Natural Resources Problems in Japan

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IF THE TRAGEDY OF A WAR only compounds the tragedies of its causes, nothing can obscure its waste. If hostilities cannot settle most of the issues which brought these hostilities into being, and if the greater portion of the conflicts and frustrations which bred the initial violence remain unaffected or even aggravated after the war has come to an end, then the terms of the victory are inevitably revoked and the peace becomes a temporary truce.

In Japan, the outcome of the Pacific war has given the Allied Powers the opportunity to direct all of their wisdom and good will toward mitigating the tragedies of its causes. Seen from this perspective, the work of the occupational forces has an historical significance of the first magnitude. What is being done in Japan to build a good society, economically, socially, and politically, may, if it is successful, serve to justify the efforts and sacrifices of millions of people in fighting this part of World War II.

Japan's complex economy is closely geared to her natural resources, and some of the most intricate problems of the occupation have involved the technology of their use. Her oligarchic social structure derived much of its strength from hereditary ownership, concentrated in relatively few hands, of the natural wealth of the land and the sea, and sweeping reforms in the rights to these resources have had to be made. Work in this direction began early in September 1945, only three weeks after General of the Army Douglas MacArthur was designated Supreme Commander for the Allied Powers. On October 2, 1945, the Natural Resources Section was established as a special staff section of General Headquarters to advise and inform him on policies and activities pertaining to agriculture, fisheries, forestry, and mining (including geology and hydrology) in Japan.

The scientists at work on this project have been drawn from the ranks of the Army, the Navy, and other governmental agencies, from academic and research institutions, and from private industry. Their duties include arranging for and coordinating surveys and reports in the pertinent fields; locating and arranging to obtain source data in Japan relative to pertinent activities in countries formerly occupied by Japan; recommending measures to insure the development, exploitation, production, processing, and distribution of the basic industry products to the extent required for rehabilitation of the national economy within the terms of the Potsdam Declaration and to meet the needs of the occupation forces; and making recommendations relative to the conservation of natural resources and the operation or nonoperation of basic industries and of related scientific activities.

Because of the disintegration of the Japanese economy resulting from the war, it was first necessary to make immediate provision for a subsistence level of food, to provide minimum quantities of fuel and minerals, and to accelerate production of building materials. Thus, short-range problems of increasing food production by adequate production and distribution of fertilizer, by reclamation of unused arable land, for agricultural purposes and by supervision of crop collections were the first agricultural problems. The urgent needs of the fisheries were primarily vessels, nets, cordage, and fuel. So far as the forests and the mineral resources were concerned, the primary problem was to increase fuel production and to obtain as much lumber for rebuilding as was consistent with future productivity of the forests. Maximizing indigenous production of Nippon's natural resources remains the project of highest priority.

Some of the resources are renewable if properly managed. Accordingly, the sequels to these immediate problems were the problems of sustained yields. Consideration has been given to agricultural research and dissemination of its results, to research on fish population management, to reforestation and erosion control, and to improvements in technology of use of wood products. Finally, the Japanese have been encouraged to begin planning on a national scale for the development and use of their natural resources.

While the problems dealing with mineral resources are not identical with those of the renewable resources, they follow similar patterns. It has been necessary to eliminate obstacles to production and to attack the problems of developing mineral reserves and reducing waste in their exploitation. In all of these fields, a large part of the over-all problem is the determination of the actual state of the economy—that is, the obtaining of reliable statistics.

In this nation of so many people on so little land,

Ths article was prepared for presentation at the 18th Session of the International Geological Congress, London, England.

food production is the most pressing single problem. Current yields from the 15,000,000 acres under cultivation are not sufficient to feed the population of nearly 80,000,000 and in all likelihood never will be. Although Japan may succeed, by increasing both yields and acreages, in producing a bare subsistence requirement, we see no escape from the conclusion that food will always have to be imported, particularly in the light of the net increase in population of more than 1,000,000 per year. Any increase in the domestic food production is of interest, both to the American taxpayers, who paid more than $295,000,000 in 1947 for food for Japan, and to the citizens of all of those countries who, during these last few years, have had to look beyond their own boundaries for food. The low fertility of Japanese soils, the shortage of fertilizers, the scarcity of unused arable land, and plant diseases are major obstacles to increased food production.

Before World War II, Japan was one of the world's largest consumers of commercial fertilizers both in amount per unit area and in total tonnage, and practically all the phosphate and potash fertilizer used was imported. The addition of reclaimed land to the total cultivated area and the steady growth of population make present and future fertilizer requirements greater than those of prewar years. In order to supplement the inadequate supply of domestic fertilizer, high priority has been given to the importation of ammonium nitrate, phosphate rock, and potassium salts. Since the end of hostilities, more than 1,500,000 metric tons of all types of fertilizer have been imported. Priority has also been given to the rehabilitation of factories for the manufacture of nitrogen fertilizer and for the conversion of phosphate rock and potassium salts to fertilizer. Japanese workers, under the supervision of General Headquarters personnel, are mining phosphate rock in Angaur Island in the Palau group. These operations have contributed substantially to raise 1947 agricultural production to 93% of the 1931–40 level, whereas 1945 production was only 76% of that level.

Although the Japanese have long recognized land reclamation as an important means of expanding cultivated acreage, past reclamation programs have been ill conceived and managed. At the beginning of the occupation, American agricultural specialists reviewed the reclamation program of the Japanese Government and recommended revisions of certain plans and practices. Surveys of 370 areas proposed for reclamation are now in progress under the direction of these men. Reclamation projects have already added about 770,000 acres of arable land to the cultivated acreage; improvement projects have added 250,000 acres more. In addition to the land reclaimable for agriculture, Japan has about 3,000,000 acres of uncultivated, nonforested slopes which are being investigated as possible pasture and forage lands for livestock.

National land-use programs and better planning for future production are urgently needed in Japan to insure maximum agricultural and forest returns. In order to provide a sound basis for these plans, American scientists have carried nearly to completion a reconnaissance soil survey. This survey, the first to employ modern methods of classifying and mapping Japanese soils, allows comparisons between soil groups in Japan, as well as with soils of other parts of the world. It provides for the first time a general inventory of soil types for the use of those agencies responsible for increased food production through land reclamation and improvement.

American experts have worked with Japanese officials on problems of insect and plant-disease control. Japanese spray equipment is antiquated, and dusting has had only limited use. Because of the poor equipment, as well as the scarcity of oil for the preparation of emulsions, the use of insecticide and fungicide dusts is now being encouraged. New insecticides have been introduced. Japan is currently producing about 150 tons of DDT annually, and the manufacture of benzene hexachloride has been started. In an effort to control virus and other diseases, an intensive program has been initiated for producing certified white potato seed.

There are 666 national and prefectural agricultural experiment stations, seed increase farms, livestock breeding farms, and sericultural service stations in Japan. In addition, 273 private laboratories and educational institutions are conducting research in agriculture. Research in some fields was found to be highly developed and skillfully conducted. Some of the most notable work has been done in sericulture and small grain variety improvement and in cytogenetics. Unfortunately, much of the agricultural research in other fields has been of little scientific or practical value. A lack of central guidance and coordination has resulted in extensive duplication of effort on some problems and neglect of other equally important phases of agriculture. Thus, economic aspects of agricultural production have received almost no attention from the research standpoint. Modern design of experiments and statistical analysis of data are almost unknown. However, in spite of its weaknesses, agricultural research in Japan has been responsible for making Nippon the outstanding country in the Far East in agricultural production.

Agricultural extension work, as a means of disseminating the results of research, has been conducted by quasigovernmental agricultural associations. Al-

though this system has been effective in forcing farmers to adopt some improved farm practices, more than 40,000 public employees have been required to carry out the program. After considerable study of Japanese agricultural research and extension, American specialists recommended that the Japanese Government develop a closely coordinated research and extension system. As a result of these efforts, the Japanese Diet on July 5, 1948, passed two laws which provide a legal basis for reorganization of these lines of work. The first establishes in the Ministry of Agriculture and Forestry an Agricultural Improvement Bureau which is responsible for the coordination and technical guidance of research and extension activities. The second provides the basis for the national government to conduct research and extension work cooperatively with the prefectures.

A corollary to the production problem is the administrative task of establishing staple food collection quotas to insure equitable distribution of crops in the existing inflationary economy. Accurate appraisals of the food situation had been hampered by the Japanese Government's inadequate crop-reporting system which depended on reports by local officials, responsible primarily to local agencies. To rectify this situation, the Ministry of Agriculture and Forestry was assisted in establishing an autonomous Statistics Bureau, which controls branch offices at prefectural and village levels. Marked effectiveness of the new system will not be attained for several years because of lack of trained personnel, but great improvement over the old system is expected.

Although provision of a minimum caloric subsistence level for Japan is primarily an agricultural responsibility, the principal sources of animal proteins in the Japanese diet are fish and other marine products. American fisheries technologists have supervised a program to make the best possible use of critically scarce equipment and to increase imports of needed raw materials. Under this program, fishing boats have been built, fuel oil, cotton, abacá, and other fibers have been imported, net and twine factories and cold storage and refrigeration plants have been restored to use. Production has been increased from the 1945 level of 4,000,000–5,000,000 pounds to more than 7,000,000 pounds, which is about as much as the present fishing area can support.

Gen. MacArthur has authorized the Japanese to conduct Antarctic whaling expeditions during the past two years. These have been accompanied and supervised by his personal representatives, and all operations have been in accordance with the International Whaling Convention. Utilization of catches during the last expedition was well-nigh total. The yield from these operations has supplemented the Japanese diet where it is most deficient, namely, in animal protein and fat, and has included valuable by-products. A third expedition, operating under similar conditions, will leave for the Antarctic this November.

The productivity of the Japanese fisheries is due to more than the coordination of Western technology with the Japanese economy. Japan itself has done more research on technological and biological problems in fishing methods and development of new fisheries than has any other nation. Now, however, exploitation has reached the point where some marine populations are being badly depleted. Unfortunately, also, corrective measures are not available, because little attention has been paid to the long-range and more complex problems of fish-population management. For a stable economy it will be necessary in the future to devote the major research effort to good management rather than to exploitation of these resources. American scientists are emphasizing to Japanese scientists, government officials, and industrial representatives the necessity of directing their research along those lines in the interests of sustained yields.

In pursuit of these objectives, a committee of competent Japanese scientists and fishing industry representatives has been appointed by the Minister of Agriculture and Forestry to plan a reorganization of the aquatic research of both government and university facilities. The committee will also study the planning and financing of long-term programs and the efficient use of facilities. They have recommended the reorganization and elevation in status of the Bureau of Fisheries. Pursuant to this and supporting recommendations, the Diet on July 1, 1948, reorganized the Bureau and gave it the higher status of a Fisheries Agency, with broad powers to conduct the planned research projects, direct the practical application of the results, and supply information to Japanese fishermen through extension programs.

The concentration of wildlife in Japan is, to anyone familiar with conditions in the United States, appallingly low. The diminution of wildlife up to now has been related closely to the increase in the population and the pressure for food. Legislative action has been taken to prevent extinction of insectivorous birds and to halt the wholesale destruction of game in order to insure sustained yields. There is need for a well-conceived wildlife conservation program, but a great deal of effort will be required by Allied experts to initiate and execute such a program. The most obvious material benefits would not be inconsiderable, for even as recently as the years from 1931 to 1941 the annual harvest of wild meat averaged 7,000 tons.

Japan's forests, which suffered from overcutting and insufficient replanting during the war, are now

subject to heavy demands for reconstruction. The major task of Gen. MacArthur's staff in this field is to institute measures to counteract the wartime overexploitation and at the same time to furnish necessary wood for fuel and contruction. Surveys show that Japan faces the possibility that its more desirable timber stands will be exhausted within 15 years. Less than 25% of the present forest area furnishes 85% of the annual timber production. The Government has a 5-year reforestation program which aims to place timber production on a sustained-yield basis. American foresters supervised the planning and administration of this program, through which 780,000 acres have been reforested since the beginning of the occupation. They have the continuing objective of seeing that it is maintained rather than being postponed and diminished, as were earlier reforestation programs.

Although all accessible forest areas have been overcut, approximately one-tenth of the total forest lands of Japan, or one-fifth of the wood volume, has been unexploited because of lack of roads. Some of these inaccessible areas are in Hokkaido; most of them are near large consuming centers on Honshu. Roads constructed since the beginning of the occupation have made 495,000 acres of forest land accessible. Although this project is progressing satisfactorily, material shortages and increasing labor costs are impeding progress.

Erosion control is closely related to reforestation. Japan's rugged topography, heavy precipitation, long shoreline, and strong coastal winds contribute to serious erosion and to sand dune movement. The denuding of mountain slopes for many years has aggravated these problems. The removal of natural water controls has resulted in silting of river channels, which, in turn, has retarded the normal run-off of excess waters and increased the threat of floods in some of Japan's most productive farmlands. Gen. MacArthur is stressing the replanting and management of the protection forests which have been damaged by excessive and unauthorized cutting.

Material savings have been effected by introducing improved methods of processing pulpwood. One of these, a semichemical pulping process adapted to present pulp mill equipment, yields one-third more pulp than the former process and gives consistently better quality papers. Another improvement was the addition of locally procured volcanic ash to red pine pulp in order to overcome pine pitch difficulties in the manufacture of newsprint. Information on improved processes in manufacturing machine-coated and kraft papers has been given to the industry and is being used by paper mills. General specifications for various types of paper have been developed and used for the first time in the Japanese paper industry. In the plywood industry, similarly, specifications have been adopted, and improvements in gluing techniques have also been effected. New processes for the utilization of forest and pulp mill wastes have been introduced.

Emphasis in forestry research has been to establish coordinated programs designed to utilize wood more efficiently and to increase the productivity of the forests. The 13 central government experiment stations now have a single director, and much former duplication of studies has been eliminated. The work of the other 34 experiment stations is being reviewed. Although industrial research is behind that of other industrial nations, progress has been made not only on wood waste and sulfite liquor saccharification for yeast fodder and alcohol production, but also on lignin utilization, wood fuel, and wood preservation.

Let us turn now to mineral resources. The coal mining industry was in a particularly bad condition when World War II hostilities ceased. The demands of the war industries had forced a huge increase in coal production, with little concurrent exploration, development, or maintenance. In late 1945 production had declined to only 600,000 metric tons per month; nonindustrial requirements alone were three times as much as this. Today, the minimum coal requirement is 36,000,000 tons annually, while production is about 31,500,000 tons.

Programs of geological exploration and studies of engineering and social problems designed to help the Japanese Government to increase the productive efficiency of the coal mines have been initiated. American engineers have completed studies of mining techniques, equipment requirements, and labor utilization throughout the industry. Depletion of developed reserves in the mines, war damage to surface installations, the accumulated effects of poor maintenance, and shortages of housing, materials, and equipment are the physical handicaps to increasing production. Economic difficulties include the effects of inflation, unsatisfactory labor relations, and monopolistic management.

Surveys of the principal coal- and lignite-producing fields were made, and data on proved and potential reserves were assembled. Through the efforts of General Headquarters personnel, a Coal Exploration Advisory Committee was formed to insure proper coordination and guidance of exploration activities by the Japanese Government agencies. This committee, which includes the best-qualified Japanese coal geologists, engineers, and technologists, might be compared with the Regional Committees which operated under the chairmanship of the Regional Controller of the Ministry of Fuel and Power in England and

which have recently carried out surveys of each coal region in Great Britain. Current emphasis in Japan is on the remapping and surveying of solid fuel deposits, on preliminary geological field studies, on seismic prospecting on a national scale, and on related research, aimed to extend present fields and establish new reserves.

The development of Japan's meager petroleum resources has been slow. For the purpose of coordinating exploration and executing a balanced program of geological and geophysical surveying and exploratory drilling, Gen. MacArthur sponsored the establishment of the Petroleum Exploration Advancement Committee, the members of which are drawn from the Japanese Government agencies, private producers, and the universities. Several small new oil fields and extensions to two producing fields have been discovered.

Although the reserves of coal are adequate to meet the requirements of industry, Japan has never been able to fill her requirements for metals from her own mines. Lack of foreign exchange, however, has made it imperative that maximum use be made of available mineral resources. As with the coal mines, overproduction from metal mines during hostilities, with the concurrent lack of development and wearing out of equipment, has left mines in poor condition to meet present demands. Gen. MacArthur's staff has conducted studies of the available metallic mineral resources. Both the geology of the deposits and mining and milling techniques were investigated. New blasting techniques introduced by American engineers have increased the speed of driving development workings. Efforts have been made to educate the Japanese in techniques of selective mining in the narrow veins, common to many of Japan's mineral deposits, to reduce the quantity of barren waste being hoisted and processed through mills already in a serious state of deterioration from overuse. Some improvement in mill recoveries has resulted from insistence upon more attention to better control of mill feed and reagents.

Pyrite, one of the few minerals of which Japan has adequate quantities to satisfy her needs, is the principal source of sulfur in her sulfuric acid industry. Close attention has been paid to maintaining production adequate to meet the sulfuric acid requirements of the fertilizer industry.

No less than in other phases of the mining industry, wasteful practices were found to be common in metallurgical plants. Merely by introducing new methods for the production of copper "starting sheets" for use as cathodes in electrolytic refining, man hours required in this operation have been reduced by more than 50%, and, in addition, it has been found that the percentage of rejects, because of faulty finished sheets, has been reduced from 25% to about 2%. By introducing improved "poling" techniques in refining electrolytic copper, General Headquarters technicians were able to reduce plant fuel consumption as much as 27%. Similar improvements are being introduced as rapidly as the industry can assimilate the new techniques.

Research within the mining industry must be coordinated, and universities and mining companies must share their findings, if optimum utilization of Nippon's meager but varied mineral resources is to be obtained. There is striking need for an extensive reorganization of the Japanese Mining Bureau, the past complexion of which has been largely political. Current recommendations call for the creation of a Research Division, staffed by competent technologists and directed to provide for a greater exchange of information between public and private agencies. In addition, General Headquarters is advocating that the laboratory facilities of the large mining companies be made available to both academic researchers and smaller mining companies. And related to research is the newly established centralized statistical section of the Japanese Mining Bureau, an organization that provides for the first time in Japan an agency for coordinating the gathering of mineral statistics.

As a result of the study of all natural resources, it has become fairly clear that, while both Japanese science and Japanese technology are based on European and American foundations, the liaison between them has been poor. Again, economic planning has never been considered on a national scale. Indifference toward national economic planning is a luxury Japan can ill afford, but Japanese science and technology have never been in a position to attack the problem on a practical basis. These shortcomings are particularly regrettable in a country of such limited per-capita resources. Gen. MacArthur has stressed the need for a centralized agency to coordinate national planning programs in the interests of Nippon's natural resources. A first step was taken toward this goal by the creation of a Resources Committee, established by a Cabinet Order of November 13, 1947. This committee, which functions under the auspices of the Japanese Economic Stabilization Board, is composed of government and academic specialists in geography, mining, geology, metallurgy, forestry, agriculture, chemistry, and power engineering. Its first concern is to plan and coordinate government activities relating to land, water, and energy utilization.

At the same time that these technological changes were being instituted, the Supreme Commander took steps designed to lead the Japanese into a more democratic way of life. The social problems of present-

day Japan are intimately related to those of development of her resources. The land reform program, which has been correctly singled out by all commentators as Gen. MacArthur's most important reform, strikes at the roots of the feudalistic agrarian system which has held Nippon's tenant farmers in economic bondage for centuries. This reform provides for the purchase of 4,500,000 to 5,000,000 acres, or approximately 80% of the tenant-cultivated land. The tenants will become owners of that land. The program is being carried out smoothly and expeditiously. Most of the land subject to the reform has already been purchased by the Government, and 75% of it has already been resold to the tenants. The end of 1948 will witness the successful completion of the historic and far-reaching reform. The economic and social status of Japanese farmers has been further improved through the dissolution of autocratic and regimented agricultural associations through which the Government dominated the agricultural economy during the war. Agricultural cooperative legislation enacted by the Diet in November 1947 authorizes farmers to organize, on a voluntary basis, democratically controlled cooperative associations formed on internationally recognized principles.

In the fisheries, the long-continued pressure for food has resulted in the development of property rights in aquatic resources to a far greater extent than in any other country. While maintenance of a system of fishing rights is essential to retard depletion of this heavily burdened resource, the existing system is full of abuses, including excessive concentration of fishing rights, absentee ownership, exorbitant rentals, and a complexity almost beyond comprehension. Study of this problem has led to the preparation of two bills which, it is anticipated, the Diet will pass during the next session. The Fisheries Rights Bill will simplify the present classification of 6 groups and almost 3,000 subgroups of rights into 5 groups and 7 subgroups. Rights will be granted according to an eligibility and priority schedule established by law to reduce personal latitude by officials, committees elected by the fishermen from among themselves will arbitrate disputes, and actual operators alone will be entitled to fisheries rights. Provision is also made for a rational system to control intensity of fishing. The Fishing Cooperatives Bill will provide the machinery whereby fishermen can work together for their common interests.

Ownership of forest lands is divided roughly equally between the prefectures and national government on the one hand and private individuals on the other. Individual holdings are for the most part too small for efficient forest management and are not a hindrance to social reform. Accordingly, since economic considerations in this case bulk larger than social considerations, the members of General Headquarters have opposed compulsory changes in ownership.

In the field of mining and geology, programs of decentralization of economic power are now being detailed. General Headquarters personnel are cooperating in the development of these projects with the objective of maintaining the greatest efficiency of use of the resources which is consistent with needed reform in management. A safety program for the coal-mining industry has also been proposed which includes safety education of the miners and regulations for mine operation at progressively higher levels over a period of years. It has the ultimate objective of attaining Western standards of safety.

The basic technical information obtained by members of Gen. MacArthur's headquarters in the course of the surveys of Japan's natural resources has been issued in a series of published reports which provide an analysis and a compilation of the most valuable statistical data on these subjects obtainable in Japan. They thus serve as points of departure for future investigations. Moreover, they are of practical value to Allied industry because for the first time they make available the information concerning Japanese natural resources and exploitation techniques. Such reports are an index of Japan's production potential and a prerequisite for determining policy toward postwar development of industry and foreign trade. Above all, these publications serve as a foundation for the evaluation of Japan's capacity for achieving economic self-sufficiency.

This account of the activities of the Natural Resources Section has highlighted certain problems of resources utilization and the work of Allied scientists in assisting Gen. MacArthur to develop a sound basis for the formulation of reconstruction policies. It would fail in its intent, however, if it did not make clear the fact that other staff sections of General Headquarters and the Military Government teams of the Eighth U. S. Army have made comparable contributions in their respective fields toward the solution of the basic problem of the Allied Powers—the development of a sound economy for a free, noncolonial, democratic Japan, for a Japan that will neither need nor want to wage war again.