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IMPLEMENTATION PROBLEMS OF RURAL ECODEVELOPMENT POLICY IN CHINA+

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1. RURAL ENVIRONMENTAL PROBLEMS AND THE IMPORTANCE OF ECODEVELOPMENT

Throughout its long history, China has been the stage of dramatic encounter between man and nature. Indeed, there are many historical studies of Chinese rural economy which list the successive problems of drought and flooding that have continually menaced the livelihood of the Chinese people[1]. In the past six years this "ecodrama" has assumed both startling and tragic proportions. In 1976 an earthquake devastated Tangshan. In 1977 under the new government headed by Hua Guofeng (who was joined in August 1977 by Deng Xiaoping), the Chinese economy continued to be plagued by natural catastrophies. During that year there was unseasonable cold followed by drought which resulted in a poor harvest. In 1978 and 1979 harvests were better and the rural economy improved, but disasters continued to menace the rural economy. For example, from July 1979 Hebei province has had very little rain. Since that time more than 165 000 acres of saplings have perished. Low runoff and high evaporation have reduced nearly all of Hebei's 600 rivers to less than half their normal capacities. The land is dry and the rural economy has been devastated. Further south in Hubei province, flooding in mid-1980 again devastated the rural economy and caused serious damage to water conservation and irrigation projects. In both provinces, Chinese government aid expenditure has already exceeded 300 million dollars. Realizing that it could not satisfactorily address the problem, which altogether afflicts nine provinces, the government requested the United Nations to provide nearly one billion dollars in aid[2].

Other damage[3] includes soil erosion by wind and water, occuring as a consequence of rapid deforestation which in turn has resulted from the high demand for timber as a source of building material and firewood in the rural

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areas. Currently, landscape damage and ecological degradation is resulting from the reclamation of agricultural land, not only from forests, but also from lakes. The use of chemicals, mainly pesticides, and the use of sewage water for irrigation is creating more problems. Finally, industrial pollution is affecting agricultural production and soil fertility. Fluorine and cadmium are destroying grasses and herbs, and polluted water, used for irrigation purposes, is degrading the soil fertility.

Such disturbances are not new in Chinese history; indeed, they have been recurrent. Nor is an "ecodevelopment" policy, which serves both economic and ecological goals, something new in Chinese development, for in modern times it has been emphasized by successive administrations. But past policies have failed. The problem now is to find an effective "eco-economic" policy that can actually be put into practice. To this end, rural ecodevelopment policy is being discussed with increased vigor during this period of China's economic readjustment. Recently, the standing commission of the National People's Congress issued an important document on forestry which gives high priority to "eco-economic policy", i.e., policy which seeks to relate economic development to the environment. This term was used by Jingji Yanjiu to translate "jingji shengtai". The priority was further emphasized in the national ecology campaign which lasted from mid-March to the end of April in 1981[4]. For reasons of clear communication, we prefer the term "ecodevelopment" which is used more widely.

Why do the Chinese consider an ecodevelopment policy to be so important? The various reasons for this can be grouped into two general categories[5]. The first of these relates to the livelihood of the people. That is, good ecodevelopment policy is plainly necessary if high levels of production are to be achieved. The second relates to the quality of life in China. It calls for the maintenance and protection of China's natural beauty. Moreover, an improved quality of life is also important economically for China's tourist industry. Thus, for reasons of livelihood and quality of life, drafting and implementing a successful ecodevelopment policy at this stage of Chinese history is seen as a matter of fundamental importance.

There are two general types of ecodevelopment policies: They tend to be either transformative or adaptive. Transformative policies aim to alter the natural environment and include measures such as building reservoirs, constructing irrigation systems, and adopting methods for soil reclamation and conservation to prevent erosion. They also include afforestation and climate modification. Adaptive policies, on the other hand, seek to change the way in which nature is exploited. They include research into new crop varieties which are better adapted to particular habitats, migration control, and measures to reduce waste and recycle materials.

Both types of policies, transformative and adaptive, are applied on two levels. The first, the local level, includes the commune, the village and the team.

At this micro-economic level, the main task of the local units is to enhance, or at least maintain, the quality of the biophysical environment so as to improve production and to increase the welfare of the people. At the second, or macro-economic level, the provincial and national governments are responsible for providing the necessary rural infrastructure.

2. LOCAL-LEVEL IMPLEMENTATION PROBLEMS

In this section, local-level components of rural economic policy are discussed. In so doing, we will raise four issues: administrative structures, transformative policies, adaptive policies, and the limits of management.

2.1. Administrative Structures

Throughout the period of communist party administration in mainland China, administrative structures at the local level have been hotly disputed. In order to understand the nature of the disputes and the importance of administrative structures at the local level, it would be helpful at the outset to review some characteristics of local rural economy. Local rural economy is generally divided into five sectors, according to the type of product produced. Five types of agricultural goods are generally discussed. These include: grain, forest products, fish and aquatic products, animal husbandry (including poultry), and those goods whose production falls in the area of "subsidiary activities". Subsidiary activities comprise all rural productive activities not contained in the first four categories. For example, handicrafts and small local industries (such as the production of bricks) would both belong to subsidiary activities production. In addition to the goods produced at the local level, collective services should also be considered. These include health, education, and public services, as well as local financial and market services.

Within this general context, there are three main goals of agricultural administration[6]. The first, is to produce enough food and other materials to satisfy the basic needs of the people both in the rural countryside and in the cities. The second, is to produce a sufficient supply of agricultural products to serve as industrial inputs. Such crops are primarily cotton, sugar cane and sugar beet, tea, rubber, hides, etc. The third, is to produce a surplus of both food and industrial products for export.

Over the last thirty years, especially since the Great Leap Forward in 1958, there has been considerable discussion within the party leadership regarding the precise definition of the above goals and the priorities to be assigned to each[7]. An example is drawn from the goal of producing enough agricultural

goods to meet the needs of the people. There are two aspects of this goal which are disputed. The first is how to increase production, and the second is how to establish a suitable method of distribution. Historically, high production and socialist distribution principles have been seen to conflict. The matter has not yet been satisfactorily resolved.

During the Cultural Revolution, from about 1966, several sweeping changes were made in local administration. The first followed up on changes initiated during the Great Leap Forward in which the local administrative structure, including commune, brigade and team, was established[8]. With the Cultural Revolution, the administrative structure known as the "revolutionary committee" was established. The revolutionary committee was composed of members of the party, members of the military and peasant representatives. In a sense, the revolutionary committee brought in greater participation by the peasants and the military. However, one of its effects was to limit the influence of local party officials and local experts. The revolutionary committees generally gave far greater importance to "putting politics in command", as the slogan of the Cultural Revolution put it. This administrative feature was soon displaced by the new administration of Hua and Deng. The new administrative structures were similar to those of the period of recovery from the Great Leap Forward (1961-1965). The commune, brigade and team were maintained, but important changes were made regarding decision-making and accounting structures. It was the goal of the left wing of the party to continually move to higher levels of socialist integration. This meant that the major decision-making and accounting responsibilities were to be moved first from the team to the brigade, then from the brigade to the commune, and ideally, from the commune to the state farm[9]. In practice, however, such a transformation did not materialize during the Cultural Revolution. But it remained as an ideal and was manifest in certain model brigades such as Dazhai.

At present, the administrative movement in China is moving in the opposite direction. First of all, there is an insistence that the brigade should not become the unit of decision-making and accounting; rather that these functions should generally belong to the team. In some cases, it is argued that the family unit should be the locus of decision-making and accounting. This movement is captured in the slogan b a o c h a n d a o h u which means: secure production on the level of the household[10].

In summary, the present administrative structures at the local level have great importance for rural eco-economic policy. This can be seen in the fact that whatever is done on the local level, will be done primarily on the levels of team and household. While the team and even the household are the locus of decision-making and accounting, they nonetheless have an obligation to integrate all their activities into the higher forms of administration. Thus household and team-level decisions are to be in harmony with higher level brigade and commune decisions, as well as with county, province, and national government decisions.

2.2. Transformative Policies

In examining the transformative and adaptive policies of rural eco-economic policy in the following two sections, we discuss primarily what should be happening. In the final section, on the limits of local management, emphasis is given to what actually is, or seems to be, happening. The content of the transformative policies regarding the local eco-economic environment does not amount to a list of new measures[11]. Four major items which seem to be important are afforestation, water control measures, soil management, and the introduction of new biochemical technology.

An examination of The People's Daily since January 1980 shows that each month many articles are devoted to forestry. In fact, almost every other day something regarding forestry is published. Why is forestry so important? There are a number of reasons, but the main motivations for implementing a comprehensive forestry policy fall into three categories[12]. These are the effect of forests on climatic conditions, the role of forests in controlling erosion, and the need for forestry products in developing the Chinese economy. In this context, forest refers not only to timber production, but also to orchard cultivation and the production of fruit to be processed in the food industry[13].

According to recent reports, over the last thirty years more than 28 million hectares of forests have been planted. However, the afforestation programs have involved several problems. Other reports indicate that barely one-third of the saplings planted have survived. Indeed, one observer indicated than if account is taken of repeated plantings, nearly 90 million hectares have been afforested but only one-fourth of the saplings have survived[14]. Such statistics need to be carefully examined for they serve both an economic and a political purpose. It has been indicated that afforestation policy is not new. What is new under the contemporary administration is the system of local administration. With regard to the statistics on the historical record of forest policy, there are two points to be noted. The first relates to economic management; forestry methods must be greatly improved so that a larger proportion of saplings survive. The second point is that the aim of the cited article which quoted the forestry statistics was to discredit a previous administration. The argument is that forestry policy will succeed only if a local administrative system based on the team and the household is adopted[15].

Similarly, the water management policy prescribes no new economic measures; however, it does include a new form of local administration and management. It has been a longstanding policy in the People's Republic to emphasize what is called "rural capital construction"[16]. This means using slack labor to build up local productive resources. In many areas of China, especially in the North where often only one crop is grown, there is a considerable amount of slack (i.e., underutilized or surplus) labor power. For years the policy has emphasized this labor power, either in production through subsidiary activities, or in the construction of local water, soil and transport infrastructures. In his

interesting study of employment in China, Thomas Rawski pointed out that China has achieved considerable gains in the rural economy for two reasons[17]. The first, was a system of local administration which mobilized surplus and slack labor in the off-season. The second, was a supply of industrial inputs such as pumps, cement, and tools, which made rural capital construction possible. It cannot be denied that over the years there have been considerable technical problems in local water management. Such problems include overcoming excessive salinity in the land, providing for adequate drainage and runoff, and tackling the problem of the silt accumulation in reservoirs and behind small dams. Nevertheless, reports state that the irrigated areas has increased steadily over the years. It should be noted, however, that there is no single definition of what constitutes irrigated land. Official sources frequently note that a third of Chinese agricultural land is of poor quality, another third is weather-dependent, while only the final third consistently produces high yields[18].

The water management problem is closely related to the rate of soil erosion which leads to rapid silt accumulation in reservoirs and behind small dams. The rate of soil erosion, as noted earlier, is closely linked to the forestry management policy. The principal means of controlling erosion (and also desertification) has been extensive tree-planting. It has already been noted that the development of pasture land has been emphasized. But in addition, there are other important aspects of soil managwment policy. First and foremost is the traditional peasant method of terracing the land to control erosion and act as a means of water management. Secondly, there is the collection and application of manure. This includes the use of human and animal waste, and also the production of green manure crops. Again, what is being prescribed is not new; but, as will be seen below, something new does emerge with regard to management.

In conjunction with the forestry, water, and soil management policies, there is another set of policies to transform the local environment. These policies comprise a series of biological and chemical methods to improve the agricultural productivity[19]. In addition to the use of local manures, the policy requires the introduction of chemical fertilizers and pesticides; it also calls for new biological methods of pest control including the use of natural predators - either reptiles or birds - to control insect populations. A number of interesting and creative experiments have been made, and recently there has been a demand for an extension service to spread these agricultural innovations throughout the rural areas.

2.3. Adaptive Policies

With regard to adaptive policies of rural eco-economics, a number of measures have been tried over the past years. One of the most important has

been population policy. Later we will discuss national efforts to control the growth in population. What is to be noted here is the policy of migration, i.e., the effort to redistribute the population. During the period of the Cultural Revolution, there was concerted effort to get the young people to "go down to the countryside."[20] This policy was most unpopular and seems now to have been largely abandoned. Yet the ideal of preventing the stream of rural-urban migration remains. So does the ideal of redistributing the rural population from areas of high density to areas of low density. Measures for controlling population distribution involve, for example, food-ration and cloth-ration tickets. Since these are generally valid only in the area where they are issued, an individual would lose some purchasing power by travelling or moving to another area.

Other ways of adapting to the eco-economic system are found in crop production choices. Here the emphasis is first on the selection of crops which can be most efficiently grown in given environments. There has also been discussion about introducing grain crops into areas where their production was not favored. For example, in Yunnan province the tropical forest was burnt and rice planted[21].

The policy emphasizes diversified local output comprising grain, forestry, aquatic products, animal husbandry, and subsidiary activities[22]. Priority is given to the choice products which are most suited to local conditions. Many experiments have been made. One example is the planting of crops in seedbeds and then transplanting them to larger fields. This clearly enables larger fields to be used for growing other crops over a longer period of time. Also, attempts have been made to interplant different crops and to grow plants closer together. These measures seem to maximize the use of the soil over a given period of time[23]. In each case, precautions are necessary to avoid exhaustion of the soil's fertility. It is also clear that both transplanting and interplanting are labor-intensive techniques. Hence, it is evident that the present policies strongly emphasize increasing production through fuller employment of the rural labor force.

In addition to migration and crop selection, there is a third set of adaptive policies currently being implemented. These emphasize minimizing waste and recycling all possible materials[24]. While such measures would seem to be straightforward, there are difficulties in that they call for a certain amount of technical expertise. For example, in the application of natural and chemical fertilizers, qualified judgment is necessary to determine the relative production gains that may be derived from increased applications of fertilizer. Further, in the area of forestry, there is a need for a reforestation strategy to ensure that timber is not removed more rapidly than it is replaced over a given period.

As previously noted, the transformative and adaptive policies which are presently emphasized include few new methods or new technical elements. There

are, however, some new features concerning management. In what follows, we discuss the dilemmas of local managers in implementing the rural eco-economic policy.

2.4. Contemporary Dilemmas of Management

The contemporary dilemmas of local management associated with rural eco-economic policy are strongly linked to five factors. These are political risk, eliciting the participation of the peasants, finance, securing industrial inputs, and technical education.

Over the past thirty years, there has been considerable discussion concerning socialist administration and socialist management, revolving around the establishment of specific goals and the means to achieve them. During the Cultural Revolution, more than 60 percent of the present middle-level and lower-level managers came to power. This was the period in which politics were in command; the slogan, "Min Fu Guo Qiang" (when the people are well off, the country is strong), was explicitly condemned. In its place, the May 7th cadre schools were established for middle and lower-level managers to teach them the "correct" political line. A continual process of "struggle, criticism and change" was prescribed. But, with the new (succeeding) administration, the slogan, "politics in command", the May 7th cadre schools, and the continual exhortation to "struggle, criticize and change" have all been rejected. Further, as regards the historical "red"-versus-"expert" struggle, present policy clearly calls for both. But it implies, however, that if forced to choose between them, one should clearly opt for "expert".

This creates tremendous difficulties for local-level managers; first, because they are encouraged to reject both former policy and the people to whom they owe their present positions; secondly, because the future leadership of Deng Xiao-pind and his followers is very much in question. Deng is in his middle seventies, and should he not survive, it is not at all clear whether his line would continue to be followed. Hence, there is much evidence indicating that local, middle and lower-level managers do not care to risk overidentification with the present administrative rural management policy. These managers have been advised that there is no single prescription for all China, such as the Dazhai model. Further, they have been advised to plan for themselves as regards local conditions, and instructed to achieve eco-economic balance at the same time. However, they have not been told precisely what these instructions imply; nor have they been given any assurance that if they undertake independent planning, they will be free of future political risks[25].

The second problem at the local level is to elicit the participation of the peasants (what is called in the literature, "fostering 'jijixing' "). Since the founding of the People's Republic, the peasants have witnessed a series of national

and local "campaigns". From 1958, these campaigns have given evidence of openly divided leadership. It would not be surprising if peasants viewed yet another campaign with relative scepticism. But there are more substantive issues in eliciting peasant participation; these relate to energy needs, local food supply, and economic benefits. For many peasants, ecology is "distant water which would not quench present thirst". In other words, ecology is not a priority among peasants -- food and energy supply represent much more urgent needs[26]. While recent articles have been quite frank on this point, the economic and political motivations behind these must always be taken into account.

Nevertheless, the question must be raised as to why peasants cut down fruit trees or clear large tracts of forest indiscriminantly. Why do they burn away tropical forests or uproot grass so extensively? It would be easy to attribute such behavior to stupidity and sheer ignorance, or, as is frequently done in official publications, to lay the blame on the Gang of Four for promoting a policy which overemphasized grain production, irrespective of local conditions. But such explanations are not really adequate: Peasants are generally quite knowledgeable about farming, and the grain policy criticized stems from a time prior to the Gang of Four. In looking for further explanations, the critical lack of food and fuel in many areas of China must be considered[27]. It is estimated that nearly 500 million out of 800 million Chinese farm households lack sufficient energy from two to four months of every year. Peasants are thus compelled to use grain stalks and even manure for fuel, rather than for soil enrichment. The same circumstances force them to fell available trees and remove grass. Hence, forests are burnt, trees cut down, and grasslands plowed up in order to plant food crops and meet critical energy needs. This situation has many parallels with what is known about management in the Ganges area of North India and the forest regions in Brazil[28].

One additional aspect to eliciting local participation is linked to labor utilization policy and financial remuneration. The present administration's policy is that peasants are to be rewarded with clearly perceptible economic benefits for participating in eco-economic policy. In fact, a recent decree on forestry (March 13, 1981) even guarantees the peasants a right to ownership over trees[29].

The third dilemma for local management concerns how to finance eco-economic policy. Under the policies of the Cultural Revolution, the local level was instructed to be self-reliant and not to seek help from the state. Yet it is evident that tree-planting and resevoir construction both involve substantial costs. Information on costs is difficult to obtain, but for one model area, 50 000 popular saplings reportedly cost 2 500 yuan, 600 apple saplings cost 15 000 yuan, and 500 000 jin (250 000 kilograms) of willow seeds cost 5 000 yuan[30]. It is clear that a poor local area unable to accumulate some sort of surplus would have great difficulty in establishing an eco-economic program. Industrial inputs such as shovels, cement, small pumps, and even hoes would

add to the local costs. It is obvious, therefore, that local management must either raise its own funds of receive outside aid.

The fourth dilemma for local management involves industrial inputs and centers on two problems[31]. The first is how to determine which inputs are appropriate. Currently there is considerable discussion over mechanization because it would tend to displace local labor. Secondly, there is the problem of how to secure the necessary industrial inputs, and how to resolve the difficulties associated with transport and marketing in order to assure the timely delivery of those goods.

Finally, there is yet another problem facing local management: the need for technical expertise and specialized education. These are absolutely necessary if the local cadre are to devise a suitable local eco-economic program and effectively implement it[32]. Many of the past failures in forestry, water, and land management resulted not from a lack of goodwill or hard work, but from the lack of proper technical understanding of the prerequisites of eco-economics.

3. NATIONAL-LEVEL IMPLEMENTATION PROBLEMS

Having examined rural eco-development policy in some detail at the local level, it is now necessary to place it in the perspective of the national economy. Even though rural eco-economic policy is primarily carried out on the local level, it will not have much success if a national infrastructure for such policy is not established. In the following discussion of national policy, four points will be considered: administrative structures, transformative policies, adaptive policies, and issues of planning and macro-management.

3.1 Administrative Structures

The first major problem facing the administration of an effective eco-development policy is the need to establish a clear policy line. This, in turn, must be accepted as authoritative for all on a long-term basis, and not merely as the opinion of the faction in power. Without clear policy outlines or an authoritative system of enforcement, present eco-economic policy will not progress. For as noted earlier, present policy involves issues that have divided the leadership for years and it poses many risks for local cadre[33].

The second issue that an effective policy administration faces is that of overcoming an atomistic bureaucracy with its competing interests and lines of authority[34]. This has been especially obvious in the area of forestry. For example, local production teams may with to clear forest tracts to expand

cropland. At the same time, if local industry wants to secure as much timber at it can, it will buy all that the local units are willing to sell. So long as this practice continues unrestrained, it will conflict with national goals of conservation and planned environmental management. This in turn represents a frustration for the forestry bureau which has the responsibility to pursue national goals, but lacks the effective authority to enforce its policy at the local level.

The importance of forests with regard to climate, water conservation, soil management, and industrial inputs, as well as scenic appeal, cannot be overstated. Recent policy statements have underlined this importance. They have also attempted to consolidate administrative control over forests. Ultimate decisions are to be placed under the scrutiny of the bureau of forestry, and at the same time, local units are to bear more responsibility for decisions they take regarding the use of forest and orchard resources.

The transformative and adaptive eco-development policies on the national level parallel, but do not duplicate, those on the local level of the rural economy. They concentrate on four issues: rivers and water management, forests and land management, infrastructure, and the provision of necessary industrial inputs.

3.2 Transformative Policies

China's national water policy has concentrated on its great rivers, notably the Yellow River and the Yangzi River[35]. River projects have sought to achieve a number of objectives simultaneously. Principal among these are irrigation, flood control, and the production of hydroelectric energy. Very ambitious, large-scale projects have been discussed and criticized since the mid-1950's, and example of which was the transporting of water from the Yangzi River to the North China Plain[36]. While there has of course been some success with these projects over past years, substantial problems remain. The biggest of these are the silting up of rivers and flooding at the lower levels, and lack of adequate irrigation during dry years, especially in arid regions. Erosion of course creates havoc for hydroelectric projects and the maintenance of river dikes for preventing floods. Local units must be instrumental in the implementation of erosion control programs - otherwise, national policy cannot work. Large-scale national irrigation and hydroelectric projects are also necessary to ameliorate the conditions of production, and at the same time, to help counter the rural energy shortage. For, as previously indicated, the rural environmental crisis is intimately linked to the rural food and energy problems.

The importance of afforestation for climate, water, and soil management, as well as forest products, has already been stressed[37]. The role of the national government in setting up effective administrative structures and research and development units has also been emphasized. In addition to this, the govern-

ment has another important role: that of breaking the vicious circle characterizing the food-environment-energy interrelationship. Following the planting of timberwood or orchards, there is a period of several years during which these areas of agriculture enjoy no appreciable output. The local units cannot sustain themselves until the payoff period begins without additional help from the central authority in terms of food aid and energy supplements. Financial policies to achieve this end will be considered below.

Our observations so far cast the government in an actively supporting role for eco-economic policy. Its task is to creat conditions under which implementation of the prescribed set of eco-economic policies become feasible at the local level. Apart from the extension services noted above, measures involving credit, transportation, energy and overall infrastructure are required.

The role of credit is clear. It enables the local unit to purchase the necessary inputs for rural capital construction or meeting cutbacks in agricultural production during that period just before a newly introduced range of agricultural products can be marketed and begins to pay off[38].

Transport has an obvious importance for the development of rural commerce, the accumulation of a local surplus, and the procurement of necessary inputs. It has had considerable influence in the exploitation of natural resources, especially forestry. In the northeastern province of Heilongjiang, there is an example of forest mismanagement that has been cited in numerous reports[39]. Timber has been vastly over-exploited in the southern part of the forest in question, while the northern part of the same forest has remained relatively untouched. Forest roads in the northern sections were either non-existent or so poor that exploitation of the area was not possible. Also, 80 percent of the forests in China are still managed at the local level (commune, brigade, or team), rather than the national level. Moreover, large-scale timber exploitation has traditionally belonged to the industrial sector, and was particularly favored for capital investment. But nearly two-thirds of local-level forest industry has no access to public highways, and one-half lacks trucks. These transport conditions have led to very uneven patterns of resource exploitation.

The energy issues have already been briefly considered. At a recent meeting of energy experts in China, it was stated that the most appropriate path for the country to follow would be the exploitation of coal and China's greatly underexploited hydroelectric capacity[40]. (To date, only about three percent of China's hydroelectric potential has been tapped.) This comprise a relatively low-cost and plentiful future source of energy, as well as serving irrigation needs. In addition to large-scale projects, in recent years considerable emphasis has been placed on setting up local hydroelectric plants with a small capacity. At present, there are about 90 000 of these. However, these plants are not evenly distributed: Over one-seventh are in Guandong province alone, and the rest are heavily concentrated in a few south-eastern provinces[41]. In general, there is more scope for hydroelectric projects in the south,

and for the exploitation of coal in the north. This is particulary true for Shanxi Province which is rich in coal and where large-scale investments are currently being planned.

Other sources of energy will continue to play an important but restricted role. Petroleum is being developed at a slower rate than expected, although it is important for trade strategy as a foreign exchange earner whose assets would help to finance other development projects. At present, large-scale nuclear energy is also a distant reality[42]. Other components of energy policy encourage conservation and the development of new forms of basically renewable energy. Currently, there are plans to close or modify plants and equipment which are not energy- efficient, and to convert some plants allowing them to make use of their own exhaust heat[43].

Considerable attention has been given to tidal and geothermal energy, to methane, and to solar energy. The first two are very limited; it is the latter two which hold the most promise for resolving the rural energy problem. With only about two-thirds of the rural countryside electrified, local-level economic units look primarily to coal and hydroelectric power on the one hand, and methane and solar energy on the other, if they are successfully turn away from the consumption of wood, stalks and manures for fuel. Solar technology is not yet feasible, either in terms of achieving high levels of technical efficiency or in terms of cost efficiency. Even in the most industrially developed countries solar energy is comparatively more expensive than petroleum. It represents a very important, but basically future, source of energy.

Methane has been the focus of considerable attention, and by 1978, about seven million units had reportedly been established. Crop stalks, grass, organic wastes, and human and animal excrement are used to produce biogas as fuel for cooking and lighting. The sludge left over from the fermentation process is used as fertilizer. Biogas replaces coal and firewood as an energy source in rural areas. Its use is highly promoted by the state because of its economic and ecological benefits. Gas pits can be used for seven or eight months per year; one pit with a capacity of 8 to 10 cubic meters can replace one ton of coal per year. Consider the example of Qician Commune in Fengxian County close to Shanghai. After the indroduction of biogas, in 1978, the peasants saved 1 700 tons of cropstalks and 1 000 (out of originally 1 500) tons of coal, thus representing a total saving of over 100 000 yuan[44].

A recent report in Red Flag points out, however, that only about 60 percent of biogas plants function, and most of these would not provide fuel sufficient to boil rice three times a day, nor sufficient fuel for successive use day after day[45]. It is clear that the author of this report was making more than a technical point: He was seeking to discredit certain party factions and their rural management policies. Nevertheless, there are numerous problems with methane, so that, as one other article points out, its full potential will probably not be realized for at least twenty years. These problems touch on several

facets, one of which has to do with crop stalks. Stalks can be used in a variety of ways - as compost, as material for handicrafts, as building material, as fodder, and as fuel. But rather than turn them over to a team or brigade for methane production, in a significant number of cases, peasants reportedly prefer to make use of their stalks otherwise - even as fertilizer, although in the long run this is compatible with methane production. The same is true for animal wastes. Households prefer to keep them for private use as fertilizer or fuel. Moreover, there are reports of peasants unwilling to collect raw materials for methane production because they feel their efforts are not properly remunerated.

Other problems are technical in nature and relate to the construction of methane pits, temperature regulation, and management to ensure a steady and reliable flow of energy. Methane production demands a certain amount of local expertise, but this is often lacking among many brigades and teams[46]. In Anhui Province, for example, a technical extension service was set up to compensate for this shortcoming[47].

The final aspect of transformative eco-development policies on the local level to be discussed here relates to the set of industrial inputs necessary for effective water and soil management. Since the 1960's, emphasis has been placed on agriculture and the rural economy; yet until 1978, heavy industry maintained a clear priority in investment projects. Now, in the period of economic reconstruction, more emphasis is being placed on industrial and trade policy to ensure the provision of industrial inputs for the rural sector[48].

3.3. Adaptive Policies

What are the policies by which the national government seeks to adapt to eco-economic reality? First and foremost is population policy. Following the 1953 and 1964 population counts, a new census is planned, with United Nations assistance, for 1982[49]. This should provide a more scientific basis for policy than has heretofore been available. Population policy concentrates on two issues: population distribution and birth control. The latter has been the main focus of policy, resulting in more rigid legislation, especially in terms of marriage laws. It is obvious that population policy is crucial to the success of ecodevelopment policy for the future. But even with encouraging results, China's population is expected to climb to about 1 250 billion by the turn of the century. Unless demographic transition occurs, or there would be scope for massive emigration (as in 19th-century Europe), China will face a severe strain on its resources without some unprecedented technological breakthrough.

A second element of adaptive policy concerns land use planning[50]. For the past several years, an extensive land survey has been undertaken. It is sched-

uled to be completed by 1984. This survey should provided the basis for effectively planning the most efficient use of China's available land, in terms of crop specialization and assessing the potential for reclamation of lands or upgrading low-productivity land. A third set of adaptive measures currently under experiment in China spans the gamut of bio-chemical technical measures. At present, these experiments are generally taking place within the context of research and development, but their future potential is quite significant. Researchers are experimenting in entomology to control pests, with photosynthesis to improve the energy-efficiency of plants, and with the development of hybrid varieties which would better adapt tp particular local environmental conditions. In addition, various types of mechanization which do not displace labor are being tested. These are required to speed up the handling of crops at the planting and harvesting stages, to facilitate multiple-cropping agriculture[51].

As far as full application of chemical inputs is concerned, there is sufficient reason on economic and ecological grounds for being cautious. Moreover, compost, for instance, after high temperature fermentation, contains nitrogen, phosphorus, potassium and other essential nutrients; compost fertilizer significantly raises crop output. "It also helps to loosen the toil (i.e. increase its granular structure), thus improving soil quality. Ordinary chemical fertilizers have no such function."[52]

In the field of pest control, traditional biological methods are still applied and enforced. The present official line of policy seems to take an integrated approach, employing both biological and chemical methods. The primary reason for not favoring chemicals more strongly seems to be environmental concern. But it is also noted that chemicals are more expensive[53]. Research and development activities currently include experiments to produce natural biocides - i.e., microorganisms which prey on pests[54].

Together with decisions to unify and tighten control over foresty and the administration of other environmental resources, there has been a call to restore research and development structures to improve the overall efficiency of natural resource management. Simply planting trees has frequently produced only meagre results. This is partly due to negligence and partly to half-hearted implementation of policy. But there is still more to it. Local units have reported difficulties in finding cover species which are suited to local environmental conditions, and in building a total ecoenvironment, for instance, incorporating the types of birds and other predators useful for crop insect control[55].

The final type of adaptive policy to be discussed involves planned exploitation of resources to maintain desired levels of conservation, use of waste materials in other production processes, and the creation of natural reserves for protection of wildlife and preservation of the natural beauty of China's countryside[56].

In particular, the recycling of waste materials has always been an eco-economic issue of paramount importance. Since liberation, a number of strategies have been developed, which treat the disposal of garbage as the "comprehensive utilization and conversions of wastes into treasures." By applying such principles, ecological and economic purposes have been well-served. Not only were the problems of garbage dumps and related hazards being solved, but the resource base for industrial raw materials and agricultural fertilizer inputs was broadened[57].

A large variety of waste items are presently being collected: iron and steel, nonferrous metals, cotton fibres, chemical fibres, plastics, rubber, glass, paper, bone, animal horns and hooves, and hair. In 1978, 4.76 million tons of iron and steel, 0.11 million tons of nonferrous metals, 0.13 million tons of plastic, 0.18 million tons of rubber, 0.19 million tons of broken glass, 400 million bottles, 1.64 million tons of paper-making materials, and 0.24 million tons of animal bone were recovered. In all, this amounts to 10 million tons of waste materials recovered annually, at a value of 1.6 billion yuan[58].

To summarize, what is needed in the area of eco-development management policy at the national level is a comprehensive and unified bureaucratic system which can effectively plan and implement an efficient policy for the administration of natural resources. This authority should be further supported by an infrastructure of research and development, including information extension services. Such a program would, of course, call for increased investment. The financial aspects of this policy are considered below.

3.4. Problems of Planning and Macro-Management

The above issues relate closely to planning and financial management at the national level. Only if policy at this level is ironed out, will suitable conditions be created within which effective eco-development policy can be implemented. The financial issues are primarily related to budget policies, timing and coordination of investment projects, and planning. The importance of timing and coordination are abvious; yet they have been a major problem in China. While some people continue to believ in the possibility of "great leaps" - "more, faster, better, cheaper!" - recent articles have challenged the conceptual foundations of that notion. Further, negative comparisons have been drawn between the first years of the "Four Modernizations" program (1975-1977) and disastrous period of the Great Leap Forward. These criticisms have a political target, Hua Guofeng, and a technical point: that economic growth is slow and painstaking, and must proceed stepwise. What is now promised for the next twenty years is slow, moderate, but steady growth[59].

Increased emphasis will be given to agricultural development and light industry. Heavy industry will be scaled down to harmonize the three main sectors of the

economy, and to avoid fostering a dualism that would threaten the very fabric of the political economy. Capital investment has been scaled down from 55 billion dollars to about 30 billion. Approximately 9 percent of this sum will be spent on energy, with the majority intended for hydroelectric development. That would seem to be money well spent.

A newly enacted price policy provides an incentive to improve agricultural production. It raises the prices for agricultural commodities while holding the prices for the industrial means of production down. Price increases range from 15 to 50 percent, when the quota level of mandatory sales is surpassed by specific percentages. Attractive prices increased the total value of retail sales for the state by more than 30 percent between 1978 and 1980.

Other financial policies include investments for research and extension services, and in industries producing useful inputs for rural areas. (Precise figures for these investments are not currently available). In addition, terms of trade favoring the rural sector are being set up, thus allowing rural units to accumulate surplusses. These in turn can then be used to build up the local economies. Emphasis has been on raising the prices for rural products, controlling the prices of industrial commodities, making credit available, and allowing more freedom in financial decision-making at the local level.

The final component of national support for local ecodevelopment concerns international trade policy. That is, the distribution of benefits derived from both imports and exports will favor the poorer local rural areas, thus allowing them to survive a period of economic adjustment. (This is especially important for food production and rural industrial inouts). The amount of national aid is not clear, but it will undoubtedly be provided at the expense of other possible state investments which are directly needed for developing other sectors of the economy. Although the present situation of the Chinese rural economy is a relatively healthy one, it is not unproblematic. Serious relapses have been suffered, due to severe drought in Hebei, for example, flooding in Hubei, and unfavorable conditions in as many as nine other provinces.

4. PROSPECTS AND DILEMMAS

Ecodevelopment policy in contemporary China is a matter of paramount importance; it constitutes a major element of the overall economic readjustment policy. As noted earlier, the policy contains many elements which apply to both the local and the national level. In theory, it is logical and compelling. But, what are its prospects for success in practice? If this policy is to work, it must resolve six sets of problems posing the major difficulties for policy implementation. At the local level, there are three interrelated issues - food

supply, energy supply, and eliciting the participation of the peasants. At the national level, the present administration must effectively establish its power and authority; it must improve the mechanisms of planning, and it must build up the infrastructure that ecodevelopment policy requires. We will sum up these issues in terms of two categories: administration and management policy, finance and trade policy.

As we have observed, one of the historical problems of eco-economic policy in China is that the bureaucratic administration has not been coordinated under a system with clear lines of responsibility. Further, it has been plagued by factionalism within the ruling circles such that effective policy implementation has been hindered by organizational politics. Unless this problem is resolved - and it is not clear that it will be - the success of any plans drawn up remains doubtful. The government must establish effective authority, and it must move from repeated "campaigns" to building and sustaining structures and institutions - that is, creating a strong system to provide a positive milieu for policy implementation.

At the local level, it has been noted that present management strategy is based on the production team and the household. If this arrangement is to be effective, two conditions must be fulfilled. First, clear lines of decision-making and responsibility must be established. Secondly, the contract system, by which households are related to teams and teams to the higher units of brigade, commune, county, province and nation, must be made more efficient. Otherwise, national planning may simply collapse.

Once structures of administration and management responsibility are clarified, then the chief priority should be the adoption of a financial and trade policy which would facilitate implementation of ecodevelopment policy. As noted earlier, investment capacity is limited; for 1981, it has been scaled down from 55 billion yuan to 30 billion. Recent policy has emphasized that large budget deficits and negative balances are to be avoided; such a policy amounts to yet a further limitation on available funds.

Within this context, if ecodevelopment policy is to work, investment priorities must concentrate on providing industrial equipment for the rural sector, solving the local energy problem, and overhauling the transport system. It is a positive sign that recent investment policies emphasize just these priorities. But there is more. Price and fiscal policy must favor the rural sector so that local units can accumulate funds required to purchase food, energy and other needed inputs. For some time now, the price policy has been so adjusted. However, inflation has eaten away many of the planned gains from the policy[60]. Further, foreign and domestic trade policy must be readjusted to assure a steady supply of food in deficit areas, and to assure that the rural economy is provided with energy and industrial inputs.

Notes:[+]

1) Li Wenzhi, ed., Modern Chinese Agricultural History (C), Beijing Sanlian Shudian, 1957.
Shi Nianhai, "Lesson to Be Learned from the Experience of the Change in Forests in the Middle Reaches of the Yellow River", (C), Hongqi, March 1981, No. 5, pp. 30-34.

2) "Drought Worsens in North China", International Herald Tribune, April 4, 1981, p. 4.
James P.Sterba, New York Times Service, "Peking Reportedly Understates Disasters in Asking Outside Aid", ibid., April 27, 1981, p. 2.
New China News Agency, April 9, 1981 (040906), "Flood Hit Areas Are Making a Comeback". The dispatch states that this flood in Hubei, which was the worst in 115 years, affected 1.2 million hectares. Jingzhou prefecture was the worst hit. Jingzhou normally produces one-half of Hubei's cotton crop and thirty percent of its cereals.

3) Information given to B. Glaeser by representatives of the Ministry for Agriculture, Institute for Environmental Protection, on April 2, 1981, in Beijing.

4) New China News Agency, March 12, 1981 (031141), "Chinese Communist Party Central Committee Decision on Forestry". The full text is found in Renmin Ribao for the same date, p. 1.

5) "Strengthen the Study of Eco-Economic Problems - Speeches at the Forum on Economics of Environment", (C), Jingji Yanjiu, November 1980. The meeting took place from September 27 to October 4, 1980. The names of the various speakers are given, and in general they underline the importance of eco-economic policy.
The main speakers featured were Ma Shijun and Zhang Shozhong, President and Vice President, respectively, of the Chinese Society of Ecology; Zheng Zouxin, Vice President of the Chinese Society of Zoology; and Yang Hanxi, Secretary General of the National Committee of Man and the Biosphere.
Before the national forum, the above named published an article in Guangming Ribao, on September 5, 1980, (summarized in the New China News Agency dispatch of September 5, 1980, "Protection of National Resources Urged").
The same group published a similar article in Jingji Guanli, in October 1980, pp. 28-29, 39, "Protecting the Natural Environment and Natural Resources is a Great but Not an Easy Task", (C).
The articles state the problem by means of examples, and offer various

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[+]) The symbol '(C)' following a reference title indicates that the original text is in Chinese.

proposals which center upon administration and management. Some examples of problems show that:

- Soil erosion is very serious on one-sixth of the country's land.
- Useable grassland has been raised to 220 million hectares, but 46 million of those have been hit by sandstorms or otherwise degenerated. The output of grass has decreased by fifty percent.
- Since 1949, ten species of animals and birds have become extinct and another twenty are on the verge of doing so.
- The catch of freswater fisch in the 1970's was less than fifty percent of that in the 1950's.
- The fertile topsoil of 400 000 hectares is washed into the rivers and sea each year.

The examples vary and the statistics do not always match, but the point is clear.

A large number of articles have appeared, spelling out the importance of eco-development policy. Six of these are listed below, and the points made in them are summarized.

National Forestry Bureau Policy Study Group, "Discussing the Relations Between Forestry and Agriculture", (C), Hongqi (Red Flag), 2, 1979, pp. 23-26.

Huang Yongshi, "Expand Forestry and Maintain Ecological Balance in Agriculture", (C), Jingji Yanjiu, March 1981, pp. 41-45.

"Emphasize the Protection of Rural Environment", (C), editoral appearing in Renmin Ribao, August 22, 1981, p. 1.

Xu Dixin, "Eco-Economics and Realizing Modernization", (C), Jingji Yanjiu, November 198/, p. 14-18.

Yu Mouchang, "Transform Nature's Gains and Losses", (C), Hongqi, November 1979, pp. 56-64.

He Naiwei, "Promote the Study of Forestry Eco-Economics and Go All Out for Agricultural Modernization", (C), Jingji Yanjiu, February 1981, pp. 72-74.

These articles emphasize the importance of eco-development policy and tend to feature aspects of forestry, namely:

- the effects on climate,
- the effects on soil - both moisture and erosion,
- the effect on desertification and the uses of windbreaks,
- the role of forest as habitat,
- the role of forest products in industry, handicrafts, and the rural economy, and
- the importance of maintaining the beauty of nature and the environment.

6) Heilongjiang Revolutionary Committee Agricultural Bureau, "Put Agriculture, Forestry and Animal Husbandry Production on the Same Footing", (C), Hongqi, March 1979, pp. 240-243.

Zhang Zongli, Gu Zhenming, "The Road and Targets for Chinese-Style

Agricultural Modernization", (C), Jingli Yanjiu, December 1980, pp. 49-51, 72.

7) The Shanghai periodical, Xuexi Yu Pipan, in existence from 1973 until the demise of the Gang of Four in 1976, published frequent articles criticizing Deng, and especially after he was dismissed in April 1976. See also, China News Analysis, No. 1055, October 1976, and Renmin Ribao, August 23, 1976.
The leftist errors are constantly in the press.
For a brief summary, see New China News Agency, "People's Daily Reviews Guidelines in China's Economic Work", April 10, 1981.

8) A series of six articles in Peking Review, 1973, Nos. 13 through 18, "A visit to Tung Ting People's Commune", clarifies the management structures in the models operative at that time.

9) "Learning from Tachai: Powerful Force for Developing People's Agriculture", Peking Review", April 13, 1972, pp. 7-10.

10) Wang Guishen, Wei Daonan, "On Fixing Output Quotas for Individual Households", (C), Jingji Yanjiu, January 1981, pp. 64-67. This article discusses the policy of "Bao Chan Dao Hu", and the objection raised by some that the rich families will become richer while the poor become poorer.

11) "The Plan for Jia Ding County's Agricultural Development, 1974-1980 (Revised), "Xuexi Yu Pipan, September 1974, pp. 53-59.

12) Cf. Qiou Ping: "The Planting and Protecting of Forests is a Great Item in Building a Prosperous People", (C), Hongqi, March 1980, pp. 117-122.

13) As an example, see New China News Agency, "Northwest Boosts Fruit Crop", December 19, 1980.

14) "Planting Trees and Protecting the Forests is Everyone's Responsibility", (C), Renmin Ribao, March 9, 1981, p. 3.
This point is confirmed elsewhere. See China News Analysis, February 16, 1979, where references are made to two issues of Renmin Ribao: January 14, 1978, p. 4 and January 12, 1979, p. 2.

15) Liang Xinming, Wu Haozhi, "Investigating Xiadingjia Brigade's Prosperity in Planting Forests and Building Up the Mountainside", (C), Hongqi, January 1981, pp. 23-26.

16) New China News Agency, "Chinese Peasants Build More Water Conservancy Projects", January 7, 1981.

17) For a table of water management statistics from 1952 to 1977, see Thomas Rawski, Industrialization Technology and Employment in the People's Republic of China, World Bank Staff Working Paper No. 291, summarized in The Economist, February 16, 1980, pp. 108-109.

18) For a discussion on the problems of estimating irrigation in China, see L.T.C. Kuo, The Technical Transformation of Agriculture in Communist China, New York, Praeger, 1972, Table 8, p. 80.
See also, "Water Conservancy", China News Analysis, No. 579, September 3, 1965; "Small Waterworks and Irrigation", ibid., No. 837, April 9, 1971; and "Water", ibid., No. 908, January 2, 1973.

19) New China News Agency, "One Fifth of China's Farmland Uses Fine Seeds", January 17, 1981.
New China News Agency, "Scientists Stress Biological Control of Forest Pests", March 28, 1981.
New China News Agency, "Sex Scent Helps Fight Cotton Pests", March 29, 1981.
"Emphasize the Prevention of Harm Done by Forest Pests", (C), Guangming Ribao.

20) Charles Bettelheim, et al., La construction du socialisme en chine, Paris, Francois Maspero, 1968.

21) Wang Sanpei, "Exploitation of Natural Resources and Ecological Balance in the Xishuangbanna Area", (C), Jingji Yanjiu, December 1980, pp. 52-58. The scenario is very similar to what happened in the Brazilian selva: in the first year there was a very high yield, then within three to four years the productivity had declined, the local forest was destroyed, and serious ecological damage was done.

22) "The Party Central Committee Calls for Positively Developing Diversified Management", (C), Renmin Ribao, April 6, 1981, p. 1.

23) Dieter Albrecht et al., Landnutzungsplanung in China, Berlin, Oberbaumverlag, 1980, pp. 121ff. ("Anbaumethoden").

24) Huang Yongshi, "Expand Forestry and Maintain Ecological Balance in Agriculture", (C), Jingji Yanjiu, March 1980, pp. 41-45.

25) The extent of the problem is revealed in the indices of articles appearing in major publications which emphasize liquidating leftist thought and following the line of party leadership.

26) "A Visit to Northern Shaanxi - Preliminary Survey on Building Livestock Breeding and Forestry Bases on the Loess Plateau", China Report, October 1980. Translation of an article appearing in Hongqi, August 1980, 15, pp. 13-18.

27) Chen Dzuya, "On Solving the Rural Village Energy Problem", (C), Renmin Ribao, January 22, 1981, p. 3.
Further confirmation is given in a New China News Agency dispatch of January 3, 1981, "Scientists Want Rural Energy Sources Studied". Professor Yang Yike (Chinese University of Science and Technology in Hefei) is quoted as saying that 500 million of the 800 million rural households

lack firewood for three to five months per year. But, he goes on to say that in the provinces hardest hit, about 70 % of the households suffer, and even among those best off, 25 % are afflicted. Present firewood production is sufficient for only two months of demand. Professor Yang suggests that 66 million hectares of wasteland and barren hills are suitable for afforestation; further, there is additional scope for methane gas and local coal production.

28) "Savage Water That Will Not Be Tamed", The Economist, September 9, 1978, pp. 58 ff. (India).

29) "Rural Policy", China News Analysis, June 23, 1978, quoting Renmin Ribao, April 21, 1978, p. 2.

30) Hongqi. August 1980, 15, pp. 13-18.

31) For a table on the growth of industrial inputs into China's rural economy, 1957-1977, see T. Rawski, op.cit., pp. 58-59 (Footnote 33).

32) See § 3 of the article by Zhang and Gu, op.cit.

33) There are a number of competing factions which make it difficult for any one group to hold sway without eliciting the cooperation of others. Principle groupings are supporters of Deng, supporters of Hua, supporters of the left-wing leaders (Gang of Four), and the military. There are also numerous regional loyalities as well as perennial Chinese family relationships.

34) Cf. article cited in Footnote 5 by Ma Shijin et al. in Jingji Guanli; also, by the Policy Research Division of the Department of Forestry.
"An Important Question in Present Forestry Management Organization and Management", (C), Jingji Guanli, July 1980, pp. 29-32.
"Put Into Practice: 'Follow the Law, Plant Trees!' " (C), Hongqi, March 1980, pp. 27-31.

35) New China News Agency, "Water Conservancy Projects Play Their Role in Flood Prevention", September 6, 1980.

36) "Rivers", China News Analysis, No. 1109, February 10, 1978, outlines the background of the problematic.

37) The interrelations between water management and forestry policies has been noted before. For references concerning this matter, see the article by He Naiwei, op.cit., and the Central Committee Decision on Forestry, op.cit.

38) Cf. article by Wang, op.cit.

39) See the articles cited in Footnote 5, and the article by Qiou Ping, op.cit.

40) Chi Hong, "Coal is Top Priority in China's Energy Resource Policy", Economic Reporter, March 1981, pp. 23-26.
Gao Yangwen, Minister of Coal Industry, stated that the present structure

of China's energy supply is as follows: coal, 70.6 %; oil and natural gas, 21 %; and hydroelectric power, 3.3 %. He further stated that this structure will remain basically unchanged for the next twenty years. Moreover, China's immense hydroelectric potential presently supplies only 18 % of of electricity. But, this is expected to grow to 25 % by the end of the century.

41) Great emphasis has been placed on small hydroelectric power stations (New China News Agency, "China Builds 4 000 Smal Hydroelectric Power Stations", January 1, 1981).

42) New China News Agency, "Scientists Urge Exploitation of Energy Resources", January 6, 1981.
New China News Agency, "China to Produce 305 000 Million Kilowatts of Electricity in 1981", January 19, 1981.

43) "Energy Conservation - The No. 5 Energy Resource", Economic Reporter, February 1981, pp. 5-9.
New China News Agency, "Chinese State Council Decision Regarding Environmental Protection", March 14, 1981.

44) Wu Tzechin, Conversion of Waste Materials into Useful Resources, Environmental Protection Office, Beijing, November 25, 1980.

45) Huang Zhijie, Zhang Shenmu, "The Development of Methane Is an Important Task in Solving the Rural Energy Problem", Hongqi, November 1980, No. 21. (Translated in China Report, January 19, 1981, JPRS No. 77195).

46) BORDA (Bremen Overseas Research and Development Association), Biogas in China, Abschlußbericht zum Projekt, 1981, mimeographed paper.

47) According to Mr. Yang Yike, Deputy Chairman of Anhui Province: information given to B. Glaeser on April 10, 1981, in Hefei.

48) New China News Agency, "Yao Yi Lin Presents Economic Report at the NPC Meeting", February 26, 1981. New investment will decrease from a planned 55 billion yuan to 30 billion. Priorities are light industry, consumer goods, and the rural sector.

49) New China News Agency, "China to Conduct 1982 Census", March 10, 1981.

50) New China News Agency, "China Completes National Soil Survey of 192 Counties".
For some historical background, see China News and Analysis, April 30, 1965, No. 562, "A Scientific Survey in Land Utilization"; ibid., No. 1141, "Hard Facts on the Use of Land"; ibid., No. 1172, January 18, 1980, "Scientists and Land Utilization".

51) New China News Agency, "One Fifth of China's Farmland Uses Fine Seeds", January 17, 1981.

52) Wu Tzechin, 1980. op.cit.

53) According to Mai Yongpin, Director of the Institute for Environmental Protection, Ministry of Agriculture. Information given to B.Glaeser on April 2, 1981, in Beijing.

54) Institute of Forest Research and Pedology of the Chinese Academy of Sciences in Shenyang. The Institute was visited by B.Glaeser on April 6, 1981.

55) "From 5 Sides Spread the Work of Diffusing Agricultural Scientific Discoveries", (C), Renmin Ribao, April 4, 1981, pp. 1-2.
New China News Agency, "China Issues a Circular on Popularization of Agricultural Scientific Research Units", April 5, 1981. This dispatch makes reference to the Renmin Ribao article cited above.
New China News Agency, "State Council Sends 410 Groups to Grassroots Units for Economic Investigation", April 7, 1981.

56) New China News Agency, "New Principles for Transforming Loess Plateau", December 14, 1980. Report of a speech by Shi Shan, Deputy Secretary of the Chinese Academy of Science. In conjunction with the ministries of water, agriculture and forestry, experiments were set up in fourteen counties to test methods. The loess plateau covers 530 000 square kilometers, and has a population of thirty million. Measures such as erosion control, afforestation, terracing and water conservation are reported in "Erosion Control on the Loess Highlands", China Reconstructs, Vol. 27, No.3, 1978, pp. 36-39; "Good Fields on Loess Plateaus", ibid., Vol. 27, No.4, pp. 30-32.

57) Wu Tzechin, 1980. op.cit.

58) Ibid.

59) New China News Agency, "People's Daily Article Reviews Guidelines in China's Economic Work", April 10, 1981.
"How Are We to Grasp This Year's Economic Work Well?"
Renmin Ribao, March 0, 1981.
"Going Down a New Road of Economic Development in Readjustment", Hongqi, No. 7, April 1981, pp. 6-8.

60) Financial Times, April 30, 1981.