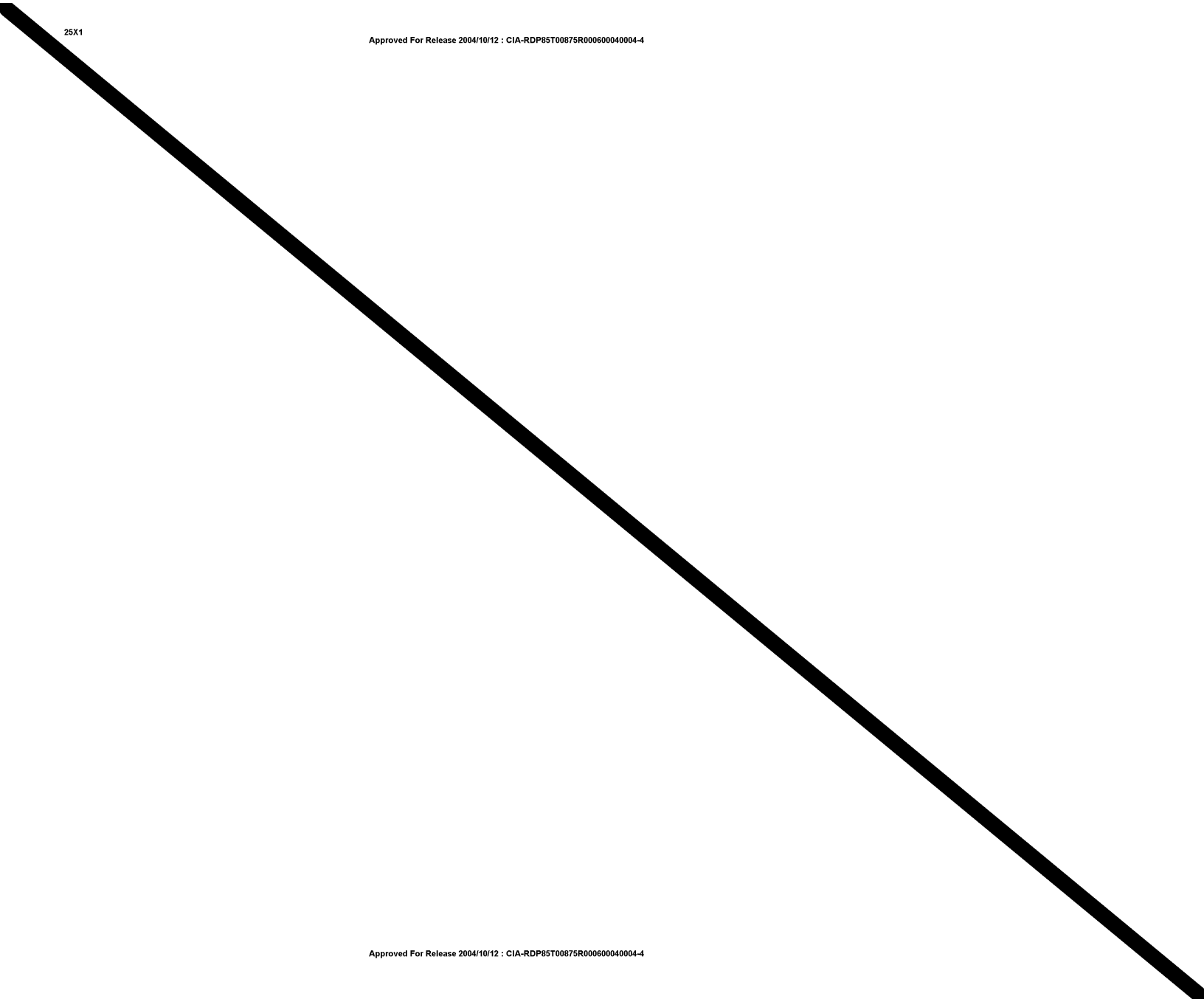
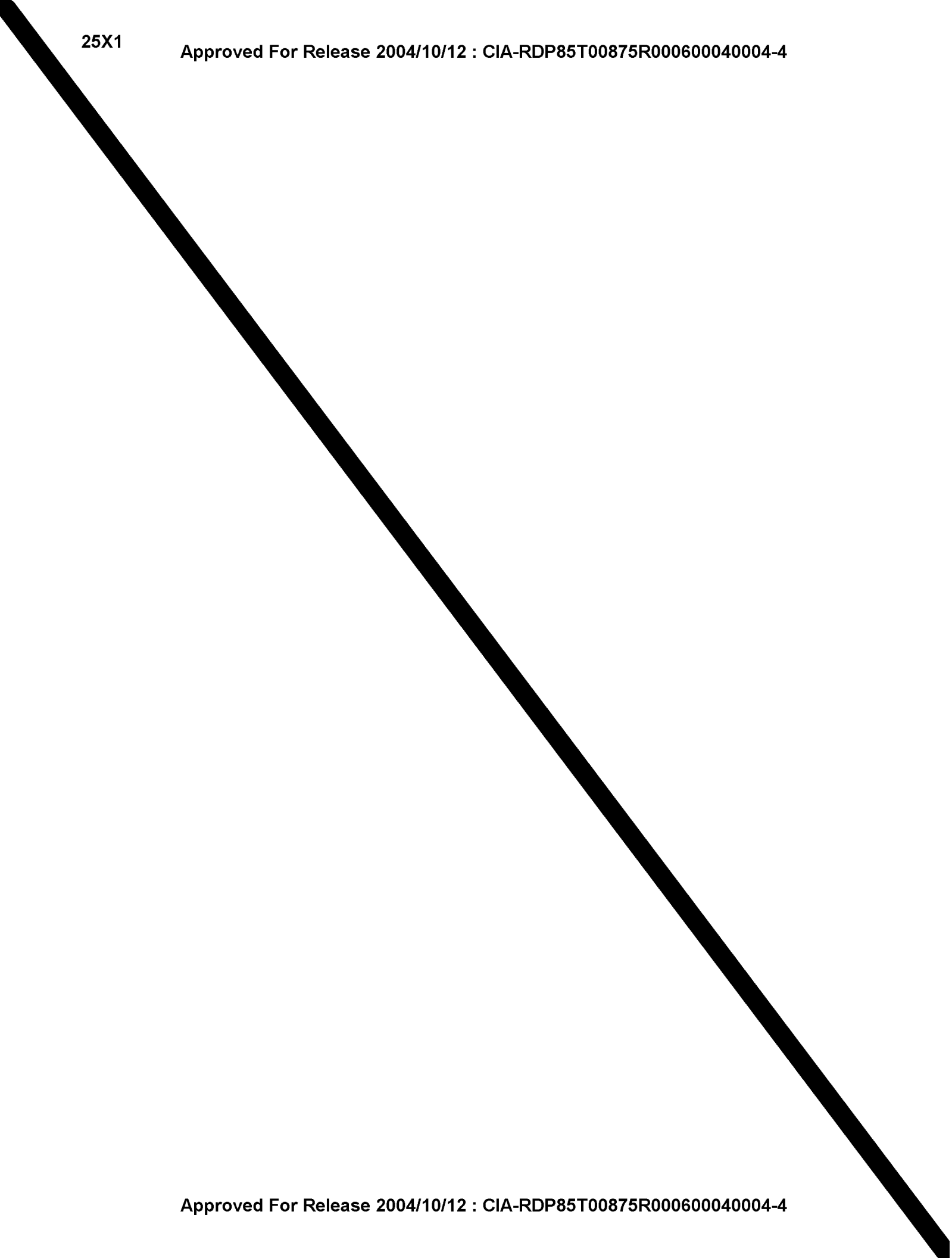


The Transformation of Nature in China



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C O N T E N T S

Central Intelligence Agency
Directorate of Intelligence
September 1973

THE TRANSFORMATION OF NATURE IN CHINA

SUMMARY

Agriculture is a critical element in China's present and future. A key question -- and problem -- is the ability of the People's Republic of China (PRC) to increase agricultural output sufficiently to keep pace with the annual rate of population increase. The answer is complex, but an important factor is China's progress in the protection, improvement, and management of its land resources. Maximum benefits must be realized from increased use of chemical fertilizers, larger supplies and improved distribution of water for irrigation, new crop varieties, and other technological advances. Although the PRC's land area of 3.7 million square miles is exceeded only by the USSR and Canada, its agricultural land resources are subject to major limitations. Specifically:

The amount of cultivated land is virtually static; a number of reasons, mostly physical, suggest that this will continue to be true for the foreseeable future.

Much land now cultivated is of average to low productivity.

25X1

Climatic conditions, particularly in North China, are highly variable, specifically in the amount, distribution, and intensity of rainfall, with resultant serious effects upon agricultural output.

A sizable proportion of the land now tilled is subject to yearly damage from drought, flooding, erosion, and waterlogging.

Environmental improvements were implicit in the major river basin and other water conservancy programs begun in the early years of PRC rule. Additionally, China's rural labor was mobilized periodically to engage in local compaigns of ditch digging, tree planting, and a host of other activities designed to improve agricultural conditions through the upgrading of environmental resources. Peking characterized these menial tasks as an opportunity to "remake nature" and to put an end to natural calamities. Nature, or the physical environment, was labeled an "enemy" that caused drought, floods, privation, and famine.

Mastery of nature has not been an easy task, even to those inspired and guided by Mao Thought. [redacted] 25X1

25X1 [redacted] 25X1

[redacted] trees and shrubs on previously barren hillsides and extensive tree plantings [redacted] results of China's "greening" campaign. 25X1 [redacted] 25X1

increased water storage facilities and the expansion of irrigated land.

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[redacted] he record is not complete but at this time would include the following:

Enough environmental improvements have been made to lessen the impact from either prolonged rainfall or lengthy dry periods.

Water impoundments, canals, and related water control and storage facilities have been built by the millions, though most are small and many inadequate for intended needs.

The Huang Ho (Yellow River) project, the most widely publicized and largest in scope of the river basin projects, has been scaled back drastically and altered -- principally because of the lack of effective anti-erosion work.

Some improvements in the Huai and Hai basins apparently have been made; serious flooding is less likely and damage from waterlogging probably reduced.

Millions of young saplings have been planted, but results in terms of original goals have been a patchwork of success and failure.

The PRC has not claimed complete victory in its battles with nature, but some improvements in the overall picture are undeniable. That more has not been accomplished and initial goals have not been reached is due not to a lack of incentive or official dedication to the tasks at hand, but rather to the reliance upon mass labor, lack of technically trained personnel, failure to coordinate related projects, overall managerial weaknesses, and the immensity of the problem.

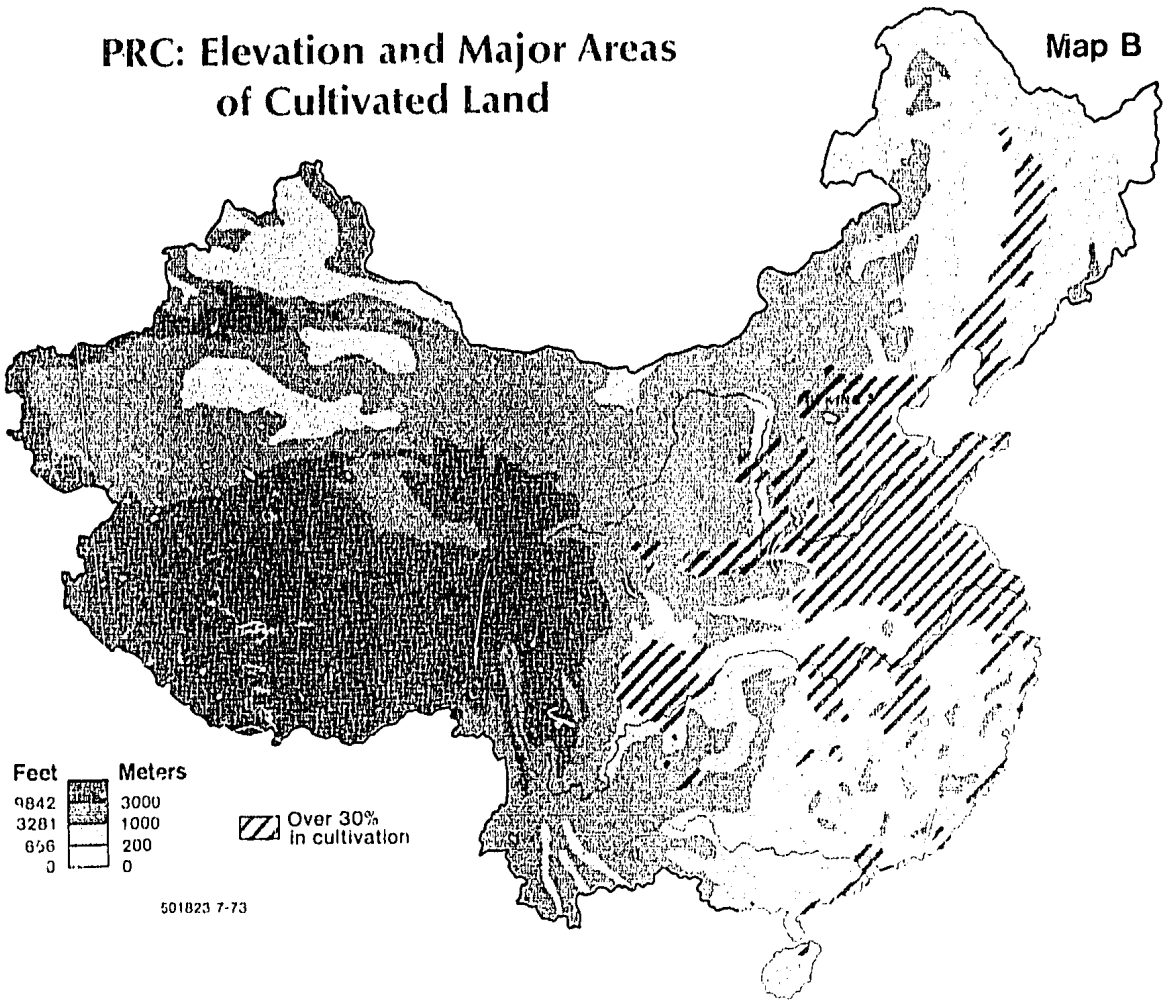
People's Republic of China

Map A

The Good Earth?

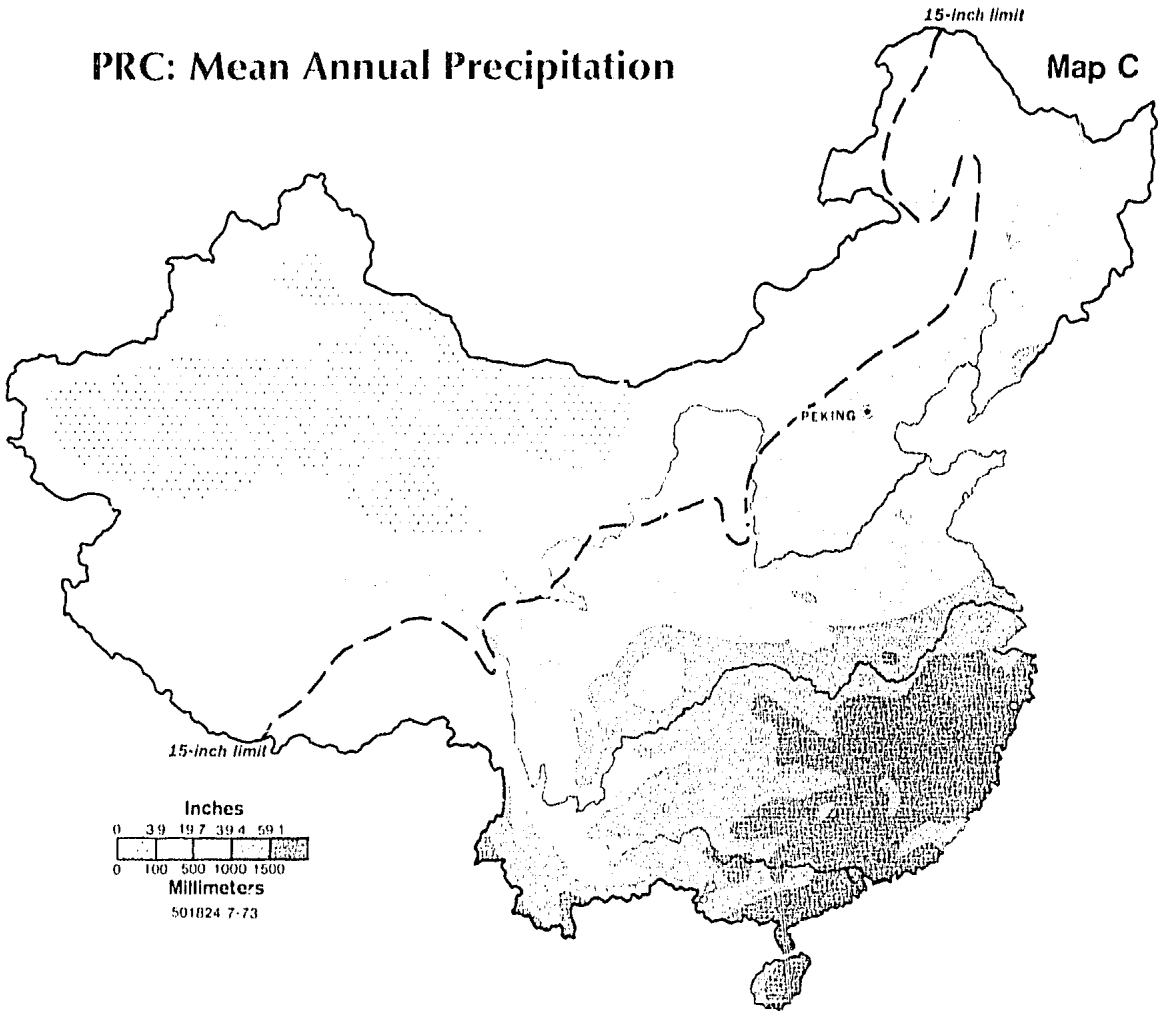
1. The amount of cultivated land in China is relatively small -- approximately 11 percent of the total area -- and no sizable tracts of good agricultural land remain unused. The physical constraints that account for this situation can be summarized simply but aptly: most of China is too steep, too high, too cold, or too dry to support intensive, Chinese-style agriculture.

2. Hills, mountains, and high plateaus comprise more than two-thirds of the Chinese landscape -- landforms ill-suited to intensive, Chinese agricultural practices (Map A).



Much of China is at comparatively high elevations: about one-third of the land is above 6,600 feet and two-thirds exceeds 3,300 feet. The lower summer temperatures, shortened growing season, and steep slopes usually found at these higher elevations combine to preclude much agriculture (Map B). Nevertheless, the pressure for additional agricultural land has been so severe in China that sizable upland areas have been painstakingly and laboriously terraced to obtain additional fragments of agricultural land.

3. Nearly half of China receives so little rainfall (15 inches or less annually) that crops cannot be grown

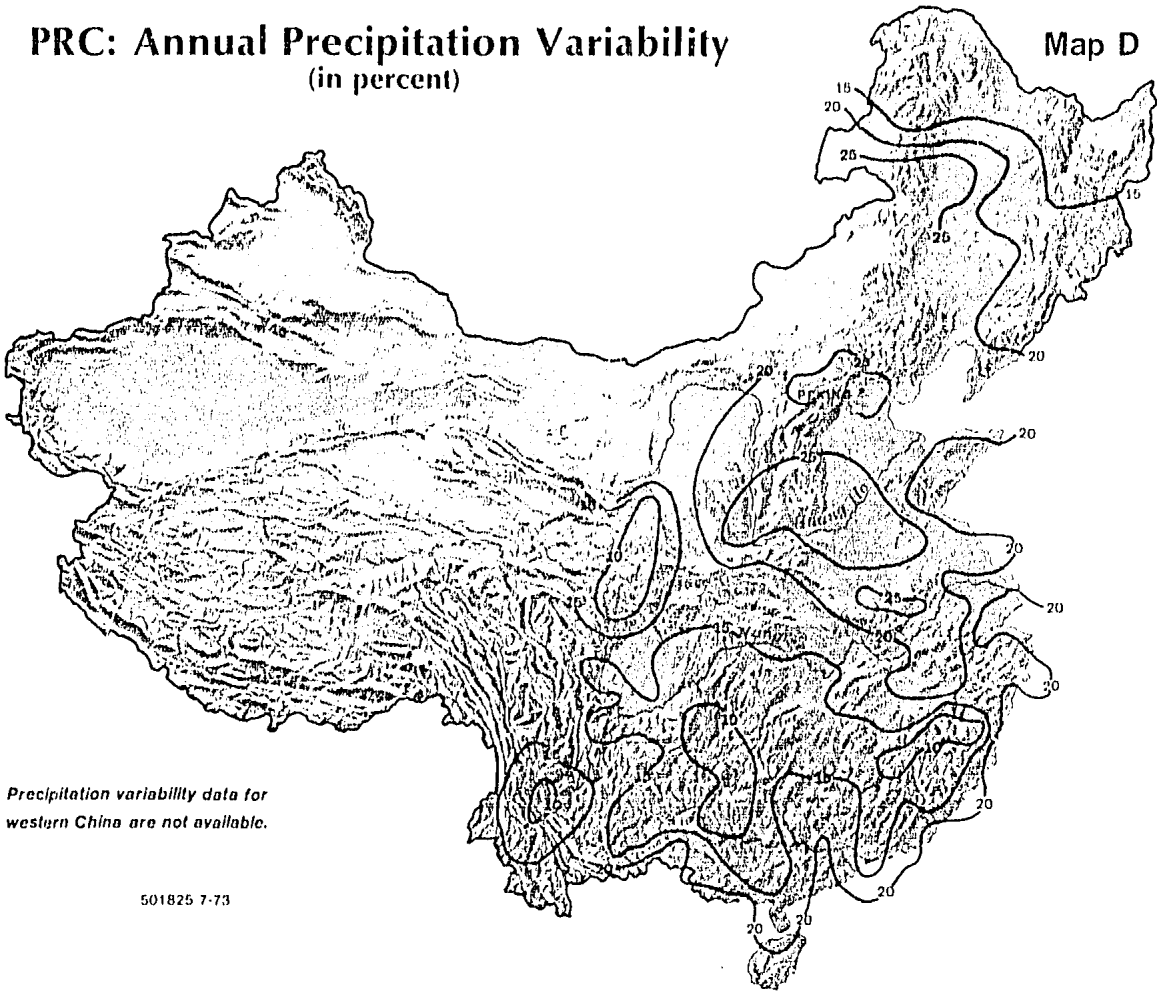


unless under full irrigation (Map C). Areas of deficient precipitation include almost all of western and northwestern China, but they contain overall only about 4 percent of China's total cultivated acreage. Although additional supplies of underground water probably can be tapped, no major areas of cultivated land are foreseen being developed there.

4. Of greater agricultural importance is the seasonal amount, variability, and intensity of rainfall in the major grain producing provinces. In North and Northeast China, where annual precipitation averages only 25 inches (about the same as central Kansas), 60 to 75 percent of this total

PRC: Annual Precipitation Variability
(in percent)

Map D



Precipitation variability data for western China are not available.

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is concentrated in only 3 summer months.* This concentration in so short a period poses an annual threat that meager spring and early summer rains will stunt the growth of spring-sown crops or that too much summer rain in too short a period will damage crops by local flooding and erosion.

5. The variability of rainfall also is a crucial factor in the major grain growing areas (Map D). The most serious

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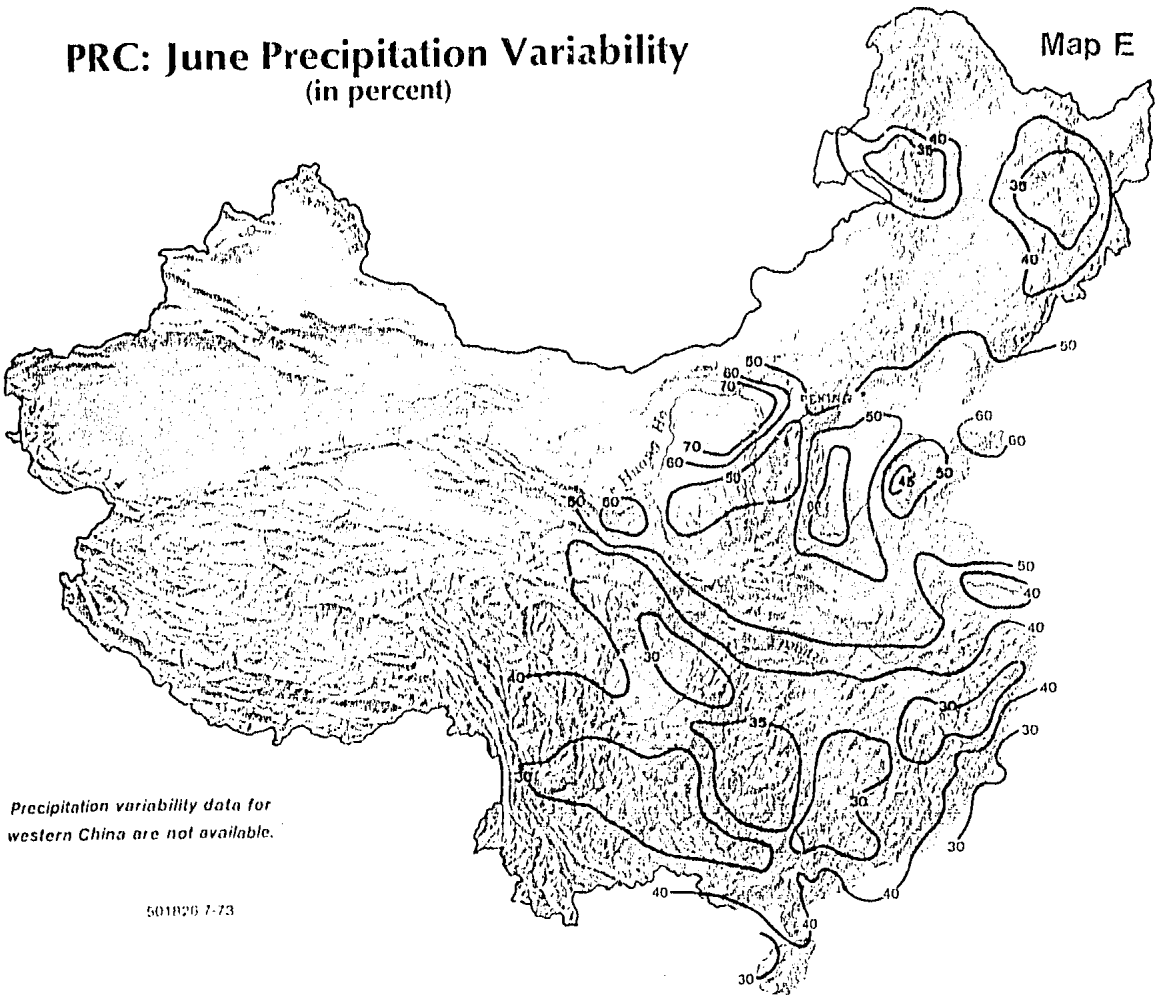
* *In Kansas only about half the yearly rainfall is recorded during the May through August period; furthermore, average daily rainfall intensity in July is less than half of the amount for North China stations.*



conditions exist in North China, where annual variability (departure from normal rainfall) ranges from 20 to 30 percent -- in agricultural terms a high figure because crop yields are considered unstable when departures from normal exceed 20 percent.* Spring and summer variability is especially critical and is extremely high on the North China Plain (Map E). Absolute variation in rainfall amounts is

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* *Variation is computed by averaging the absolute values of departures from the average, dividing this figure (mean variation) by the average, and multiplying by 100 to arrive at variation expressed as a percent.*

immense in North China: K'ai-feng has received as much as 19.5 inches of rain in July and as little as 1.6 inches, and at Tientsin the range is from 15 inches to 1.6 inches. Finally, how much rainfall occurs during any one "rain" is another significant indicator of agricultural stability; here again, North China is frequently subject to brief gully-washing rains that cause flooding and erosion and damage water control works. Many of the weather stations in North China, for example, have recorded as much as 9 to 10 inches of rain during a single 24-hour period.*

6. Not only is most of China's land poorly suited for agriculture because of terrain and climatic factors, but even the presently cultivated area possesses inherent physical liabilities. Only an estimated 31 percent of China's cultivated land is classified by PRC officials as "fertile," and of the remainder, 40 percent is "ordinary" and 29 percent "low-yielding." Although the precise meaning of these terms is unclear, they at least suggest the shortage of good land and the predominance of ordinary and relatively poor agricultural land. The Chinese also have been explicit in stating that sizable percentages of their cropped land are subject to a variety of environmental hazards, all of which threaten yearly crop output and overall economic stability. Again, evaluation of these assertions is difficult, but they do emphasize the necessity for the careful management and control of China's physical resources.

Man and Nature: Traditional Views

Let there be no action contrary to Nature, and there is nothing that will not be well regulated.

--Taoist Commentary

* *Average July rainfall for most of North China is 6 to 9 inches recorded on 9 to 13 days per month; Washington, D.C., averages about the same number of days of recorded rainfall but its total for the month is only 4.15 inches.*

7. Harmony between man and nature was a basic philosophy of ancient China, originating in Chinese folklore with elaborations from those philosophical-ethical precepts of Taoism and Buddhism that were assimilated into Chinese culture. Practical observations of what happened when man tampered with his environment undoubtedly helped strengthen these philosophical underpinnings, as suggested by the following memorial of Ch'eng Hao to Emperor Shen-tsung, ca. A.D. 1075, which stated:

> It is not merely that the nature of things has been violated, but that the mountains from which forests and woods grow have all been laid bare by indiscriminate cutting and burning. As these depredations still go uncurbed, the fish of the stream and the beasts of the field are cut short in their abundance and the things of nature are becoming wasted and exhausted. What can be done about it?

8. The belief that China had achieved a harmonious relationship with the earth reinforced the belief of 18th century Western humanists in the superiority of Oriental culture in general and Chinese culture specifically. Chinese philosophical views toward nature were contrasted to those of Western man, conditioned by his Judeo-Christian heritage: man is created in God's image, he has been given dominion over the earth, and he shall subdue nature so that progress will continue and a better tomorrow be realized.

9. In spite of official injunctions against actions "contrary to nature," the Chinese in the course of more than three millennia of intensive occupance of their land probably altered their environment to a greater extent than has any other civilization. This record is impressive whether measured by the changed appearance of the Chinese

landscape or by the immense physical labor involved and the massive amounts of earth materials removed and reshaped. The North China Plain, for example, has been under intensive cultivation for so long that its "natural" vegetation still is a subject of scholarly debate. Some 2,000 years ago almost all of the lower Yangtze Valley was choked with thick forests and extensive swamps; several centuries of clearing and drainage work were necessary before the regulated, almost geometrical landscape of the present day emerged. Although continued tillage and expansion of cultivated land produced an often dramatic physical modification, the process itself was viewed as part of a never-ending cycle of life. The constant working and reworking of the soil, with continual return to the earth of its products in the form of compost and fertilizer, renewed the soil's ability to produce again sustenance for mankind.

10. Man thus was a much more active participant in altering the physical landscape of China than Western humanists realized. The Chinese recognized that environmental mastery was not only a legacy of their legendary founders but also a necessity. The manipulation and management of the environment were viewed, however, not as subjugation of nature but rather as cooperation with and adjustment to natural conditions.

11. A significant change in man-land relationships became apparent by the mid-19th century. The physical resources upon which agriculture depended had been stretched to the breaking point, and, increasingly, erosion and flooding damaged cropland, famine became more common, and the general standard of living of the peasantry declined markedly.* Much of this breakdown can be traced directly or indirectly to the rapid increase in population that had taken place since the beginning of the 18th century -- from about 150 million to perhaps 430 million by 1850.

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* *Other factors such as bureaucratic corruption and inefficiency, military ineffectiveness, the impact of the Western nations, and fiscal problems also played important roles.*

Although increased agricultural productivity was recorded during this time span, much new land was required to provide sufficient food for the rapidly growing population. Most of this new land was in South China, where settlers cleared forested uplands and planted mountain fields of corn and sweet potatoes.* But careless tilling of the uplands speeded erosion, which in turn led to more frequent and serious flooding in the valleys and plains, as indicated by a contemporary 19th century source:

> Formerly the bed of the Hsiang River [a tributary of the Han River located in southwestern Honan and northern Hupeh] was several tens of feet deep. Ever since the systematic deforestation consequent upon maize growing, the topsoil has been washed down by torrential rains . . . . The further upstream one goes, the shallower the river bed becomes. Small wonder that from 1821 to the present [ca.1838] there has hardly been a year in which the Hsiang River did not flood.

12. Pessimism permeated the reports of both Western and Chinese earth scientists who in the 1912-1949 period investigated the status of China's physical resources and problems. The more striking and serious problems were in North China. Although locally some progress had been made to combat erosion through contour plowing of slope lands and the construction of terraces, erosion was so widespread and so little ground cover remained that improvement seemed

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* *Corn and sweet potatoes, crops native to the Americas, were introduced into China in the late 16th century. They soon were well established in the Chinese agricultural system because of their high yields and adaptability to environmental conditions unsuited to rice, wheat, and other traditional staples.*

impossible without major capital-intensive projects under government auspices. In contrast, management of land resources in the lowlands of South China was more successful principally because rice -- the dominant crop -- required the leveling and diking of small parcels of land and a carefully regulated flow of water into the fields (Figure 1). Consequently, irrigated rice farming produced an agricultural system that maximized the use of available land resources and minimized damage to them. Reckless use of nearby upland fields continued, however, and erosion often was so rapid that some land had to be abandoned because of exhausted soil fertility after no more than two or three seasons of cultivation. By the end of Manchu rule in 1911 and the opening of China to wide-scale modernization, damage to the environment had so worsened that traditional methods of combating these problems no longer were effective. The lack of technical knowledge of how best to combat environmental difficulties remained a serious drawback, and the lack of a truly effective national government prevented the introduction of enough technical advisors and sufficient capital to initiate large-scale land and water conservancy programs.

Man and Nature: Post - 1949 Developments

No matter how big the hills are and how deep the gullies can be, they are inanimate things. But men are living beings. We have our hardworking hands.

Mao Tse-tung -- "The Foolish Old Man Who Removed the Mountain"

13. Since 1949 China's millions have been enjoined to "conquer" and "transform" nature, to "harness" the deserts, and in other ways to alter the physical environment for the benefit of man. Chairman Mao, the oft-cited source and inspiration for these admonitions, over the years has issued a series of exhortations demanding fulfillment of a variety

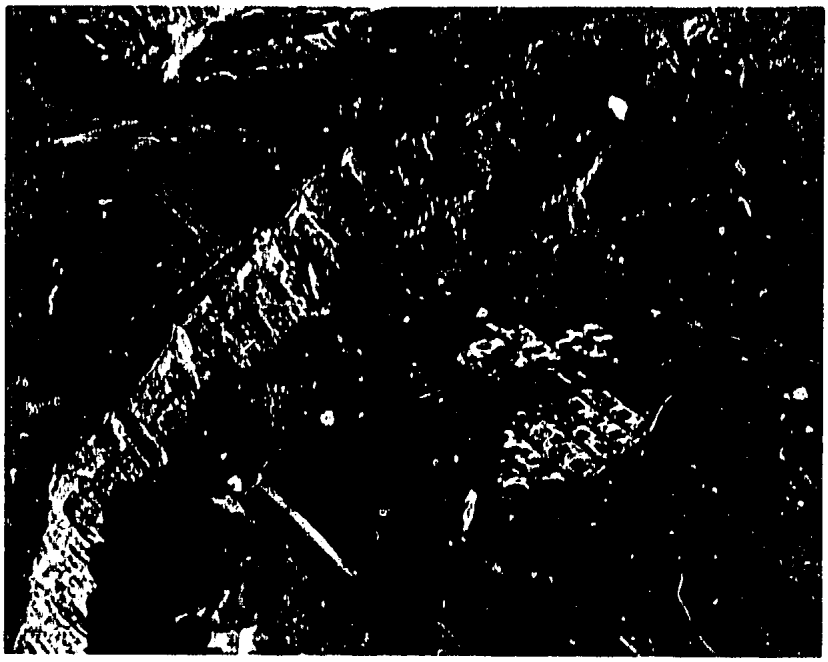

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Figure 1. North China landscapes (above) reflect dry field agriculture, lack of protective upland vegetation, and severe erosion -- particularly in loess areas. Rice landscapes of South China (below) maximize land resources through elaborate water control measures and terracing.

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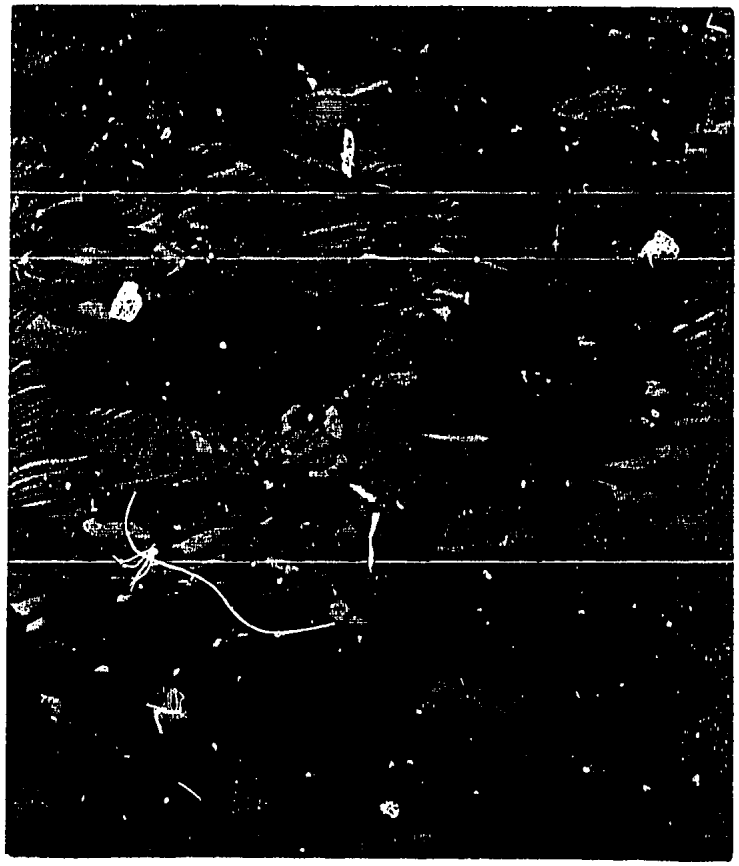

of environment-related tasks. Recently, the "changing nature" theme has reappeared in the Chinese press, which features articles centered around Mao's instructions, indicating progress made and work currently underway.

14. The view of nature as an "enemy" and the glorification of man as an instrument of change contrasts with traditional Chinese views of adjustment to and harmony with nature. The aggressive tone of the PRC leaders' rhetoric is in keeping with Marxist-Maoist views that conflict, contradiction, and the struggle are the proper condition of society and, indeed, its most important dynamic. The emphasis in Chinese treatment of its environmental problems has been on what man can do, under the guidance of the Party, to initiate change and bring about improvement.

15. Major Chinese efforts have focused on water conservancy and protective afforestation, including both large-scale state-directed and -financed projects and a host of local works involving little investment but massive amounts of rural labor. During the early years of economic rehabilitation (1949-52), emphasis was on repair of dikes, irrigation canals, locks, and similar facilities. Additionally, work commenced almost immediately on two major flood control projects, the Huai River and the Ching -- the latter name applied to that portion of the middle Yangtze River down to southern Hupeh.* Later, when the First Five-Year Plan (1953-57) was announced, a modest amount of state investment was allocated to initiate major, long-term programs designed to control the perennially unruly rivers of North China -- the Huang, the Huai, and the Hai (Map F).

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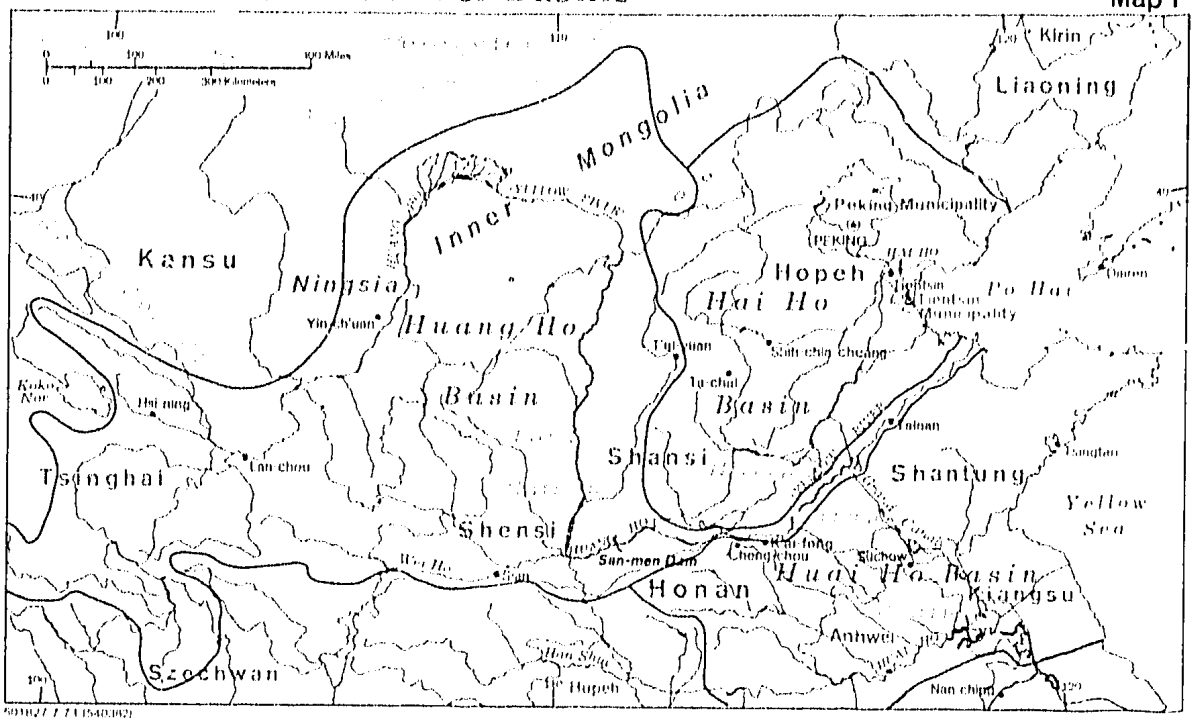
* *The Ching project involved the construction of dikes and sluice gates to provide a flood retention basin for the Yangtze south of Sha-shih.*

PRC: North China River Basins

Map F



16. More specific plans relating to protection and improvement of the physical environment were incorporated in the Twelve-Year Plan (1956-67) of the National Agricultural Development Program, adopted in 1958. These included such basics as increased development of water conservancy works, irrigation, and flood and drought control projects, with emphasis upon small and medium-sized projects, soil improvement, extension of soil and water conservation practices, promotion of afforestation, and expansion of the network of meteorological and hydrological stations. Use of the commune and its organizational structure to mobilize the rural masses was the principal means specified to implement the objectives of the Plan.

17. Planning and work on some early projects was hampered by an inadequate data base and the lack of scientifically trained personnel. To remedy the situation China's scientists undertook, with some Soviet help, a series of major surveys designed to inventory, describe, and interpret physical conditions of key areas and their

specific problems. Priority was given to studies of the loess areas of the middle Huang Ho (Yellow River) basin and the extensive arid areas of western China. By the late 1950's the results of some of these efforts were beginning to be published in the form of major monographs and articles in technical and professional journals. More specific technical material undoubtedly was forwarded to appropriate ministries in Peking for use in particular projects.

Controlling the Huang Ho

If you wait till the Huang Ho is clear, how old will you be?

--Chinese Proverb

18. Matteo Ricci, the pioneer Jesuit missionary to China in the late 16th century, remarked that: "The Yellow River has no respect at all for Chinese law and order. It comes from a barbarous region and . . . frequently ravages whole districts of the realm, silting them up with sand, and changing its course at will." Though news to Europeans, Father Ricci's description and characterization of the river merely reiterated what the Chinese had known since earliest times: control of the turbulent Huang Ho was the most persistent and serious environmental problem in all of China.

19. The PRC leadership placed a high priority on a plan to permanently control the Huang, eliminating its periodic floods and erratic changes in course and at the same time more fully utilizing the river both for power generation and as a source of irrigation water. Accordingly, in 1955 the "Report on the Multi-Purpose Plan for the Permanent Control of the Yellow River and Exploitation of Its Water Resources" was presented to the National People's Congress. The plan, ambitious in concept and massive in scope, was based upon earlier studies and recommendations, plus post-1949 investigations. It called

for construction of a series of multi-purpose dams designed for flood control, power generation, irrigation, and navigation purposes. The most publicized project was the building of a giant hydroelectric dam at San-men (Three Gates), a point on the Huang upstream a few miles from where the river and its valley widen before emerging on the North China Plain (Map F). Smaller dams were planned upstream from San-men, including two on the upper Huang near Lan-chou, plus a series of reservoirs on principal tributaries. But the key to success was, in the words of the plan, the necessity ". . . to develop at the same time large-scale water and soil conservation works in Kansu, Shensi, and Shansi Provinces and other loess regions." Numerous soil and water conservancy targets were spelled out in the plan (Figure 2).

20. It probably was inevitable that the massive physical changes required to reduce soil erosion did not in fact occur to any significant degree, given the short time schedule for construction of the San-men project (1957-61), the immense size of the soil and water conservancy tasks (only 5 percent of the loess area was covered by trees), and the dizzying rural organizational changes of the period. The San-men Dam was essentially completed in 1961 and a mammoth reservoir was to have been filled, taking several hundred thousand hectares of cropland out of production (Figure 3). But it was soon discovered that the silt load of the river had not been measurably reduced: by 1963 the penstocks were clogged with mud. Since then the gates have remained open and the Huang Ho continues as before -- transporting its heavy burden of silt seaward.

21. Mention of the Huang Ho project, and particularly of San-men Dam, virtually ceased in the PRC press after 1961. In late 1963 and continuing until the advent of the Cultural Revolution in 1966, an occasional article appeared on proper techniques to reduce erosion and soil and water losses in the middle Huang Valley. Only recently have press items reappeared commenting on the overall problem of the Huang. Progress is related in general terms, usually tied to one or more of Chairman Mao's statements, but specific references are to small-scale local achievements rather than a review of accomplishments throughout the Huang Ho basin. No mention, for example, is made of the 1955 plan nor of the great mass of concrete at San-men.

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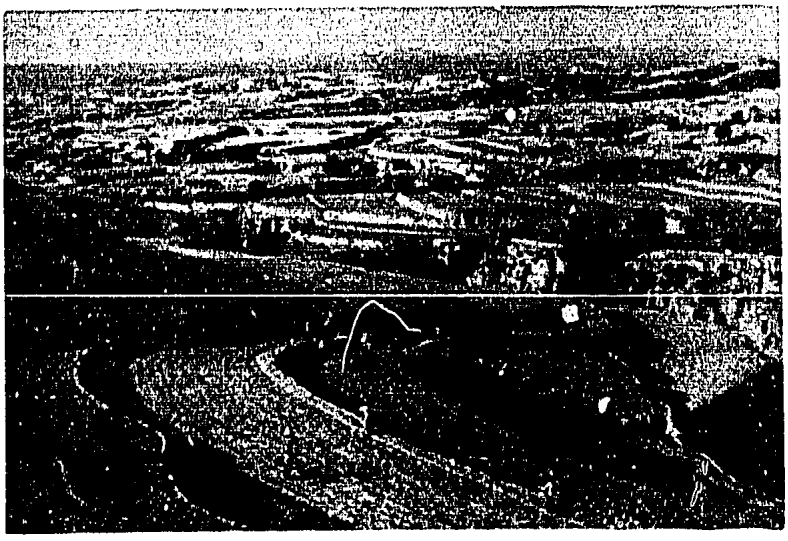
Figure 2. The key to control of the Huang Ho is minimizing erosion from barren loess-covered uplands. Terracing and the planting of protective vegetation on non-cultivated slopes are essential.



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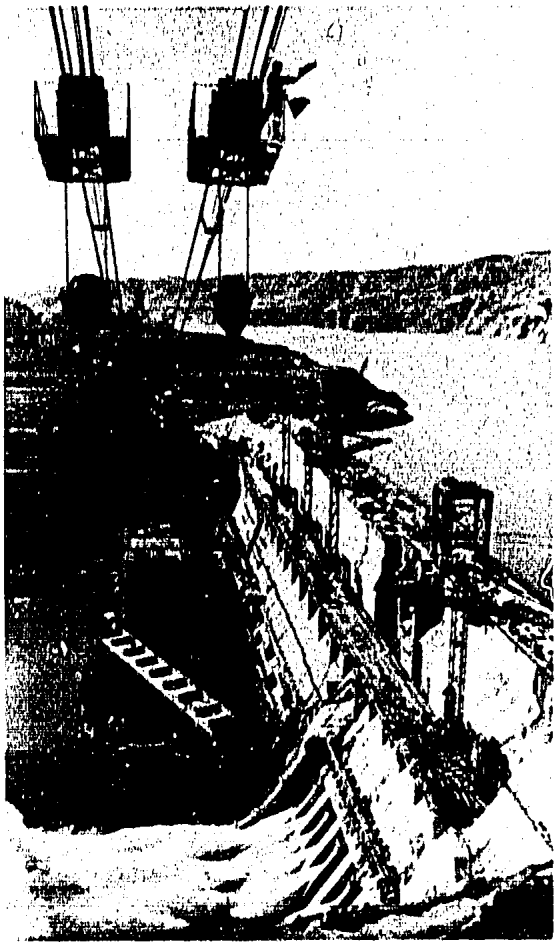
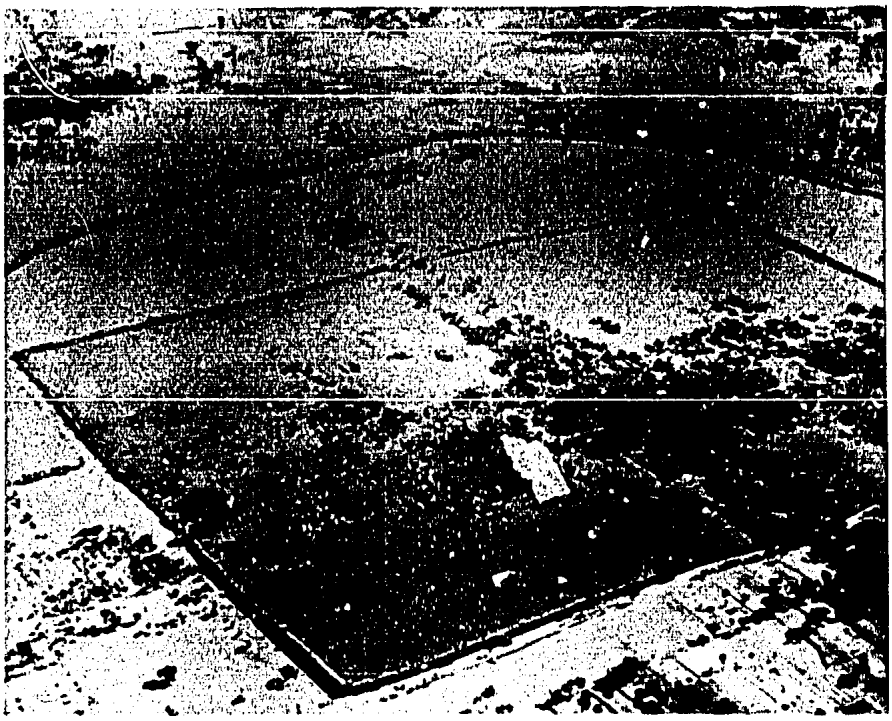


Figure 3. San-men Dam, nearing completion in 1961, was expected to prevent serious flooding (as below), provide irrigation water from its massive reservoir, and generate power. Only limited flood control benefits have as yet been realized from San-men.



22. It is clear that Chinese planners grievously underestimated the importance of systematic, long term soil and water conservancy work in the loess-mantled middle reaches (Shensi, Shansi, and eastern Kansu) of the Huang, origin of almost nine-tenths of the sediment load of the river. Press reports of 1963 and later clearly indicated that diverse physical factors present in the middle Huang Valley had not been taken into account. A December 1963 People's Daily article stated that henceforth "geographical considerations based on actual practice" would be the criteria to be followed in future local land and water conservancy projects. Earlier, for example, projects suitable for a particular physical environment had been imposed on other areas with differing physical conditions -- with predictable results. In the future, according to the article, ". . . preventive measures [soil and water conservancy projects] should be geared exactly to the problems as they exist."

The Huai and Hai River Basins Projects

Water Conservancy is the Lifeblood of Agriculture

--Mao Tse-tung

23. Two other problem rivers, the Huai and Hai, received early attention from PRC leaders. Both river basins suffered from excessive loads of silt and from their inability to discharge through their silt-clogged channels a sufficient volume of water to prevent flooding during periods of heavy rains. Although flood prevention was the most immediate problem, other objectives included water for irrigation and the generation of electricity.

24. Early work on the Huai consisted principally of repair and rehabilitation of existing facilities. Because considerable engineering data were available from pre-1949 studies on control of the Huai, the PRC was able to shift quickly into a comprehensive program involving the building of new outlets, straightening river courses, and the construction of reservoirs. The pace, direction, and emphasis

of the plans, however, frequently changed. Announced successes were often followed by later admissions of failure. Familiar problems arose -- uncoordinated efforts, incompetent planning, hasty work, poor maintenance of completed works, and failure to complete basic erosion control in headwater areas.

25. By late 1972 a Chinese article proclaimed that the basin " . . . had been transformed."* The construction work of over two decades certainly has superficially transformed the Huai basin landscape with new reservoirs, new river channels and outlets, and a host of lesser works completed. Whether the transformation has completely eliminated the chronic problems of the Huai awaits the test of prolonged heavy rains and lengthy dry spells before a final verdict can be reached (Figure 4).

26. The Hai River, a short but important stream in the northern portion of the North China Plain, serves as the outlet for five major streams that wind across the northern Plain and which unite just west of Tientsin. This portion of the Plain long has been subject to serious flooding and its agricultural potential limited by considerable amounts of waterlogged and alkalinized or salinized land. Although some flood control projects were completed during the 1954-1960 period, very serious flooding in 1963, when all five rivers overflowed, prompted a decree from Chairman Mao Tse-tung that "The Hai Ho must be brought under permanent control." (See Chronology of Water Control Projects and Problems . . . following text.)

27. A variety of projects were subsequently undertaken, including major drainage projects that have involved the digging of new channels and providing new outlets.

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* *Nevertheless, an April 1973 broadcast from Anhwei told of the "first stage" of a Huai project calling for a 123-km canal and the construction of bridges, regulators, and navigation locks to relieve some 400,000 hectares of cultivated land from the threat of flooding.*

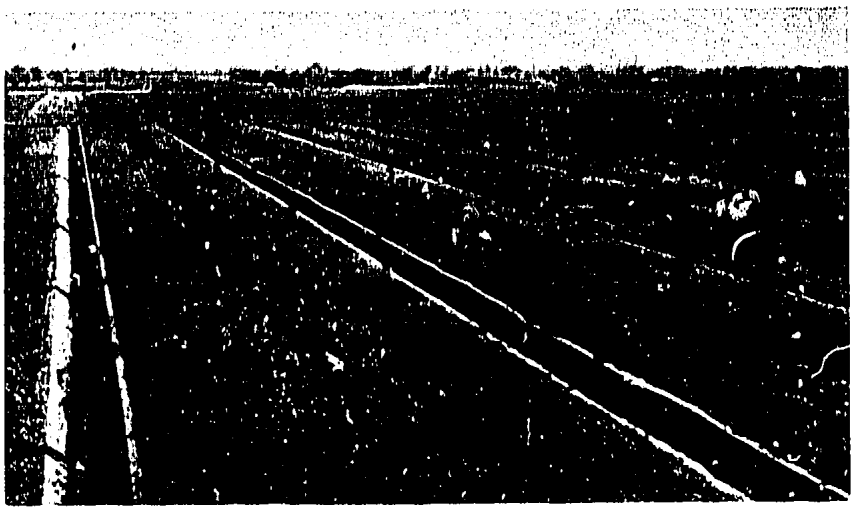

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Figure 4. Major Huai and Hai River projects have been carried out to reduce waterlogging through improved drainage and leveling of individual fields and to lessen flooding by construction of new channels and locks.

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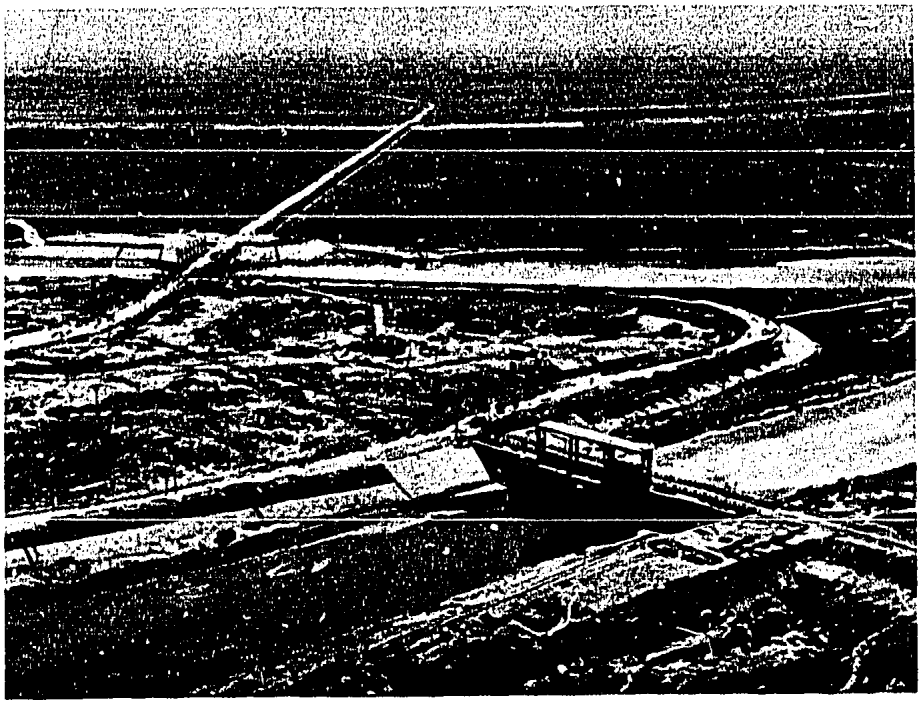


Progress also has been made in relieving waterlogging and saline conditions, thus improving existing cultivated land and reclaiming additional land. The area of alkaline land, according to recent reports, has been reduced by half. Overall, the amount of work done in the Hai basin is impressive (Map G).

28. Although the probability of serious flooding in the Hai basin certainly has been greatly reduced, the long term success of the present programs will depend upon efficient management of the newly created control and drainage systems. Dikes must be inspected and strengthened, protective vegetation on the dikes maintained, water seepage from streams to areas of sandy soil controlled, dredging continued, and pumps continually maintained and repaired. Improved crop yields can be expected over the next few years from land that previously had been waterlogged, although salinized soil must be leached for years before it becomes fully productive. Some successes have been achieved in reducing the area of alkaline land, but the complicated network of new channels must be operatively synchronized to prevent the development of additional problems of waterlogging and salinization following periods of above-normal rainfall.

Afforestation

Develop forestry and clothe all possible bare land with green.

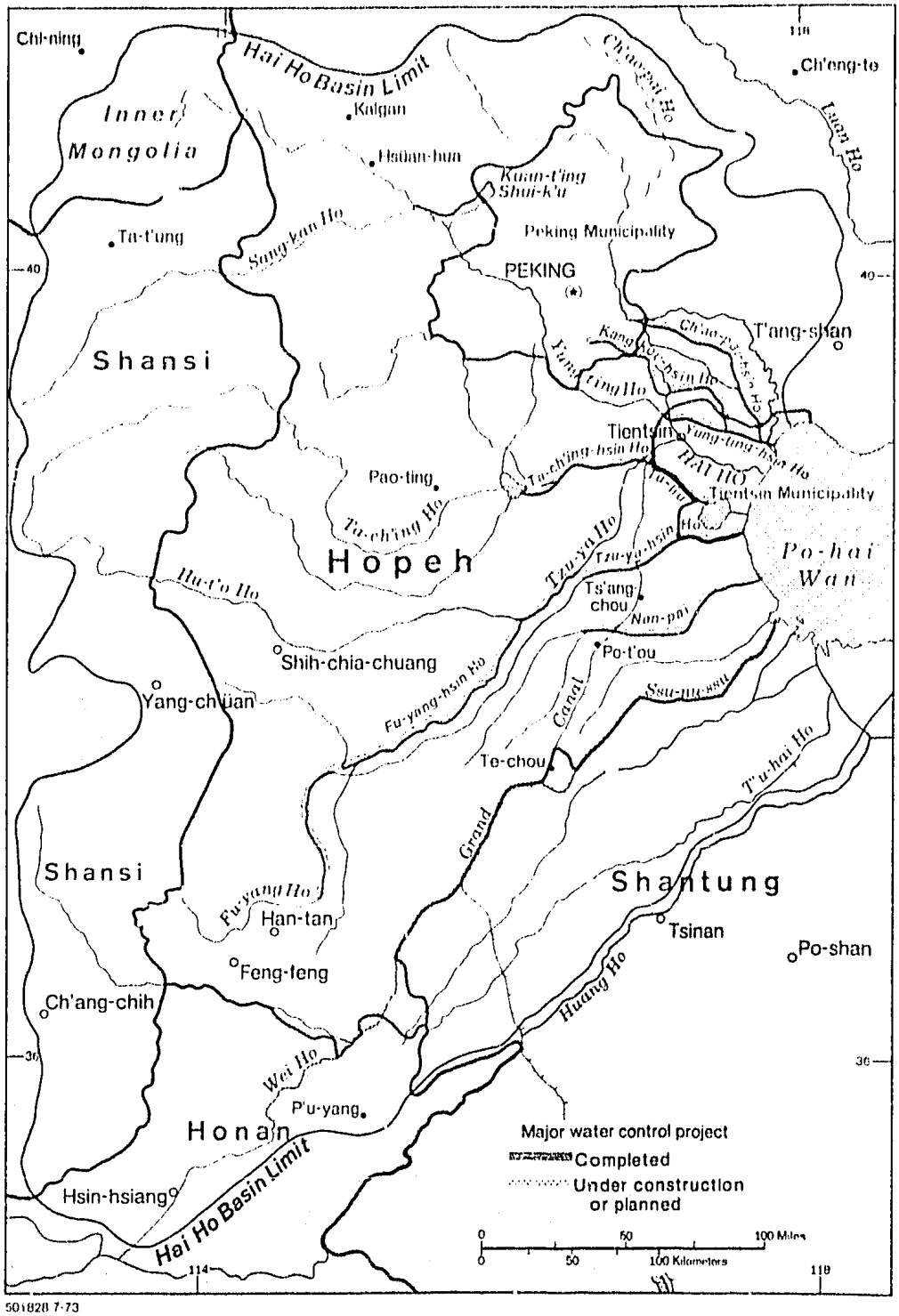
--The National Program for Agricultural Development

25X1

[redacted] extensive planting of trees on previously barren hillsides, along major roads, and in the cities. Visible contrasts between pre-1949 conditions and the present are great (Map H). How much has actually been accomplished is difficult to determine, even though abundant statistics have been released on land afforested -- particularly during the first decade of PRC rule. It is clear that the yearly figures have contained

PRC: The Hai Ho Basin

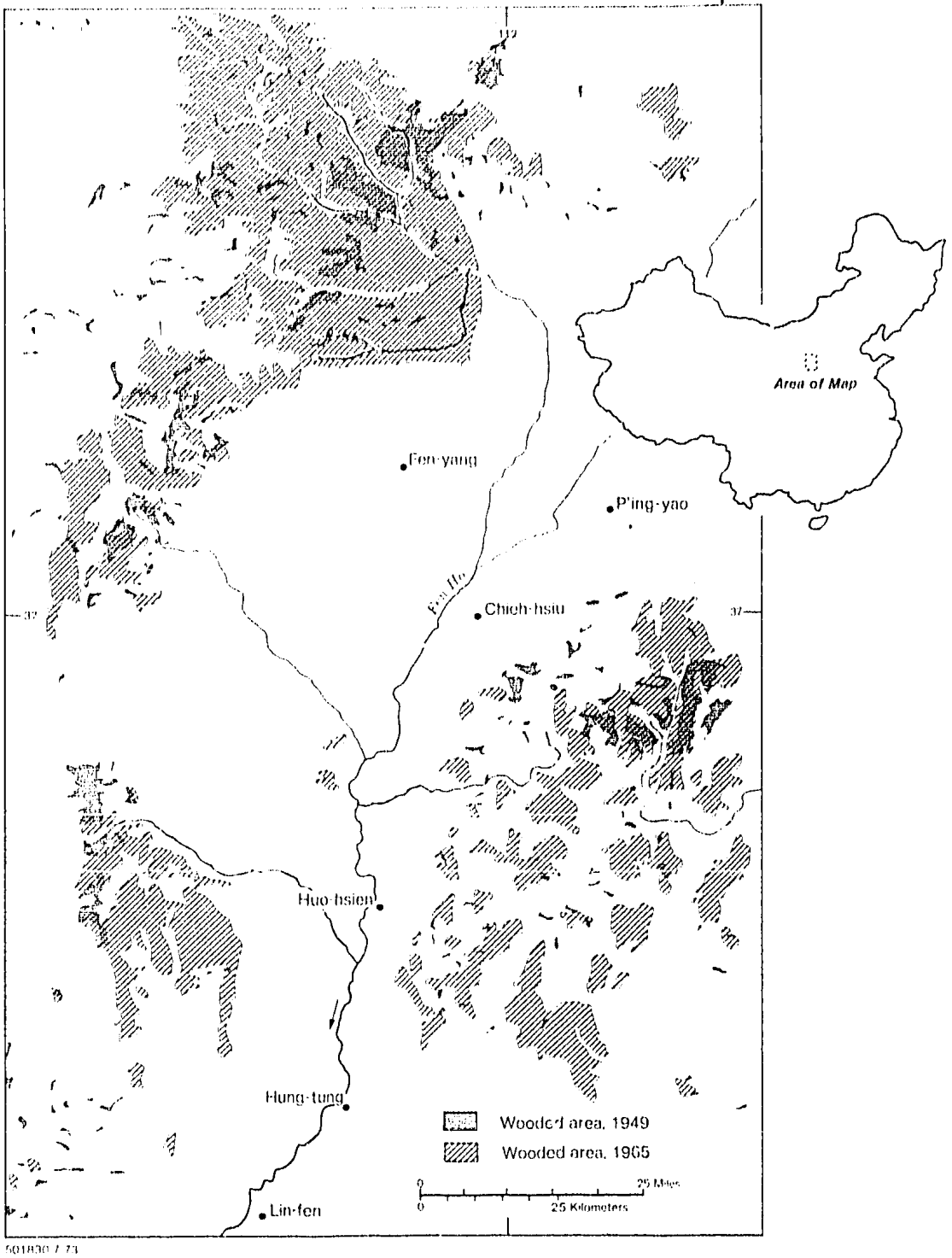
Map G



PRC: Increase in Wooded Area

Central Shansi Province

Map H



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some duplication, including sizable areas where replanting of afforested land previously had been reported as completed. In addition, the trees in many areas reported as afforested have had low survival rates, and the condition of the land is not now markedly different than before. Still unreached is the goal, originally targeted for 1967, of increasing China's forested area from the 1957 base figure of 8 percent to 19 percent of the total land area.

30. Afforestation projects serve several PRC objectives. A major goal has been to ease a serious national timber shortage and to redress the regional imbalance of wood resources.* Equally important is the coordination of protective afforestation plans with water and soil conservancy work -- erosion control, stabilization of sandy areas (particularly where they threaten cultivated or cultivable land), and related shelter belt plantings (Figure 5). The PRC also has stressed extensive roadside plantings and the planting of trees and shrubs in industrial and housing areas -- a program that has been highly successful.

31. A widely publicized program begun during the late 1950's was the "great green wall," a series of protective vegetative buffers designed to ward off the blowing sands of the Inner Mongolian deserts. Although Chinese sources were vague concerning precise locational details, the "wall," consisting of a series of shelter-belt systems, was planned to extend from the Greater Khinghan Mountains in Northeast China to northwestern Kansu Province.

32. Recent Chinese commentary has avoided discussion of "green walls," and articles on shelter belts have been confined to those in a few specific areas. The most extensive plantings reported and confirmed occur in the Wu-wei -- Min-ch'in area, in the Kansu Corridor, some 250 kilometers north of Lan-chou. Here plantings of several rows of trees to widths of about 100 meters occur in places;

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* *As of 1963 approximately 10 percent of China was forested, of which about 60 percent was located in Northeast China.*

Figure 5. Afforestation involves mass labor campaigns. Preparation of sites, care in planting, and proper post-planting measures are essential to insure success.

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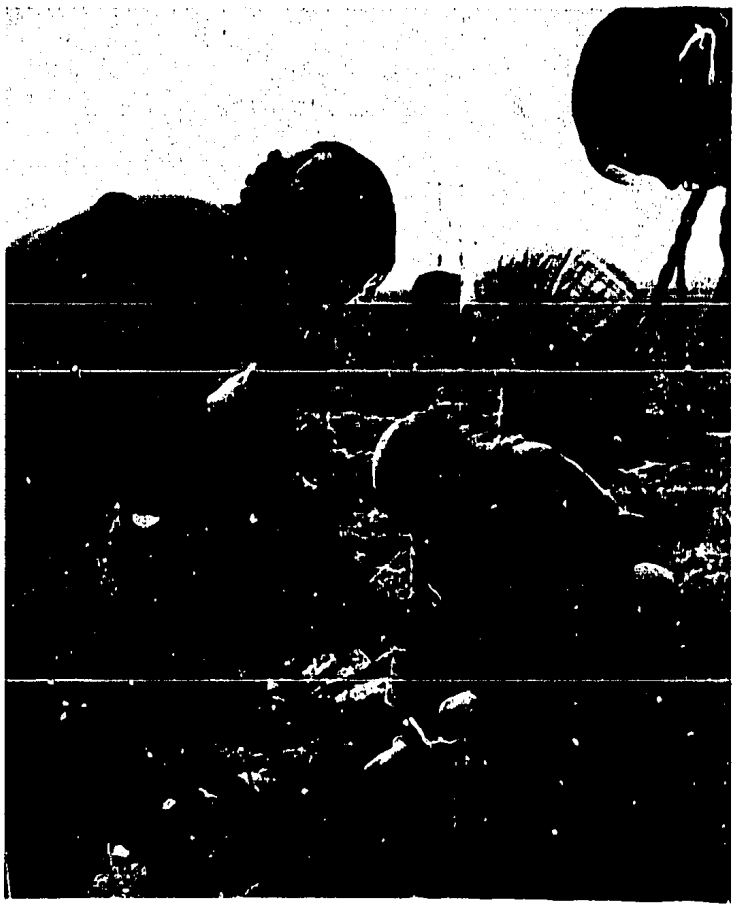

more common are irregular plots of trees, a situation most likely caused by planning and planting at different times by separate groups. Single rows of trees usually line roads, irrigation canals, and dry stream channels. In other areas occasional plantings have been started, but evidence is lacking elsewhere in the Kansu Corridor of large-scale shelter belts commensurate with the publicity over the "green wall."

33. The gap between plans and accomplishments has been caused by a combination of physical, political, and economic factors. Much of the area to be afforested consists of poor land deficient in soil nutrients. Careful preparation of sites and use of fertilizers is required to insure a high survival rate. The prolonged periods of dry weather that characterize the northern half of China pose additional survival problems. Qualified observers also have commented that in some cases species that are unsuited to the particular environment have been planted, with a consequent low survival rate.

34. Another key obstacle to a successful afforestation program has been the lack of trained personnel to oversee the managerial and technical aspects of the programs and the widespread use of rural and untrained labor to undertake the actual planting. Commonly, afforestation drives are mounted in late winter and early spring under the direction of local rural administrative units that mobilize hundreds or even thousands of laborers to plant young saplings. [redacted] 25X1

25X1 [redacted] that very dissimilar wooded plots could be found adjoining one another. The explanation was that different production teams were involved in planting and maintenance, and that the care and knowledge of those in charge of the tree planting was the major factor relating to success or failure. In some areas, [redacted] 25X1 poor tree survival might be related to the inadequate supply of fuel and to regulations that permit individuals to harvest dead trees for local use. This suggested [redacted] 25X1 "a vested interest in early mortality."

35. A 1963 editorial in People's Daily stated the need to change the idea that trees, once planted, will grow naturally without anything further being done. The editorial

also stressed the need for idealogical and educational work so that individuals understand " . . . the important relationships of forests with state construction and people's livelihood." Some progress is suggested by a 1972 report from Kiangsu that praised the cadres and masses in a certain locality for "heightening their consciousness of the struggle" so that "better results" in afforestation had been achieved compared to past years. The key word is "better"; quite likely, work in early years was done poorly and extensive replanting was necessary. Better management and education continue to be highlighted in press reports (Figure 6). A 1972 report from Anhwei comments that "the importance of developing forestry is not fully appreciated . . . [and] . . . they [referring to people in "some localities"] have no time to attend to forestry because their grain production is not yet up to the quota." The final paragraph of the article stressed anew the key point of management:

> One of the present important tasks in afforestation is to strengthen forestry management. In some localities there is still a serious tendency to stress planting and neglect management. Therefore all localities must combine the mass afforestation movement, as a crash program, with constant management and protection. They must at the same time carefully train and develop a contingent of professional workers for afforestation, and set up and perfect the system for forest protection along with its required rules and regulations. They must pay equal attention to planting and managing so as to raise the quality of afforestation and consolidate its gains.

36. A recent issue of Peking Review reported that a hsien (county) located in a coastal region of Fukien Province had afforested nearly 40,000 hectares during the

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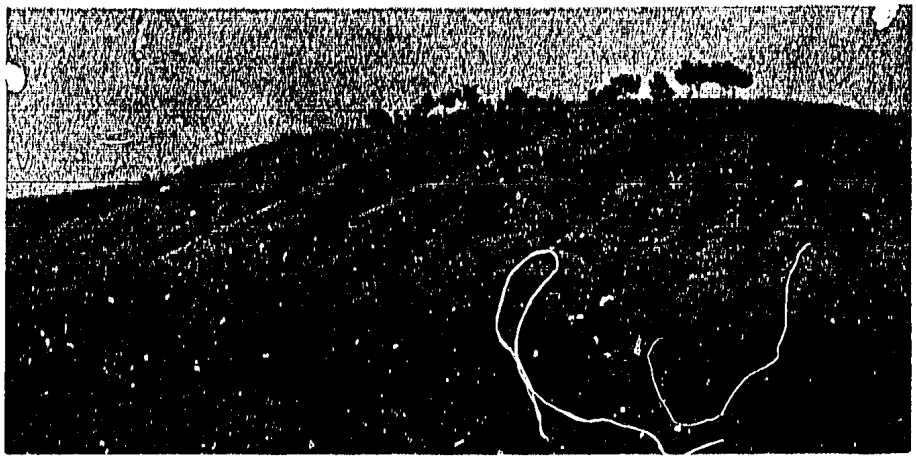

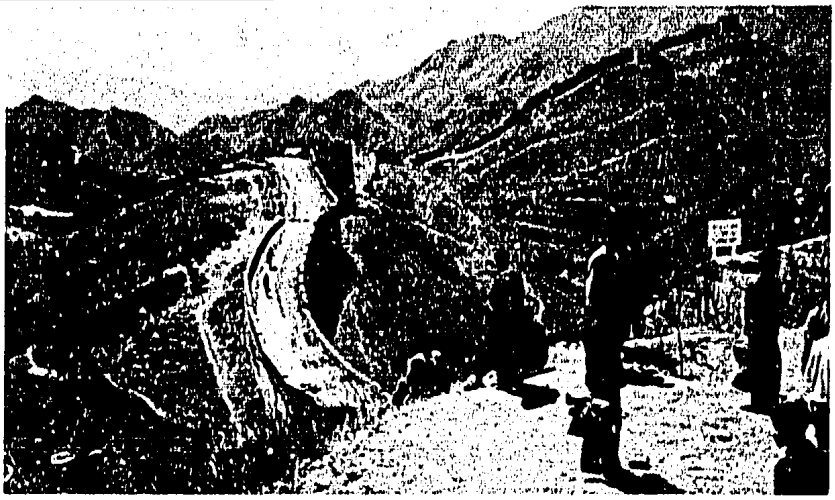

Figure 6. A hillside in South China five years after its afforestation (top); a patchwork of young plantings adjacent to the Great Wall; and (bottom) a successfully afforested tract.

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past two decades, planted 500 kilometers of windbreaks, and started orchards where none had existed before.* [redacted] 25X1

25X1 [redacted] confirm the existence of orchards, tree-lined roads, and numerous windbreaks between fields and in beach areas, many low hills near the lowlands still remain ravined and barren. Some hills and patches of uplands have been planted with varying degrees of success, but evidence of a systematic program is lacking and plantings seem to be on a hit-or-miss basis.

Nature in Transformation: Progress and Prospects

To transform nature we must rely on ourselves...

--China Reconstructs

37. According to a recent article in China Reconstructs, ". . . nature in old China became more unkind with each year," but in recent times the ". . . picture has changed greatly." Although visible change in the landscape and environmental modifications have occurred since 1949, questions arise as to the quantitative and qualitative aspects of the changes:

How much change actually has taken place?
How has change been effected?
How successful have these changes been in the context of PRC goals?

38. Victory has not been claimed by the PRC in its battles with nature. Reports of environmental damage caused by flooding, waterlogged soils, and excessive erosion still continue in the press. For example, grain output in the PRC is estimated to have declined by about

* *The 40,000 hectares figure seems implausibly high since it would amount to at least a third to possibly two-fifths of the total area of the hsien.*

10 million tons in 1972 (a drop of about 4 percent), and the blame for the shortfall has been attributed primarily to drought, floods, and other environmental conditions. Almost certainly, however, recent crop losses would have been greater had it not been for the two decades of effort to control floods, extend irrigation, and lessen erosion.

39. Water conservancy programs have played a key role in PRC planning toward control and modification of the environment. Early and ambitious projects to control the major rivers of North China produced mixed results. Initial objectives were not achieved because of lack of planning and coordination, high costs, and limited technical resources. A major problem was a lack of appreciation by PRC planners of the importance, massive scope, and complexity of the soil conservation and afforestation work required -- particularly that needed in the Huang Ho basin (Map I).

40. Publicity on the Huang Ho project recently has resumed to the effect that flooding is basically under control, though use of the word "basically" strongly implies that some but not all required work is done. In a word, flooding now is less likely -- but it still could occur. This likelihood is given added emphasis by the recent admission that insufficient attention has been paid to silting and that only now is an active study of that problem being carried out. The dimensions of the task confronting the Chinese leadership in the Huang Ho basin are best reflected in a 1971 article in China Reconstructs:

> The success in harnessing the Yellow River over the past 20 years or so is only the first step in a long, long march. Advancing along Chairman Mao's proletarian revolutionary line, the people living in the Yellow River valley are continuing their efforts to harness it further. (Emphasis added.)

More evidence of the scope of "continuing efforts" is reported in a 1972 radio broadcast from Shensi Providence that in 20 years of work only 20 percent of the Huang Ho basin [in Shensi] had benefited from soil erosion measures.

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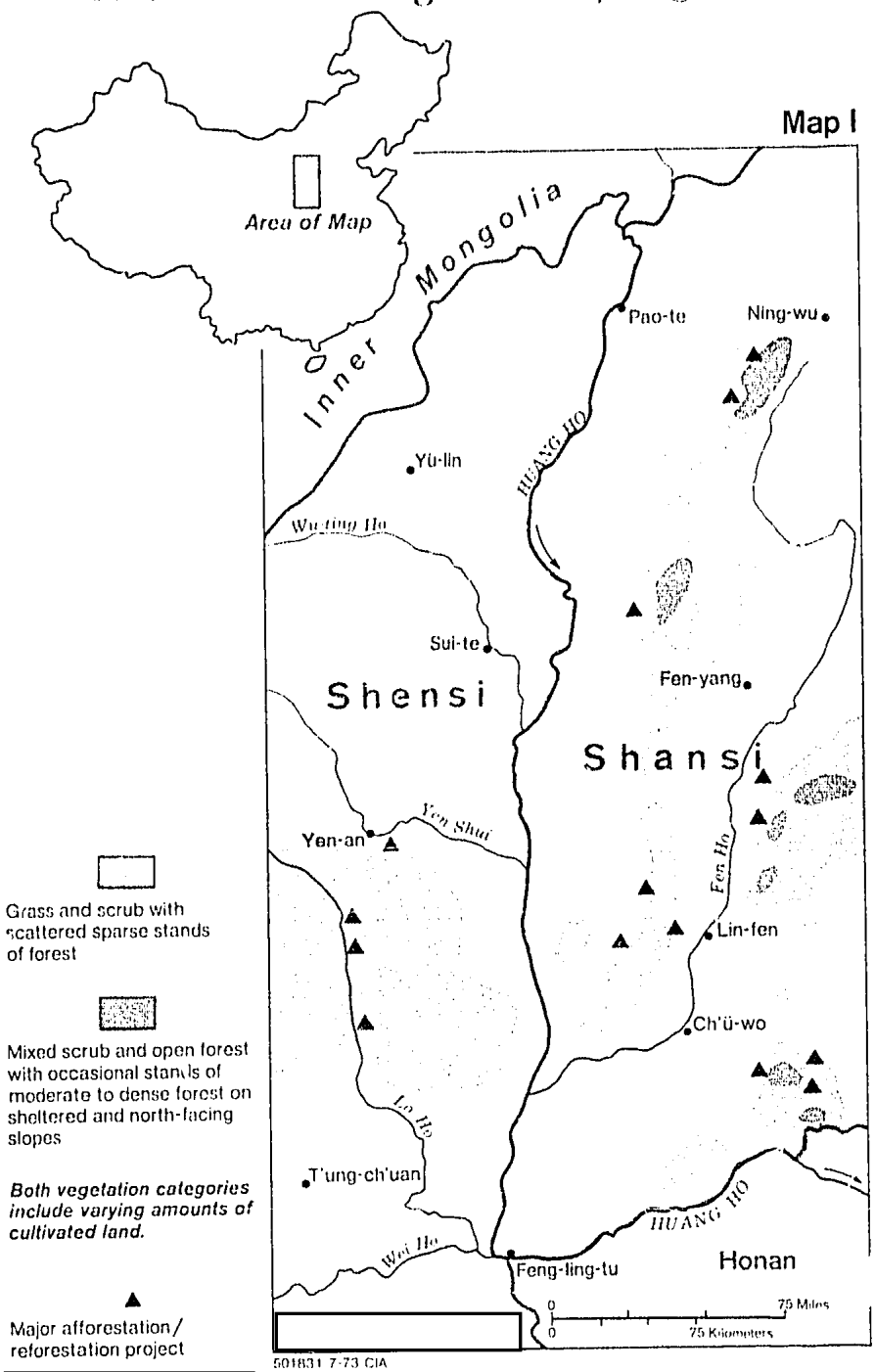
PRC: Middle Huang Ho Valley Vegetation



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41. China's rural landscape has been altered markedly by the construction of vast numbers of water impoundments ranging in size from small ponds to a few large reservoirs.* A visual impression of the increase in size and number of these ponds and reservoirs, based upon a comparison of maps compiled prior to 1949 and after 1965, is shown on Map J.** Most of these areas had few if any significant water storage facilities prior to 1949. However, an impoundment, though it has some intrinsic value in regulating waterflow, does not guarantee use of water in adjacent agricultural lands. Many of the smaller storage facilities lack sufficient capacity to be of use during dry spells when irrigation needs are greatest. Other facilities are of limited use because of the lack of pumping equipment and distribution systems or both.

42. Water conservancy projects have enabled the PRC to increase the amount of irrigated land substantially over pre-1949 levels and, in recent years, to embark upon a rapid enlargement of high-yield farmland -- land under controlled irrigation and drainage and capable of producing a crop in spite of either drought or floods.*** Water

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* *In the 1949-59 decade, some 29 million projects reportedly were completed including 56 large reservoirs, about 19 million small and medium-sized projects other than wells, and about 10 million wells. The small size of the vast majority of these is indicated by the statistic that on the average each could irrigate slightly less than 2 hectares of farmland.*

** *Only those impoundments that back up at least one-half mile or more of water are shown because of the scale limitations of the source map used. For this reason the more numerous small reservoirs and farm ponds that range downward to only a few acres in extent are not depicted.*

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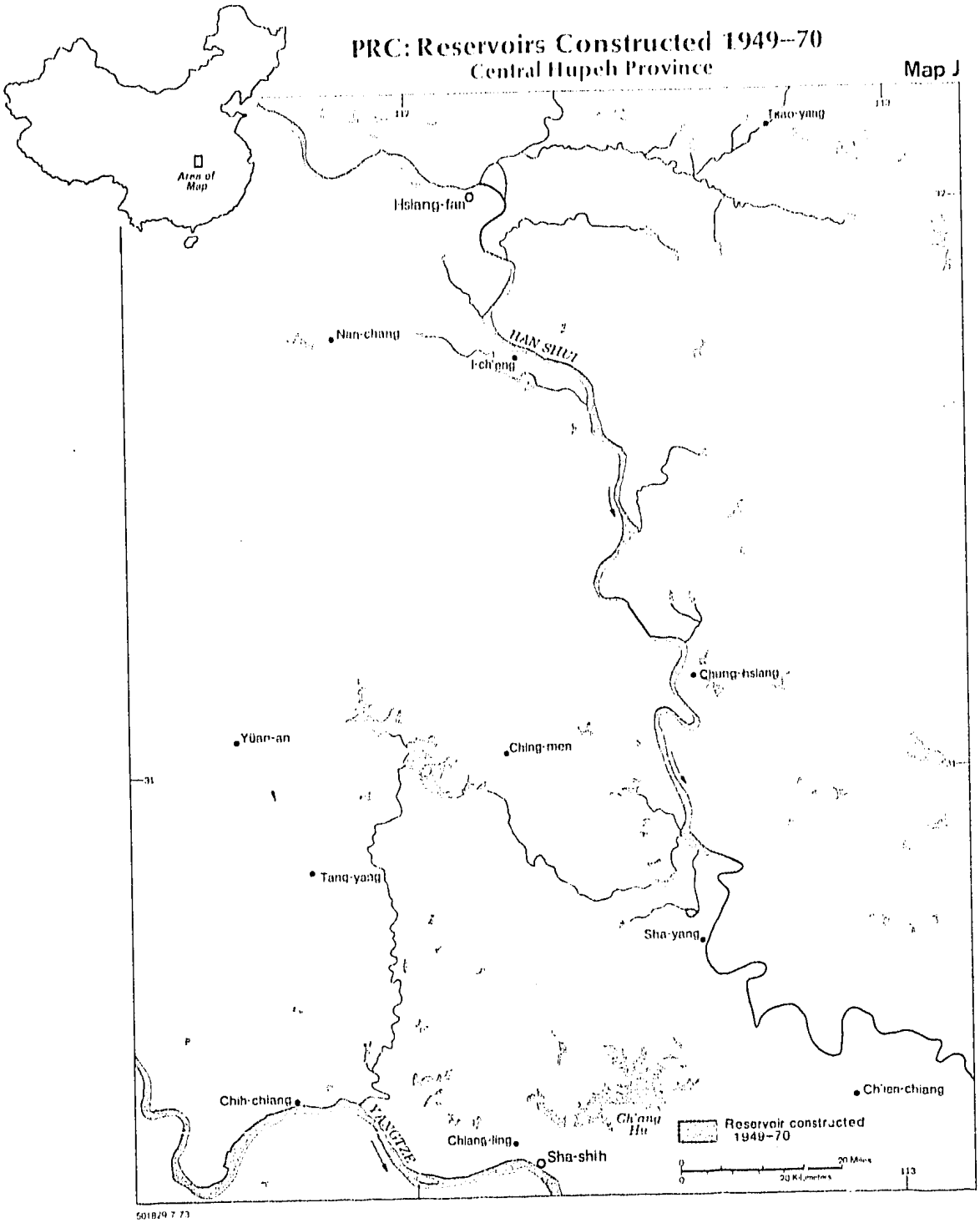

conservancy gains have been made at a cost -- staggering use of labor; profligate construction of impoundments, canals, and other projects; and frequent ignorance or disregard for basic physical conditions, needs, and the interrelationship of projects. These shortcomings have plagued water conservancy programs from the very beginning and continue today. A commentary in the People's Daily of 23 March 1973 summarized the current situation as follows:

> In evaluating the achievements of water conservation projects, we do not merely count their number but consider their role in increasing agricultural production. Constructing water conservation projects only to meet state targets in disregard of efficiency; thinking that these projects once built, will naturally play their proper role; and only knowing how to open sluice gates to discharge water without paying attention to the output of agricultural products -- are all erroneous ideas and work styles.

The key to success is thus in management and technical knowledge. But as before, as acknowledged in People's Daily, reliance is placed upon ". . . the broad masses of commune and brigade members to properly manage water conservancy projects [and] do a good job in maintaining them."

43. Progress has been made in increasing the amount of land covered by forests and other types of vegetation that will slow erosion. Although reliable data on the extent of progress are lacking, undoubtedly more of China is now "green" than has been the case for many decades if not longer. Crude comparisions for one area of North China using maps of identical scale but compiled from pre-1949 and post-1965 data provide rough indications of gains made (Map H). Familiar problems affect the PRC's afforestation schemes: proper management and technical knowledge are often limited or lacking; investment in fertilizers and pesticides usually is inadequate; reliance upon annual mass labor drives to reach targets results in a patchwork approach to a problem

where coordinated efforts are needed: and the result all too frequently is a low survival rate of the saplings and the consequent necessity for the work to be redone.

44. Programs to protect and improve China's physical environment have involved both major capital-intensive projects and local projects using China's vast, untrained pool of rural labor to dig, build, and plant -- making use of local resources, simple tools, and strong backs. Early environment-related programs stressed the major projects, such as the comprehensive plan for development of the Huang Ho. Later, Chinese planners began to place greater emphasis upon small-scale projects in which little investment other than manpower would be required. During the past decade emphasis increasingly has been on Maoist views that individual motivation and social organization are the keys to environmental improvement.

45. The most widely publicized example of this approach has been at Ta-chai, the model brigade tucked away in a loess-covered and mountain-rimmed pocket of central Shansi, which long has played the role of exemplar for rural China (Map F). Dedication and sacrifice have been exalted, together with self-reliance, as the key to material advance. The successes attained at Ta-chai have been propagandized throughout rural China (and groups from all parts of the country as well as foreign visitors have visited this Maoist model) in an effort to persuade the individual that handicaps and difficulties can be overcome without waiting for the distant promise of technology to modernize agriculture (Figure 7). The "war" against the "enemy," nature, also further emphasizes in Chinese minds the revolutionary nature of the struggle and the break against the old ways of the past with their passive acceptance of the environmental status quo.

46. Not all that has been done at Ta-chai seems worthy of emulation. The dam from whose reservoir Ta-chai draws its water -- conveyed in a spectacular rock-lined aqueduct -- has no spillway; a period of extensive rain could lead to its destruction. Local officials recently admitted too that the reservoir will be filled with silt in a dozen years if erosion continues at its present rate. This official comment from a model area underscores both the problem and the difficulty of successfully applying known remedies.

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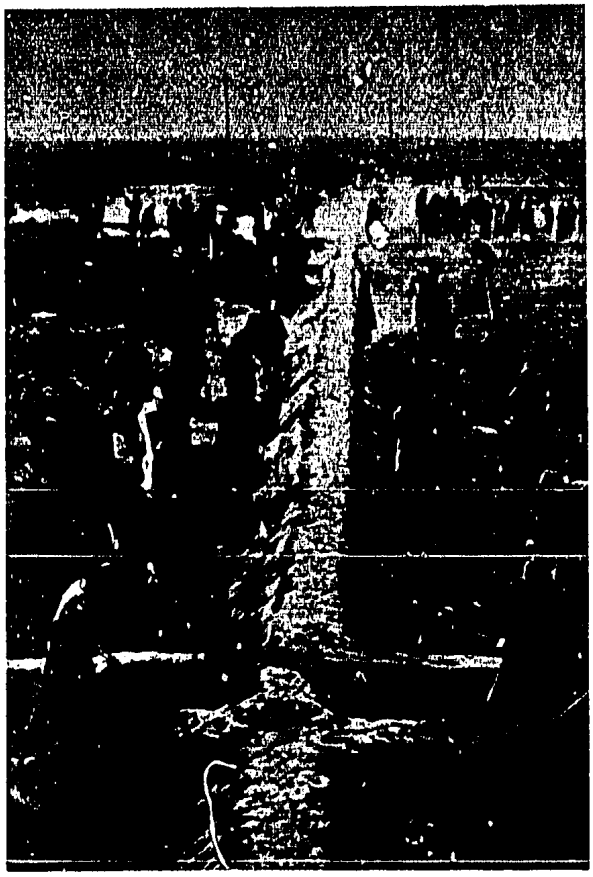

Figure 7. Transforming nature requires enormous amounts of labor. Building dry-wall stone terraces at Ta-chai; improving ordinary fields to high-yield fields by providing dependable supplies of water; elaborate earth-walled terraces to combat erosion in North China.

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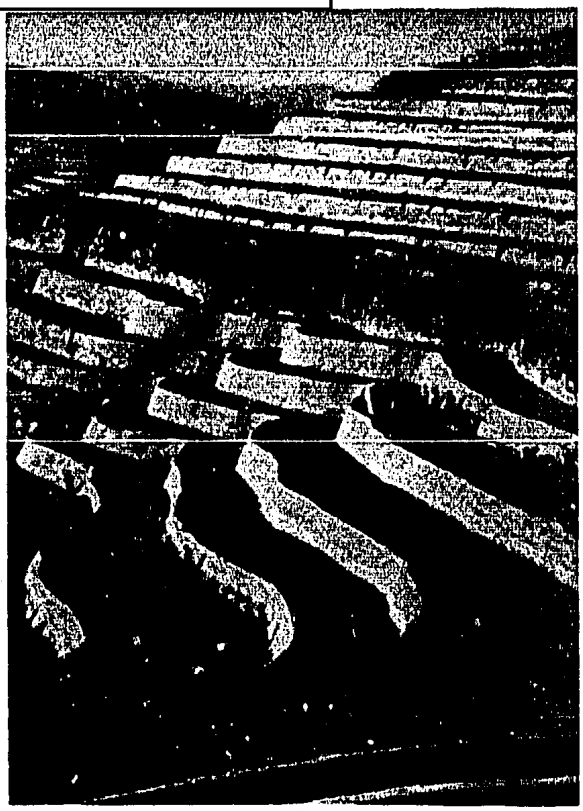

47. It is not possible to measure accurately how successful the PRC has been in harnessing its environmental assets and lessening damage to them. The objective has been to improve the physical base upon which agriculture rests. Food output, except in the disaster years of 1959-61, has kept pace with population growth; and in the 1965-71 period grain production increased at a somewhat faster rate. Many factors are responsible for increasing agricultural production, but certainly the environment-related measures of the past two decades have reversed the trend of environmental degradation and helped avert calamities of flood and drought.

48. The press in early 1973 reported renewed efforts to overcome natural calamities, as the PRC was forced to increase grain and cotton imports and to intensify efforts to conserve food. Chou En-lai, interviewed in December 1972, blamed last year's grain shortfall on drought and flood though, he added, other reasons exist related to the difficulty of implementing "plans in practice" and the need to correct methods. Nature still remains a critical element, however, in the Chinese economy. "Man can master nature," stated a recent editorial in People's Daily, and good harvests are possible if "full preparations as regards morale, measures, and material" have been made.

Chronology of Water Control Projects and Problems in the Hai Ho Basin

Year	Project	Problems
1954	Kuang-ting reservoir completed. (An 85 sq. mi. reservoir on the Yung-ting Ho, 45 mi. northwest of Peking, serving flood control, irrigation, and power generation.)	
1954 & 56		Very serious floods; Yung-ting, Ta-ch'ing, Tzu-ya and South Grand Canal streams all flooded.
1957 - 58	Peasants mobilized on small projects; small ponds and canals dug to store and convey water to the fields.	
1958		Worst drought in 30 years.
1958 - 59	Six large reservoirs completed in Hai Basin.	
1959		Severe rainstorms showed the reservoirs to be inadequate.
1959 - 60	Most of the labor shifted from construction of more large reservoirs to the digging of "checkerboard" canals.	
1960 (January)		Construction of new water conservancy projects terminated.
1963 (August)		All 5 tributaries of the Hai Ho overflowed; Mao's directive issued that "The Hai Ho must be brought under permanent control."
1963 - 65	Extensive and detailed surveys, especially of the Hei-lung-kang (in southern part of Hai Ho basin) area; overall plan for Hei-lung-kang area was made.	

Chronology Continued -

Year	Project	Problem
1965 - 66	Hei-lung-kang project: discharge capacity of the streams increased by dredging silt, building new dikes. Ta-ch'ing and Tzu-ya river improved, and given new seaward outlet in order to bypass the Hai Ho at Tientsin; 400,000 workers were mobilized for the tasks.	
1966-72	Extensive land reclamation continued in the Hei-lung-kang area digging ditches, leaching salts from the land, building raised fields, and applying organic fertilizer.	
1970 - 72	Major drainage improvement in the northern part of the Hai Ho basin (in the Peking-Tientsin area): channels now lead water directly to the sea instead of into the Hai Ho at Tientsin. Discharge capacity of Hai Ho system reportedly increased 8 times. New Yung-ting River cut. Kang-kou River improved. New Chao-pai River cut.	