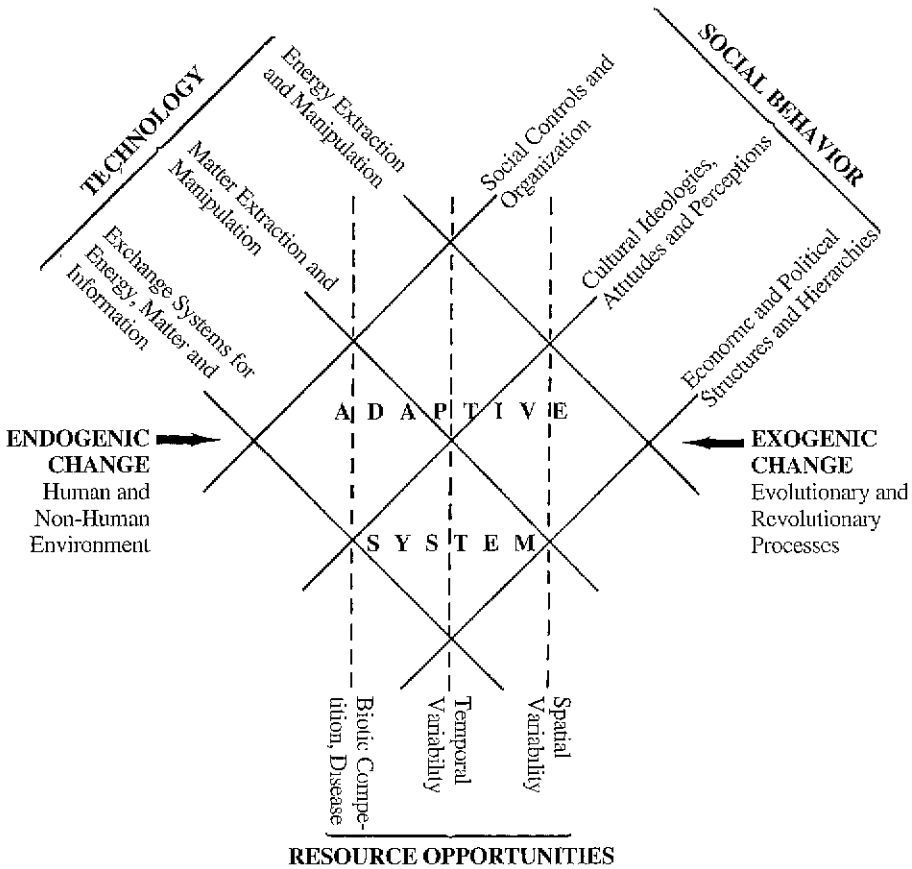
5. The Regional Human Ecosystem and Cultural Adaptation

The regional human ecosystem in rural Korea is an ecological system consisting of four components–population, agriculture, market and institution[7]. Any change in systemic interrelationships among these components may be triggered by change in any one of these components. The change in a specific component may instigate re-adjustments through cultural adaptation of systemic interrelationships between this element and the others, and, then, of systemic interrelationships among all four components. Futhermore, it is assumed that this regional human ecosystem change as an open system[8]. Indeed, in human ecosystem changes occur at the intra-regional, national and international scales.

A notable characteristic of the regional human ecosystem in rural Korea is its growing dependence since the late eighteenth century on wet-rice farming and on the marketing of rice for rural

subsistence. It is well known that the supply and control of water is the most important aspect of irrigated paddy cultivation, because rice will be grown in a wide range of soils given an adequate and well-controlled water supply. Paddy soils tend to acquire their own special properties after use, so that initially a low natural fertility does not prohibit cultivation if adequate water is supplied(Geertz, 1963, 29-30). Wet-rice cultivation is also noted for its resiliency in supporting increasing population through intensification(Geertz, 1963, 32). In rural Korea, where rice was highly valued as a cash as well as a subsistence crop, there had been a tendency for farmers to convert dry fields into paddy fields wherever drainage and irrigation permitted(Figure 1).

Cultural adaptation is defined as the continuous modification of behavioral patterns in response to changing environments, natural and social, by means of selective retention of behavior that confers increased adaptedness upon the members of society(Kirch, 1980, 110). That is, given a changing environment, certain kinds of behavior - within a total range of behavioral variation - confer a greater adaptedness upon the population. These behaviors are selected for and retained in the cultural pool of learned behavior, being transmitted from one individual to the next. In short, cultural



Source: Karl W. Butzer, 1982, Archaeology as Human Ecology, Cambridge, Cambridge University Press, 286.

Figure 1. A three-dimensional model for the interactive variables of an adaptive system

adaptation is the process of selectively fitting behavior to a specific environment.

Adaptive strategy refers to these patterns of adaptive or maladaptive behavior. Adaptive strategy may be broadly defined as the set of culturally transmitted behaviors with which a population relates to its natural and social environment(Kirch, 1980, 129). The term strategy is appropriate here, because adaptive strategy is the set of behaviors which serves as the primary means for dealing with problems posed by a heterogeneous and changing environment. A pattern of adaptive behavior is a strategem for optimizing a population's fitness given the conditions of variability, uncertainty, constraint, and limitation that are imposed by environment. It has been suggested that adaptive strategy may be analyzed in terms of components or subsystems, such as subsistence, technology, settlement pattern, land use and trade or exchange(Kirch, 1980, 137).

One of the strategies for cultural adaptation available to farmers in rural Korea has been the choice of population control including migration. Institution has also been a principal agent in cultural adaptation and thus the transformation of the regional human ecosystem in rural Korea. Demographic trends, therefore, can be used as bases of analysis for cultural adaptation. Demographic trends are defined as temporal and spatial trends of population characteristics, and as bases of analysis for cultural adaptation(Hardesty, 1977, 123)[9]. A basic premise is that demographic trends, temporal or spatial, approximate states of cultural adaptation. The temporal and spatial variations of population characteristics, such as number of persons, number and size of households, and sex ratio, are the results of adaptive mechanisms of social behavior, technology and resource opportunities(Figure 1).

In addition, some elementary terms and concepts can be used to explain the adaptive mechanisms or changes in adaptive strategy. Among these are subsistence, carrying capacity, intensification, diversification, specialization, commercialization, ecological zonation, stability, efficiency, urbanization, and institutionalization. Human problems of biological reproduction and the reproduction of social control are solved through population control on the one hand, and resource management on the other. Settlement patterns are generated through the interaction of social and ecological process, and, in a way, it may reflect adaptive mechanisms.

7. Conclusion

In the review of single-factor theories, their theoretical weakness was revealed in the historical and empirical study on the cultural adaptation in rural Korea. These theories assume a process of selection from a variety of adaptive strategies at a given time and place. The ecosystem concept is proposed as an alternative framework of analysis within which institutionalization plays a key role in adaptive process. The concepts and indicators of intensifiation, commercializaton, population control and others were introduced for further elaboration.

An ecosystem or ecological system is a relatively stable set of organic relationships in which energy, material and information are continuously circulating, and in which all processes are seen in terms of their system-wide repercussions. It is, therefore, assumed that specific changes may begin anywhere in the ecosystem, and trigger adjustment and re-adaptation among the other elements. It is also assumed that a single factor or multiple factors may emerge as transformers of systemic relationships in the culminating stages of political or societal development. Based on such an ecosystem concept, a revised concept of regional human ecosystem was proposed for the historical and empirical study

of man-environment relationships in rural Korea.

The main argument in this paper is that institutionalization, herein defined and used in a broad sense, should be given more attention, if the adaptive processes of complex modern society is to be understood. Although organization has been seen as a specific human means of adaptation to environment, no effective studies on the role of organization in cultural adaptation have been seriously undertaken in the discipline of cultural ecology. So far, more attention has been given to population growth, the numbers of people sustained by the environment, and diversification, intensification and energy efficiency of resource use.

Notes

1) Carrying capacity, in theory, is the size at which a population can be permanently supported by its environment. However, carrying capacity in reality is determined by the amount of land available for cultivation, the level of technology, and consumption standards including dietary habits.
2) Classical Malthusianism is derived from: Thomas R Malthus, First Essay on Population. Royal Economic Society, London. 1798.
3) See Mark Elvin, The Pattern of the Chinese Past: A Social and Economic Interpretaton(Stanford: Stanford University Press, 1973), pp 298-816, in particular, p 312 According to Elvin, an economy can be described as 'trapped' in the high-level equilibrium between population growth and technology development, when agricultural productivity per acre had nearly reached the limit of what was possible without industrial-scientific inputs. In the state of high-level equilibrium, the increase of the population had steadily reduced the surplus product above what was needed for subsistence.
4) Johann Heinrich von Thunen, Der Isolierte Staat(The Isolated State). 1826. This work is generally regarded as one of the first attempt to formulate a theory of agricultural land use in relation to market accessibility.
5) For more details, see the following. Michael Adas, The Burma Delta: Economic Development and Social Change on the Asian Rice Frontier(Madison. University of Wisconsin Press, 1974) ; James C. Scott, The Moral Economy of the Peasant: Rebellion and Subsistence in Southeast Asia(New Haven: Yale University Press, 1976) ; Cho-Yun Hsu, "The Chinese Settlement of the I-lan Plain." in Ronald G. Knapp(ed.), China's Island Frontier: Studies in the Historical Geography of Taiwan(Honolulu: The University of Hawaii Press. 1980), pp.69-86.
6) The ecological complex. in this article, is viewed as a frame of reference which consists of population, organization, environment and technology. The term 'ecological complex' instead of ecological system was chosen in order to avoid prejudgement of issues and assumption of equilibrium-maintaining properties, suggested by the term 'ecological system'. The limited conception of ecological complex. rather, implies a focus of interest upon the study of social organization pertaining to sustenance.
7) This idea is adopted from the concept of ecological complex in social ecology which treats ecological complex as a frame of reference. consisting of population. organization, environment and technology. For a more detailed discussion on this issue, see the following. Jenneth D Bailey and Patrick Mulcahy. "Sociocultural Versus Neoclassical Ecology: A Contribution to the Problem of Scope in Sociology," The Sociological Quarterly. Vol. 13(1972). pp.37-48.
8) Buckley's idea is that society. or the sociocultural system, is not principally an equilibrium or a homeostatic system. but a complex adaptive system involving feedback loops through self-regulation and self-direction. For more information, see the following: Walter Buckley, "Society as a Complex Adaptive System". in Walter Buckley(ed), Modern Systems Research for the Behavioral Scientist(Chicago. Aldine Publishing Company, 1968), pp 490-519, especially p 490.
9) Hardesty postulates that population concept has many advantages for human ecological studies. He states that human adaptation can be studied in part by means of population Population characteristics are often correlated with features of physical, biological, and social or cultural environment and change during the process of adaptation.

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