

**THE PROGRAM FOR WATER CONSERVANCY  
IN COMMUNIST CHINA  
1949-61**



May 1962

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THE PROGRAM FOR WATER CONSERVANCY IN COMMUNIST CHINA  
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Summary and Conclusions

Communist China must sustain approximately one-fourth of the world's people on about one-fifteenth of the earth's land surface. Only 11 percent of the land area of mainland China is cultivated, and productivity of much of the cultivated area is limited by unsuitable topography, soil, and climate. The most suitable topography for agriculture and some of the most productive soils in the country are located in the North China Plain, but the productivity of the area is limited by low rainfall. The productivity of South China, which has a long growing season and abundant, although seasonal, rainfall, is limited by mountainous terrain and leached, acid soils. The intense population pressure on the cultivated land has resulted in low productivity of farm labor and has pushed cultivation into all but the most marginal and inaccessible areas.

Since 1949 the Communist regime has embarked on a series of ambitious programs for industrialization. Almost all of these programs have depended directly or indirectly on agriculture for financing in spite of the fact that China through 1949 habitually was a net importer of food. Even with net imports of food, most of the population had been accustomed to surviving at low dietary levels. If the agriculture of Communist China were to support industrialization successfully, agriculture had to be elevated quickly to the point of producing substantial surpluses above the minimum needs of the population.

The Communist regime implemented a number of programs in its attempts to circumvent the limitations imposed on agriculture by topography, climate, and soils. Of these programs the expansion and improvement of the irrigated area and the use of larger quantities of chemical fertilizers appear to have had the greatest potential. Of the two programs, irrigation seemed to be the most compatible with conditions existing in Communist China. Irrigation, which would utilize a maximum of the abundant labor of China and a minimum of its scarce capital, promised quick returns. Rural labor, normally idle or underemployed during the winter months, could be used constructively in water conservancy during the seasonally slack period, but there were limitations to the potential of labor-intensive efforts for irrigation. The magnitude of the area adaptable to irrigation by simple projects was limited both by natural conditions and by the shortage of trained technicians, and apparently the regime was either unwilling or unable to supply the required quantities

of capital and materials, especially iron, steel, and cement. These materials were needed especially for the complicated, large-scale projects. The initial irrigation program late in 1949 assigned priority to flood control and secondary importance to the rehabilitation of irrigation projects damaged or destroyed by war. In 1952 it was claimed that practically all the dikes along the major rivers had been completed, and it is believed that by that time the irrigated area approached or slightly exceeded that under irrigation before the outbreak of the Sino-Japanese War in 1932.

After 1952 the regime began to carry out larger and more complex projects for control of the larger rivers. At that stage of development the policy was still to divert flood water into rivers that would drain into the sea. The government also introduced the "lower stage" agricultural cooperative in 1952 and gave greater autonomy to lower administrative levels in the construction of facilities for water conservancy. This effort resulted in the first "upsurge" in water conservancy in 1952.

A shift in the basic policy of the regime in 1955, along with a nationwide drive for the formation of "higher stage" agricultural cooperatives, led to the second "upsurge" in 1956. A shortage of skilled labor and a lack of technical capabilities together with long construction periods, waste, higher requirements for capital, and disappointing results associated with large government-initiated projects apparently induced the regime to shift its emphasis to the small-scale project constructed by the peasants themselves. This procedure, in effect, gave rise to two simultaneous programs for water conservancy within the country. The large projects remained directly under the central government, whereas authority over the construction of the smaller projects was shifted to the province, the hsien (county), or the cooperative. In order to circumvent the limitations imposed by the inadequate technical force, an attempt was made to standardize projects for the country as a whole. The drive in 1956 was characterized by great emphasis on sinking wells.

Following a year of "consolidation" and "advancement" in 1957, the third and most ambitious of all the "upsurges" was touched off during the "leap forward" of 1958, accompanied first by additional "tidying up" of the "higher stage" cooperatives and later by the shift to communes. Additional emphasis was placed on the small projects. Millions of small reservoirs and ponds were constructed to store excess water rather than to facilitate its removal, and the peasants were given almost complete autonomy for the design and construction (and financing) of these projects. The state also shifted more responsibility for the large projects to the lower administrative levels.



The commune organization had been extended throughout all of Communist China by late in 1958, and thereafter the regime assigned still more responsibility for the large irrigation projects to the communes. Before 1958 the masses had donated materials, funds, and "volunteer" labor to the large-scale projects. Now the communes were "permitted" to build large projects, many of which were said to have been divorced completely from state aid.

Fewer but larger projects were said to have been constructed in 1959, and emphasis was on the "improvement" of areas under irrigation rather than on the development of new areas of irrigation. This trend continued throughout 1960 and into the early part of 1961. No increases in the irrigated area have been claimed since 1959.

The regime claims that from 51 million to 57 million hectares\* were brought under irrigation between 1949 and 1959, 32 million hectares of which were said to have been added during 1958. Ample evidence and some official admissions indicate that actual achievements have fallen far short of these official claims. Several provinces have scaled down rather sharply their original claims for irrigation accomplished in 1958, but the national total claimed has remained unchanged. The cultivated area and the multiple-cropping area have declined since 1956, and there has been no widespread substitution of high-yielding or high-value crops such as rice and cotton for low-yielding ones such as wheat and "miscellaneous" grains. These conditions seem incompatible with a great increase in irrigation, for if irrigation projects were as numerous and efficient as claimed, the droughts of 1959, 1960, and 1961 should not have been so devastating. Some sources announced that the irrigated area was based on the designed capacity of the projects, whereas other sources admitted that many projects were not completed, that these projects were not performing up to potential, and that ditches would have to be dug and the land leveled before many projects would be beneficial.

The shortcomings of the Chinese Communist campaigns for irrigation have been so serious that the benefits of the programs probably will be very limited in relation to the tremendous expenditure of labor. It is apparent that the resources have been unwisely used in many cases, for these campaigns seem to have contributed little to the solution of the agricultural problems during 1959-61.

The advisability of the indiscriminate construction of millions of small reservoirs and ponds is doubtful, as these pools have lowered the potential of many large and medium-size projects and have resulted in instances of water logging, soil alkalization, and/or salinization.

\* One hectare equals 2.471 acres.

Because the construction of so many small reservoirs has changed the water equilibrium, many streams and rivers have ceased to flow, and the dependability of others has been affected.

Apparently, little potential remains for expanding irrigation by the small or medium-size projects. The easiest and cheapest areas to irrigate undoubtedly were the first to be brought under irrigation. Consequently, extension of irrigation has become increasingly more difficult and costly, and future substantial increases in the irrigated area will have to come from large, capital-intensive, multipurpose projects. According to the Chinese Communists, such projects require 3 to 5 years to build and 2 to 3 years more before they become beneficial. Although a few projects are in various stages of construction, it will be many years before many large projects can be constructed and put into operation, and the problems of silting and alkalinity in North China, the region most urgently requiring this type of project, will limit their effectiveness.

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## I. Background

For centuries the people of China have survived only by intensive use of the small part of the mainland that is suitable for agriculture. Since obtaining control of the mainland in 1949, the Chinese Communist regime has embarked on a series of ambitious programs for industrialization that have depended heavily on agriculture. The state has demanded from agriculture a level of production that not only would feed a rapidly growing population but also would provide large quantities of industrial raw materials as well as substantial surpluses to be exported in exchange for imports of industrial capital. These demands have stimulated the introduction of many new and at times questionable programs and policies to increase agricultural production. Because the opportunities for expanding the cultivated area are very limited, these programs have emphasized increasing the yield per unit of the land.

### A. Extent of the Cultivated Area

Communist China encompasses about 9.5 million square kilometers, one-fifteenth of the land surface of the earth, but its population constitutes about one-fourth of the world total. 1/\* The limitations placed on Chinese agriculture by topography and climate are clearly revealed by the fact that in spite of intense population pressure over the centuries, the cultivated area still comprises only about 11 percent of the total land area. By comparison, the cultivated area of the US exceeds that of China by about 75 percent and on a per capita basis by more than five times. In China, however, the intensive use of land through multiple cropping permits the sown area to exceed the basic cultivated area by almost 50 percent and to exceed somewhat the sown area in the US. According to Chinese Communist claims, which in this instance appear to be realistic, the cultivated area reached a maximum of almost 112 million hectares in 1957 and declined to about 108 million hectares in 1958 2/ and to 107 million hectares in 1959. 3/

### B. Limitations on Increasing Agricultural Production

The population pressure on agricultural land in Communist China has forced very poor land into production, and the low productivity of agricultural labor has made the formation of agricultural capital difficult. Consequently, increases in agricultural production have depended largely on more labor inputs. In October 1959 an editorial in the People's Daily (Jen-min jih-pao) revealed that of the cultivated area of China, about 31 percent is classified as "fertile," 40 percent

\* For serially numbered source references, see Appendix B.

as "ordinary," and 29 percent as "low yielding." 4/ In addition, nearly one-half of the farmland is in hilly or mountainous regions that are not suitable for significant improvement by means of conventional irrigation programs. 5/

The productivity of the cultivated area is greatly affected by climate, as precipitation varies widely from region to region, from year to year, and from season to season. About 25 percent of the land, largely in the north and east, receives less than 12 inches of rainfall annually and either is entirely unfit for agriculture or is usable only under special conditions of dry farming or irrigation. 6/ In general, the regions south of the Yangtze River receive abundant rainfall (see the map, Figure 1\*). South China has 75 percent of the national water resources but only 38 percent of the cultivated acreage. 7/ Of the total rainfall in the summer months, North and Northeast China receive almost 60 percent, and Central and South China more than 40 percent. 8/

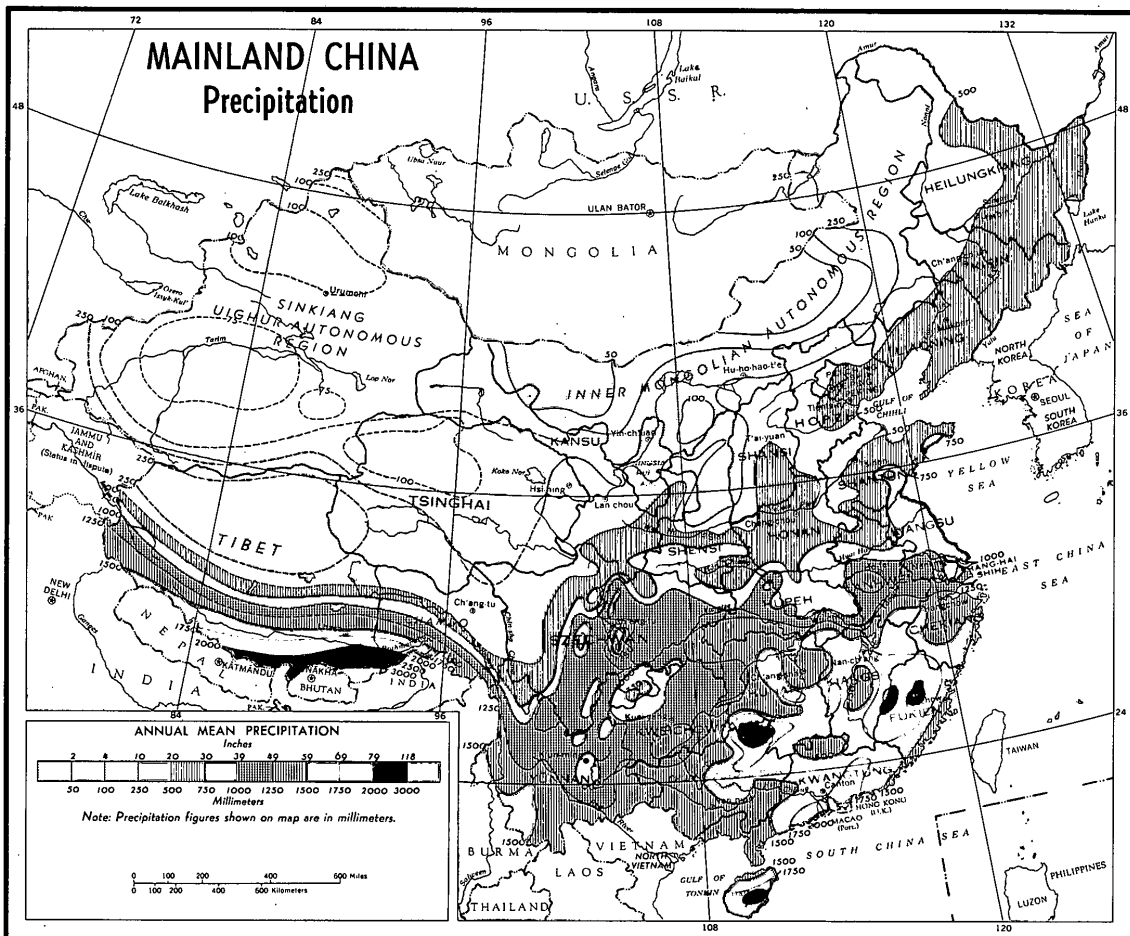
China has a wide variety of types of soil, as would be expected in a large country with such diverse climatic conditions (see the map, Figure 2\*). In general, soils south of the Yangtze River are acid as a result of intense leaching brought about by the combination of high rainfall and warm temperatures, whereas comparatively cool temperatures and low rainfall north of this river have given rise to alkaline or saline soils. 9/ The adverse effects of nature on the soil have been intensified further by centuries of concentrated cultivation that has resulted in an almost universal deficiency of nitrogen 10/ and organic matter. 11/ The shortage of organic matter is due primarily to the habitual use by the Chinese peasants of plant stalks and leaves for livestock feed and fuel. The content of organic matter in manure and night soil fertilizer has been too low to make up this loss. The soils also are often deficient in phosphorous and potassium, but these deficiencies are not so widespread or so severe as that of nitrogen.

### C. Attempts to Overcome Limitations

The Chinese Communist regime has implemented a number of programs in its attempts to circumvent the limitations of topography, climate, and soils. The "deep plowing" and "close planting" programs of the "leap forward" had little scientific basis. The campaign to accumulate "native fertilizer" was of dubious value, especially because of increased labor requirements. The two most promising methods of increasing agricultural production per unit of area in Communist China are the development of irrigation and the increased use of chemical fertilizer. Of the two the Chinese leaders apparently believed

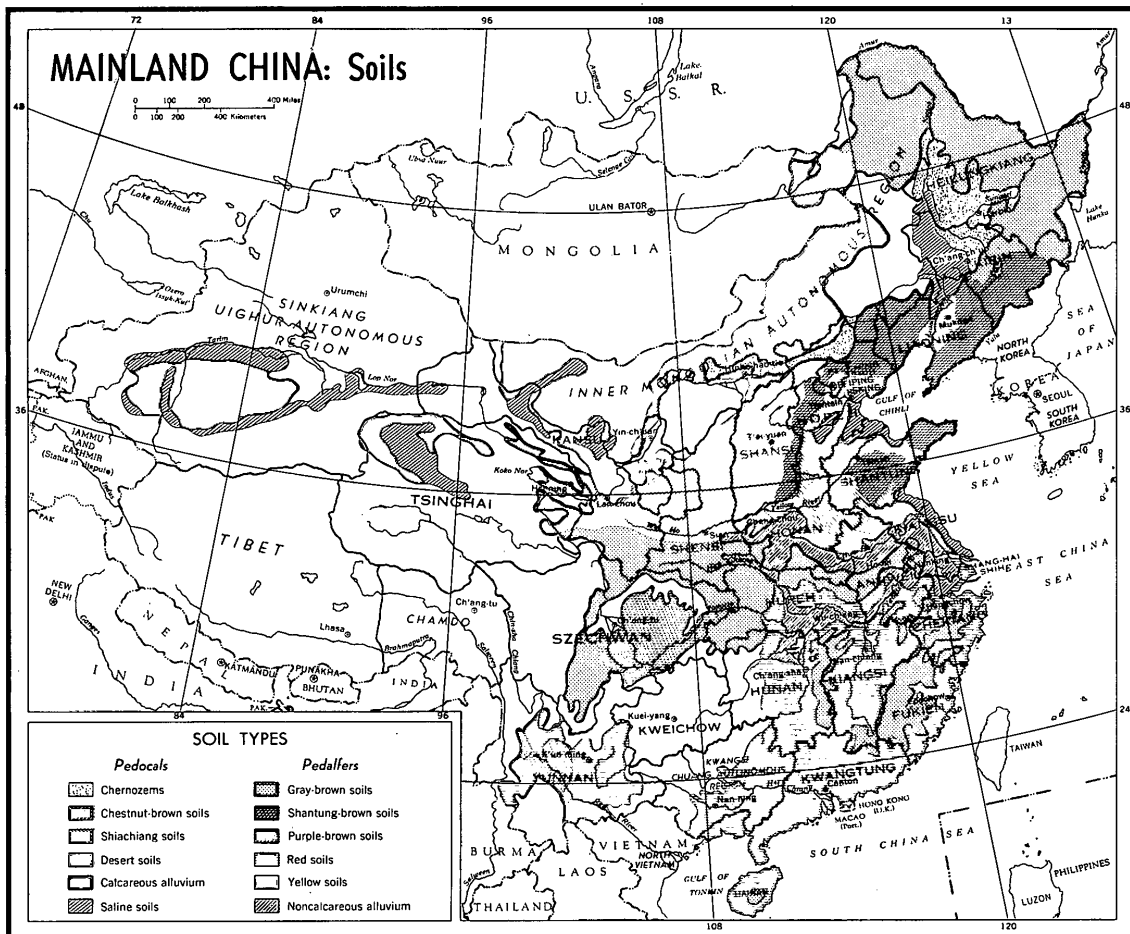
\* Following p. 6.

Figure 1



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Figure 2



that irrigation held the greater potential for quick returns at significantly lower costs. The regime has placed great emphasis on campaigns to bring large areas under irrigation and to improve the facilities on the land already under irrigation. Irrigation appears, therefore, to have appealed to the leaders as a program compatible with the requirements for quickly obtaining a substantial increase in yield, while at the same time using a maximum of abundant labor and a minimum of scarce capital.

Irrigation permits (1) the cultivation of crops in areas formerly too dry to produce a crop; (2) the cultivation of two or more crops annually in areas where, without irrigation, only one could be grown; (3) the substitution of higher yielding crops for lower yielding ones; and (4) the increase in yields of existing crops. Consequently, almost immediately after taking control of the mainland in 1949, the Chinese Communists made plans to increase the size of the area under irrigation.

## II. Irrigation Program, 1949-61

### A. Administration and Organization of Irrigation Programs

The actual administrative structure behind the effort for water conservancy in Communist China, although somewhat obscure, apparently has been organized on four levels -- national, provincial, conservancy districts,\* and hsien.

The national Ministry of Water Conservancy was organized in 1950,\*\* 12/ with Fu Tso-yi, a former war lord, as minister. Apparently the primary functions of this ministry have been to execute Party directives in administering and coordinating construction of irrigation projects involving more than one province and to plan and supervise state-financed projects. It was reported in 1955 that this ministry was composed of about 15 offices, bureaus, and committees 13/ and four river commissions (the Yellow, Yangtze, Huai, and Ching Chiang\*\*\* River Control Commissions), 14/ with still another organization, the Yellow River Planning Commission, having responsibility for planning the long-range development of the Yellow River. 15/ This latter commission was said to be a joint venture of the Ministries of Water Conservancy, Fuel

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\* The area included in a water conservancy district cuts across other administrative lines and is determined by a drainage area, a river valley, or other natural factors.

\*\* In 1958 this ministry was combined with the Ministry of the Electric Power Industry and renamed the Ministry of Water Conservancy and Electric Power, retaining Fu Tso-yi as minister.

\*\*\* The section of the Yangtze River between Chih-chiang and Lake Tung-t'ing.

Industry, Agriculture, Communications, Geology, and Railroads and the Chinese Academy of Sciences.

Directly below the national ministry are the various provincial organizations, seldom mentioned in the press. The administrative structure below the provincial level also is obscure. In 1957, one source noted: "At present in some hsien and administrative districts in certain provinces, a water conservancy department or bureau is still maintained. Planning should be done at the provincial, hsien, village, and cooperative levels." 16/ Nevertheless, no uniform organizational structure appears to have been maintained below the provincial level. From the national level down to the cooperative and later to the commune, organizations for water conservancy have been required to carry out policy and directives dictated by the Party and have followed the lead of the Party cadres sent to the countryside to enforce them.

The organization of activity in the program for water conservancy has undergone significant changes during the period under discussion. These changes have been related directly to changes in the social organization in the countryside. The first "upsurge" in 1952 was accompanied by the introduction of the "lower stage" agricultural producers' cooperatives, the second in 1956 by the shift to "higher stage" cooperatives, and the third in 1958 by the communal movement.

A government resolution, released early in 1952, paved the way for the first "upsurge" in water conservancy. This resolution authorized various levels of government to establish offices for drought prevention under the leadership of Party committees. 17/ A second shift in the basic policy for water conservancy in 1955, along with the nationwide drive for the formation of "higher stage" agricultural cooperatives, led to a second "upsurge" in 1956.

It was possible to shift greater responsibility to the agricultural cooperatives because the consolidation of farm units had increased the land, the labor, and the capital that each unit had at its disposal. Cooperatives were able to undertake and to complete assignments beyond the physical capability of the smaller mutual aid teams or individual peasants. Also, under the cooperative structure, there was less room for disagreement over water rights or over the removal of land from cultivation to accommodate irrigation projects.

Following a year of "consolidation," the third and most ambitious of all the "upsurges" was touched off late in 1957, coincident with the wholesale formation and establishment of the rural commune.



## B. Inadequacies of Planning and Training

Poor planning appears to have been characteristic of the program for water conservancy in Communist China. The technicians were unable to conduct effectively and with dispatch campaigns of the magnitude demanded by the regime. The number of technicians in the organizations for water conservancy increased from 5,460 in 1952 to 36,000 in December 1957, 18/ the latter period being the most feverish period of the irrigation "leap forward." This force would hardly appear adequate if "several thousand small projects have to be built in each hsien." 19/ The policy of setting overoptimistic goals pressured zealous cadres, especially at the lower levels, to drive the masses to attempt ill-conceived projects and to report fictitious results.

As reported by the press, the basis used by the regime to establish annual goals for water conservancy\* is confused and contradictory. For example, Fu Tso-yi stated in May 1957 that the target for irrigation of farmland was based on the preliminary plans of the provinces, 21/ whereas the Central Committee of the Chinese Communist Party announced in September 1957 that the Ministry of Water Conservancy had informed the lower levels of the targets for irrigation of farmland in 1958. 22/ A striking example of the confusion that must have existed, even among the Party and government hierarchy, was illustrated by the fact that on 23 June 1958 Li Pao-hua, Vice-Minister of Water Conservancy, announced that Communist China would have 80 million hectares, or 75 percent of its cultivated land, under irrigation by the end of its Second Five Year (1958-62) in 1962. 23/ Just 3 days previously, however, Ho Chi-feng, Vice-Minister of Agriculture, had said, "Our aim is to provide irrigation facilities for most of China's cultivated land by next spring, and the whole cultivated land by 1960." 24/ Such contradictions, together with the extreme discrepancy that has existed between announced plans and claimed accomplishments, especially since 1956,\*\* suggest that there

\* Programs for water conservancy have been based on a so-called "irrigation year" that runs from 1 October through the end of the following September. 20/ Unless otherwise indicated, all data presented in the rest of this report will be on the basis of the irrigation year rather than the calendar year.

\*\* For instance, the original plan for 1956 called for an increase of 2 million hectares in the irrigated area, 25/ later revised to 12.6 million hectares, 26/ but the claim was made that 10.6 million hectares were irrigated. 27/ This claim, however, was revised later to 10 million hectares, 28/ to 7.9 million hectares (accepted as the most consistent estimate), 29/ and finally to 6.7 million hectares. 30/ The original plan for 1958 called for an increase of 2.9 million hectares, 31/ but it was claimed that 32 million hectares 32/ actually were brought under irrigation. The original plan for 1959 called for an increase of 33.3 million hectares, 33/ but the regime announced that the increase was only 4.7 million hectares. 34/

was little sound basis for the formation of plans and that the practice of assigning overambitious goals encouraged the construction of many projects with little or no utility and retained for water conservancy large numbers of peasant labor which could have been used to greater advantage in farming.

The greatest shortcomings in the program appear to have been the neglect in obtaining basic engineering data and the failure to coordinate plans, and not surprisingly the regime had to accept some serious setbacks in its construction of large-scale projects. A detailed national survey of the soil was not started until the fall of 1958. 35/ It was admitted that the project to harness the Huai River was attempted with inadequate data, especially hydrographic data, 36/ with Minister Fu Tso-yi himself admitting in May 1957 that there had been no basis for deciding on Huai River projects and that constant changes had been necessary because comprehensive plans for the river basin had not been fixed. 37/ Also, it has been admitted that "heavy" waste was incurred in the construction of the Ta-huo-fang Reservoir. Work had to be stopped on two occasions at the Nan-wan Reservoir because of geological problems. 38/ The design of the Fo-tzu-ling Reservoir was so poor that another had to be built at Mo-tzu-t'an. The Shih-man-t'an, Pan-ch'iao, and Pai-sha Reservoirs had to be rebuilt. 39/ Some sites for reservoirs were not properly selected, and thus the Fo-tzu-ling, Hsiang-hung-tien, and Mo-tzu-t'an Reservoirs on the P'i River did not meet flood requirements, making it necessary to build still another reservoir at Liang-ho-k'ou. 40/ Not until the Kuan-t'ing, Ta-huo-fang, Fo-tzu-ling, and Mei-shan Reservoirs were under construction and the Huai-ho, Shih-man-t'an, Pan-ch'iao, Pai-sha, and Po-shan Reservoirs were completed, was it decided that they should be altered to serve a multipurpose function. 41/

The lack of over-all planning, coordination, and division of responsibility among the various departments gave rise to inefficiency and to clashes of authority. For example, the Yellow River Commission announced late in 1957 that only 20 percent of the planned work for soil and water conservancy, which ultimately would determine the life span of the San-men Gorge Dam, had been completed. The delays were attributed to clashes of authority and the lack of coordination between the Commission and the departments of forestry and agriculture. 42/

The regime, through an accumulation of errors and experiences, appears to have become aware by late in 1957 of the shortcomings of its efforts in planning water conservancy. The following statements are typical:

Through several years of practice, our country has gained very much experience in selecting dam types.

Basic information is well prepared. Reliable foundations underlie our selection of dam types. This is really a principal experience of great importance. Such experience, however, was only obtained by learning through errors. 43/

We have learned three lessons. First, in the absence of over-all plans for the river valley, important water conservancy projects must not be hurriedly started. Second, before the start of important conservancy projects, we must have sufficient time to collect data, draw on several plans, and repeatedly compare and select them. Third, the standard of important conservancy projects must not be set too low. Of course, it is not right to set them too high either. 44/

To judge from these statements, the regime by late 1957 should have been able to advance rational measures to alleviate or eradicate many of the undesirable features of the program. Instead, a series of poorly planned "leap-forward" policies were adopted. Partial responsibility for harnessing large rivers and for constructing medium-size and, to a certain extent, large projects was transferred "to the masses." 45/ A great number of small projects were to be substituted for many of the proposed medium-size and large projects, 46/ and the design and construction procedures became even more questionable.

In September 1957 an editorial in the People's Daily complained of the neglect of mass projects and said that the plans for the Huai and Hai Rivers, which called for state investments of 5.4 billion and 7.2 billion yuan,\* respectively, had little realistic significance and were unsuited for China's economic conditions in the near future. 47/ Criticism was leveled at the plans because they were too comprehensive and did not touch on the "essential" problem of relying on the masses. Too many unnecessary rules, it was claimed, demanded too much data and handicapped the masses in their undertaking of large irrigation projects. 48/ Designs were to be worked out according to the availability of local construction materials, 49/ but technical problems were to be solved by "letting all teachings contend," -- that is, through free debate and practice. 50/ "Locally manufactured" cement and steel were utilized, and wood, bamboo, tile, and other materials were substituted freely for steel, iron, and cement, 51/ without any apparent concern for the fact

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\* Yuan values in this report are given in current yuan and may be converted to US dollars at a rate of exchange of 2.46 yuan to US \$1. This rate does not necessarily reflect the value of the yuan in terms of the dollar.

that replacement would be required within a comparatively short time.\* There probably were as many "formulas" for concrete as there were construction sites. One such "formula" called for 70 percent powder ground from old brick, 25 percent lime, and 5 percent gypsum, 53/ and a hsien in Ningsia was said to be making concrete with clay as the principal component. 54/

The acute shortage of capable technical personnel, coupled with the inability or unwillingness of the regime to finance adequately the program for water conservancy, gave rise to a division of projects on the basis of their complexity or size. The state retained responsibility for harnessing large rivers 55/ and for large irrigation projects. Medium-size projects were to be built with state aid, 56/ and the small projects by the masses themselves. 57/ The regime undoubtedly reserved most of the competent technical personnel for the large projects. The Chinese Communist technical force, augmented by teams of Soviet experts, benefited from plans inherited from the previous regime 58/ -- plans that had been drawn up by foreign engineers (mostly American).

The technical force was said to have been augmented by the training of "peasant" technicians, and many technical problems were left to the masses to be solved by their own devices. The "training" of peasant technicians apparently was based on the premise that "the construction site is the school and work the textbook." 59/ A hsien in Kiangsi Province claimed to have trained 40 survey workers by giving them 1 week of "special" training on the job. 60/ Shantung Province announced plans to train 1 million peasant experts during the winter and spring of 1957-58, 61/ and communes were said to have solved the problem by "doing survey, design, and construction work at the same time as learning on the job." 62/ Although most of these technicians had little or no schooling, the claim was made that they were guiding the technical work of building large projects. 63/

### C. Types of Irrigation Facilities

#### 1. Before 1949

Irrigation techniques were primitive, and few large irrigation projects existed in China before 1949. The larger projects drew water directly from streams, with or without the aid of a diversion dam. 64/

\* In February 1959, Minister Fu Tso-yi announced that the quarterly allotment of cement did not meet one-third of the requirements and that of steel less than one-fourth and that there had been problems with specifications and delivery periods. 52/

The use of water directly from streams is the simplest method of irrigation, and this procedure has been followed throughout China for centuries. This form of irrigation has been most important in the northwest provinces, where reservoirs and wells are rarely compatible with the topography, soils, and climate of the region, but the capacity of irrigation systems that draw directly from streams is dependent on the source of water for the system. Because the streams often drop to extremely low levels during prolonged drought, the systems often are inoperative or function at greatly reduced levels during the periods when water for irrigation is needed most. Although the utilization of large storage reservoirs for irrigation in certain areas appeared practical to some Western engineers, no large reservoirs had been built. 65/ The peasants, however, had built thousands of small reservoirs and ponds, mostly concentrated in the southern part of the country, where precipitation is high and the topography such that this type of small project could be used advantageously.

Before 1949 the use of wells to obtain underground water for irrigation was confined largely to areas with insufficient surface water resources. Consequently, the greatest number of Chinese irrigation wells was found north of the Huai River in the North China Plain, 66/ with the heaviest concentration of wells in Honan, Shantung, and Hopeh Provinces. The majority of these wells were shallow, being only 3 to 15 meters deep, 67/ with water levels below 6 meters considered to be "deep underground reserves." 68/

## 2. Communist Approaches Since 1949

Since 1949 the Chinese Communist regime has built a number of large reservoirs, most of which are multipurpose in nature (see Table 1\*), but serious weaknesses exist in this program. According to the leader of a team of Soviet experts on water conservancy in Communist China, in regions deficient in water, such as the basins of the Yellow and the Huai Rivers, much water is lost because the reservoirs lack the capacity to retain the water during periods of high flow until it is needed later for irrigation. 69/

North China, the area most limited agriculturally because of marginal precipitation, is unsuited for effective use of reservoirs. The loess soils of North China are easily eroded, and, consequently, silting is a serious problem. Before the Communist takeover, many non-Chinese engineers concluded that the heavy silt in the rivers of North China would prohibit the efficient use of large storage reservoirs.\*\* 71/

\* Appendix A, p. 33, below.

\*\* In the summer months the waters of the Fen River were reported to carry solids up to 23 percent by weight, the Yellow River up to 40 percent, and the King River in flood stage as much as 50 percent. 70/

The Communists estimated that 100,000 cubic meters (cu m) of the 260,000-cu m capacity of the Yang-huai-wen Reservoir, which was to be built near Peking, would be filled by silt within a year after its completion. 72/ In spite of limitations the Chinese Communists have constructed many small and medium-size reservoirs in North China, and 16 of the first 18 large reservoirs constructed by December 1958 were located in this region (see the map, Figure 3\*). 73/

The Chinese Communists claim that large reservoirs can assist small reservoirs in dry years and that the small reservoirs can retain a part of the flood water in years of high rainfall, thus easing the strain on the larger reservoirs. 74/ It is clear, however, that the projects have not been properly coordinated, for in periods of extreme drought in North China, small reservoirs are seldom capable of preventing crop failure.

The regime claimed that 4,000 large irrigation systems draining directly from streams had been constructed by the end of 1959 (see Table 2\*\*) but did admit that most of those systems constructed up to 1957 were "backward," 75/ that 40 to 60 percent of the water was lost through leakage, 76/ and that 30 percent of the capacity of the large and medium-size projects in the northern provinces and southern part of the northeastern provinces was not being utilized. 77/ Most of the irrigation systems that draw directly from streams are very small. 78/ High seepage from canals, coupled with inadequate drainage, causes an area to become waterlogged and sometimes produces serious alkalization 79/ and salinization 80/ so that the land is unfit for agriculture. On the other hand, the digging of the network of extremely deep canals in the North China Plain -- a project that the regime claims has been accomplished -- may lower the water table to undesirable levels in some areas.

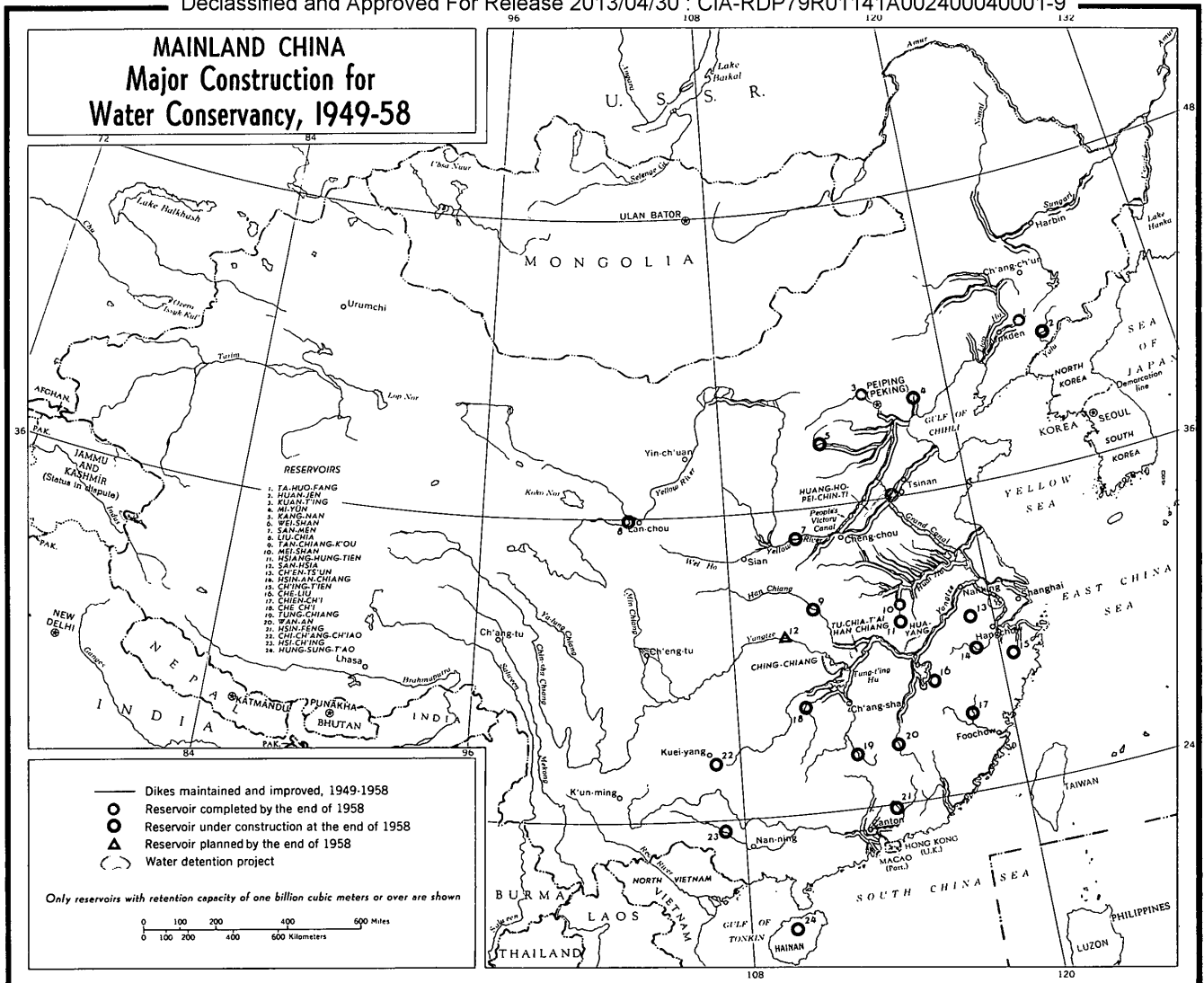
The regime also has claimed an increase from about 2 million wells irrigating about 889,000 hectares in 1949 81/ to 12 million wells (see Table 3\*\*\*) irrigating 22.2 million hectares in 1959. 82/ Although the programs for sinking wells undoubtedly have produced some results, the actual increase probably is far short of the claims of the regime. The claim that 22.2 million hectares were irrigated from wells in 1959 implies that the average area irrigated per well had increased to about three times that of 1958 compared with an increase of only 36 percent from 1949 through 1958. Although 4.6 million wells were supposed to have been dug in 1956, it was admitted that only 40 percent of these wells were of "good quality," that 40 to 45 percent were usable but

\* Following p. 14.

\*\* Appendix A, p. 34, below.

\*\*\* Appendix A, p. 35, below.

Figure 3



lacked adequate water for effective irrigation, and that 5 to 10 percent were useless. 83/ Because most of the wells are very shallow,\* a large number of them would become unproductive with only a small decrease in the water table.

Artesian wells, another source of underground water, also are used for irrigation. Reportedly, known artesian resources are located within an area of 250,000 square kilometers in 200 counties throughout China, 86/ but artesian water is often so high in soluble salts that it is injurious to crops. Some artesian water in Szechwan Province contained so much salt that commercial production of salt was possible. 87/

#### D. Progress of the Irrigation Program

##### 1. Consolidation and Recovery, 1949-52

The initial irrigation programs of the Chinese Communists assigned priority to flood control. River dikes were strengthened or rebuilt, and by the fall of 1952 it was claimed officially that practically all the dikes along the major rivers had been completed. 88/ This program, however, was not an unqualified success. It was reported that the Huai River dikes in Honan Province were strengthened and heightened without consideration of the effects that this change would have downstream. The dikes in Anhwei Province could not match them, and when heavy rains came upstream, the dikes in the Anhwei sector were washed out.

From 1949 to 1952, little emphasis was placed on increasing irrigation, and most of the work that was done on irrigation facilities was carried out by individual peasants on their own plots of ground. The government resolution of 1952 establishing local offices for drought prevention permitted local areas to organize and carry out local irrigation campaigns. These actions led to the first irrigation "upsurge" in 1952, during which the regime claimed that about 2.7 million hectares were brought under irrigation (see Table 7\*\*). Although this campaign placed some emphasis on irrigation of farmland, the regime apparently continued to give priority to the large, multipurpose projects. For example, in September 1953, Chang Tse-lin, Director of the General Bureau of Irrigation of the Ministry of Water Conservancy, stated:

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\* Honan Province, for example, had only 100,000 deep wells in 1960 84/ compared with a total in 1958 of 1.8 million wells. A "deep" well, according to the Chinese, is one deeper than 6 meters. 85/

\*\* Appendix A, p. 40, below.



Large-scale projects now amount to about 20 percent of the total irrigation work done ... . Such large-scale projects will account for a greater and greater part of future irrigation work. 89/

## 2. First Five Year Plan, 1953-57

The First Five Year Plan in Communist China (1953-57) did not get off to a particularly auspicious start in the field of irrigation. Claims for increases in the area irrigated were relatively modest in 1953, 1954, and 1955, being only 1.2 million, 1.1 million, and 1.5 million hectares, respectively. Most of the increase during this 3-year period was attributed largely to small and medium-scale projects, although three major reservoirs were put into operation in 1954, and some large irrigation systems probably also were commissioned.

The foundation for the second irrigation "upsurge" in 1956 was laid in March 1955, when Liao Lu-yen, Minister of Agriculture, stated that no technical innovations were available to increase agricultural production in the immediate future and that increases could occur only by making better use of the available resources. Concerning water conservancy, Liao said that more large projects generally could not be undertaken at present but that a large number of small projects could be built by the peasants themselves. 90/ Thus, in effect, the program for water conservancy was further decentralized, and the emphasis was shifted from large to small projects.\* 93/ Peasant labor was organized and expended in a frenzied attempt to build a mass of small projects, mostly wells. Leadership, however, was not efficient, and a considerable part of the labor and capital expended in the campaign of 1956 was wasted. Although it was claimed that more than 7.9 million hectares were added to the irrigated area in 1956, much of the newly irrigated area was inefficient or worthless, and efforts in 1957 centered around attempts to rectify the mistakes of 1956 rather than to bring new areas under irrigation.

\* Apparently at this time there was no specific definition of the size of projects. In September 1957 the regime announced that it was difficult to set up a standard for small, medium-size, and large projects but that a standard might be determined by the scale of work, the technical questions involved, and the results expected from the standard. 91/ Somewhat later, probably in 1958, criteria were established whereby large reservoirs were defined as those reservoirs with a capacity exceeding 100 million cu m, medium-size reservoirs as those with a capacity of less than 100 million cu m but more than 10 million cu m, and small reservoirs as those with a capacity of less than 10 million cu m. 92/

### 3. "Leap Forward" of 1958

The third and most ambitious of all the Chinese Communist irrigation "upsurges" occurred in 1958. This campaign involved further emphasis on small rather than large projects and an almost complete shift to the concept of storage rather than drainage of water. The regime reverted to stressing the construction of large projects, especially reservoirs, after the establishment of communes late in 1958, but work on most of these projects apparently has been conducted by the communes with little or no financial and technical assistance from the state.

Theoretically, all projects for water conservancy, no matter how small, have been subject to supervision by the Ministry of Water Conservancy. <sup>94/</sup> The immense number of projects initiated since 1956, however, made it impossible for even a small fraction of these projects to be scrutinized adequately by the limited technical force of the ministry. In an effort to exercise some control over the irrigation projects, the regime in 1956 established a few standard types of projects. <sup>95/</sup> For example, in 1956, emphasis was placed on sinking new wells. In 1958, emphasis shifted to ponds, pools, and reservoirs to store water for irrigation and in 1959 to canals and fewer but larger reservoirs.

Indications are, however, that there was some official recognition that enthusiasm for irrigation got out of control in 1958. An editorial in the People's Daily in January 1959 cautioned that water conservancy should not be overdone, for "leaps" would have to be made in other fields as well, and that although it was a good thing to build projects for water conservancy, "We should not complete all good things in 1 or 2 years." <sup>96/</sup> Also noted was the fact that although projects for water conservancy undertaken during 1958 had been noted for their vast numbers, those in 1959 were noted for their high quality. <sup>97/</sup>

### 4. Policies and Programs Since 1958

By early in 1959, emphasis in Communist China had shifted again from small projects to large projects, and most of the peasants were directed to concentrate on "improving" the area under irrigation rather than on developing new facilities for irrigation. Fewer but larger irrigation projects were to be constructed, and most of these were to be built without state aid. The emphasis on large projects and on improving existing projects apparently continued throughout 1960 and 1961, although no increases in land under irrigation have been made since the increase of 4.7 million hectares claimed for 1959.

### III. Input Factors

#### A. Finance

Since 1949 the peasant in Communist China has borne most of the financial burden of the program of the regime for water conservancy. He has contributed both indirectly through state financing of water conservancy and directly through "peasant investment." As the regime obtained increasingly greater control over the peasants and their financial resources through a series of socialization programs, direct peasant investment, in the form of direct monetary and material inputs furnished by the farms and cheap or "volunteer" labor contributions, accounted for a large part of the cost of the program for water conservancy. Although the peasants have always been directly responsible for the construction of small projects, 98/ the government initially financed large projects and supplied assistance, usually of a technical nature; specifications; and supervision for the construction of medium-size projects. 99/ By 1958 the "masses" reportedly were building medium-size projects without government assistance and were contributing funds, materials, and labor for the large projects,\* and by 1959 it was said that the communes were building many large projects without government assistance. 101/

#### B. Irrigation Equipment

Insufficient quantities of irrigation and drainage equipment also have limited the effectiveness of China's program for irrigation. The water wheel, a simple, primitive, water-lifting device, long used by the Chinese peasant, requires huge quantities of human or animal power.\*\* The regime claimed that nearly 8 million water wheels were in use in 1956 compared with about 2 million in 1949. 103/ The statement was made in 1959 that 80 percent of the irrigation in North China was by gravity or machines and that 20 percent, or a "very small percentage," was done manually, 104/ but there have been other statements that large areas were irrigated in recent years with buckets and water carts.

The need for pumping equipment is great. For example, it was stated that water had to be pumped a minimum of 1 meter and a maximum of 4 meters from the canal systems located north of the Huai River. 105/

\* The claim has been made that the masses have supplied more than one-half of the steel, lumber, and cement required for projects in which the government has invested between 1958 and April 1960. 100/

\*\* It has been stated that a 120-horsepower (hp) diesel engine could irrigate 800 hectares, an achievement that equaled the work of 1,800 people using native equipment. 102/

The Chinese Communists have made fantastic claims as to the number of mechanical pumps produced (see Table 4\*). It appears unlikely, however, that production of this equipment could have increased almost sixfold in a span of 1 year, and this skepticism is reinforced by the conflict in Chinese claims. In April 1959 the claim was made that 13 million hectares would be irrigated by machines by the end of June 1959, 106/ but in March 1960 the claim was made that 2.5 million hp would be added in 1960, bringing the total area irrigated by machines to 13.3 million hectares, or double the area irrigated in 1959. 107/ In April 1960 it was stated that the area under mechanized irrigation would reach 17.7 million hectares in 1960, or 38 percent of the total area requiring mechanized irrigation and drainage. 108/

### C. Labor

The Chinese Communist campaigns for water conservancy have been characterized by the use of unlimited numbers of laborers (see the photographs, Figures 4 and 5\*\*). Official claims imply that almost 50 billion man-days were expended in water conservancy between 1949 and April 1960 (see Table 5\*\*\*). The claims for the labor used in earthmoving and in constructing facilities for irrigation are incredible -- for example, 58.3 billion cu m of earth were moved in 1958. It has been said also that 2 cu m of earth were moved per man-day, and the implication is that 29.2 billion man-days were spent in earthmoving in 1958 -- an average of 120 days per man for the entire rural labor force of 240 million men. Even if the enthusiasm of the "leap forward" for work is considered, this statement is unbelievable, and in some of the most important irrigated areas such as North China the implied labor inputs are even more incredible.

The rationale behind such use of labor has been that rural labor, normally idle or underemployed during the winter months, could be employed constructively in constructing projects for water conservancy. Approximately 80 percent of the annual task usually has been completed during the winter. 109/ The construction period has varied somewhat from region to region because of the great diversity of natural conditions. The periods for mass labor on conservation projects have been October through November and March to May in North China, October through March in South China, and October to May in Northeast China. 110/

The labor force, almost entirely unskilled, has been drawn from a number of sources, the greatest part being composed of peasants and supplemented by the Peoples Liberation Army and compulsory reform units.

\* Appendix A, p. 36, below.

\*\* Following on p. 20.

\*\*\* Appendix A, p. 37, below.



Figure 4. Communist China: Construction of a Reservoir

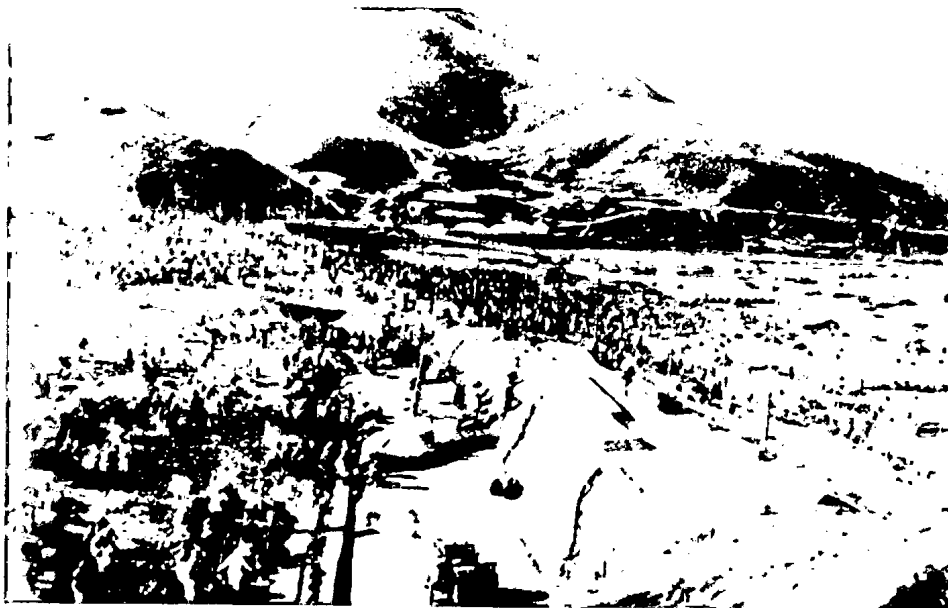


Figure 5. Communist China: Po-shan Reservoir on the Upper Reaches of the Huai System

Army units alone were said to have contributed 15 million man-days during the first 4 months of 1958. 111/ The claim also was made that during 1958 many of the urban population, including teachers, professors, students, doctors, and other professional people, were called on to "volunteer" a few weeks or months of their labor. The statement was made that 20 million people were engaged annually in water conservancy from 1949 through 1952, 112/ 100 million in 1958, 113/ 77 million in 1959, 114/ and 70 million in 1960. 115/ It also was stated that 90 percent of all able-bodied men and women in some localities were so employed during the winter and spring of 1958-59 116/ and that, during 1959, of a total labor force of 77 million engaged in water conservancy, nearly 30 million were women. 117/ The demands of the program for water conservancy together with the demands of other labor-intensive programs, such as collection of native fertilizer, deep plowing, and "backyard" blast furnaces, created competition for agricultural labor, especially during 1958, and gave rise to a serious shortage of labor.

The regime instigated a campaign for "improved tools" late in 1957. These improvements or inventions consisted of peasant innovations of simple tools. For example, "Shoulder poles and baskets were claimed to be in the process of being replaced by carts, barrows, and wagons running on improved iron or wooden rails. Various types of rollers, drawn by engines, animals, or men with laborsaving devices have been devised to tramp the earth." 118/ (See the photographs, Figures 6 and 7.\*)

The tremendous successes claimed for the campaigns for the innovation of tools, however, are hard to believe. The campaign in Anhwei Province in 1957 reputedly raised the labor efficiency from 1 to 3.8 cu m of earthwork per man-day, and the campaign during the winter and spring of 1960 also reputedly resulted in a rate of efficiency of 13 cu m of earthwork per man-day of labor. 119/ The claim was made that in Communist China as a whole productivity increased from 1.5 cu m of earth per man-day in October 1959 to 4 cu m in January 1960. 120/ The cost of the Tzu-yun-shan Reservoir in Kiangsi Province was said to have been cut in half and the construction period by a year as a result of a tenfold increase in the efficiency of labor. 121/ Additional knowledge is gained about the problems encountered in the campaigns for innovation of tools by Chinese statements concerning the drive to produce machinery and metal for the Jun River Dam -- "Workers ... toiled without regard to day or night. In order to perfect the precision and durability of these goods, they remade them many times." 122/

Wages varied greatly, and much of the labor was conscripted. Early campaigns offered payment in goods. It was said that workers on

\* Following on p. 22.

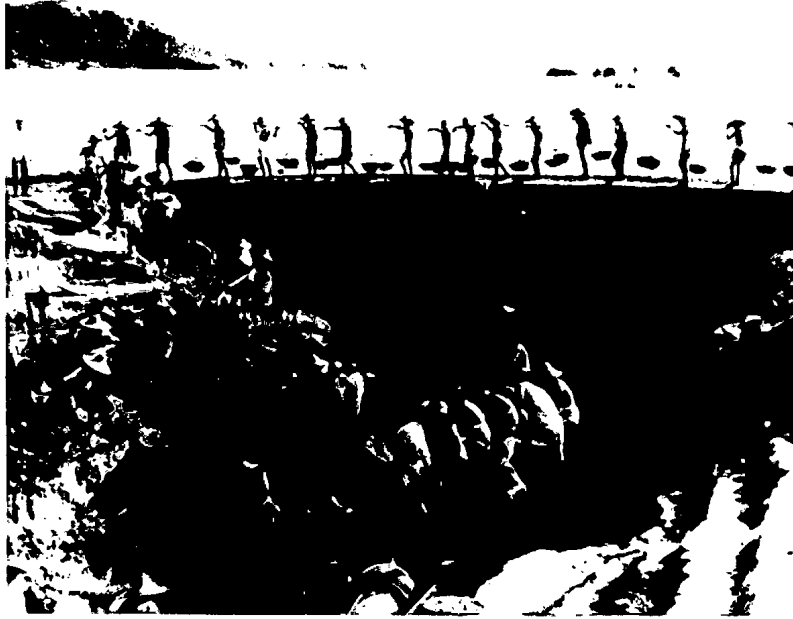


Figure 6. Communist China: Reservoir for Irrigation in Wei-hsing Commune



Figure 7. Communist China: Workers at the Construction Site of the Mi-yun Reservoir

the Huai River project at one time received 3 catties of grain daily.\* 124/ Later, cash payments were substituted for payment in goods, and workers on the Huai River project were paid 0.85 yuan per day, a sum that was reduced to 0.6 yuan late in 1957. 125/ The figure of 0.85 yuan was said to be needlessly high, and once the masses had been "politically educated," they not only "willingly" accepted the cut but "voluntarily" resolved to do 70 percent more work daily. 126/ In October 1957, labor for water conservancy in Kwangtung Province was being compensated as follows 127/:

<u>Daily Wage**</u> <u>(Yuan)</u>	<u>Percentage of</u> <u>Total Workers</u>
More than 2	5
1.0 to 1.2	25
0.7 to 1.0	65
0.5 to 0.6	5

Laborers in Anhwei Province were said to be paid according to the amount of earth that they excavated. 129/

The Huai River Committee had a semimilitary system of organization in 1951. Contracts reportedly were made with individual squads, the basic organizational unit, with the rate of payment dependent on the volume of work completed by the squad. 130/ The contract system was reported to have been functioning on both government and cooperative projects as late as September 1957. 131/ The collectivization program apparently necessitated revision of both the state and cooperative wage policy by late 1957. In September 1957, Ho Chi-feng, Vice-Minister of Agriculture, indicated that irrigation workers for the state and peasants from cooperatives were to be paid on the same basis for the same work. 132/

In 1958, there were numerous references to the "volunteer" labor utilized on large projects with thousands of peasants "carrying their own food and tools." 133/ For example, it was claimed that 400,000 volunteers had contributed labor for the Ming Tombs Reservoir 134/ and that 75 percent of the man-days expended on the Huai River in Tientsin had been contributed by organized volunteer forces. 135/

\* A catty of grain (one-half kilogram) was valued at about 0.7 yuan. 123/

\*\* These data were taken from the original sources, which also stated that "it is self-evident that these wage scales are too high." 128/



#### IV. Analysis of the Results

##### A. Claims and Credibility

The Chinese Communist regime has made widely varying claims in regard to the size of the irrigated area on the mainland. For example, various sources have said that on the Communist assumption of power late in 1949 the Communists inherited 15.4 million hectares, 136/ 16 million hectares, 137/ or 20 million hectares of irrigated land. 138/

The regime claimed an increase of 5.35 million hectares 139/ during the reconstruction period of 1950-52 and a total of 21.3 million hectares by the end of 1952 (see Table 7\*). 140/ Officially announced achievements for the years included in this period, as for most subsequent years, display serious discrepancies. Fu Tso-yi, Minister of Water Conservancy, announced on 13 September 1952 that an increase of 3.3 million hectares had been achieved since 1949. 141/ In 1932 the irrigated area of the mainland was estimated as being about 20 million hectares (see Table 6\*\*). 142/ Thus, by the end of 1952, the regime probably had attained, or slightly exceeded, the area irrigated before World War II.

The first significant additions to the irrigated area probably were accomplished during the First Five Year Plan (1953-57). The original goal of the First Five Year Plan called for an increase of 4.6 million hectares, 143/ but it was claimed subsequently that more than 14.5 million hectares actually had been brought under irrigation. 144/ More than 7.9 million hectares of the increase claimed during the First Five Year Plan was said to have occurred in 1956 alone, but there is considerable skepticism as to the validity of these claims. The "up-surge" in water conservancy in 1956 generated a great deal of confusion. The original plan for 1956, as announced by the Ministry of Water Conservancy, called for an increase of 2 million hectares. 145/ In April 1956, however, Chou Chung-ming, Vice-Minister of Water Conservancy at that time, stated that the increase in 1956 would be 12.6 million hectares. 146/ In May 1957, Fu Tso-yi, Minister of Water Conservancy, stated that 10 million hectares were added to the irrigated area in 1956 147/ but that only 6.7 million hectares were being benefited by the new projects. 148/ Fu went on to state that the claim in 1956 included some 1.5 million hectares of single crop land which were converted to multiple cropping. Without this land the actual increase was 8.96 million hectares. 149/ The plan for 1957 called for an increase of 4.7 million hectares, 150/ but an increase of less than 2.9 million hectares was claimed later. The total irrigated area was reported to have been

\* Appendix A, p. 40, below.

\*\* Appendix A, p. 38, below.

34.6 million hectares at the end of the First Five Year Plan in December 1957 (see Table 7\*).

In December 1957 it was announced that 13.4 million hectares 151/ would be added during the Second Five Year Plan (1958-62), bringing the total irrigated area to 48 million hectares by 1962. 152/ Later, in February 1958, it was stated that 33.3 million hectares 153/ would be brought under irrigation during the Second Five Year Plan, bringing the total to 66.6 million hectares by 1962 154/ (implying that the total for 1957 was 33.3 million rather than 34.6 million hectares). This plan, as unrealistic as it appeared at the time, was soon eclipsed by the claim that the revised goal of the Second Five Year Plan had been met by an increase of more than 32 million hectares in 1958 alone. The original plan for 1958 had called for an increase of 2.9 million hectares.\*\* As the campaign of 1958 gained momentum, the plan was revised upward to approximately 6 million hectares 156/ in December 1957 and to 17.3 million hectares in April 1958. 157/ The total irrigated area was claimed to be 66.7 million hectares at the conclusion of the irrigation year on 30 September 1958.

An obvious discrepancy exists between the revised Second Five Year Plan and the claims for 1958. The former implies a total of 33.3 million hectares for 1957, whereas the latter implies a total of 34.6 million hectares for the same year.

The original plan for 1959 called for an increase of 33.3 million hectares 158/ but later was scaled down to about 6.5 million hectares. 159/ A total of 4.7 million hectares 160/ was claimed to have been added during the year, 4.2 million 161/ of which were said to have been added by 25 May 1959. Ho Chi-feng, Vice-Minister of Agriculture, announced in June 1959, however, that the total irrigated area had reached 68.6 million hectares, 162/ thus implying that less than 2 million hectares had been added since the end of the campaign of 1958. The total irrigated area was claimed to have been 71.3 million hectares 163/ at the conclusion of the irrigation year of 1959.

Few official announcements have been made of the plans or accomplishments for the irrigation years of 1960 or 1961. It was reported on 21 February 1960 that the irrigated area had been expanded by about one-eighth since 1 October 1959, 164/ a statement that implies an increase of about 9 million hectares and a total irrigated area of about 80 million hectares. Nevertheless, an article appearing in the issue of Red Flag (Hung-ch'i) for 16 December 1960 stated, "At present, about 60 percent of the cultivated land is under irrigation," 165/ a

\* Appendix A, p. 40, below.

\*\* Also announced as 2.3 million hectares. 155/

statement that implies a total irrigated area of only about 65 million hectares, based on the fact that the cultivated area in 1959 constituted 107 million hectares.

Although the claims for irrigation in 1958 for the country as a whole have remained unchanged, some provinces have lowered their earlier claims. For example, Honan Province reduced its claim for the total irrigated area from 8 million hectares 166/ to 4.6 million hectares. 167/ The claim of the Inner Mongolian Autonomous Region was reduced from 1.6 million hectares under irrigation 168/ to 941,000 hectares. 169/ Shansi Province had claimed that its irrigated area exceeded 1.5 million hectares 170/ but subsequently announced that the land actually irrigated in 1958 amounted to 918,000 hectares and would reach only 971,000 hectares by the end of 1959. 171/ Shantung Province had announced in November 1958 that its irrigated area for that year had reached about 6.1 million hectares 172/ but later said that 900,000 hectares had been added in 1959, bringing the total to only 4.7 million hectares. 173/ Still later, on 9 April 1960, Shantung Province announced that the total irrigated area had reached only 3.4 million hectares.\* 174/ These revisions suggest that the claims of other provinces are also inflated, although they have neglected to publish revised figures.

There are no data available concerning the regional distribution of the irrigated area in 1952, but if the distribution approximated that in 1932,\*\* about 40 percent of the increase would have occurred in the four northern provinces.

#### B. Probable Effectiveness of the Program

The Chinese Communist regime has claimed that approximately 29 million projects for water conservancy capable of irrigating more than 55 million hectares were constructed during the decade 1949-59 (see Tables 2 and 7\*\*\*). In spite of the intensive effort and great emphasis attached to the program for water conservancy, there are many indications that the program has not been nearly so successful as claimed. The obvious propaganda aspects of the campaigns, the confused and seriously conflicting claims, the shortages of materials and skilled personnel, and the lack of adequate planning provide an adequate basis for skepticism as to the practical accomplishments. Unfortunately these same

\* The sum of the admitted discrepancies between the highest and lowest claims for the four provinces alone is 7.3 million hectares, and a decrease of 41, 42, 39, and 44 percent for the Inner Mongolian Autonomous Region, Honan, Shensi, and Shantung Provinces, respectively.

\*\* Based on estimates of the distribution of the irrigated area in 1932, as shown in Table 6, Appendix A, p. 38, below.

\*\*\* Appendix A, pp. 34 and 40, respectively, below.

characteristics of the campaigns make it impossible to make any precise estimates of the results. It is striking, however, that the cultivated area and the multiple-cropping area have declined since 1956 and that there has been no widespread substitution of high-yielding or high-value crops such as rice and cotton for low-yielding crops such as wheat and "miscellaneous" grains. These conditions seem incompatible with a great increase in irrigation.

The years 1959, 1960, and 1961 were characterized by severe, widespread droughts centered in the northern provinces. These provinces accounted for nearly one-half of the increase in the irrigated area claimed since 1952. Numerous accounts of the drought in 1959 appeared in the Chinese Communist press. The total area hit by this disaster (including areas affected by flood, drought, and pestilence) was said to have been 43.3 million hectares 175/ (including 33.3 million hectares 176/ of land affected by drought), of which 26.6 million hectares were said to have suffered serious damage. 177/ The attempt was made to give the impression that through irrigation and massive campaigns against drought, the droughts were largely overcome. These campaigns were far more intense than would have been warranted, however, if irrigation facilities actually were as numerous and efficient as had previously been claimed. It was announced that 82 percent of the 14 million small and medium-size reservoirs and ponds in Hupeh Province had dried up by early August 1959 178/ and that 3.6 million of the 4.3 million hectares of farmland in the province were affected by drought. 179/ Kiangsu Province reported late in September 1959 that one-half of the 500,000 reservoirs in the hilly regions had been dry since mid-August, 180/ and Honan and Shantung Provinces, among others, reported "many" dry ponds and small reservoirs during the drought of 1959.

Numerous accounts of campaigns against drought appeared in the Chinese Communist press. It was stated, for example, that in Szechwan Province "5-year-old and 6-year-old children, 80-year-old people, disabled servicemen, and even the blind voluntarily joined the ranks of the antidrought army" during 1959. 181/ One commune in Shensi Province was said to have "organized 1,300 laborers to carry water to 833 hectares of wheat, to have used urine to irrigate 313 hectares of rice, and to have irrigated some 1,167 hectares of wheat with snow during the 1959 drought." 182/ The Chinese claimed that the drought in 1960 was even more severe than that in 1959. In Honan Province the rural labor force, supplemented with teachers, students, factory workers, and army personnel, reportedly was able to plant some 2.7 million hectares by carrying water to the fields during the drought of 1960. 183/ The abrupt cancellation of the drive for water conservancy late in 1960 or early in 1961 suggests that many small irrigation projects failed to meet expectations after the droughts of 1959 and 1960.

Official statements have implied that the practical results of the campaign for water conservancy have been disappointing. In September 1957, Ho Chi-feng, Vice-Minister of Agriculture, stated that 34.7 million hectares were under irrigation but that almost 30 percent of this total, or about 10 million hectares, was unable to resist drought and that 5 percent, or about 1.7 million hectares, was ineffective because of poor engineering. 184/

In June 1959 it was announced that "in about one-third of the country there are better irrigation facilities and adequate water supply; in one-third of the country there are irrigation facilities, but there is inadequate water supply ...; and in one-third of the country, there are no irrigation facilities, or if there are, they are so bad that drought and water logging still take place." 185/ This statement probably referred to the cultivated area of 108 million hectares, and it implies that about 36 million hectares were irrigated effectively, with a similar area receiving only limited benefit because of inadequate water resources.\*

In September 1959, Vice-Premier Chou En-lai announced that the water conservancy works throughout Communist China could irrigate 66.7 million hectares (the extent claimed earlier as of September 1958) but said that only 33.3 million hectares "can benefit fully from irrigation, and more than 20 million hectares derive partial benefit" and that "the remainder also can benefit from the irrigation works after the land is leveled and irrigation ditches are built." 186/ Later, in October 1959, it was announced that the irrigated area had reached 71.3 million hectares but that only two-thirds of the projects had been completed and that "much work still remains to be done to increase the efficiency of the completed works." 187/

The regime has emphasized the "improvement" of areas under irrigation (see Table 8\*\*) and the formation, especially in the North China Plain, of areas with a "double guarantee" of drought protection -- that is, having a second source of water for irrigation. The inadequacy of small reservoirs and shallow wells became evident when most of these were unable to provide water for irrigation during the drought of 1959. As a consequence, Honan Province, and probably other provinces in the region as well, claimed to have sunk deep wells as well as to have crisscrossed the level farmland with irrigation canals. 189/ It is possible that this practice has given rise to double counting in the tabulation of statistics for the irrigated area.

\* The total irrigated area would thus have been about 72 million hectares, a total that is consistent with the claim of 71.3 million hectares for 1959.

\*\* Appendix A, p. 41, below.

In April 1960, Vice-Premier Tan Chen-lin reported that 40.7 million of 71.3 million hectares could withstand droughts of 30, 50, or 70 days 189/ and went on to reaffirm the goal of 60 million hectares to be "fully benefited" by irrigation by 1967.\* 190/ Tan Chen-lin went on to state that "Even when the target is achieved, we can only prevent ordinary floods and drought." 191/ In April 1960 an editorial in the People's Daily pointed out, "According to the designed capacity of the water conservancy projects, our country's irrigated acreage has been expanded to some 66.67 million hectares." 192/ The editorial went on to quote part of the speech by Tan Chen-lin cited above: "In irrigation, the building of reservoirs itself does not mean that the irrigated acreage indicated in the construction figures has all actually received the benefits of irrigation. These benefits can only be obtained when the reservoirs are filled, canals and ditches are dug, the land is leveled off, and lifting equipment is at hand." 193/

An article in Red Flag of 16 December 1960 stated: "Most of the existing water conservancy projects can resist only general drought and water logging ... . In some cases, wells have been sunk, but water carrying tools are lacking ... . Such conditions still exist generally." 194/

Although large projects, especially those constructed exclusively by the government, undoubtedly are much more effective on the whole than the projects "designed and constructed by the masses," the total number of large projects constituted only 0.014 percent of all the projects constructed since 1949 and probably accounted for less than 10 percent of the area claimed to have been brought under irrigation.

Many medium-size reservoirs in Honan Province were reported to have excess capacity because the water for these reservoirs was held back by the small projects. 195/ Kiangsi Province reported in June 1960 that small projects had stored water to about 80 percent of capacity, but large and medium-size reservoirs had stored only 60 percent of capacity. 196/ Many streams and rivers have ceased to flow, 197/ probably because the water is held back by dams and ponds. The holding back of water has reduced the water resources available for irrigation downstream.

The irrigation canals, dams, and ponds have taken some land out of cultivation. It was reported that the network of irrigation

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\* This goal was established originally in the National Plan for Agricultural Development for 1956-67. It appears unusual that the goal remained unchanged after the spectacular achievements claimed in the field of water conservancy since the inception of the plan.

canals under construction in the plains area of Honan Province would reduce the cultivated area from the current 80 hectares per square kilometer to 53 to 67 hectares per square kilometer. 198/

The advisability of the indiscriminate construction of millions of small reservoirs and ponds is doubtful, for this effort has lowered the potential of many large and medium-size projects and has resulted in instances of water logging, soil alkalization, and/or salinization. Many small reservoirs have changed the water equilibrium, many streams and rivers have ceased to flow, and the dependability of others has been affected.

It appears that little potential remains to expand irrigation by small or medium-size projects, for the easiest and cheapest areas to irrigate undoubtedly were the first to be brought under irrigation. Consequently, increases in irrigation have become increasingly more difficult and costly. Future substantial increases in the irrigated area will have to come from large, capital-intensive, multipurpose projects. According to the Chinese Communists, such projects require 3 to 5 years to build and another 2 to 3 years before they become beneficial. Although a few projects are under various stages of construction, it will be many years before a substantial number of large projects can be constructed and put into operation, and the problems of silting and alkalinity in North China, the region most urgently requiring the large type of project, will limit their effectiveness.

A communique of 20 January 1961 from the Ninth Plenary Session of the Eighth Central Committee of the Communist Party of China stated that 20 million hectares had been added to the area effectively irrigated from 1958 through 1960, 199/ a figure about one-half of the earlier claims. It is not clear what the claim of 20 million additional hectares "effectively" irrigated means in terms of the actual availability of water facilities or of the effects on production of crops. The shortcomings of the Chinese Communist campaigns for irrigation have been so serious that it is likely that the benefits of the programs will be very limited in relation to the tremendous expenditure of labor involved. It is apparent that the resources have been used unwisely in many cases. The campaigns for irrigation seem to have contributed little to the solution of the agricultural problems of the last 3 years.

APPENDIX A

STATISTICAL TABLES



Table 1

Communist China: Large Reservoirs Claimed to Have Been Completed a/  
1949-59

Reservoirs	Purpose	Date Completed	Number	Claimed Capacity (Million Cubic Meters)	Claimed Irrigated Area (Thousand Hectares)
1949-57			9	7,300	N.A.
Kuan-ning	Hydroelectric power, flood control, and irrigation	May 1954		2,270	8 <u>b/</u>
Fo-tzu-ts'en	Flood control and irrigation	Oct 1954		582	33 <u>c/</u>
Po-shan	Flood control and irrigation	Dec 1954		292	67 <u>d/</u>
Nan-wan	Flood control and irrigation	Dec 1955		932	7 <u>e/</u>
Mei-shan	Hydroelectric power and irrigation	Apr 1956		2,275	100 <u>f/</u>
Tou-ho	N.A.	Dec 1956		134	N.A.
Shih-men	Multipurpose	Jul 1957		123	N.A.
Pai-sha	Flood control and irrigation	Aug 1957		274	27 <u>g/</u>
Pan-ch'iao	Flood control and irrigation	Aug 1957		418	N.A.
1958			16	N.A.	N.A.
Huai-jou	Flood control	Jul 1958		90 <u>h/</u>	N.A.
Shih-san-lung	Multipurpose	Jul 1958		82 <u>h/</u>	N.A.
T'ai-hsing-ti	N.A.	Aug 1958		1,230	N.A.
Ta-huo-fang	Multipurpose	Sep 1958		1,970	N.A.
Tung-p'ing-hu (Wei-shan)	Primarily for irrigation	Oct 1958		4,000	930 <u>i/</u>
Tung-chang	Multipurpose	Dec 1958		186	N.A.
Ma-ku-hu	Primarily for irrigation	Dec 1958		158	40 <u>j/</u>
Hsiang-kung-tien	Multipurpose	Dec 1958		2,650	N.A.
Mo-tzu-t'an	Hydroelectric power and flood control	Dec 1958		336	N.A.
7 unknown reservoirs	N.A.	N.A.		N.A.	N.A.
1959			31 <u>k/</u>	10,000 <u>l/</u>	N.A.
Total			56	N.A.	N.A.

a. All data are based on source 200/ unless otherwise indicated.b. 201/c. 202/d. 203/e. 204/f. 205/g. 206/

h. Medium-size reservoirs, according to Chinese Communist definition.

i. 207/j. 208/k. 209/. Another source 210/ claimed that 33 large reservoirs were completed in 1959.l. 211/

Table 2

Communist China: Number of New Irrigation Projects Claimed, by Type  
1949-60

Period	Large Reservoirs <u>a/</u>	Large Projects Drawing Water from Rivers	Small and Medium-Size Projects (Thousand)		Total <u>c/</u>
			All Types Other than Wells	Wells <u>b/</u>	
1949-52	0	230 <u>d/</u>	1,000 <u>e/</u>	668	2,000
1953-57	9	770 <u>f/</u>	9,000 <u>g/</u>	5,332	14,000
1958	16	1,800 <u>h/</u>	8,000 <u>i/</u>	3,000	11,000
1959	31	1,200 <u>j/</u>	1,000 <u>k/</u>	1,000	2,000
1960	N.A. <u>l/</u>	N.A.	N.A. <u>m/</u>	N.A.	N.A.
Total 1949-59	<u>56</u>	<u>4,000</u>	<u>19,000</u>	<u>10,000</u>	<u>29,000</u>

a. See Table 1, p. 33, above.

b. See Table 3, p. 35, below.

c. Rounded to the nearest million projects.

d. Based on source 212/.

e. Based on source 213/.

f. Residual. The claim was that 1,000 projects were constructed during 1949-57. 214/

g. Small reservoirs and ponds only. 215/

h. Residual. The claim was that 3,000 projects were constructed during 1958-59. 216/

i. Residual, not considering medium-size projects for 1958. The claim was that 19 million small and medium-size projects were completed during 1949-59. 217/

j. 218/

k. 219/

l. The claim was that 250 large reservoirs were under construction in 1960. 220/

m. The claim was that 3.1 million small and medium-size projects were under construction in 1960. 221/

Table 3

Communist China: Number of Wells Claimed for Irrigation  
1949-59

Period	New Wells	Thousand Wells
		Cumulative Total of Wells
October 1949		2,000 <u>a/</u>
October 1949 through 1952	668 <u>b/</u>	2,668
1953	62 <u>c/</u>	2,730
1954	137 <u>d/</u>	2,867
1955	613 <u>e/</u>	3,480
1956	4,500 <u>f/</u>	7,980
1957	20 <u>g/</u>	8,000
1958	3,000 <u>h/</u>	11,000
1959	1,000 <u>i/</u>	12,000

a. 222/

b. During 1949-52, 668,000 wells were sunk or restored. 223/

c. Residual. During 1949-53, 730,000 wells were added. 224/

d. Plan. 225/

e. Residual. During 1949-55, 1.48 million wells were sunk. 226/

f. 227/

g. Residual. During 1949-57, 6 million wells were sunk. 228/

h. Based on source 229/.

i. Residual. During 1949-59, 10 million wells were sunk. 230/

Table 4

Communist China: Claimed Production of Engines  
for Drainage and Pumping a/  
1956-59 and 1960 Plan

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<u>Year</u>	<u>Thousand Horsepower</u>
1956	189 <u>b/</u>
1957	265
1958	1,820
1959	1,972
1960 Plan	2,500 <u>c/</u>

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a. Including diesel, gasoline, and wind-operated engines of factory and peasant manufacture.

b. 231/

c. 232/

Table 5

Communist China: Earthwork, Work Efficiency, and Man-Days  
Claimed to Have Been Spent in Water Conservancy  
1949-60 a/

<u>Period</u>	<u>Earthwork (Billion Cubic Meters)</u>	<u>Work Efficiency (Cubic Meters per Man per Day)</u>	<u>Man-Days <u>b/</u> (Billion)</u>
1949-52	1.7 <u>c/</u>	1.0 <u>c/</u>	1.7
1953-57	6.3 <u>d/</u>	1.5 <u>e/</u>	4.2
1958	58.3 <u>f/</u>	2.0 <u>g/</u>	29.2
1959	13.0 <u>h/</u>	2.4 <u>i/</u>	5.4
1960	27.0 <u>j/</u>	3.0 <u>k/</u>	9.0
Total	<u>106.3</u>	2.1 <u>l/</u>	<u>49.5</u>

a. Based on the irrigation year ending 30 September of the year stated.

b. Column 1 divided by column 2, except for the total.

c. 233/

d. 234/

e. Estimated. Although the Chinese Communists were using a norm of 2 cubic meters (cu m) per man-day as an average for estimating labor requirements, 235/ this figure was too high. Many provinces, for example Honan and Anhwei, were using a norm of 1.5 cu m as late as December 1958. This procedure, together with the low efficiency of 1949-52, suggests that a norm of 1.5 cu m would have been more realistic during the First Five Year Plan (1953-57).

f. 236/

g. 237/

h. 238/. Apparently a great deal of confusion existed in 1959. For instance, Anhwei Province alone set a target of 15 billion cu m of earthwork for 1959, although this total admittedly was "pretty" high. 239/

i. 240/

j. Claim through April 1960. 241/

k. Claim as of December 1959. 242/

l. Column 1 divided by column 3.

Table 6

Communist China: Irrigated Area in 1932 and Claims  
by Region and Province  
1957 and 1958

Thousand Hectares			
<u>Region and Province</u>	<u>1932 a/*</u>	<u>1957 b/</u>	<u>1958 c/</u>
Northeast			
Heilungkiang	25	323	549
Kirin	95	280	1,088
Liaoning	75	460	1,786
Total	<u>195</u>	<u>1,063</u>	<u>3,423</u>
North			
Hopeh	688	1,764	6,840
Honan	520	2,811	8,890
Shansi	242	754	1,659
Shantung	160	1,992	5,678
Total	<u>1,610</u>	<u>7,321</u>	<u>23,067</u>
Inner Mongolian Autonomous Region			
	<u>93 d/</u>	<u>800</u>	<u>1,641</u>
Northwest			
Shensi	207	649	2,039
Kansu	352	1,060	2,095
Tsinghai	N.A.	125	319
Total	<u>559</u>	<u>1,834</u>	<u>4,453</u>
Sinkiang	N.A.	<u>1,709</u>	<u>2,032</u>
East			
Kiangsu	2,372	2,558	3,852
Chekiang	1,987	1,593	1,981
Anhwei	1,389	2,284	4,450
Total	<u>5,748</u>	<u>6,435</u>	<u>10,283</u>

\* Footnotes for Table 6 follow on p. 39.

Table 6

Communist China: Irrigated Area in 1932 and Claims  
by Region and Province  
1957 and 1958  
(Continued)

	Thousand Hectares		
<u>Region and Province</u>	<u>1932 a/</u>	<u>1957 b/</u>	<u>1958 c/</u>
Central			
Hunan	1,923	2,659	2,853
Hupeh	1,752	1,928	2,833
Kiangsi	1,577	1,719	2,172
Total	<u>5,252</u>	<u>6,306</u>	<u>7,858</u>
South			
Kwangtung	1,646	2,603	3,541
Kwangsi	N.A.	1,333	1,624
Fukien	799	988	1,279
Total	<u>2,445</u>	<u>4,924</u>	<u>6,444</u>
Southwest			
Szechwan	2,815	2,561	4,016
Yunnan	802	772	1,580
Kweichow	634	612	1,873
Total	<u>4,251</u>	<u>3,945</u>	<u>7,469</u>
Grand total	<u>20,153</u>	<u>34,337 e/</u>	<u>66,670</u>

a. 243/. Geographic areas are not entirely consistent throughout the period, because of the shift of boundaries. Jehol Province has been combined with Liaoning Province, Suiyuan Province with the Inner Mongolian Autonomous Region, Chahar Province with Hopeh, and Ningsia Province with Kansu.

b. 244/

c. These data were extrapolated on the basis of the area claimed, 245/ by assuming the same proportional increase of the national total by province during 1 June 1958 through 30 September 1958 as during 1 October 1957 through 30 May 1958. Therefore, the data may not coincide with the claims of the individual provinces cited in the text.

d. Suiyuan Province only.

e. The Chinese Communist State Statistical Bureau reported that the irrigated area in 1957 was 34.6 million hectares. See Table 7, p. 40, below.

Table 7

Communist China: Claimed Increase in the Irrigated Area Annually  
and the Total Irrigated Area a/  
1949-59

<u>Year</u>	<u>Million Hectares</u>	
	<u>Claimed Increase</u>	<u>Total Area Claimed</u>
1949	N.A.	16.0
1950	0.80	16.8
1951	1.86	18.6
1952	2.68	21.3
1953	1.20	22.5
1954	1.07	23.5
1955	1.48	25.0
1956	7.91 <u>b/</u>	32.0 <u>b/</u>
1957	2.87	34.6 <u>c/</u>
1958	32.03	66.7
1959	4.67 <u>d/</u>	71.3 <u>e/</u>

a. Source 246/ unless otherwise indicated. No increase has been claimed since 1959.

b. The "Claimed Increase" for 1956 is too high to be consistent with the "Total Area Claimed" for 1956. The increase in the irrigated area during 1956 also was reported as 6.7 million hectares (see the second footnote, p. 9, above), but this figure is too low to be consistent with the "Total Area Claimed" for 1956.

c. Reported as 34.3 million hectares in the issue of the People's Daily for 3 June 1958 in Peking. See Table 6, p. 39, above.

d. 247/

e. 248/



Table 8

Communist China: Claims of the Extent of the Improved Irrigated Area a/  
1949-60

<u>Period</u>	<u>Million Hectares</u> <u>Improved Irrigated Area</u>
1949-55	24.0 <u>b/</u>
1956	4.8 <u>c/</u>
1957	4.7 <u>d/</u>
1958	14.0 <u>e/</u>
1959	N.A.
1960	19.3 <u>f/</u>

a. The category "improved" irrigation apparently refers to the area on which work has been done for major maintenance as well as substantial modifications. No precise definition is available.

b. 249/

c. 250/

d. 251/

e. 252/

f. Through April 1960 253/ including both the increase and the improved area. The increase of 4.7 million hectares claimed for 1959, however, brought the total area claimed to 71.3 million hectares, or 63 percent of the cultivated area. 254/ In March 1960 it was claimed that 60 percent of the cultivated area was under irrigation. No claims of any substantial increase in the cultivated area have been made since 1958, and, therefore, the claim must have consisted almost entirely of "improved" irrigation.

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