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DIRECTORATE OF
INTELLIGENCE

Intelligence Memorandum

Rural Electrification In Communist China

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CENTRAL INTELLIGENCE AGENCY
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INTELLIGENCE MEMORANDUM

Rural Electrification In Communist China

Introduction

Rural electrification has the potential of increasing the productivity of the huge rural sector of the Chinese economy in two principal ways: it can supply an important ingredient for raising crop yields by improving the control of water, and it is required for the success of any small plant industrialization in China. In the case of water control, electricity is used primarily for pumps to operate irrigation and drainage systems. Most of the areas where electricity has been supplied in rural China already were irrigated -- and perhaps drained -- by primitive equipment. With power-operated systems, however, large amounts of water can be moved more quickly and more efficiently than with primitive equipment, thus greatly reducing the adverse effects of sustained periods of drought and flooding (and associated waterlogging). By blunting the adverse effects of weather on crops and by providing reliable supplies of water for the application of chemical fertilizer, crop yields can be increased. Similarly, increased electricity is necessary for any sizable program for establishing and operating small manufacturing plants which, by tapping additional raw materials and China's abundant supply of labor, can provide industrial inputs for agricultural development.

Both of these uses contrast with past practices in the USSR. Until recently, investment in agriculture in the USSR was designed more to save labor

Note: This memorandum was produced solely by CIA. It was prepared by the Office of Economic Research.

than to increase output, and industrialization was centered around large-scale urban factories. Communist China's rural consumption of electric power in 1969 was as large as that of the USSR in 1955. This illustrates a fundamentally different strategy of development. The Russians, in effect, wished (but only partly succeeded) to make agriculture an integrated adjunct of the urban factory system, depending on the cities for material supplies and consumer goods other than food. The Chinese seem to be creating a separate, largely self-sufficient rural economy, leaving the party and government free to concentrate on a specialized urban development shaped by strategic objectives. Sending electricity to the countryside is conceivably a substitute for sending many other more complicated and expensive things.

While the potential advantages of rural electrification seem to be recognized within China, and to some extent are being exploited, it is still a question whether or not China's leaders will pursue a rural development program that will make good use of this potential. This question of course has many facets and no good means for deriving definitive answers. Nevertheless, rural electrification is important as an indicator, even though only a tentative one, of how well the Chinese may be progressing in rural development. In particular, the regime appears to be attempting to modernize -- without disemploying -- the vast rural population with its labor-intensive farming, handicrafts, and primitive transport, thus reducing the dependence of the rural sector on the small but highly capitalized urban sector of the economy. This memorandum relates current developments in the rural electrification program to those of earlier years, and discusses the direction the present program is taking, the progress of this program to date, and some of the possible economic implications.

Chronological Developments in Rural Electrification

Rural Electrification Program Through 1957

1. Before the Leap Forward (1958-60), very little work was accomplished on rural electrification in Communist China. Nearly all rural production and processing operations depended on manual or animal power and even the small amount of mechanical equipment used was quite primitive (see Figure 1). Total rural consumption of electric

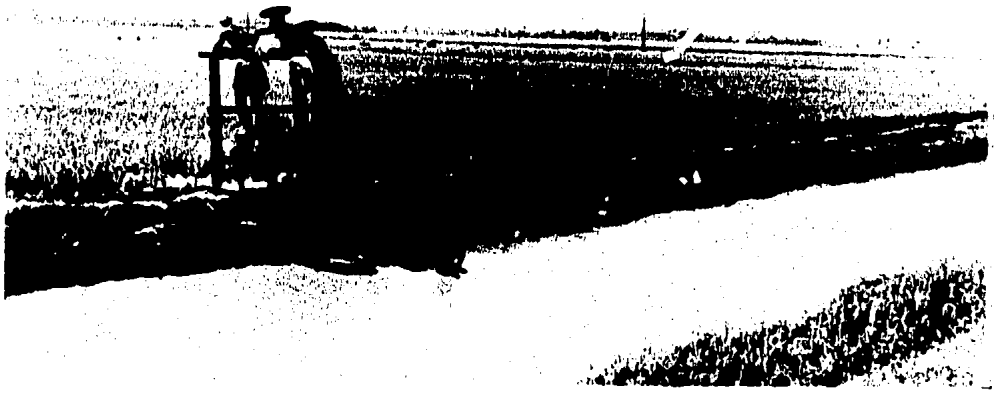

Figure 1. Foot-operated irrigation pump in Kwangtung Province. Such equipment--typical of the primitive equipment used for irrigation before 1958--is still being used extensively in China. (1963)

power in 1957 was only about 110 million kilowatt-hours (kwh) and only about 250,000 hectares of land were irrigated and drained by electrical systems (see Table 1). These figures represent about 0.5% of total electric power production and 0.7 of 1% of the total irrigated area.

Electrification During the Leap Forward

2. The first major attempt at expanding the rural electrification program occurred during the Leap Forward. This attempt was supposed to develop electrification by construction of both modern and "native" plants. The modern plants were to consist of large multipurpose hydroelectric projects built by the State. The "native" plants were to consist of thousands of small powerplants -- mostly hydroelectric -- built by individual communes. Statistically, progress in rural electrification in 1958-60 was impressive; the amount of electricity consumed increased by about seven times and irrigated acreage increased by nearly six times. By

Table 1

Estimated Growth of Rural Electrification in Communist China a/

Year	Electric Power Consumption (Billion Kilowatt-Hours)	Installed Capacity of Motors (Megawatts)	Length of Transmission Lines (Thousand Kilometers)	Area With Electrical Irrigation and Drainage (Million Hectares)
1957	0.1	70	5	0.2
1958	0.4	250	16	0.8
1959	0.5	420	24	1.1
1960	0.8	800	38	1.7
1961	1.1	1,100	52	2.3
1962	1.5	1,600	70	3.3
1963	2.1	1,770	88	4.5
1964	2.5	2,050	120	5.2
1965	2.7	2,230	126	5.6
1966 b/	3.1	2,600	146	6.5
1967	3.2	2,600	149	6.6
1968	3.4	2,800	158	7.0
1969	3.9	3,200	180	8.0

a. Data for 1957-65 are either official Chinese Communist figures or are based on Chinese claims for increases over a given period. Figures for 1966-69 for areas with electrical irrigation and drainage are based on estimates of increases by province in 1966-69 over 1965. The other categories were increased by a similar percentage.
b. Plans for 1966 called for consumption of 3.7 billion kilowatt-hours, motors with an installed capacity of 3,060 megawatts, transmission lines with a total length of 170,000 kilometers, and an area of 7.8 million hectares to be irrigated and drained by means of electric power. Provincial figures indicate that these plans were underfulfilled by a large margin.

1960, the capacity of rural hydroelectric plants reached 520,000 kilowatts (kw) compared with a capacity of only 20,000 kw at the end of 1957. However, the program was beset with many problems. The large projects were not built as rapidly as envisioned, and, by 1960, construction of many of these projects had been halted. The small plant program also moved more slowly than anticipated; although the regime planned to build small hydroelectric stations with a total capacity of some 900,000 kw in 1958, only about 110,000 kw of capacity actually was built during the year. The small electric powerplant construction program did not pick up greatly thereafter, even though a large number of hydraulic stations* reportedly were built in 1959-60.

3. The inadequacies of the electrification systems developed in the Leap Forward era were much more serious than delays in the program. These inadequacies were largely the result of faulty planning, overzealousness, and inadequate technical knowhow. Thus, many of the small plants and systems were extremely costly and inefficient and often failed when most needed. Few of the systems were able to cope with serious flooding or drought conditions. Such factors as ground water levels, seasonal rainfall, the need for branch lines, the amount of good land that would be flooded by reservoirs, and the overall needs of particular drainage systems were often overlooked in implementing this program. There were many cases of land being ruined through salinization, decreases in land available for cultivation, one area benefiting at the expense of another area, increases in the extent of waterlogging, and excessive clogging of ditches. In nine regions in North China using mostly gravity-type irrigation systems, it was reported that, although the major components of the systems had been completed, only 20% to 70% of the ancillary small canals and ditches had been built. In Kwangtung Province the acreage irrigated by large reservoirs in 1961 accounted for only 20% of the planned goal, while that for medium reservoirs was some 40% of plan. Nationally, the power equipment and the pumping equipment installed during

* *Hydraulic stations drive pumps or other equipment directly from the power of water and can include very crude equipment such as various types of waterwheels.*

this period were of poor quality and were not standardized. [redacted] about 50% of the water turbines for rural powerplants were wooden propellor-type turbines. As late as 1964 the head of the National Economic Commission noted that about 20% of the power equipment used for farming in China was inoperable due to the need for repairs, and that the situation was expected to become worse because of the many varieties of equipment, the shortage of spare parts and repair facilities, and the low operational capacity and technical standards of plants manufacturing such equipment. Thus, the statistics probably greatly exaggerated the real benefits of the Leap Forward program of rural electrification. 25X1

Construction in 1960-66

4. While reviewing the state of the economy after the collapse of the Leap Forward, China's planners found that the small plant program was not working and that most of the large multipurpose projects could not be completed. Even more important, they found that a large amount of electric power capacity was available in the cities which could be readily used by extending transmission lines to rural areas. Obtaining electric power from existing networks has many advantages, including the ease with which it can be done, reduction of costs, and better load distribution. For example, power from isolated plants in Kiangsu Province cost users about 0.14 yuan per kwh while that from the electric power network was only 0.08 yuan per kwh. The limitation of this method is that power can be sent only a short distance from the central power source, roughly equal in miles to the kilovolt rating of the powerline. This usually limits the distance from main plants to about 100-200 miles and from main lines to about 30 miles. For a given voltage, the further the distance, the greater the line loss; thus the higher the cost. During this period the Chinese also adopted a priority system for water conservation construction which gave first priority to areas densely populated, to areas where output of food and cotton were proportionally great, and to areas which suffered most from flood disasters. Second priority was given to areas where a large part of the inhabitants were engaged in industry and which were incapable of producing sufficient food to support the local population. This priority

included the lower reaches of the Yellow River where much usable farm land is washed away by annual floods. The third priority was to be given to areas inhabited by ethnic minorities.

5. The new program adopted in the early 1960s included development of large electrical irrigation systems in the deltas of the Yangtze and Pearl Rivers and in Hopeh Province and smaller systems in Shensi, Shansi, Chekiang, Szechwan, and other provinces (for examples of projects built during this period, see Figures 2 and 3). The amount of

Water turbine pumps on display in Hunan Province. These pumps have been popularized in recent years and are used to pump water and process agricultural products. They also can be hooked to generators to produce electric power. (1966)

Figure 2.

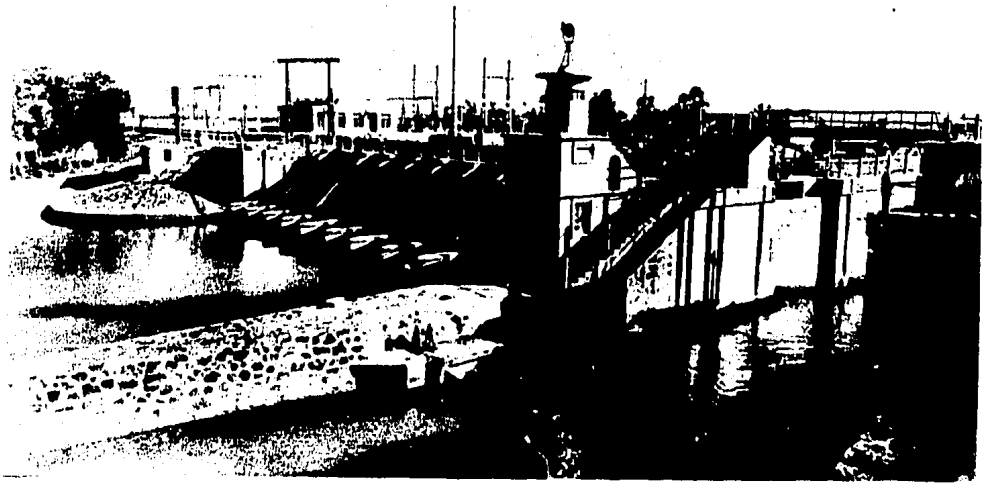

Figure 3. A pumping station in Kwangtung Province. (1965)

electric power consumed by rural areas increased from 800 million kwh in 1960 to 3,100 million kwh in 1966 and the area with electrical irrigation and drainage increased from 1.7 million hectares to 6.5 million hectares. Much of the electric power was provided from large thermal powerplants in cities via transmission lines extended to adjacent areas. The remainder of the power was mostly from a few large hydroelectric plants located in rural areas. Electricity was supplied from the powerplants to newly built transformer stations which in turn served a number of electrical pumping stations. The pumping stations usually had reversible pumps which either pumped water from reservoirs to irrigate fields or pumped water from the fields to control flooding or waterlogging. The larger systems such as those on the Yangtze and Pearl River Deltas had several alternative sources of power and included thousands of kilometers of transmission lines and irrigation canals. In the Yangtze River Delta, for example, it was reported in 1965 that the area had 10,000 kilometers of high-voltage powerlines and that nearly two million hectares of land were irrigated and drained by electric power. It was also reported that many areas of the Yangtze Delta could withstand 100 days without rain and 200 millimeters of rain without flooding (see Figure 4).

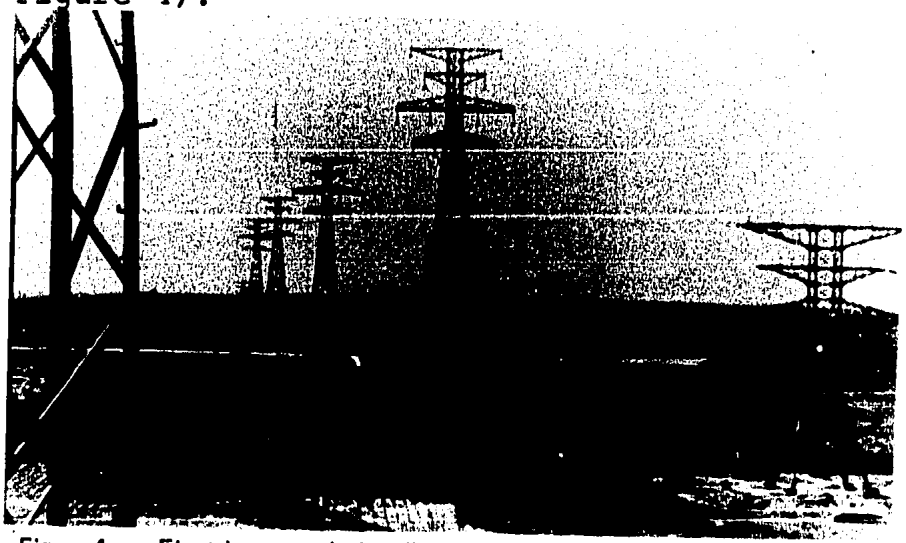

Figure 4. Electric transmission lines for irrigation pumping stations in Tungting Lake area in Hunan Province. (1965)

6. Between 1960 and 1964, the small plant program suffered a severe decline. Many of the plants were abandoned and only a few new plants were completed. About 1964, however, effort was renewed to build small plants in those areas that could not be

reached by powerlines from major powerplants. This effort was much smaller than that of the Leap Forward; more emphasis was placed on sound design and technological feasibility than in the past, and attempts were made to standardize and improve the design of the equipment used. There was also a return to building hydraulic plants, but after 1960 these plants used a water turbine pump of more modern design than the crude turbines used in the hydraulic plants of the Leap Forward period (see Figure 5). The costs of this small plant program were borne mainly by local jurisdictions.

Figure 5. Interior view of electric pumping station south of Tungting Lake in Hunan Province. (1965)

7. The accomplishments of this period in rural electrification were significant, but not as great as the statistics in Table 1 imply. Generally, where the systems were completed, at least partial protection was afforded against major disasters. Also, there is evidence of better administration of the systems and coordination of electrical uses with other agricultural inputs thereby establishing the foundation for future increases in crop yields on a selective basis. However, many of the systems constructed during this period have not reached full potential and the amount of power available to individual households is still very small. Most of the electric equipment installed replaced other mechanical or primitive equipment and there was little net addition to total irrigated area.

Construction During the Cultural Revolution

8. The electrification program slowed down during the early part of the Cultural Revolution, but by 1968 the rural electrification program was again receiving some impetus. In 1969 the program gained considerable momentum. Rural electric power consumption was 3.9 billion kwh in 1969, about 8% of total production and about 15% over 1968. Recent reports claim large increases in electric powered irrigation, in the number and total capacity of small hydroelectric plants, and in the length of transmission lines in certain rural areas of China. Thus far the current drive appears to be concentrated on filling out and completing the irrigation systems started in the early 1960s and on building small plants in areas that cannot be reached by power-lines from large powerplants. Some of the projects under way or completed in recent years are listed in the Appendix. From meager data available, it is estimated that the area irrigated and drained by electrically powered machinery increased by a total of about 20% in 1968-69 after a virtual standstill in new construction in 1967.

The Present Program for Rural Electrification

9. The present rural electrification policies are in many respects reminiscent of the policies during the Leap Forward. Local funds are to be used to build the small rural powerplants, peasants are to be trained to build and operate the plants, and power is to be utilized in electrified irrigation systems, expanded radio networks, and small industrial plants. Moreover, dubious goals of mechanizing farm work in five years have been announced for some provinces and some of the recent statistics reported for individual provinces appear to be exaggerated. However, the Chinese planners seem to be taking a more pragmatic approach than during the Leap Forward, equipment appears to be more efficient and better standardized, and there is a larger reservoir of technicians than in the late 1950s. Much of the present effort in water control is concentrated on making existing systems more efficient and in providing new irrigation or drainage systems where they are most needed. While the results of the recent programs are not statistically as spectacular as those of the past, progress toward the primary objective -- increased crop yields -- may have been much greater.

10. The thrust of this program is perhaps more the result of necessity than of new directions in planning. Basically, the easiest areas have already been electrified. These areas -- within about 100 miles of major sources of electric power, in gently rolling or plains regions where pumping needs are minimal, and in the south where the supply of water is plentiful -- are being improved. Here the basic facilities are completed and most of the present work in water control involves extending canal laterals and repairing and maintaining the systems. There is some evidence, however, that work has begun or is about to begin in the more difficult areas. The recent stress on establishing water turbine pumping stations and small hydroelectric plants in mountain areas may reflect a move in this direction. Work has apparently been resumed on some large-scale multipurpose projects that were begun in the late 1950s; completion of these projects would enable the Chinese to extend electrified systems considerably.

11. There is also [redacted] some work on medium-size river systems in Honan, Hopeh, and Shantung Provinces in North China. Work on comprehensive control in the huge Yellow River system, however, is practically at a standstill, and even the Huai River system, which has been worked on for about 15 years, has not been completed. In the north and northwest, such problems as ground water control, total water supply, and high evaporation rates are extremely difficult to resolve and solutions depend on major efforts to control entire river systems. 25X1

12. One of the prime differences between the programs of the early 1960s and the present program is that most of the systems and plants are to be built with local funds. The shift in cost bearing from the State to local jurisdictions started in 1964-65. In larger systems the communes appear to bear 60% to 90% of the costs with the State absorbing the remainder. The government usually erects high-tension transmission lines, substations, and larger power stations and pumping stations while the communes build small stations and supply the distribution and utilization equipment in most cases. The systems are also run by local technicians -- the "straw-sandaled technicians" -- who are specially trained for this purpose.

Electric Water Control Systems

13. The use of electricity for water control systems is based on its relative cheapness. On the basis of statistical data available in 1963, it was reported that the cost of electrical irrigation generally amounts to only half the cost of mechanical irrigation and the cost of electrical drainage amounts to about two-thirds of that of mechanical drainage.* In the Yangtze Delta the cost of electric irrigation in 1962 was 2.3 yuan per mou,** 50% less than that of mechanical irrigation and 70% less than that of manual irrigation. Generally, in terms of lifting power it has been stated that a 40-horsepower diesel engine can lift 120 tons of water to a height of 35 meters in an hour at a cost of 3.4 fen*** per ton of water while the cost for similar lifting by an electric motor is 2.18 fen. The cost per mou to lift water 17 meters manually is 16.5 yuan while electric power can be used to lift water 26 meters at a cost of 2.9 yuan per mou. Even though use of electric power for water control has increased greatly, more than one-half of the pumping equipment in China is still powered by nonelectric means -- mostly diesel, steam, and gasoline engines. In terms of growth, however, electric power equipment increased nearly 40 times and nonelectric by only about seven times between 1957 and 1966; the amount of nonelectric equipment has remained relatively stable since 1960 (see Table 2).

Other Uses for Electricity in Rural China

14. Although water control uses probably account for about 80% of the total electricity used in the countryside, other uses for electricity have been given increasing attention. One major use is as the power source in rural broadcasting networks. The Chinese use radio diffusion networks to carry radiobroadcasts to individual brigades, production

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* *Mechanical irrigation and drainage means irrigation and drainage performed through the use of equipment operated by diesel, steam, and gasoline engines.*

** *One hectare is equal to 15 mou.*

*** *The fen is equal to 1/100 of a yuan.*

Table 2

Estimated Inventory
of Irrigation Equipment
in Communist China

Year	Electrical Equipment a/ (Million Horsepower)	Nonelectrical Equipment b/ (Million Horsepower)	Total c/ (Million Horsepower)
1957	0.09	0.61	0.70
1958	0.33	1.77	2.10
1959	0.56	2.84	3.40
1960	1.07	4.33	5.40
1961	1.47	3.53	5.00
1962	2.13	3.67	5.80
1963	2.36	3.54	5.90
1964	2.73	3.37	6.10
1965	2.97	4.33	7.30
1966	3.47	4.53	8.00

a. Based on installed capacity of electric motors (see Table 1) converted from kilowatts at the rate of one horsepower equal to 0.75 kilowatt.
b. Residual after subtracting the amount of electrical equipment from the total. Including equipment operated by gasoline, steam, diesel fuel, and gas.
c. Based on Chinese Communist claims.

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teams, and households. These networks are composed of radio stations, usually at the *hsien* (county) or commune level, which receive and amplify programs from the national networks and send them through wires to loudspeakers in the villages. Telephone and telegraph wires, electric powerlines, and iron wire are usually used as the transmission mode. Broadcasting networks are an important means of political indoctrination and of education. During the Leap Forward, networks were widely developed and the number of loudspeakers increased from less than one million in 1957 to more than 4.5 million in 1959. The number of radio stations also increased from about 1,700 in 1957 to more than 11,000 in 1959. After the Leap Forward, many of the commune stations were closed and some of the

networks fell into disuse. It was still reported, however, that by mid-1964 there were six million loudspeakers even though the number of stations had been reduced to less than 2,000. Around that time a new effort was begun to extend radiobroadcasting to rural areas, but the program abated somewhat during the Cultural Revolution. In 1969, large increases were reported in the number of stations being built at the commune level, the length of lines extended in rural areas, and the number of loudspeakers. It is possible that there are now as many as ten million loudspeakers operating.

15. Electricity also is important in the countryside as a source of power for small industrial facilities. This use was given some impetus during the Leap Forward but most of the small plants which used electric power were shut down in the early 1960s. Now there is a drive to build small plants, particularly those producing agricultural inputs and processing agricultural products. The average rate of use of electric power generating facilities for water control purposes is quite low; thus ample capacity is usually available for use by these small industrial facilities.

16. Electric lighting is a fourth major use of rural electrification facilities, particularly lighting of individual households. Other uses of electricity have received some attention from time to time, including abortive attempts to popularize electric plows, but these uses are minimal at present. Looking to the future, electricity needs will increase as more modern equipment is introduced -- particularly in the areas of agricultural processing, poultry raising, dairying, seed and feed drying, and household chores.

Economic Implications

17. The effects of the present program of rural electrification on economic development can be roughly divided into four categories: (1) the direct effect of the program on agricultural production, (2) indirect effects on peasant incomes and technical orientation of the farmers, (3) the effect on the development of local industries, and (4) the effect on other sectors of the economy of channelling resources to rural electrification.

18. The most important direct use of electric power is in water control. The main significance of water control is in reducing the extent of crop failures, thus moderating violent fluctuations in crop yields. Also water control is important for deriving maximum benefit from other modern agricultural inputs. To increase crop yields substantially, a combination of modern inputs including water control is required. The Chinese recently have made some efforts to combine various agrotechniques such as seed selection, water control, and application of chemical fertilizers, pesticides, and herbicides on an experimental basis. Benefits are illustrated by claims of increases in yields of 750 kilograms per hectare in the Yangtze River Delta region after electrical irrigation systems were established. China has only begun to adopt this approach on a selective basis, however, and striking results will not be achieved for some time to come.

19. Some additional cultivated land can be made available through new water control systems but the possibilities are limited because of weather, terrain, and soil factors. Also, in many cases, the establishment of needed reservoirs takes away more good land than is added. Thus the best results can probably be attained by concentrating on increasing yields on land that is already under cultivation.

20. Rural electrification also affects the economy of the countryside by indirect means. Letters from mainland China indicate that the residents are enthusiastic about the introduction of electricity in their villages. Household lighting is particularly attractive to the peasants and illustrates the advantages of modernization, thus serving as an incentive to look toward other means of technological change. The processing of agricultural raw materials by electricity speeds up this chore considerably and relieves the workload of the peasants, thus again furthering their interest in technological change. In some cases, new or additional products are made available and peasant incomes are increased. The radio diffusion networks can be important in introducing changes in the countryside as well as ensuring that the peasantry has a proper political orientation.

21. The contribution of rural electrification to national industrial growth has probably been

small. The expansion of industrial facilities in rural areas has been minor compared with the amount of capacity added to modern industry. Some products produced in the countryside in small plants may be used as raw materials for larger industries but most are used locally.

22. The effects of rural electrification on other sectors of the economy are also felt in the competition for resources. Despite the claims of using local funds and resources, much of the machinery and material used for small powerplants is obtained from the larger, modern sector industry. The requirements for ordinary steel, copper, aluminum, motors, and electrical machinery must be significant, not only for building the powerplants, but also for providing the means to utilize the power. Attempts are being made to substitute more abundant materials for those in short supply; for example, the use of aluminum and steel wire instead of copper wire and concrete poles instead of wooden poles. However, these attempts have been only partly successful and have contributed additional strain to the capacity of some supporting industries -- for example, that of the aluminum industry.

Conclusions

23. Since 1957, significant progress has been made in rural electrification in Communist China. Electric power consumption in rural areas has increased from 110 million kwh in 1957 to nearly four billion kwh in 1969; the proportion of total production has increased from 0.5% to 8%. The area served by electrical irrigation and drainage has also increased during this period and at present perhaps 15% to 20% of the irrigated land in China uses electricity as a power source. Most of the power is used to assist irrigation and drainage and has resulted in improving the stability of crop yields as well as increasing output. Electric power is also important in expanding radio networks, providing improved lighting, and operating small industries in the countryside.

24. The first intensive program for rural electrification occurred during the Leap Forward and consisted primarily of the construction of thousands

of tiny primitive plants and the start of construction of a number of large multipurpose projects. Because of poor planning and haste in construction, most of the projects were ineffective. After the Leap Forward, surplus power was available from modern urban electric power generating facilities and major transmission lines were extended from large urban powerplants to rural areas. About 1964 the Chinese again began a drive to build small electric power installations in the countryside. These were to be built mostly in the hilly and mountainous areas not reached by major transmission lines. Most of the large multipurpose construction projects begun during the Leap Forward remained dormant.

25. After a brief hiatus in the rural electrification effort in 1966-67, the program was renewed during the winter of 1967-68. The present program is similar to that of the Leap Forward in certain respects, but it is being conducted on a smaller scale and so far is more carefully planned. A small plant program with some similarities to that of the Leap Forward is now being pushed by the regime, and construction apparently is moving at a rather rapid pace. Some large-scale electrification projects are being built but most of the work is concentrated on completing and maintaining the systems built earlier. Also, some work is under way on expansion of transmission facilities in rural areas. However, most of the areas that could easily be served from thermal powerplants in major cities have already been served. Further development of large integrated transmission networks in more remote areas will depend on completion of large-scale river development schemes. Some of the large hydroelectric schemes, dormant since the Leap Forward, are again under active construction.

26. Along with expansion of rural electrification the present program also emphasizes the expansion of power utilization equipment. This includes pumping machinery, radio diffusion networks, household lighting, and small industrial plants. Electricity was said to be available in most of the villages in more than half of China's 2,126 *hsien* at the end of 1965 for use in irrigation and drainage, processing, and lighting of homes and schools. Since then additional powerlines, small powerplants, and radio diffusion networks

have been built in many areas. By extension of electric power the peasant workload has been relieved somewhat, the interest of the peasants in technological change is gradually being aroused, and state access to rural China is being improved.

27. Rural electrification is likely to continue to expand. Modernization of water control systems is essential to any effort to improve crop yields in a country where a large part of the equipment used for water control is still operated by animal and human power. Progress of the electrification program may be slowed, however, because the most suitable and least costly areas have already been electrified; thus further electrification of rural areas will be increasingly more expensive and time consuming.

APPENDIX

Selected Activity in Rural Electrification
1967-69

Project and Location	Description
Huai-pei area (12 Hsien in Anhwei Province)	Possibly related to the To River project. In 1969, 650 kilometers of transmission lines, 26 power transformer stations, and 42 power-driven irrigation stations were completed. Construction is continuing in the area.
Ta-pieh Mountain area in Anhwei Province	Built 95 water-turbine pumping stations and 15 hydroelectric stations using water-turbine pumps. The electric power is used for a radio diffusion network and lighting (1969 information).
To River Project in Anhwei, Honan, and Kiangsu Provinces	Part of the Huai River scheme. A major canal called the Hsin-pien River was completed in 1969. This project will help drain water into Hung-tse Lake freeing one million hectares of land from the menace of flood and waterlogging. In May 1969 there were 450,000 people working on the project. The Hsin-pien River will also be used for irrigation by electric pumping.
Chekiang Province	[redacted] the province now has 1,000 small hydroelectric plants with a total capacity of more than 40,000 kilowatts. In the three years of the Cultural Revolution the province built small stations equivalent to all such stations built in 17 prior years. More than 85% of the stations were built with collective funds, simple equipment, and local materials. The electricity is used for electric pumping, electric lighting, and radio diffusion networks.
Sui-ch'ang Hsien in Chekiang Province	By July 1969, 76 medium-size hydroelectric powerplants with a total capacity of 3,500 kilowatts were completed. Electric lights and loudspeakers were installed in 28,000 households, and the acreage of irrigated land was increased substantially.
Fukien Province	[redacted] more than 2,000 small hydroelectric plants with a total capacity of 50,000 kilowatts have been set up in the hilly areas of Fukien Province.
Heilungkiang Province	Electric power is available in all [redacted] and 60% of the communes and production brigades. Since the Cultural Revolution 20 small-scale powerplants have been built or rebuilt and more powerlines have been installed than in the 17 previous years (1969 information).

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Project and Location	Description
Honan Province	A total of 30,000 kilometers of high- and low-tension lines have been put up in the last two years in the villages (more than all the lines put up before 1967). Also 90,000 power-operated wells were built, 50% more than the total before 1957. Farmland under electrified irrigation now totals 666,000 hectares. [redacted] the province had a network of 70,000 kilometers of electric lines, more than four times the length before the Cultural Revolution (15,600 kilometers). In addition, about 1,000 small hydroelectric plants have been built. To meet the increasing need for electric wire, the province has set up several small aluminum plants which use local raw materials.
Feng-ch'iu Hsien in Honan Province	In 1969, 300 kilometers of high-tension lines and 400 kilometers of low-tension lines were built. The power is used to irrigate 12,000 hectares.
Hsia-i Hsien in Honan Province	Powerlines, including a 63-kilometer line from Sui-ho Hsien in Anhwei and 160 kilometers in 13 communes, were completed one year ahead of schedule in 1969. Possibly related to the To River project.
Hsi-ch'uan Hsien in Honan Province	One commune in the county built 12 water-turbine pumping stations enlarging the irrigated area by 2,000 hectares. Three of the stations can supply electricity (1969 information).
Hua Hsien in Honan Province	In October 1969, a 110-kilowatt line and a 35-kilowatt circuit were completed. The project required 11 months, and will provide electricity for industry and agriculture in five counties.
Lan-k'ao Hsien, Honan Province	In 1969, the county completed a small electric pumping station on the Yellow River to drain and irrigate 3,000 hectares.
Wen Hsien in Honan Province	In 1967-69, a total of 827 kilometers of powerlines, 253 transformers with a capacity of 22,600 kilovolt-amperes, a number of powered irrigation stations, and 1,690 pumped wells were completed. The projects serve 26,000 hectares of land.
Yung-ch'eng Hsien in Honan Province	Built 600 kilometers of lines in 19 communes in 18 months (1969 information). Possibly related to the To River project.
Ta-ching River in Hopeh Province	Part of the Hai River harnessing scheme. The first stage -- to enlarge the capacity of the Ta-lu-chien channel -- was completed in 1969. It is probable that this project will use electric power for pumping at a later stage.

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Project and Location	Description
Hunan Province	At the end of 1967 the province had installed 16,748 sets of water-wheel pumps which irrigated 127,000 hectares. The pumps also were used to operate 4,600 processing machines and electric power generators with a capacity of 10,000 kilowatts.
Hunan Province	The first high-tension powerline of 220,000 volts was completed in September 1969. This line is 293 kilometers in length and is to supply power to the central and northern parts of the province. Possibly some of the power will be used for water control. Construction of the line began in 1965.
Kuei-tung Hsien in Hunan Province	By February 1969, the county had 69 power-generating stations and 50% of the brigades had electric power. Before the Cultural Revolution there were only five generating stations and less than 10% of the households had electricity.
Stone Horse (Shih-ma) Project in Hunan Province	Project was begun in 1966 and by 1967 it benefited several thousand hectares of land. It has 30 medium and small water-turbine stations and 684 kilowatts of electric power capacity.
Hilly areas in Kiangsi Province	In the past three years (1967-69) 2,300 small hydroelectric powerplants with a total capacity of 40,000 kilowatts have been built. This is nine times more than the capacity built in the 16 years prior to the Cultural Revolution.
Lo-p'ing Hsien in Kiangsi Province	Electric pumping capacity was up from 1,900 kilowatts in 1966 to 3,400 kilowatts in 1969. Processing of farm produce was up five times and electric lighting had increased by 40%.
Sui-ch'uan Hsien in Kiangsi Province	Three big water conservation projects were completed by the end of 1968. The electric power capacity is 2,000 kilowatts and the irrigated area increased from 2,000 hectares to 20,000 hectares.
Yu-kan Hsien in Kiangsi Province (south of Po-yang Lake)	In the past three years (1967-69), 141 electric pumping stations, four transformer stations, and 300 kilometers of powerlines have been built. Now one-half of the total cultivated acreage (of the county) benefits by electrified irrigation and drainage.
Kiangsu Province	A 110-kilovolt transmission line from Hu-si-yin to Hai-chou was completed in early 1969. This 130-kilometer line supplies electric power to four counties and two cities and will promote industrial and agricultural development in these areas.

Project and Location	Description
Kuan-yun Hsien in Kiangsu Province	In 1968-69, 68 pumping stations with 106 electric motors and 159 kilometers of transmission lines were completed.
Yang-chou area in Kiangsu Province	A water control project was completed when the third large electric pumping station began operating in 1969. Work on the project started in 1961. The project can be used to irrigate and drain 165,000 hectares.
Kwangsi Chuang Autonomous Region	Special districts, counties, and rural communes have built small hydroelectric stations, and the amount of electricity used for agricultural purposes has doubled compared with 1967
Lu-ch'uan Hsien in Kwangsi	By late November 1969, the county had built 63 small hydroelectric power stations with a total capacity of 5,142 kilowatts. Fifty of the plants were built with funds raised in the county. The electrically irrigated area exceeds 2,000 hectares.
Pei-liu Hsien in Kwangsi Autonomous Region	In April 1969, the first stage of the Chao-yang water-turbine pumping station was completed. At present this project benefits 2,000 hectares and on completion it will benefit 5,000 hectares.
Lo-ting Hsien in Kwangtung Province	By August 1969, power generation projects scheduled to take five years had been completed in two years. These projects include 395 water-turbine stations with 738 sets of machines that benefit 6,000 hectares.
Commune on outskirts of Kuei-yang in Kweichow Province	Of 84 medium water conservancy projects, 50 were built during the Cultural Revolution; of 41 mechanized pumping stations, 31 were built during the Cultural Revolution; and of nine medium and small powerplants, four were built during the Cultural Revolution. Electric power capacity of rural plants is up 540 kilowatts.
Mei-chiang River Project in Mei-t'an Hsien, Kweichow Province	In the past two years (1967-68), 12 hydraulic-turbine pumping stations were built and 3,000 hectares of land are protected.
Fu Hsien in Liaoning Province	Every production brigade has electric rice and flour mills and all houses except those in remote mountainous areas have electric light. In the area, 223 electrically pumped wells, six small pumping stations, seven river dams, and 31 dikes help to irrigate over 2,000 hectares (1969 information).
Shantung Province	A 110-kilovolt powerline extending 130 kilometers across the Yellow River was completed in 1969. This line is to supply electricity to the Po-hai Plain for rural use.

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Project and Location	Description
Shantung Province	[redacted] large-scale construction of small power stations has resulted in an increase of 3.7 times in the power-irrigated area over that of 1965.
Hai River Project in Shantung Province	Some 500,000 people were working on this water conservancy project in the winter of 1968-69. This large project will affect an area containing nearly two million hectares of farmland in northern Shantung. There is no evidence as yet of the use of electric power.
Lo-p'ing Hsien in Yunnan Province	A large drainage and irrigation station was built, and 130 sets of water-turbine pumps were installed in 1969.