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**LAND RECLAMATION
AND IMPROVEMENT IN EUROPE**

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**EUROPEAN CONFERENCE
ON RURAL LIFE**

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LAND RECLAMATION AND IMPROVEMENT IN EUROPE (*)

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I. — GENERAL ASPECTS.

Among the slow but unceasing efforts made for the general improvement of the conditions of agriculture, land reclamation understood in the specific sense of the conquest of land over water represents one of the most ancient forms of activity, going back at times to the earliest days of the very existence of States.

Speaking generally, land reclamation schemes are undertaken for hygienic or economic reasons, or because of demographic and social considerations, these causes working singly or more often in combination. The same importance, however, does not attach to each of these reasons; it is evident that the interests of health render land reclamation a matter of greater collective utility and urgency than in the other cases. Land reclamation for hygienic reasons was formerly mainly carried out by private enterprise but now ever more frequently assumes a public character, with constantly greater intervention on the part of the public authorities. This tendency is clearly reflected in legislation.

In many countries, the first impetus given to land reclamation was due to the necessity of draining marshlands from which emanated malarial infections. In Italy, the Pontine Marshes are a typical example. In times long past, the Italic populations in that region were in fact compelled to wrest their soil, foot by foot, from the treacherous swamps and from the malaria pest.

In other cases hygienic considerations did not exist or were less urgent. The motive for land reclamation was rather of an economic character. Land had to be won from water for agriculture, so as to ensure the population the means of existence. A classical example of this type is the Netherlands, where the formation of *polders* represents the result of centuries of effort for the conquest of land for cultivation⁽¹⁾. The region of Haarlem, which is to-day the great flower garden of Holland, consisted originally of submerged sand and peat. As a well known Dutch writer put it: "Nature has done nothing for us; she has refused us her gifts; all that you see in this country is the fruit of the toil and industry of the inhabitants."

In the following pages an account will be given of these two oldest and most celebrated types of land reclamation.

But in recent times new factors have contributed to reawaken interest in land reclamation and to widen the original concept, especially in European countries. As is well known, there is in Europe a constant increase of population. In 1810 the population of the whole continent, including Russia, was 199

(1) L'AGRICULTURE AUX PAYS-BAS. Ministère de l'Agriculture et des Pêcheries. Direction de l'Agriculture. La Haye, 1937.

million inhabitants; in 1840 it was 251 million; in 1870, 308 million; in 1900, 393 million; in 1930, 496 million and in 1935, 519 million. Hence for the first period of 30 years there was an increase of 26.1 per cent., during the second of 22.7 per cent., during the third of 27.6 per cent.; and finally during the fourth period of 30 years, the first 30 years of the present century, the increase has been 26.2 per cent. On the basis of the present birth and mortality figures, it may be roughly calculated that the population of Europe will reach 596 million in 1960, or a further increase of 20.2 per cent.

Furthermore it must not be forgotten that only slightly less than 50 per cent. of the population of Europe live by agriculture. The highest densities of rural population are in Bulgaria with about 81 per cent., Yugoslavia with about 79, Rumania with 78, Poland with 76, the Baltic States with about 70, and Finland with 65 per cent.

This population increase acts as a stimulus to the highest possible intensification of food crops to meet the growing consumption needs. Anxiety in this respect is clearly expressed, as concerns Germany, in the preamble of the regulation in application of the law of February 10, 1937 on hydraulic and land consortia: "Sun and water are elements indispensable to life; but water is also a destroying force. The German people desire to increase the yield of their soil and to ensure their existence on that soil; one of the means of reaching those ends is the regulation of the water system. The Reich, the *Länder* and the communes recognise that there lies one of their tasks." In Hungary also increase of population has made it necessary to irrigate the lowlands with a view to internal land settlement. The Law No. 20 of 1937 provides for a great irrigation scheme and for a National Office for the purpose, the object being to achieve the most abundant production possible.

In many European countries, however, intensity of cultivation has very nearly reached the limits set by present-day technique and profitableness. Hence the necessity of winning new areas for cultivation, or of increasing the fertility of those already under cultivation. Increased efforts are being made to attain this latter object by means of marling and liming. In Great Britain in 1937 measures were taken to help the farmers to increase the fertility of their land by the addition to the soil of supplementary elements (lime and basic slags). For some time past there has been considerable activity of this kind in Denmark. The Danish Society for the Cultivation of Heathlands (*), as well as works for bringing marshes under cultivation, for the establishment of irrigation canals and for the dyking of land exposed to floods, has organised systematic marling of land recently cleared as well as on thousands of hectares which had been under cultivation for a long time but needed lime. In Hungary, as early as 1926, the Government took measures for the dressing of saline lands by liming and by the application of calcareous sub-soil.

(*) FLENSBORG C. E.: La Société danoise pour la Culture des Landes. *Revue commerciale danoise* (Informations du Ministère des Affaires Étrangères du Danemark), No. 59, January-March 1938. Copenhagen.

Moreover, surplus population no longer finds, as formerly, a ready outlet in emigration: the currents of migration between the continents have enormously declined. Disquieting conclusions were reached by a commission of experts on the possibilities of colonization offered by the principal regions of the world which are up to the present inadequately developed. These conclusions are set out in a report (*Limits of Land Settlement: A Preliminary Report on Present-Day Possibilities*), presented to the Xth Conference of International Studies which was held in Paris from June 28 to July 3, 1937. In substance, the best lands are already occupied, and in view of the measures restricting movements of population, migration does not now afford a sufficient remedy for the state of economic and social tension caused by overpopulation. Furthermore, it has been shown by experience that the existence of unoccupied lands does not necessarily imply possibilities of land settlement, such possibilities depending also on the financial resources and on means of transport available.

Apart from these considerations, it is clear that with the adoption of the policy of autarchy or self-sufficiency the problem of land reclamation has entered on a new and more active phase. The whole conception of it has been transformed, and it is now no longer seen as mere land drainage, but as a far wider and more complex policy of land utilisation, with definite economic and social aims. The obstacles placed in the way of the free circulation and distribution of commodities by the many commercial and customs restrictions, as well as by currency policy, tend to the economic and commercial isolation of the different countries and to make of them so many closed economic systems. The result is that it becomes essential for the different States to give the greatest possible encouragement to national production, whether agricultural or industrial, in order to render themselves as independent as possible of foreign imports of foodstuffs and of raw materials. In regions where intensive cultivation has already reached its maximum and where on the other hand there are waste lands either marshy or subject to flooding, land reclamation has been seen to be the indispensable means for rendering these lands productive, in the general interest of the nation. Without dwelling on the better known and more striking examples (Germany, Italy, the Netherlands, etc.), the case of Greece may be cited. In the absence of cultivable lands, and faced with the necessity of making provision for the settlement of 250,000 refugee families who poured into the country after the Great War and the following war with Turkey, the Greek Government was obliged to organise far-reaching schemes of reclamation of marshlands, in order to form new centres of rural life. Bulgaria also had to carry out drainage of marshes and swampy lands in order to settle her refugees.

The new autarchic aspect explains the greater intervention of the governments, taking the form of large grants of funds and of facilities of all kinds for carrying out the schemes. There is the problem of feeding the nation and of finding employment for the mass of surplus labour. There is the demographic problem, since it is to the rural masses, physically and morally healthy, that a vigorous and constant increase of the population may be looked for.

The range and complexity of the question is thus evident.

Land reclamation is no longer judged from the simple point of view of economic profit, of a favourable balance of expenditure and receipts; but on the basis of the whole of the advantages derived from it, which go far beyond the narrow idea of the return to the private operator. The chief consideration is the increase in the aggregate return accruing to the farming and also to the non-farming classes, throughout the whole country, from the fact of the increase in production, from the larger possibilities of employment and from the impulse given to internal land settlement.

This change in the conception of land reclamation finds an eloquent illustration in the so-called "integral" land reclamation in Italy. In that country the first Land Reclamation Law, that of Baccarini (1882), had as object mainly the drainage of marshes, which was regarded as a problem in itself, independent of the larger problem of the regulation and utilisation of the waters. The main idea was merely the redemption of unhealthy marshes, without taking count of the other aspects of the question.

The idea was none the less fertile in results in Northern Italy, where a general regulation of the water system was already in existence after a century of persevering endeavour, and formed a basis for the drainage of the marshlands. Nothing of the kind was possible in the south, nor in the islands, where the mountains are denuded of forest, the valleys narrow and swept by torrent waters; where the geological structure of the soil is unfavourable and the weather conditions still more so, because of the rapid evaporation owing to the high temperatures, and also because of the uneven distribution of the rainfall, usually concentrated in a few intense winter precipitations.

On the other hand, in regions with inadequate and intermittent water supply and subject owing to the scanty rainfall to periodical droughts, the problem of the control of surplus water is inseparable from that of the utilisation of the water.

Having regard to these differences in the degree of applicability of the Law of 1882, the Italian Government based the new Law of December 30, 1923 on the two following principles:

(1) the hydro-geological operations of land reclamation are not to be separated from all other works intended to ensure the general regulation of the water system, both as regards protection against flooding and in respect of the utilisation of waters;

(2) hydraulic reclamation is to be supplemented by all the subsidiary works designed to create healthy surroundings, and attach the population to the land.

The reclamation carried out under the new Law does not therefore end, as formerly, with drainage and levelling operations; it is linked up and co-ordinated with the correction of water-courses in the mountains and in the valleys, and is supplemented by irrigation works, road construction, organisation of communications by water (internal navigation), arrangements for supplies of drinking water, erection of dwellings for land workers and the formation of rural centres, distribution of electric power, establishment of agricultural industries, and finally, as the crown of the whole work, the campaign against malaria.

These principles inspired the Decree of February 13, 1933 which co-ordinated in Italy all the former provisions on the subject, while introducing improvements suggested by experience.

Land reclamation as now conceived seeks to create conditions of life which will solve one of the most important problems of national agriculture, that of transforming migratory workers into permanent workers by inducing them to settle on the land on small holdings of their own, with the assurance of a stable and peaceful existence.

This is the truly "integral" land reclamation covering the geological, hydrological, sanitary, agricultural, economic and social aspects and embracing the problem from first endeavours to final results.

As Prof. Serpieri has said, integral land reclamation is the reclamation alike of the population and of the soil, in their mutual relations.

The general situation varies naturally from country to country, and this fact explains the difference in the meanings attached in different regions to the expression "land reclamation".

The prevailing tendency, however, is for land reclamation activity to have a constantly widening range of objectives, which may be roughly summarised as follows:

(1) improvement of the hygienic conditions of large tracts of land, and so of the general well-being of the population;

(2) extension of the area under cultivation, and so of the production of foodstuffs;

(3) employment for the maximum number of workers, thus reducing unemployment; land reclamation works, apart from their intrinsic utility, are undoubtedly of great value in this respect (1);

(4) conversion of an increasing number of casual labourers into permanent cultivators, or farm settlers, thus encouraging internal land settlement;

(5) creation of new industries subsidiary to agriculture.

It is clear that these objectives can hardly be realised by the efforts of individuals and that action on the part of public authorities is required. In consequence the taking of the initiative and the facing of the difficulties of this work of land transformation, which involves many and various kinds of operations, frequently devolves upon the State which is, moreover, aware that this work will create such national wealth as will justify every effort. As regards the group of countries where agrarian reform has been carried out, it must be admitted that the scheme of land drainage operations, wherever they appear to be required, is to be considered an essential complement of agricultural reorganisation. These operations are a means of solving a problem of hygiene and production. Actually, it would be useless to bring into being a legion of farm workers and to establish them on plots formed by a parcelling

(1) On this special aspect of the question see: L'ORGANISATION DES TRAVAUX PUBLICS DANS SES RAPPORTS AVEC L'EMPLOI DES TRAVAILLEURS. International Labour Conference, 23rd session 1937. Geneva, International Labour Office, 1937.

out of the land, if the land to be distributed were poor and gave no return to the efforts of the cultivators. Labour in vain, time lost, and expenditure incurred without adequate return: such would be the deplorable results of a distribution of lands which had not been properly prepared for cultivation. On the other hand, if the portions of land assigned have been rendered fertile and remunerative, as will be the case if brought under a planned scheme of drainage and land improvement, the agrarian reform will be complete and results assured.

The intervention of public authorities is usually concerned either with organisation and supervision of operations, or with giving financial assistance.

A distinction should be made between land reclamation operations of mainly public interest and those in which private interests are predominant. In the former case, the State is the principal operator and undertakes the greater part of the financial responsibility; in the second case, the work is most usually undertaken by the parties concerned, brought into association, sometimes compulsorily, and sharing the financial burden on an agreed quota basis.

As typical organisations, entrusted with the carrying out of land reclamation operations, there may be mentioned, among others, the *Wasser- und Bodenverbände* (drainage and land consortia) of Germany, the land reclamation and land improvement consortia of Italy, the *wateringues* of Belgium, the land drainage co-operative societies of Poland, the public economic associations for carrying out land improvements in Bulgaria.

In this connection mention may be made of the improvements in the already existing systems of land drainage made in Great Britain in 1930, as the result of enquiries made by the Royal Commission on Land Drainage. Catchment Areas have been constituted and put under the control of Catchment Boards, which have to make provision for the upkeep of the necessary works and for the due functioning of the principal water courses.

In other countries, there are special societies dealing with land improvement, such, for example, as the Society for the Cultivation of Heathlands in Denmark, already referred to, and, in Finland, the Land Drainage Society and the Society for the Cultivation of Marshlands.

A problem of primary importance is that of obtaining credits for land reclamation operations. It is not easy to obtain funds, since it is a question of investments of large capital sums, with expectation of return only after a long period. Several methods have been adopted: funds are supplied, according to circumstances, directly by the State, or by the banks, or by the social insurance institutions; in some countries there are even special bodies ready to undertake and to finance certain of these operations; occasionally the necessary funds are supplied by means of taxes, the proceeds of which are earmarked for the purpose. Special credit certificates or improvement bonds are sometimes issued; this is the case in Poland. These bonds, based on real property, are widely recognised as sound investments; they may even be State guaranteed.

Thus, when the question is one of large scale works, where the interest of the community is predominant, the State most often assumes the initiative and meets the larger proportion of the costs.

On the other hand, when it is a question of works undertaken by private persons, singly or in association, loans at reduced rates, or non-repayable subsidies, are granted.

In Italy the land reclamation zones are divided into two categories; the first is made up of these zones which have an exceptional importance, especially for purposes of land settlement, and the second of all other zones. In the first category zones, the expenditure for works in certain regions within the competence of the State is met by the State up to 92 per cent. In the second category zones, expenditure by the State amounts to 87.50 per cent.

For the execution of supplementary works of improvement and transformation within the competence of private landowners, the State grants a subsidy which is normally one third of the expenditure, but which may rise to 38 per cent. when land improvement of mountain pastures is undertaken, to 45 per cent. in the case of installations of electric power for agricultural use, and to 75 per cent. for the construction of rural aqueducts.

In Germany, the financing of land improvement works is assured by means of loans, by payments made by the parties concerned themselves, by the payment from the *Reichsanstalt* fund of sums earmarked for soil improvement, and by subsidies given by the *Reich*, the *Länder*, the provinces, and by other institutions.

In Great Britain, an increase of soil fertility, the aim of the Act of 1937 already mentioned, is to be secured by means of subsidies.

In Poland, a State credit fund for land improvements was set up as early as 1925.

In Belgium, the *wateringues* receive State subsidies.

In Switzerland, the Federal Council is empowered to subsidise undertakings the object of which is to improve the soil or to facilitate its working. Grants may be made up to 50 per cent. of the total expenditure, and a percentage subsidy may also be given by the cantons.

In Portugal in 1937 all the work of studying, and of carrying out, land improvement was concentrated in the hands of the State, and an independent *Junta* or Board of agricultural land drainage works was instituted. The State will be reimbursed for the expenditure on this work by means of an annual fixed charge per hectare, known as "irrigation and reclamation levy."

In Denmark, the State supports the marling operations mainly by grant of credits.

In Sweden, the State grants amortisable loans and direct non-repayable grants, for the clearing of swamp lands, for land drainage, and in general for soil improvement.

In Finland, State assistance is given to land improvement works, either by direct subsidies or by amortisable loans at reduced rates.

In Lithuania, the work of draining and improving agricultural land is financed, for the most part, by the State Treasury.

These and other examples are proof of the interest taken by the public authorities in the land reclamation works and in land improvement in general.

In the succeeding pages, in which are given particulars of land reclamation work in a certain number of countries, will be found further evidence of the new tendencies which have appeared in this sphere of agricultural activity and which we have already stressed. It will be seen there has been an increasing association and coordination of public and private activity for the achievement of ends which are no longer, as formerly, purely hygienic and economic, but now also social. These social objectives can only be fulfilled in land reclamation conceived essentially in terms of land settlement.

II. — ORGANIZATION AND DEVELOPMENT OF LAND RECLAMATION OPERATIONS IN CERTAIN EUROPEAN COUNTRIES.

In the following account of land reclamation work in certain European countries neither completeness nor precision must be looked for, owing to the absence in many cases of special reports on the subject. The sources, though numerous, are fragmentary. The object of this study, however, is to indicate the main lines of the policy followed in this field by the governments and to describe the most characteristic systems and examples.

BELGIUM.

Attention should be drawn to the more special associations in the Flemish districts, existing side by side with the official agricultural associations: these are the polder and the *wateringue* associations. These terms have gradually acquired a special meaning. By *polders* is meant the coastal areas where dyking operations have been carried on, and by *wateringues* the inland districts protected against the waters of rivers and streams. The same name is given to the associations which undertake the work of dyking, irrigation and drainage.

The *polder* and *wateringue* associations, organized under the Laws of June 18, 1846 and April 27, 1848, are considered as public bodies with legal rights. They may expropriate lands and levy taxes, but they act under the control of a permanent deputation.

Schemes to be executed by these associations must first be submitted for the approval of the competent Ministry. Subsidies are granted to the *wateringues* as a contribution to the expenses resulting from the carrying out of improvements of a hydrological kind on agricultural lands. By a circular of August 4, 1938 the Ministry of Economic Affairs and Agriculture directed that the ordinary and extraordinary subsidies for drainage works are not to exceed 1500 and 1125 francs per hectare respectively.

BULGARIA.

Land improvements in Bulgaria consist mainly of irrigation and drainage works, carried out by public associations (syndicates) and by the State.

The syndicates for irrigation resemble co-operative societies in their organization and objects. The legal difference between the hydraulic syndicates and the co-operative societies lies in: (1) the obligatory nature of the former, all holdings or estates within the area of the waters under regulation being compulsorily included, and (2) in their dependence on the Ministry of Agriculture and Public Lands.

There are now in Bulgaria 64 hydraulic syndicates: 46 for irrigation, 9 for land drainage and correction of water-courses, and 9 for electrification. The majority are thus syndicates for irrigation, the object of which is the irrigation of the cultivated lands of the farmers who are obliged to join them; 17 of these operate in the basin of the Maritza, 14 in that of the Struma, and the others are distributed along the larger watercourses of Bulgaria.

In the Sofia district there is a syndicate for land drainage and correction of water courses, another in that of Ruschuk and a third in the district of Sumen.

From the standpoint of the national economy, the syndicates engaged in irrigation are the most important. They include 30,792 individual members and 337 collective memberships, or a total of 31,129.

These irrigation syndicates now serve a total of 10,540 hectares of cultivated lands, the greater part being rice-fields, tobacco plantations and orchards. These lands, which may be said to be intensively cultivated in view of the relatively large amount of labour and attention they require per unit of area, although not accounting for more than a small proportion of the total of cultivated lands, represent in all 65.70 per cent. of the whole irrigated area, the yield of which has been increased as the result of the irrigation.

According to the figures available in respect of 48 hydraulic syndicates, these have expended for various works 129,971,000 levas, for the upkeep of these works, 49,743,000 levas, or, in all, 179,714,000 levas.

In addition to these costs of construction and upkeep of the works connected with land improvements, the administrative costs of irrigation have amounted yearly to 4,809,000 levas, or an average of 460 levas per hectare.

As a result of these improvements, the value of the whole of the irrigated lands in Bulgaria, *viz.*, 10,540 ha., has increased by 253,168,000 levas, or by about 23,010 levas per hectare. It is estimated that the yield of the irrigated crops of this area has increased by a total of 106,111,000 levas, or an average of 10,060 levas per hectare.

Irrigation improvements are in the hands of public syndical organizations, but land drainage has been carried out almost exclusively by the State and by special institutions, such as the Department for the Settlement of Refugees and the Public Debt Department. By means of the 1926 loan for the settlement of refugees, negotiated under the auspices of the League of Nations, drainage of certain marshlands and of coastal marsh districts, as well as other operations, was effectively carried out. The result was to secure for cultivation large areas

of lands, especially: by means of the drainage of the Messemvria swamps (11,164 ha.); by the drainage of the Strandja marshes (2,485 ha.); by that of the Mandra and Yakizli lagoons (2,109 ha.); and by the draining of the lowlands along the course of the Danube, 17,347 ha.; in all, 23,105 ha.; which were utilized for various crops.

At the end of September 1937, the expenditure in respect of various types of drainage operations amounted to 131,118,000 levas, of which the greater proportion was utilized for the construction of the dyke for protection against the Danube floods near the village of Ghiguene.

In 1937 several drainage and dyking operations were carried out in the district of Vidine with the assistance of forced labour and credits allocated by the Ministry of Agriculture.

CZECHO-SLOVAKIA (*)

Land improvement in Czecho-Slovakia, more especially land drainage, are important not only from the economic point of view, as preventing damage by floods, but also on the hygienic and social grounds.

The history of land improvement in this country may be divided into three periods: pre-War years; the period between 1919 and 1930; and that from 1931 when land improvement received a new impetus from the Law of 27 March 1931, regarding allocation of the State Fund for this purpose.

The cost of hydraulic works is met by subsidies from the different provinces, included in their annual budgets, supplemented by the State Fund above-mentioned. In cases which involve important hygienic interests (laying on of water) subsidies may also be granted by the Ministry of Public Health.

Subsidies from the Fund can only be granted when the province has undertaken to provide that proportion of the total expenditure which is required by the Law.]

The most generous subsidies are granted for the regulation of large water courses involving a considerable amount of stonework, for cutting intake canals, for the correction of torrent waters and for the construction or enlargement of reservoirs for protection against floods. In such cases, the amount granted may represent 70 per cent. of the total expenditure, provided that the province undertakes a grant of at least 25 per cent. The remainder of the expenditure is at the charge of the parties concerned.

65 per cent. of the expenditure may be granted by the Fund for the following purposes: the construction of smaller reservoirs for protection against damage caused by water; the construction of dykes in valleys for the protection of property against inundation; the protection of lands with loose soil. In each case the subsidy is only granted on condition that the province undertakes to provide at least 25 per cent. of the cost.

(*) This section was written in December 1938.

60 per cent. of the expenditure may be granted by the Fund for work connected with less important reservoirs intended for the collection of water for irrigation purposes, for the supply of communes or for other agricultural requirements; also on condition that the province undertakes to be responsible for at least 25 per cent.

A subsidy of 45 per cent. may be granted for the reconstruction or repair of locks or sluices, on condition that the province undertakes to provide at least 15 per cent.

Subsidies of 30 per cent. may be granted in respect of drainage, irrigation, utilization of sewerage, the clearing of land laid waste by mining operations, the general reconditioning of unfertile land, more especially on the physical side. When the financial position of the parties concerned is unfavourable a proportion of 35 per cent. may be granted. With regard to the construction of main intake canals on land that has been drained, and of main irrigation canals, the subsidy from the Fund may reach 40 per cent. of the approved expenditure, if the province undertakes to provide at least 15 per cent. of the expenses incurred in connection with works of the first category and 20 per cent. of the expenses incurred in connection with works of the second.

When the estimate of works and improvements exceeds 1,250,000 Kč., the Fund may undertake to pay part of the interest on a loan instead of granting a direct subsidy. Such share of the interest is equal, in this case, to the agreed proportion of the direct subsidy. The sum is paid to the respective credit institutions twice a year for periods varying from 25 to 30 years. The contractor must be responsible for at least 2.5 per cent., apart from the amortization.

Years	Regularisation of rivers		Correction of torrents		Land improvement	
	Length km	Cost Kč	Length km	Cost Kč	Area ha.	Cost Kč
1919-30	1,341	411,324,721	282	110,849,979	202,841	756,814,190
1931-35	1,076	465,486,978	244	64,749,630	121,809	326,761,010

Years	Installation of aqueducts		Drying by canals	
	Length km	Cost Kč	Length km	Cost Kč
1919-30	2,905	471,988,570	—	—
1931-35	1,876	316,314,334	189	41,665,711

In regard to works undertaken for the purpose of supplying the communes with water and for their drainage, the subsidy from the Fund may amount to 35 per cent. for the establishment of collective water supply schemes supplying at least

three communes; 40 per cent. of the approved expenses is allowed on condition that the province undertakes to provide at least 10 per cent.

These subsidies may be granted to districts, communes, water syndicates, or other associations of a similar nature. Only under very exceptional circumstances may a subsidy be granted to private persons; when, for example, an unsuccessful attempt has been made to form a syndicate or similar association, or when the nature of the work does not admit of such a proceeding.

Moreover, for the purpose of subsidizing the less important works of various kinds, the Minister of Agriculture has formed a "General Endowment Fund for Hydraulic Improvements" (1).

The total amount spent on hydraulic works during the period 1931-35 amounted approximately to 1,215 million Czecho-slovakian crowns, as compared with 1,751 million during the period 1919-30. The difference is due to the economic crisis. A summary of the various classes of works carried out is given on the preceding page (2).

The law providing for the new State Fund has made it possible to undertake systematic works of hydraulic improvement on a programme corresponding to the utility of the different enterprises for the national economy. This is especially the case in regard to Slovakia and Subcarpathian Russia (Ruthenia). The programme has been drawn up for ten years, on the basis of small and large properties. The cost of the proposed operations amounts to approximately 3.5 milliards of Czecho-slovakian crowns.

DENMARK.

In the middle of last century, more than one fifth of the territory of Denmark was waste or uncultivated land. The greater part of this area consisted of the immense heathlands of Jutland, covering more than 100 square leagues (3) and extending in one unbroken plain along the western and central parts of Jutland. Some 30 square leagues consisted of marshes scattered over the country, unhealthy watery tracts where no crops of any value could grow. It was only then that the cultivation of these heathlands, the importance of which was realized, was actively undertaken. The work was entrusted to the Danish Society for the Cultivation of Heathlands (*Det danske Hedeselskab*), founded in 1866. Great interest was aroused among the inhabitants of these tracts, and they took an increasingly active part in the various operations, which included irrigation of lands, establishment of communications and working

(1) V. LESTINA: Encouragement aux améliorations hydrauliques en Tchécoslovaquie. *Est Européen Agricole*, No. 10. Paris, July 1934.

(2) Dr. Ing. JAN HORÁK: Le développement actuel et le programme des améliorations foncières dans la République Tchécoslovaque. Ministère de l'Agriculture. Prague, 1931. — Ing. URWALEK: Die Entwicklung wasserwirtschaftlicher Meliorationen in den Jahren 1931-1935 und der Bauplan für das Jahr 1930. *Wasserwirtschaftliche Mitteilungen*, No. 5-6 Prague, May-June 1936.

(3) A square league = 56.73832 km².

of the marl. By degrees, the uncultivated fields were transformed into grasslands; at the same time trees and quickset hedges (1) were planted in large numbers. Great importance was also attached to the reconstitution of forest zones. Wooded lands, which in 1866 represented 2.5 per cent. of the total area of Jutland, now cover about 9 per cent., as a result of the planting of 2,800 conifer trees, covering in all some 90,000 ha., and of the establishment by the State of plantations on the dunes and heaths over an area of nearly 80,000 ha. The heaths, which formerly extended further than the eye could reach, have been reduced and they now cover only 30 per cent. of the area they occupied in 1866, and their complete disappearance is imminent, given the annual clearing of some 5,000 ha. (2).

It is recognized that the first necessity for the cultivation of the heathlands is the production of marl; the previously mentioned Society at once undertook prospecting on a large scale and succeeded in finding extensive layers of utilizable marl. The greater part of Jutland is now intersected by lines laid down for the transport of marl. State support has been given to these operations in various ways and in particular by the assignment of credits.

Mention may also be made of the operations of agricultural associations, of the State Laboratory for Crop Cultivation and of the Heathlands Association, with the object of determining the lime requirements of the soil. These investigations were begun in 1915; and in 1933 they had covered 25,416 farm holdings with a total area of 509,538 ha. of cultivated fields and grassland, or about 16 per cent. of the arable area of Denmark.

The legislation in favour of marling societies, and the measures taken to ensure subsidies for the transport of marl and of lime, facilitate these investigations, the object of which is to provide that no land is marled or limed until the lime requirements of the soil have been determined.

The object of the Society for the Clearing of Heathlands (*Hedebruget*), founded in 1906, is to give financial support to those engaged in this work and to direct their efforts. It is affiliated to the Society for the same purpose already mentioned. During the thirty years of its work of bringing the heathlands under cultivation, this Society has received grants from the State amounting to 2,895,000 crowns, and has thus been enabled to assist in the clearing of 75,062 ha. of heathland, that is, in the formation of 3,753 holdings of 20 ha. each. In addition to these grants, special subsidies have been allotted to farm workers since 1918. These subsidies amount as a general rule to 100 to 300 crowns, and are granted, once for all, to any needy farm worker who shows his intention of making a home on the heathlands and proves that he is in a position to do so.

The following figures will illustrate the extent of heathland cultivation. Whereas from 1860 to 1925 the population increased by 25 to 30 per cent. in the rural areas known as the islands, in the same period it doubled in the

(1) DANEMARK. L'AGRICULTURE. Publication du Conseil de l'Agriculture. Copenaghen, 1935.

(2) FLENSBORG C. E., article already quoted.

rural districts of the Jutland heaths; from 1904 to 1916, the proceeds of the land tax in the rural departments of the islands increased by about 40 per cent., that of the department of Ribe by about 76 per cent. Similar results were achieved in the other heathland areas. Investigations made in 1930, covering 620 large and small holdings on heathlands, or about 10 per cent. (since the Society for the Cultivation of Heathlands has a membership of 6,300), show that the taxes paid to the State and to the communes in 1930 by these 620 farms amounted to 156,551 crowns; before reclamation, they amounted to 25,288 crowns only. These same farms now pay taxes higher than the subsidies which the Society receives from the State for developing the work of reclamation.

In respect of irrigation, mention should be made of the cutting of 110 canals of a total length of 410 km. serving an area of 7,400 ha. One of the largest works of canalization is that of the Skjernaa waterway, which is 21 km. long and which discharges, at the outlet, about 4 m³ of water per second; the irrigated area is about 385 ha.

In the last fifty years, and mainly since 1900, the Society for the Cultivation of Heathlands has made possible more than 3,000 enterprises for the regulation of water courses, covering an area of more than 167,000 ha.; the cost was about 15,000,000 crowns. Mention may be made, for example, of the reclamation of the Aamosen marsh, in the north of the island of Zealand. This work which was finished in 1933, cost 455,000 crowns and resulted in the reclamation of 3,300 ha.

Artificial drainage works, in cases where it was not possible to regulate a flooded area by natural means, have been effected by virtue of the Law on pumping of June 2, 1917. Some of this work was carried out by private technicians, for example, the most important draining operation in Denmark, carried out in the Tønder marsh, involving some 11,000 ha. and costing 6,250,000 crowns.

Draining by ditches and drains has been effected by the Society over more than 65,000 ha.

Among recent dyking operations there may be mentioned the sea dykes of the salt marshes of Ribe, 18.4 km. long and protecting 6,820 ha., and that of V. Vedsted at Søndernäs (Slesvig) covering 2,800 ha. The area regained by dyking operations may be estimated at about 23,500 ha.

State encouragement is given to draining operations either by means of large subsidies to the Heathlands Association, which in its turn, grants technical assistance on favourable conditions, or by loans, or even, in recent years, by direct subsidies.

By virtue of the Laws of March 31, 1933 and December 22, 1934, the State set aside, for a period ending on April 1, 1937, a capital sum of 25 million crowns for the improvement of lands; this capital is distributed in the form of loans and subsidies for land improvement.

The Law of February 26, 1937 (*) prescribed that every loan for the purpose of land improvement would be privileged in the same way as the claim

(*) ANNUAIRE INTERNATIONAL DE LÉGISLATION AGRICOLE, 1937, p. 432.

of the communes for communal taxes on real property which has been brought under land improvement operations. By this latter term are understood all works of irrigation, drainage, marling, liming and dyking, as well the clearing of heaths and of swamps. The first instalment of repayment is due only at the end of three years, after which amortization will be effected by means of half-yearly payments of one-fourteenth over seven years reckoned from the date of the granting of the loan. In every departmental jurisdiction, a Land Improvement Commission is set up. Loans can only be granted for work, which in the opinion of this Commission, would result in an increase in value greater than the sum advanced and in a return enabling repayment, at due date, of the prescribed rate of amortization.

Loans may also be granted when several landowners jointly execute works of drainage, irrigation, marling and liming.

In the second half of the XIXth century more than half the waste lands of Denmark were brought under cultivation. The most striking example of reclaimed marshland is the Store Vildmose marsh, in the North of Jutland. This work was undertaken by the State under the supervision of a special commission; in this way, 2,700 ha. of sphagnum moor covered with heath were transformed into excellent grassland with a good growth of white clover.

FINLAND.

Land improvement in Finland (*) includes drainage, irrigation and regulation of water courses, including, not only the regulation of streams, torrents and brooks, but also the lowering of lake waters, drainage of marshes and construction of dykes.

The planning of improvements of privately held land is, together with their execution, mainly in the hands of eight local rural engineering departments, subordinate to the Department of Agriculture. On the other hand, the Department of Highways and Water Courses is responsible for the preparation and execution of the schemes for the regulation of streams in the general interest of agriculture. These operations are entirely at the expense of the State. The Finnish Land Drainage Association, which is subsidized by the State and acts under State supervision, is almost the only body to undertake drainage schemes by means of underground conduits. The purpose of this Association, founded in 1918, is to extend this system of land drainage and to develop irrigation in the areas of cultivation (**).

(*) AGRICULTURE IN FINLAND. Ministry of Agriculture in Finland, Helsinki, 1937.

(**) Mention should also be made of the Finnish Society for the Cultivation of Marshlands, founded in 1894, the object of which is to encourage the utilization of the more extensive marshlands, either by cropping or for industrial purposes. This Society carries out scientific and practical investigations on the marshlands, organizes the work of bringing these lands under cultivation and arranges trials in cropping, etc., both on its own experiment stations and on private farms.

Land improvement is encouraged by the Finnish Government both by means of direct subsidies, and by amortizable loans at reduced rates of interest. State assistance is granted on the condition that a fixed proportion of the area drained is brought under cultivation during the period for which the loan is given. As a rule, the direct subsidies cover the costs of survey, of the purchase of tools and equipment, of investigations and part of the labour costs. The remainder of the labour costs may be covered by means of loans repayable by instalments of capital and interest. On an average, the direct State subsidy amounts to about 50 per cent. of the total cost of each scheme. The period over which loans may be amortized, is, according to circumstances, from 13 to 21 years.

State aid is given to underground drainage schemes mainly under the form of amortizable loans bearing a moderate rate of interest; the maximum amount granted per hectare brought under this type of drainage is 2,000 Finnish marks.

Collective land drainage operations subsidized by the State are carried out under the direction of experts paid by the State.

In 1934 the sum shown on the budget for land improvement works under the supervision of Government Departments was 31,000,000 Finnish marks, of which 20,000,000 represented direct subsidies and 11,000,000 amortizable loans.

Each year since 1918 has seen progress in land improvement, as is shown by the accompanying table which gives the number of drainage operations carried out with State aid under the supervision of the Department of Agriculture over the period 1919 to 1933, the sums set aside for the purpose, and the area drained.

Period	Number of operations	Expenditure Finnish marks	Area drained			
			Cultivated land ha.	Meadows and cultivable marshlands ha.	Uncultivable marshes, forest lands and marshlands ha.	Total ha.
1919-23	115	15,096,728	9,549	22,503	1,179	33,231
1924-28	367	57,070,025	17,945	35,832	10,952	64,729
1929-33	1,102	105,097,917	41,734	53,283	15,032	110,049
Total	1,584	177,264,670	69,228	111,618	27,163	208,009

Underground drainage by means of brick or wooden conduits was undertaken under the supervision of the Finnish Land Drainage Association on a total area of 1,261 ha. in 1919-23, of 5,677 ha. in 1924-28 and of 13,091 ha. in 1929-33. Recourse was had to State loans for one fourth only of these operations.

Drainage operations have been carried out in the desmesne forests with a view to land settlement, and roads have been made through the forests under the supervision of the Engineering Office of the Land Settlement Department. In 1934 a total of 500,000 Finnish marks was set aside for this purpose.

FRANCE.

Land reclamation has not been undertaken in France by the Government in any particular region; the density of population was not such as to make such undertakings necessary. However, already in the XVIIth. and XVIIIth. centuries numerous and important drainage works were carried out, and the operations for protection against the flooding of the Loire and the Garonne were completed in the XIXth. century.

On the other hand, extensive land improvements have been effected by private owners, sometimes with State aid. The following figures are taken from the "Resultats généraux de l'enquête de 1929".

Land Improvements from 1919 to 1929.

Land clearing operations	110,000 ha.
Land drainage	100,000 "
Draining of humid soils	10,000 "
Irrigation, etc.	43,000 "
Re-afforestation	222,000 "

With the encouragement of the Administration of Waters and Forests, re-forestation is carried on with remarkable energy; landowners undertaking this work of public utility receive subsidies and are granted exemptions from taxes.

Apart from these land improvements, operations of general interest have been undertaken with the object of improving the equipment of agriculture and of stemming the drift from the country-side.

The progress achieved between 1919 and 1929 is illustrated by the results of the enquiry made in 1929:

Country roads	134,648 km.
Water supply systems	26,577 "
Electric supply services	185,410 "

Without entering into detail, mention should be made of the work done for rural electrification by the Rural Engineering Department with the assistance of private persons, of public organizations and of the *Crédit Agricole*.

Since 1929, work has been actively pushed ahead. Large credits have been assigned to local groups with a view to remedying unemployment by the opening of factories engaged on work of public utility. There was no slackening in this work of improvement of rural areas during the crisis period.

GERMANY.

Land improvements have been undertaken in Germany for a long time past. Most of the work (draining and irrigation, utilization of waste water, management of underground water, reclamations, etc.) are carried out by the *Wasser- und Bodenverbände*, which are governed by the Law of February 10, 1937 and the first Decree on these organizations of September 3, 1937⁽¹⁾. Their activities were brought under unified direction throughout the Reich by this law, which also facilitates the formation of other unions of the same kind.

The *Wasser- und Bodenverbände* are corporate bodies exercising the following functions:

- (1) Regulation of watercourses and of their banks, modification or maintenance of these, regulation of the flow and of the discharge of water;
- (2) Construction of works for navigation and floating, dams, locks, channels and the like, hydraulic installations, catchment basins, their transformation, maintenance, utilization to the maximum, and where necessary, their elimination;
- (3) Drainage and irrigation of lands and protection of land against spates and exceptionally high tides;
- (4) Collection, purification and utilization of waste waters.
- (5) Supply of drinking water and of water for other uses;
- (6) Improvement of lands under cultivation, their maintenance in improved conditions, exploitation and utilization of the cultivated areas;
- (7) Utilization of underground water tables;
- (8) Reclamation of lands by drying;
- (9) Levying of funds required in respect of utilization of waters and of hydraulic installations with the object of soil improvement and discharge of waste waters;
- (10) Promotion and supervision of the operations enumerated;
- (11) Any other functions which the Reich Minister of Nutrition and Agriculture sanctions in agreement with the other Ministers concerned.

The prerequisite for the constitution of these unions is that the undertaking is of real utility to the persons concerned. Membership of the unions may be made compulsory by the authorities who set them up even against the will of all parties concerned; it is, however, rarely necessary to exercise this power, as the majority generally joins the unions voluntarily.

The improvement of marshlands is one of the most important aims of land reclamation work⁽²⁾. Up to the present, no reliable census of the marshy areas has been taken in Germany.

⁽¹⁾ ANNUAIRE INTERNATIONAL DE LÉGISLATION AGRICOLE, 1937, p. 380. International Institute of Agriculture, Rome, 1938.

⁽²⁾ SCHROEDER G.: Landwirtschaftlicher Wasserbau. Handbibliothek für Bauingenieure, herausgegeben von Robert Otzen. Berlin, Verlag von Julius Springer, 1937.

According to an estimate of the former Association for the encouragement of marshland cultivation (*Verein zur Förderung der Moorkultur*), the area of these lands in different parts of the Reich is as follows:

	Hectares
Brandenburg	374,000
East Prussia	361,000
Pomerania	315,000
Hanover	300,000
Schleswig-Holstein	150,000
Silesia	87,000
Westphalia	60,000
Posen-West Prussia.	48,000
Rhineland	30,000
Hesse-Nassau	1,000
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Prussia	1,726,000
Bavaria	197,000
Mecklenburg	150,000
Oldenburg	120,000
Württemberg	26,000
Baden	17,000
Saxony	9,000
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Reich.	2,245,000
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Up to the present, only 15 to 20 per cent. of this total has been brought under cultivation.

In Hanover, Oldenburg and Schleswig-Holstein it is the high moors or marshlands which predominate, elsewhere the low moors. Only approximate figures are available on the distribution of the different types of marshland. According to expert opinion, nearly half or even three-fourths of all the total consist of low moors.

There are also immense tracts where water-logging is harmful to growth. According to an estimate made by the German Council of Agriculture, the land drainage requirements in 1928 were as follows:

Region	Area under cultivation ha.	Area requiring drainage	
		ha.	%
Bavaria	4,550,709	2,184,000	48
Lippe-Detmold	83,349	34,000	41
Pomerania	2,105,822	800,000	38
Lower Silesia	1,708,271	625,000	37
Hanover	2,125,303	731,239	34
Oldenburg	292,241	93,647	32
Province of Saxony	1,768,497	570,000	32
Brandenburg	2,252,103	650,000	29
Schleswig-Holstein	1,157,933	320,000	28
Mecklenburg-Schwerin	926,818	250,000	27
Württemberg	1,213,172	300,000	25
Lübeck (region)	44,500	10,000	23
East Prussia	2,682,887	525,000	20
Bremen	19,877	4,000	20
Saxony (Free State)	1,024,748	200,000	19
Cassel (District)	553,122	95,000	17
Sigmaringen	68,448	11,781	17
Westphalia	1,214,968	150,000	12
Rhineland	1,414,893	150,000	11
Baden	816,250	80,000	10
Posen-West Prussia	461,132	32,000	7
Anhalt	156,745	9,000	6
Brunswick	227,576	6,100	2.7
Lübeck (Hanseatic town)	20,218	150	0.7
Total	26,889,582	7,830,917	29

The 26,900,000 hectares under cultivation represent 91.9 per cent. of the area under cultivation in the Reich in 1937 (29,300,000 ha.). The greater part of the marshlands is not included in the table. Drainage of the lands shown above thus seems essential if normal yields are to be obtained.

It is reckoned that by means of drainage the following additional yields per hectare can be obtained in years of average moisture and on moderately heavy soils: rye, 5 quintals; wheat, 6 quintals; oats, 7 quintals; potatoes, 60 quintals; sugar beet and mangels, 100 quintals.

Peat cutting is regulated by a number of enactments. These include in Prussia the Law of August 20, 1923, in Bavaria that of February 25, 1920, in Württemberg, that of November 28, 1919 and in Mecklenburg-Schwerin the Law of April 21, 1920.

Reference may also be made to the Prussian measures of August 9, 1924 and of November 15, 1926 relating to funds or credits for improvement of marshlands forming part of the State lands.

The Central Commission for marshland improvement (*Zentralmoorkommission*) was founded in Prussia in 1876, but in 1936 the functions of this body were transferred to the Research Department of the National Association of Agricultural Sciences (*Reichsarbeitsgemeinschaft der Landwirtschaftswissenschaft*). The technical organ of the Commission was the Prussian Marshland Experimental Station, at Bremen, founded in 1887, where the new methods of bringing marshlands under cultivation were studied. In the different Prussian provinces there are marshland cultivation committees in close touch with the farmers' associations (*Landesbauernschaften*). The *Verein zur Förderung der Moorkultur* already mentioned was active in all parts of Germany and had, for several decades, devoted itself to the encouragement of schemes for bringing marshlands under cultivation and to the diffusion of technical information on the subject. In 1934 its functions were transferred to the Corporation of Agriculture.

Land improvement works have been pushed on noticeably since 1933. The following table (1) shows the improvements effected from 1933 to 1936.

Nature of works	Length, area, etc.	Cost in Reichsmarks
Regulation of torrent waters	156 km.	4,681,000
Construction of dams	183,284,000 m ³	73,775,427
Drainage by open channels	466,364 ha.	100,846,602
Drainage by pipes	178,144 ha.	85,780,452
Regulation of river courses (a)	11,604 km.	211,354,680
Supplementary agricultural operations	114,111 ha.	41,157,676
Valorization of waste lands	82,399 ha.	65,971,552
Irrigation	16,611 ha.	6,763,429
Supply of drinking water benefiting	1,380,201 inhabitants	72,776,373
Drainage of humid soils (b)	199,281 ha.	54,625,514
Lands won from the sea (works in progress)	19,000 ha.	12,999,324
Country roads	16,553 km.	72,952,510
		803,684,539

(a) 599,237 ha. of area benefited. — (b) Equivalent to about 40,000 ha. of lands capable of cultivation.

The sums shown represent the costs actually occasioned by these operations. The contribution of the Reich Labour Department to their execution amounted to 31,700,000 days' wages.

The total financing of RM 803,700,000 in round figures was effected by means of RM 422,100,000 of loans and of payments made by the parties concerned, by advances of RM 216,000,000 from the funds of the *Reichsanstalt* earmarked for soil improvement, and by subsidies amounting to RM 165,600,000. The subsidies

(1) DIE MELIORATIONEN IN DEN JAHREN 1933 TO 1936. Herausgegeben vom Reichsministerium für Ernährung und Landwirtschaft. Berlin, June 1938.

were granted by the Reich (RM 26,600,000), by the *Länder* (RM 84,800,000), by the provinces (RM 21,800,000) and by other institutions (RM 32,400,000).

Some idea of the benefit resulting from the expenditure of this sum of nearly RM 803,700,000 may be gained by considering the increase in the gross return obtained as a result of the improvements and the extent of the new lands gained for cultivation. The figures are given in the following table:

Nature of operations	Area improved ha.	Increase in gross return		
		RM per ha.	% of return on former area under crop	Reckoned as new lands ha.
Drainage by open channels	466,400	90	26	121,300
Drainage by pipes	178,100	120	35	62,300
Regulation of river courses	599,200	70	20	119,800
Valorization of waste lands	82,400	350	103	84,900
Irrigation	16,600	200	59	9,800
Drainage of humid soils	199,300	70	20	39,900
New lands won from the sea	1,700	400	117	2,000
Total	1,543,700			440,000

The Report on land improvements referred to in the foot note deals also with consolidation of holdings which aims at a more effective exploitation of land and also improves farming conditions in general. Consolidation of holdings has been carried out over 382,838 ha. and has involved an expenditure of RM 33,359,040.

Experience shows that on the farms thus re-parcelled the returns have increased by 25 to 30 per cent. Moreover, there is often a close relation between land improvements and consolidation of holdings. Frequently the dispersion of farm lands seriously hampers land improvement, while in other cases a necessary consolidation of farms cannot be effected without preliminary work of land improvement.

The diversity of the legislation in force in the different States of Germany - more than 50 measures, all of them behind the times - formerly made consolidation a most difficult task. Now, the Reich Law on consolidation of farm holdings sets up conditions for the uniform execution of this process throughout Germany.

When it is considered that in the whole Reich there is a total of about 6,000,000 hectares requiring this treatment it will be readily understood that the work accomplished hitherto in this respect will have to be substantially intensified if there is not to be a single hectare wrongly farmed or lying idle.

From 1933 to 1936 an increase in gross return has been obtained amounting to the equivalent of some 96,000 hectares, reckoning at 25 per cent. the increase in yields on the areas consolidated up to the present. The costs of the constitution of a hectare of this new area as reckoned are not very high, namely, RM 350 excluding the administrative expenses.

GREECE.

After the settlement of refugees on the land, the area under cultivation was found to be insufficient and measures had to be taken for its increase by means of the draining of humid soils. The total of lands thus recovered is 56,000 ha. in Macedonia, distributed as follows: Lake Artzan-Amatovo, 5,000 ha.; Yannitsa Lake and Loudia marsh, 31,000 ha.; Lake of Achinos, 11,000 ha. and the Philippi marsh, 9,000 ha.

In addition, protection against floods has been ensured for 75,000 ha. of land formerly periodically inundated, and a large proportion of this area will be irrigated.

Regulation of torrents and re-forestation of slopes are also contemplated.

Operations on the lakes Lyssimachia, Lessini, Xinias and Zirnassou occupy some 10,000 ha.; these are still in course of execution, except the Zirnassou works which are nearly completed.

As the water courses in Greece are torrential in character, and have to be embanked, extensive protective dykes are now being constructed, *viz.*, those undertaken for protecting an area of 79,000 ha. against the flooding of the Pinios river (Thessaly), and for bringing under cultivation 13,500 ha.

Mention should also be made of:

(1) the works of the Boeotian Cephissus, for the protection of 4,600 ha. against floods and the bringing under cultivation of another 1,000 ha.;

(2) those in Epirus (draining of Lapsista, draining and irrigation of Louros, draining of Acheron and of Margariti); by these protections against floods will be afforded to 10,000 ha., while 11,100 ha. will be brought under cultivation and 14,000 ha. will be irrigated;

(3) those of Pamissos (Messinia) for the protection of 3,200 ha. and the irrigation of 3,700 ha.;

(4) other works (Vromolimnai, Acheloos, Selinous, etc.).

A series of small- and medium-sized works of land improvement have been begun, and will be carried through by the Agricultural Bank within a period of 5 years; the intention is to recover 4,000 ha., to protect 10,700 against floods and to irrigate 3,600.

For the execution of all the works enumerated above provision is made for expenditure as follows:

(1) 622,000,000 drachmas in four years for supplementing and exploitation of the works already accomplished in Macedonia;

(2) 1,400,000,000 drachmas in 10 years for the execution of the large scale works projected;

(3) 160,000,000 drachmas in five years set aside by the Agricultural Bank of Greece for the execution of the small and medium-sized works indicated above.

Costs of upkeep of the works already executed in Macedonia are estimated at 700,000,000 drachmas over some ten years.

HUNGARY.

Hungary, which is situated under the southern slopes of the Carpathians, is for the greater part flat. This plain, which was in the past the floor of the former sea of Pannonia, is irrigated by the Danube, the Theiss, and their tributaries which in their course across the Great Hungarian Plain have a very small gradient. As a consequence, when these rivers were in spate they inundated regularly an area of about 3,800,000 hectares. Owing to the unevenness of the ground, a great part of this flood water did not subside naturally into the river beds. In the absence of proper run-off, the water became stagnant and transformed large areas into marshes, from which fevers spread.

An attempt was made in the sixteenth century to prevent the damage caused by the inundations of the Danube and its tributaries, by means of the construction of elevated local dykes. Works for the systematic regulation of the Danube and the Theiss were not begun until the middle of the nineteenth century and they were finished, for the greater proportion, in 1875 for the Theiss and in 1896 for the Danube.

Among the most important works on the Danube should be mentioned the regulation of the Upper Danube, *i. e.*, between Bratislava and its confluence with the Vág, and the regulation of the Lower Danube, *i. e.*, between the Iron Gates and the Cataracts.

The principal operations on the Theiss were the straightening by means of numerous cuts – the river was shortened by 450 kilometers out of 1,400 km. – and the construction of dykes 6,380 km. long.

Besides these works, the object of which was firstly to protect the fields from exceptionally extensive flooding, and secondly to improve the conditions of navigation, it was necessary to collect and to drain off the water accumulated in the depressions as a result of inundations, and waters coming from infiltrations and rainfall, which, in the Hungarian phrase, are called "inner waters". The network of the drainage canals is about 16,000 km. long. Since the level of the Danube and of the Theiss in time of flood is higher than that of the canal waters, it is necessary to force back the canal water into the Danube and the Theiss by means of pumping stations. The 173 pumping stations have a total power of 10,000 H. P. and can force back a volume of water of 224 m³ per second, at an average height of pumping from 1 to 7 metres.

To give an idea of the scope of the operations of regulation, etc. of these rivers, works which are the largest of the kind in Europe, it may be mentioned that 3,800,000 hectares have been successfully protected. The sums set aside for this purpose have amounted to 1,100,000,000 gold francs.

These works have been carried out partly by the State and partly by syndical associations. In Hungary, the regulation properly so called of the rivers falls on the State; the construction of dykes for protecting the lands against floods, the making of drainage canals for the "inner waters" and finally, the erection of pumping stations are the work of the syndical associations.

Mention should also be made of the irrigation works covering a total of 15,500 ha., and the formation of fish-breeding pools on an area of 10,000 ha.

At present the regulation and control of water courses are, so to speak, complete in Hungary. The country now is at the beginning of a new era, that of the utilization of the waters.

The most important hydraulic works are: (1) the development of navigable river courses; (2) irrigation on a large scale, for protecting agriculture against possible droughts; (3) improvement, by utilization of waters, of alkaline soils to an extent of approximately 500,000 ha. This programme will of course be carried out in accordance with financial possibilities and several decades will be required for its realization. During the execution of these works the Hungarian water service has been developed. At present, this consists on the one hand of the *State Department of Waters*, properly so called, and, on the other hand, of the independent syndical associations placed under State control.

The costs of the hydraulic operations are included either in the ordinary budget or in the extraordinary public works budget.

Contributions due from landowners to the syndical associations are collected in the same way as direct contributions. They usually vary between 1 and 3 pengös per annum per hectare.

IRELAND.

Owing to the natural formation of Ireland with its great central plain, several of the principal rivers and their tributaries have a slow course with a tendency to form marshes and to cause floods which take a long time to subside and cause much damage to the crops. The remedy is to maintain in proper condition the water courses into which drainage channels flow, and to ensure that the run off is sufficient. The Department of Public Works is in charge of the land drainage system, and the Drainage Maintenance Act of 1924 empowered the Department to proceed with the necessary work of reconstruction in all the drainage areas requiring attention. The expenses are met by contributions from the Government and from the counties. The County Council are empowered to levy rates, for the costs of carrying out the work and for its upkeep, on the inhabitants of districts benefiting by the operations.

The Arterial Drainage Act of 1925 relates to the drainage by means of canals, which is undertaken through the co-operation of those concerned. As, however, the undertaking involves operations and calculations, which can only be made by a qualified engineer, relating to claims in connection with lands and waters, with consequent levying of user rates, the Government necessarily intervenes.

Finally, the Minor Schemes Act of 1928 empowers the County Councils to carry out drainage schemes the estimated cost of which does not exceed £1,000 sterling. State aid cannot exceed 25 per cent. of the cost of operations, nor in any case the sum of £250.

Subsidies have been granted, during the last few years, for land reconditioning operations. The original purpose of the land reconditioning schemes was to encourage certain small owners, whose lands were valued at not more than £10 per acre, to increase their value by reconditioning and bringing under cultivation land formerly not arable which they had left as waste. The following

table shows, for each of the five financial years from 1931-32 to 1935-36, the expenditure, the number of owners who received grants in aid and the areas reconditioned.

Years	Number of owners receiving grants	Area of lands reconditioned			Amount of grants made		
		acres	r.	p.	£	s.	d.
1931-32	266	175	0	0	750	0	0
1932-33	2,373	1,918	0	16	8,277	9	4
1933-34	4,083	2,825	2	8 1/2	12,123	11	9
1934-35	3,550	2,420	1	36	10,593	10	6
1935-36	4,192	2,502	2	5	11,652	6	7

The annual credit voted by Parliament for the Irish Land Commission includes a sum for the improvement of the lands with which the Commission has to deal in virtue of the Land Purchase Acts. This expenditure is directed to: (1) the improvement of existing plots: drainage, means of access, etc.; (2) laying out of new plots; (3) operations of dyking, reconditioning of waste land, etc.

During the five year period ended March 31, 1935 the total amount of the expenditure under the head of land improvements has been year by year as follows:

Years	Buildings £	Land improvements £	Total £
1931	61,033	122,021	183,054
1932	54,290	100,816	155,106
1933	63,910	111,106	175,016
1934	74,763	153,249	228,012
1935	125,814	192,909	318,723
Total	379,810	680,101	1,059,911

A confirmation of the importance attached to the problem under review will be found in the fact that the Government of Eire has recently set up a Commission to consider the question of drainage and land reclamation in this country. The terms of reference of this Commission are as follows:

To consider the whole question of land drainage (excluding field drainage) with special reference to the technical, administrative, financial and legal aspects of the problem, and to submit recommendations as to:

(1) How an efficient system of drainage reasonably consonant with requirements and calculated to facilitate future land reclamation can best be secured.

(2) The provisions which should be made for the proper maintenance of existing and future drainage works.

(3) How the cost of drainage works and their maintenance could most equitably be apportioned amongst the various interests concerned.

(4) The changes (if any) in the existing law and administrative system which would be necessary to give effect to the recommendations.

ITALY.

Infertile, marshy and depopulated zones were found, here and there, in nearly all parts of Italy, but in two parts of the country such areas were especially concentrated in two long and narrow strips: one, situated in the north-east, on of the coast of the Upper Adriatic; the other, in the west, along the central portion of the Tyrrhenian coast. The former is shaped like a great fan, covering about one million hectares to the north and south of the river Po. On one side the fan widens out at the expense of the Venetian lowlands while its northern border reaches as far as Istria. On the other side, it spreads at the foot of the Emilian Apennines to the division between Northern and Central Italy.

In this region the struggle maintained against the marshes and malaria goes back to very remote times. This vast tract included lands lying below sea-level, and the streams that watered them were often barred, at their mouths, by dunes. Consequently, the flow of waters, naturally very sluggish, was stopped over irregular periods of varying length. Lagoons formed and rose at times to a level which prevented any attempt at cultivation. Sometimes, the landscape was one of marine depressions, filled with salt water or covered with marsh, sometimes pastures could be seen but of very poor quality, exposed to inundations of varying duration.

The second large strip of waste lands, the Tyrrhenian portion, extends from the mouth of the Serchio river to that of the Sele. It may be divided into three parts: the Tuscan Maremma, the Roman Maremma and the marshy belts of Campania.

One of the largest and best known of these marshland areas is the Pontine Marshes. Although similar in certain hydrographic features to the Adriatic zone, the Tyrrhenian zone has none the less its own special physiognomy. It is liable to sudden and frequent inundations, which in the season of violent and prolonged rainfall pour down from the neighbouring mountains on to the narrow strips of low-lying littoral, which they flood and transform into marshes. When these lands are cultivated, tracts of extensive cropping, growing cereals, alternate with pastureland. There is fertile soil in abundance and the climate is favourable to plant growth even in winter. Unfortunately, owing to the malarial conditions, the farm workers, who gave their services for short periods for certain work, were obliged to find work elsewhere for months at a time.

Further south, the general conditions were still worse, for a number of reasons: the virulence of the malaria, the irregularity of the water supply, the vast tracts (*latifundia*) where grazing land alternated with cereal cropping, the latter, however, of the extensive type with very poor yields, owing to the very low density of the rural population.

If in addition to these two immense belts of marshlands, the great number of other, smaller areas not less unhealthy, in Apulia, Calabria, Sicily and Sardinia, are considered, the magnitude of the problem of land reclamation in Italy is readily understood. This reclamation, as studied and directed in all its aspects by the Government, has been described by the term "integral".

The law, which formulated in the fullest degree the programme of "integral land reclamation," however, is that of December 24, 1928⁽¹⁾. By this enactment all existing gaps in the previous legislation were filled, and the various problems till then judged insoluble or remaining in suspense were finally solved. These included the supply of drinking water, the construction of roads essential to the intensification of cropping, the construction of rural centres and of farm buildings, etc. In particular, provision was made for financing numerous measures relating to the various land reclamation operations. The whole scheme of operations, as drafted in this law, involves a total expenditure of about 7 milliards, including 4.5 milliards for hydraulic reclamation and subsidiary work, and 2.5 milliards for irrigation, the construction of villages, farms, aqueducts and country roads.

Finally, the Decree-Royal of February 13, 1933 co-ordinated the measures in force and dealt with the whole question on the juridical plane, and further introduced the distinction between reclamation proper and land improvements.

Reclamation works are carried out in accordance with a general scheme of operations, with considerable hygienic, demographic, economic and social advantages, in areas classified and delimited by the State under the name of *comprendsòri*. Improvement work is undertaken for the benefit of one or more farms, independently of a general land reclamation scheme.

The *comprendsòri* fall into two categories: the first includes the areas of land reclamation of exceptional importance for internal land settlement, and the second, all others of minor importance.

All the operations necessary for reclamation are to be carried out in the aforesaid zones as follows: the State undertakes those recognized to be in the nature of public works, and private individuals are legally obliged to carry out the remainder. The first are at the expense of the State, with contributions from the landowners; the second are at the expense of the owners, with State assistance.

The following operations come within the competence of the State:

(a) Reafforestation and reconstruction of deteriorated forests, correction of the upper courses of mountain waters, reconditioning of slopes by means of meadows or wooded pastureland, draining and agricultural treatment of these slopes in so far as such operations are of value for the general purpose of stability of the lands and for the proper regulation of waters;

(b) Reclamation of lakes and pools, of marshes and marshy lands or lands, generally speaking, without proper run-off;

(c) Fixing of dunes and plantation of wind-breaks;

(d) Supply of drinking water to rural populations;

(1) A. SEARRE: La legge sulla bonifica integrale nel primo anno di applicazione. Ministero della Agricoltura e delle Foreste. Roma, 1931-IX. - *Idem*: La legge sulla bonifica integrale nel secondo anno di applicazione, 1932-X. - *Idem*: La legge sulla bonifica integrale nel terzo anno di applicazione, 1933-XI. - *Idem*: La legge sulla bonifica integrale nel quarto anno di applicazione, 1934-XII. - *Idem*: La legge sulla bonifica integrale nel quinto anno di applicazione, 1935-XIII. - GIUSEPPE TASSINARI, Sottosegretario di Stato per la bonifica integrale: La bonifica integrale nel decennale della legge Mussolini. Bologna, Editrice Arti Grafiche «Aldina», 1939-XVII.

(e) Protection against water, and the supply and farm utilization of waters;

(f) Transformation huts and fixed or movable lines of distribution of electric power for agricultural purposes in the zones in question;

(g) Construction of communications and other work of general interest for the area;

(h) Consolidation of parcels of land, even if they belong to different owners, into suitable units.

The expenditure to be met by the State for works within its competence may reach 87.5 per cent. of the total cost.

The subsidies granted by the State to private persons for their share in the work amount normally to one third of the total expenditure, but may reach, in certain cases, 45 or even 75 per cent. In addition various credit institutions grant credits on exceptionally favourable terms to private persons, under the form of loans, current accounts, etc.

For each *comprendorio*, one or more owners' consortia are set up on the basis of majority membership, declared or presumed, in accordance with certain well defined criteria. Consortia may also, exceptionally, be officially constituted. It is incumbent on them to supervise the upkeep of the land reclamation works and to ensure, if need be, their regular working. Unless other provision is made, the State entrusts the consortia with the carrying out of works within its competence. They are also to carry out works in the competence of private individuals when so requested, these latter to make provision for the expenses in the proportion and according to the terms established by the law.

Side by side with these consortia, the work of the *Opera Nazionale Ex-Combattenti* (Institute of Ex-service Men) should receive mention. This officially supervised body purchases and may even expropriate lands which are capable of reclamation, transforms these lands, making them suitable for intensive cultivation, and apportion them among the families of ex-service men who are farm-workers.

On July 1, 1938 the total area of the *comprendori* in which the State had carried out land reclamation works or was carrying out such works amounted to 5,700,103 ha., divided as follows:— public works in course of execution, 3,107,984 ha.; completed public works, 1,697,800 ha.; completed works carried out by private persons and subsidised by the State, 894,319 ha.

In the *comprendori* there have been constructed 10,729 km. of roads; 17,527 km. of canals for run-off and irrigation purposes; 3,737 km. of dykes; and pumping installations of 143,564 horse-power to raise the level of the waters for drainage and irrigation purposes. More than 800,000 ha. of land have been made irrigable; 34,425 houses and 43,962 lesser constructions have been built for the settlers, to which must be added the stables and stalls for 252,491 head of live-stock; 68 new rural centres have been created. The principal conduits for rural aqueducts reach a length of 608 km.

The expenditure on public works of this kind over the period 1922 to 1938 amounted to 6,579,000,000 lire. To this sum must be added 4,413,600,000 lire which the State has disbursed in the form of subsidies for

land improvements carried out by private persons, *viz.*, irrigation and water finding, rural aqueducts, farm roads, rural buildings, clearing and treatment of land, mountain pastures, applications of electricity to agriculture.

Statistics have been collected for 39 farms, representing the chief zones of land reclamation, to show the division of the reclaimed areas between different uses, the product per hectare, the gross product, the net return, the quantity of livestock, the value of the land and the amount of labour employed all this for the period before and the period after reclamation.

In this way it was shown that, for example, in the farms created in the reclaimed areas of Emilia the unproductive areas are now only 10 to 15 per cent. of the total.

In the productive areas productive waste has disappeared as a result of its transformation into seed-plots and, to a small extent, its utilisation for specialised tree cultures.

As a result of land reclamation crops requiring extensive cultivation have disappeared, and now only those of intensive cultivation cover the whole productive area of the reclaimed farms. Sowings generally extend over something like 90 per cent. of the productive area. But it is in the production of cereals that the greatest increases have been obtained. In the farms studied, for example, the average production of wheat used to be about 10 quintals per hectare, whereas now returns of 10 to 30 quintals are obtained. Similarly with regard to maize the average yield has risen from 10 to 20 quintals before reclamation to 30 to 40 and even more after reclamation.

In addition to the cultivation of cereals intensive stock-rearing is now carried on. Before in order to feed the animals they were sent out to pasture, but now food crops are cultivated for the animals, and as much as 100 to 120 quintals of ordinary hay have been produced per hectare.

The quantity of live-stock has shown a gradual increase. In most of the farms studied cattle represent a capital of 1,000 lire and over per hectare, reaching a maximum of over 5,000 lire in the zone to the right of the Sele (Campania).

The capital invested in tools and machines has in some cases risen from 200 lire to over 2,000 lire per hectare, the average amount being 500 lire.

The total of capital in the form of cattle, which before reclamation were non-existent in many areas, is now given as 4,391 lire in the farms of the Campania (to the right of the Volturno) and as 8,109 lire in the farms to the right of the Sele.

In Venetia the vendible gross product per hectare fluctuates round an average of 3,000 lire in the farms studied.

In the farms of the Campania in the two cases examined the vendible gross products were 6,430 and 3,650 lire respectively per hectare.

In the farms of the Apulian zones the vendible gross product showed the greatest increases in the campagna of Brindisi, where it rose from 74 to 3,118 lire per hectare, and in the reclaimed zone of Tavoliere, where the rise was from 214 to 3,046 lire per hectare. In both cases the net product exceeds 2,000 lire per hectare.

The transformation of lands has resulted in a rise in their values, as will be seen, for example, from the following figures referring to farms in the reclaimed zones in Venetia.

Zone	Land value excl. cattle (Lire per hectare)		Increase in value (Original value = 100)
	Before	Now	
Middle Adige	5,000	16,000	320
Delta of the Brenta	2,500	10,500	420
Lower Ongaro (I)	2,500	13,000	520
Lower Ongaro (II)	2,500	13,000	520
Mouth of the Brenta-Adige	2,200	10,000	455
Ledra-Tagliamento (I)	7,500	13,500	180
Ledra-Tagliamento (II)	8,000	15,000	188
Lower Friuli	2,600	11,500	442

Furthermore, there has been a noticeable increase in the amount of labour employed per annum per hectare.

The introduction of intensive cultivation, the regulation of the run-off of surface waters and the raising of the standard of living of the farm workers, have all been powerful factors in the struggle against malaria. The resulting increase of population in the reclaimed territories is noticeable.

A very striking example is that of the Pontine Marshes (77,000 ha. approximately). Formerly, the population of the area was only some hundred persons, and that only in the summer months, sheltered in miserable huts and exposed to all the risks of the most virulent form of malaria. Now, several towns (Littoria, Sabaudia, Pontinia, Aprilia, Pomezia) and 17 rural centres have arisen; the land is covered with farm workers' dwellings (3,147) and farms (2,574), and the population figure is 60,000 workers and settlers.

To give a fresh impulse to integral land reclamation the Decree Law of January 13, 1938 allotted a further sum of more than 3,000,000,000 lire to this purpose. This fund will be earmarked for zones that promise to give a more rapid and higher return, having regard to the social objects of land reclamation and in particular of land settlement.

LITHUANIA.

Scientific and planned reconditioning operations for the improvement of humid soils could be put in hand in independent Lithuania only in 1921. Regulation of courses of streams and construction of drainage canals were undertaken by the Ministry of Agriculture, thus enabling farmers to drain their wet lands by means of open ditches or by piping. From 1921 to 1937 inclusive, a total area of land of some 416,000 ha. had been drained by means of canals which attain a total length of 17,000 km.

The greater proportion of these works were carried out from the State Treasury Funds under the supervision of the technical staff of the Ministry of Agriculture. The owner benefiting has to repay a part of the costs by yearly instalments, and the remainder is regarded as a State subsidy.

It should also be mentioned that farmers wishing to effect complete drainage of their land may apply for the technical assistance of the experts in agricultural improvements of the Ministry of Agriculture and of the Chamber of Agriculture, and for loans for agricultural improvements granted out of Treasury Funds on favourable terms.

NETHERLANDS.

The significance of the great works of dyking and drainage that have been effected in the Netherlands, and which do honour to the Dutch people, can only be rightly understood if we assign to them their place in the history of this nation. To give an idea of the effort expended in the conquest of the sea and of the results obtained, it is enough to recall the far distant era when the present territory of Holland was merely an immense zone of sand and peat, for the most part invaded by the sea, and with marshes everywhere, a zone barely separated from the sea by a broken chain of dunes constantly washed over by the high tides and forming only a partial shelter. The portions of land which emerged consisted of sand and peat, unfit for cultivation (1).

The main reclamations in Holland were effected by means of immense artificial dykes, enclosing areas of sand and alluvial clay liable to inundation and isolating them from the sea.

Once the salt water is kept out, the areas gained are intersected with a close network of channels, arranged in groups and at various levels, which serve to drain the land. By means of numerous pumping systems worked formerly by the typical picturesque wind mills, but now by steam or electric power, drainage or alluvial water is gradually lifted into the higher level channels whence it is discharged into the sea.

The areas thus regained are called "polders" and by the industry of the Dutch people these have been transformed into fertile areas and immense gardens, and bear witness to the strength of the human will and intelligence in the struggle with the devastating forces of nature.

The most celebrated example of these drainage operations is the conquest of the Lake of Haarlem (18,500 ha.) which is now one of the richest of the polders, and supports a large industrial population.

The inundation in 1916 of the north of North Holland and the problem of the supply of cereals in the country during the Great War, led to the decision to dyke and drain the Zuyderzee. This truly national enterprise has now been largely

(1) See: L'AGRICULTURE AUX PAYS-BAS, already quoted.

realised. In 1927, the specially appointed Department of the Zuiderzee Operations was able to begin the great works to the east of the island of Wieringen and on the "Kornwerderzand", a stretch of sandbanks to the west of the Frisian coast. On May 28, 1932 the dyke was closed and the barrier thus completed.

The barrage from the coast of North Holland to the island of Wieringen is $2\frac{1}{2}$ km. long; that from Wieringen to the coast of Frisia about 30 km. The lake thus obtained is called Ysselmeer and communicates with the sea of the Wadden by means of 25 sluices, 15 near Wieringen and 10 near Kornwerderzand. Beside these sluices, locks for navigation have been constructed.

The width of this barrage or closing dyke, measured at the Amsterdam low level, is about 86 metres. As a protection against the sea, a parapet has been erected on the dyke to the height of 3 to $3\frac{1}{2}$ metres. The construction of the Zuiderzee barrage, properly so called, has taken 11 years.

The system adopted for the formation of polders is of special interest. There are three of these polders: the "trial polder", the north-west polder, and the north-east polder. The trial polder, that of Andijk, measures some 40 ha., and the dyking of it was completed in 1927. When the work necessary for ensuring the discharge of the waters was finished, the work of bringing under cultivation was begun in 1929. On the lands obtained, trial fields were established, where a number of experiments were carried out, both in respect to the hydrographic system and to the methods of manuring, soil crumbling, choice of crops and other questions. The trial polder continued to be farmed as such up to November 1, 1935, after which it was worked as an ordinary farm.

The dyking of the north-west polder, the "Wieringermeer", was begun in 1926 and finished at the end of 1929. At the beginning of 1930 the pumping of the water, which extended as far as the eye could reach, was put in hand and on August 22 of the same year the "Wieringermeer" was dry; in this way the territory of the Netherlands was increased by 20,000 ha. of cultivable land.

Towards the beginning of 1930, a special department was formed for bringing the "Wieringermeer" under cultivation. The parcelling out was executed according to a plan prepared by the Lovink Commission and published in its Report. The parcels measure on an average 20 ha. In the south-western part there was a departure from this rule, and from 30 to 70 hectares went to a plot.

After some years, the total area of cultivable lands had become so large that a special organization was required for the work of bringing them under cultivation, and for this purpose a society for farming the "Wieringermeer" was founded.

The housing of the workers proved to be one of the initial difficulties. The condition of the soil and the sinking of the ground made special precautions necessary in the erection of dwelling houses.

At the beginning of 1931, however, a start was made in planning farms and shortly after the first stone of the first village was laid. The "Wieringermeer" now possesses three villages situated at the crossroads of highways and canals, and thus at the centres of economic activity. The majority of their inhabitants are workers employed in bringing the land under crop, but a class of small deal-

ers has developed gradually. Lands for this type of enterprise are leased on terms of emphyteusis. Permission to set up a commercial undertaking in these villages is made conditional on certain qualifications, *e. g.*, professional knowledge, a certain financial stability, personal capacity, etc. Workers' families engaged for cultivation work, etc., must undergo a medical examination, and it is hoped in this way to ensure a certain selection.

The working population occupy dwellings built for them in the villages by means of State aid. The Housing Bureau of "Wieringermeer" has been set up for the erection and administration of the houses built with State aid. The houses are simple in type, but well arranged, and the average level of the housing in "Wieringermeer" is decidedly higher than that of the other rural districts in the Netherlands. Supplies of water and of electric power are duly provided, and the measures of social insurance in force in other parts of the country are applied here also.

In 1937, 156 farms had been rented, covering some 6,200 ha. In addition to these farms, 600 hectares have been let as parcels not belonging to any particular farm. The duration of leases is six years; the conditions are in accordance with the principle of sliding scale renting, that is to say, for each farm a basic rent is fixed which is adjusted by means of an index number. For arable farms, the index-number varies with that of the crop products as determined each year by the Department of Agriculture; for grazing farms, the index number varies with the average price of milk.

Applicants for tenant farming must comply with certain conditions; they must possess adequate working capital fixed, for arable and mixed farms, at 300 florins par ha. and, for grazing land, at 250 florins per ha. In assigning farm holdings to the persons concerned, account is taken of personal capacity and of vocational knowledge. Rents for the first years are fairly low, partly to allow cultivators to recover after the heavy expenses of installation, partly because the lands have not yet attained their full agricultural value.

The basic rates for the renting of sandy lands are as a rule 30 florins per ha. in the first and second years, 40 florins in the third and fourth years and 50 florins in the fifth and sixth years. For clayey soils, these rates are respectively 50, 60 and 70 florins; for sandy-clayey lands intermediate prices are fixed.

For drainage done gradually on clayey lands, the cultivators receive a compensation of 10 florins per year and per ha. The very successful results of farming by private persons in the "Wieringermeer" have done much to arouse interest in the new lands among the farming population of the Netherlands. and to stimulate the desire to acquire such a farm.

In future years, the assignment of lands will continue. Some 10,000 ha. are available for renting; the Government has set apart 1,000 ha. distributed among the different polder areas. These lands include farms of varying nature and size. The rented farms are on an average from 35 to 40 ha. The arable farms are usually somewhat larger; the mixed farms are about average in size, and the grazing farms are as a rule the smallest.

Buildings are erected at the cost of the Government. An endeavour has been made to combine simplicity with practical needs, and to reduce the cost as much as possible by mass production.

The lessons of experience are utilized, and no improvement that would be of value is neglected.

The north-east polder covers nearly 48,000 ha., of which 9,000 only are sandy lands, the remainder consisting of firmer land. While the "Wieringermeer" affords an excellent opportunity for satisfying the great demand for cultivable land which has made itself felt in recent years, the north-east polder will satisfy this demand even more fully. The works in progress give employment directly or indirectly to several thousand workers per annum.

The barrage costs of the Zuyderzee amounted to about 140,000,000 florins. The dyking of the "Wieringermeer" and of the "trial polder" required about 75,000,000. The north-east polder will require about 126,000,000 florins.

POLAND.

The essential object of land improvement in Poland is the improvement of farm lands in regions where the soil is either too damp or too dry, together with the reclamation and conversion into arable land of barren tracts, such as peat-bogs, marshes, etc. By a law passed on October 26, 1921, State assistance was provided for this work and further legislation on the regulation of waters was introduced the following year providing, among other matters, for the inauguration of co-operative hydraulic associations, mainly concerned with large-scale land improvements. In 1925 a State credit was opened for the purpose of land improvement, and from this fund the following subsidies, reaching a total of 41,143,741 zlotys, have been granted (1).

Year	Zlotys	Year	Zlotys
1925	3,743,037	1932-33	595,830
1926-27	3,170,000	1933-34	1,050,000
1927-28	4,667,260	1934-35	1,000,000
1928-29	7,152,000	1935-36	1,000,000
1929-30	10,081,088	1936-37	1,100,000
1930-31	5,806,526	1937-38	1,100,000
1931-32	678,000		

An extraordinary sum of 25,789,000 zloty, not included in the budget of the Ministry of Agriculture and Agrarian Reform, was granted for the agricultural years 1933-34 and 1937-38.

Finally, by a Presidential Decree dated March 22, 1928, the State Agricultural Bank was authorized to issue land improvement bonds.

(1) Cz. ZAKASZEWSKI, St. WAWRZKOWICZ, St. RYCHŁOWSKI, St. SIENKOWSKI: Zagadnienie melioracji rolniczych w Polsce. Warsaw, 1938.

*Land Improvements effected by the Ministry of Agriculture
and Agrarian Reform in the course of the years 1933-34—1936-37.*

Years	Works			Simple reconditioning of land		Expenditure Zl.
	Regulation of water courses km.	Canals km.	Protective works km.	Dyking m ²	Levelling of land m ²	
1933-34	219.7	85.1	101.7	1,612,706	2,392,044	6,570,511
1934-35	291.5	214.5	100.8	3,456,788	2,180,024	9,072,163
1935-36	351.5	113.4	114.5	3,663,450	2,333,420	9,508,616
1936-37	535.4	232.4	97.0	4,639,971	2,461,618	10,217,379
Total	1,398.1	645.4	414.0	13,372,915	9,367,106	35,368,669
<i>Upkeep of Works and Repair of Damage caused by Floods.</i>						
1933-34	1.1	1.0	—	24,174	578	214,515
1934-35	—	—	—	16,533	5,490	233,720
1935-36	0.4	—	—	13,619	20,891	315,609
1936-37	21.3	—	—	25,368	7,146	297,996
Total	22.8	1.0	—	79,684	34,105	1,061,740
General total	1,420.9	646.4	414.0	13,452,599	9,401,211	36,430,409

State intervention in the carrying out of essential improvements usually takes the form of financial aid in meeting the cost; indeed, when public security is involved the State may assume entire responsibility for the improvements in question. Any scheme is subject to State intervention, not only when the work is in progress, but also when the plan is still under discussion.

As a general rule private persons are not compelled to carry out land improvements; if, however, they are opposed only by a minority of the members of a hydraulic association, the association may be compelled to contribute to the cost of a scheme indispensable to the improvement of lands owned by the majority. Improvements may also be carried out, even if the majority do not approve, but only when such schemes are the result of a modification in the agrarian structure, re-parcelling, etc.

The State Agrarian Bank finances schemes for land improvement by means of loans to hydraulic associations in the form of bonds redeemable in fifteen years. Such loans are usually granted for purposes of drainage, drying and irrigation of land, the improvement of grazing land and the establishment and reconditioning of fisheries, etc. The total amount granted for such improvements by the Bank during the period 1925 to 1937 amounted to 128,129,140 zlotys. These loans are guaranteed in accordance with the provisions of the Regulation of Waters Department, which makes them preference credits.

State intervention may here take the form of a reduction of interest; the special fund mentioned above is employed for this purpose.

It is only since 1925 that the State has directly undertaken land improvement, but progress since then has been rapid. On page 42 are given the figures for 1933-34 to 1936-37 for the areas subjected to the reconstruction of their agrarian system.

According to the most recent figures there are at present in Poland 5,020,000 ha. of prairie and pasture land needing correction of their water-courses or construction of new main conduits, and 1,350,000 ha. of land at present useless but which could after drainage be turned into prairie and pasture land.

PORTUGAL.

Here the State has taken into its own hands the study and realization of land improvement. According to Law No. 1949, of February 15, 1937 ⁽¹⁾, it is the function of the State to study and carry out improvements in drainage of agricultural land when of economic and social interest, to direct and supervise their upkeep and to utilize reclaimed land in the way likely to be of the greatest social benefit. Among such operations are included the regulation of public waters for irrigation; drainage, drying and protection of lands, preparation of land for irrigation, and methods of raising the level of land. These works will be carried out by the self-governing Council for agricultural hydraulic works on authorisation by the Government.

The State will recover the sums expended on the study, organization and realization of schemes by means of an annual charge per hectare, known as the "irrigation and land reclamation levy". This will equal, for each scheme, the amortization over a period of fifty years of the expenditure per hectare, interest being calculated at the rate of 4 per cent. for first class, 3 per cent. for second class and 2 per cent. for third class land. The actual value of the instalments to be paid may never exceed the additional value resulting from the works carried out. This yearly instalment forms a real charge on the property and will be collected with the land-tax.

As soon as the works are authorized the respective irrigation association will be formed. This association will have corporate rights and will consist of the owners, usufructuaries (holders in emphyteusis), etc. of the lands in question.

Land affected by the improvement works which belongs to or is transferred to the private desmesne of the State, will be handed over to the Land Settlement Committee (*Junta*) for division into farms varying in extent from 1 to 5 ha. These will be allotted to persons who either do not own land or whose land is inadequate for the maintenance of a family: such persons must be known to have capacity for farming and to be hard-working.

Farms thus allotted may not be subdivided without the sanction of the Government.

⁽¹⁾ ANNUAIRE INTERNATIONAL DE LÉGISLATION AGRICOLE, 1937, p. 439. International Institute of Agriculture, Rome, 1938.

A. Farmers' Mutual Credit Bank, affiliated to the National Credit Bank, will be attached to each of the irrigation associations and any farmer whose land is affected by improvement schemes will be entitled to become a member.

ROMANIA.

The earliest works of any considerable extent in Romania were carried out by the owners of land liable to inundation, their main object being the reconditioning of the soil for agricultural purposes. It was not until December 1, 1910 that a law was passed on this subject, *viz.*, that for the "valorisation of land within the inundation area of the Danube". The first article of this law indicates its object; it enumerates the functions of the special service thereby established: this service will study, plan, effect and maintain all dyking works and all the works necessary for the drainage, improvement and valorisation of land in the Danube valley which is liable to inundation, whether owned by the State or by private persons, in cases where such works are necessary in the interest of the public.

Among the objects of the improvement works the law includes the drainage or "rendering healthy" of the land, regarding flooded lands as a danger to health; this justifies the declaration of the reclamation works as of public utility.

The State intervenes in the carrying out of operations and assists private enterprise. The principal modes of intervention prescribed by law are the following: (a) the State may expropriate land when work prescribed by the law is considered necessary; (b) the majority may impose their will on the minority in regard to reclamation work; (c) the State is authorized to supply the capital necessary for such landowners as cannot raise the amount required.

The law above-mentioned was superseded by a more recent enactment dated July 10, 1929 and entitled: "Law for the general administration of State fisheries and the improvement of land in the valley of the Danube subject to inundation". The clauses relating to land reclamation modify the principles of the former law as follows: (a) it extends the measure to improvements of all kinds, including those connected with agriculture, pisciculture, forestry, etc.; (b) it leaves to landowners the initiative in the works, in regard both to the preparation of schemes and the raising of the necessary capital. The State reserves to itself only the right of reclaiming its own land through the medium of an independent administration, and that of approving or rejecting the plans submitted by landowners and of determining that the work is carried out in accordance with these plans and maintained in good condition.

SWEDEN.

In Sweden the agricultural census of 1927 supplied data regarding the extent of land which had been cleared during the six preceding years, that is to say, during the period 1922-1927. It appears that an area of 22,773 ha. was cleared, representing 0.6 per cent. of the total area of the country. Thus the average area annually cleared was some 3,800 ha. or 0.1 per cent. of the arable area.

As compared with the period 1913-20, when the average area converted yearly into cultivable land was 8,444 ha., the area cleared during the years 1922-27 was only about half that of the earlier period.

In order to form some idea of the possibilities of Swedish agriculture it is necessary to realize the extent of the areas which have yet to be dealt with. In this respect, however, the statistics are inadequate and opinions are contradictory. It is thought by some that Sweden is almost entirely under cultivation, only a very limited area still requiring clearance.

Assuming that the possibilities of clearing are more or less the same throughout the north of Sweden, the total area at present cultivable should amount to 1,100,000 ha., according to an investigation carried out in 1921 in part of that region. Consequently, it should be possible to estimate a total of three times the present area of arable land in the provinces of Norrland and Dalarna. In the south and centre of Sweden the possibilities of clearing the land are considerably less, the area in that region suitable for clearing being estimated at 150,000 ha.

The total figure for all areas susceptible of clearing reaches approximately 1,250,000 ha. If the whole of this land should be cleared, the area of arable land would be increased from its present extent of 3,720,000 ha. to 4,970,000 ha., that is to say, it would be increased by about one-third.

With regard to drainage, it appears from the statistics available that about 911,000 ha. have been drained, that is to say, 24.5 per cent. or nearly one-fourth of the total area of arable land in Sweden (¹). The area drained, however, varies not only between different regions of the country but also between the size-groups of the farms in the same district. There is less drainage on the smaller than on the more extensive farms. The proportion of drained areas throughout the country amounts to 49 per cent. for the large farms, but only 7 per cent. for the 1-2 ha. farms, while the percentage is still lower in the case of the smallest farms.

The cost of drainage and the possibility of effecting it depends mainly upon the material used for this purpose. In the final balance-sheet the various zones have been classified according to the material used, and it appears that the land drained by means of pipes included an area of 5,977,700 ha.; stones were used for the drainage of 160,700 ha. and 152,600 ha. were drained in other ways.

Drainage by means of pipes was found principally in the plain of Skane and in the greater number of plains in the south and centre of Sweden, but it was very rare in Norrland where the drainage is not of great importance and is effected by means of stones or other material.

The State makes loans on terms of deferred payment, and also direct subsidies, the repayment of which is not compulsory, for the reclamation of marshy

(¹) ERNST HÖIJER: *Sverges jordbruk*. Stockholm, 1932. — OLOF JONASSON, ERNST HÖIJER, THURE BJÖREMAN: *Agricultural Atlas of Sweden*. Compiled on behalf of the Royal Swedish Academy of Agriculture. Stockholm, 1938.

land, for drainage and, in general, for the improvement of the soil. It has also taken measures for effecting and maintaining various improvements. In this connection a body of agricultural engineers have been entrusted with the work of drawing up plans for lowering the level of lakes, and with other important works for land clearing and draining.

The State subsidizes undertakings for the improvement of land in the following cases: (a) for the drainage of land under cultivation by means of culverts; (b) for the reduction of transport charges for lime intended for agricultural purposes; (c) for clearing land on small holdings which are inadequate for the maintenance of a family without some increase in the area under cultivation; such subsidies are on a generous scale and repayment is not compulsory; (d) for the drainage of wooded land. Direct grants for encouraging the improvement of land, in connection with the formation of small holdings, are granted on a given scale. They are also granted for the removal of stones from land already under cultivation.

SWITZERLAND.

Legislation on land improvement in Switzerland is both federal and cantonal, and dates from June 27, 1884, when the first decree on this subject was enacted. By this Decree the Federal Council was authorized to subsidize enterprises the purpose of which is to improve land or to facilitate its utilization. These subsidies were allocated on applications accompanied by schemes made by the cantons. They could not exceed 40 per cent. of the total cost of the proposed enterprise and were only granted in cases where the cantons, communes or corporations concerned provided an equal amount. The cantonal authorities were responsible for the upkeep of the works carried out.

The Federal Government grants subsidies of varying amounts according to the importance of the works and the practical results expected from them. Speaking generally, the cantons are given a free hand. They apportion and organize the different phases of the operations, granting also to the parties concerned (private persons, syndicates, corporations or communes) subsidies of varying amounts. The greater number of cantons legislate independently of the Federal Council on the subject of land improvement. Special services have been established by the Federal Government and the majority of the cantons, directed by rural engineers; these are responsible for everything relating to the initiation, management and superintendence of the enterprises.

The Decree of 1884 was superseded by the Federal Law of December 22, 1893 (improvement of agriculture by the Government) amended on October 5, 1929. No change was made in the general trend of the original legislation on this subject; the principle of limiting the subvention to 40 per cent. was maintained, but provision was made that exceptionally and when required the Federal Council might grant a subsidy up to 50 per cent. of the total cost of the work to syndicates and corporations on behalf of undertakings to which the cantons or communes do not contribute, or contribute less, on condition that the works were satisfactorily carried out.

The Federal Government may grant subsidies for the following undertakings: (1) reclamation; (2) canalization and regulation of the course of streams; (3) irrigation; (4) re-parcelling of the land; (5) roads and bridges; (6) transport by rope lines and funiculars; (7) the bringing of water to mountain pasture lands or to isolated farms in the mountains; (8) land settlement in remote country districts (including the supply of water, light and electric power); (9) byres in mountainous districts; (10) chalets and premises for the manufacture of goods; (11) clearing: (a) cleaning and removal of brushwood, etc. (construction of terraces); (b) raising the level of land; (c) levelling; (12) fencing on mountain pasture land; (13) installations for the utilization of manure on mountain pasture lands: (a) manure pits; (b) installations for distribution of liquid manure; (14) electric light and power conductors in mountainous regions.

Land improvement legislation was rendered easier by the insertion in the civil code, in force since 1 January 1912, of certain restrictive measures as regards ownership whereby excessive division of land was prohibited. It is also enacted that whereas only the community of the landowners interested can carry out the improvement, those in the minority must comply with the wishes of the majority.

Thus Switzerland is now evolving a definite policy in respect of land improvement; the laws which have been passed and the very wide interpretation that has been placed on some of them make it possible to adapt Government intervention and grants to the very variable conditions of the different regions.

As an example of this adaptation to regional conditions statistics are given below of the drainage of the plain of the Rhône, in the canton of Valais. (1):

Years	Areas concerned	Total area	Total cost	Cost per ha.
		ha.	francs	francs
1918-36	Plain of Viège-Rarogne	720	2,913,737.05	4,046.85
1930-39	„ „ Tourtemagne	344	231,749.75	673.69
1933-38	„ „ Uvrier-Bramois	240	650,000 —	2,708 —
1920-38	„ „ Sion-Riddes	1,200	2,360,000 —	1,966.65
1918-34	„ „ Riddes-Martigny	1,200	5,309,350.93	4,424.45
1910-24	„ „ Leytron-Fully	708	2,026,747.47	2,862.63
1931-41	„ „ Monthey-Le Lac	2,230	1,500,000 —	672.64
	Total	6,642	14,991,585.20	2,257.08

THE UNITED KINGDOM.

Reclamation of water-logged lands has proved of the utmost importance for agriculture. Hence soil drainage was the subject of comprehensive legislation, especially in the XIXth century. The Act of August 6, 1861 remained

(1) Forwarded by the Department of Public Works on July 7, 1938.

basic in this respect for a long time. By this Act, the Government was empowered to establish Land Drainage Commissions in any district, on the proposal of the Enclosures Commissioners, following on an application from land-owners representing at least two thirds of the district in question. These Commissions made provision for the upkeep of existing works, for the establishment of new works, installation of machinery, supply of water both for live stock and for irrigation, for the negotiation of loans, for the levying of taxes, for the reimbursement of expenditure, etc.

By virtue of the new measure of July 30, 1918 (Land Drainage Act), the Land Drainage Commissions could be set up not only on the application of the landowners concerned, but also on the proposal of the County Councils within whose area of administration the lands were situated. By the Act of 1918 a phase of more marked State intervention began; the Ministry of Agriculture is virtually empowered to draft drainage schemes, both on the technical and the financial side, whenever improvements can be applied ensuring to the area in question an additional value greater than the costs of carrying out and maintaining such improvements. The scheme had to be made public, and the landowners concerned had the opportunity of submitting their observations which had to be taken into consideration before the scheme could become definitive. For the execution and maintenance of land drainage work, all the functions of a Land Drainage Commission were conferred on the Ministry by the Act of 1918. Reimbursement of the maintenance expenses may be effected by summary methods; but landowners who so desired could be granted the right to pay by instalments.

The Land Drainage Act of August 1, 1930 ⁽¹⁾, which was the outcome of the enquiries made by the Royal Commission of Land Drainage, completed the organization in this respect, and marked the beginning of a new period in the history of land drainage in Great Britain. The land drainage areas are now marked off and organized in drainage districts; over each of these is placed a Land Drainage Committee which is a corporate body, with technical and administrative powers.

The most important innovation however is the constitution of Catchment Areas with their Catchment Boards, the purpose of which is to undertake and maintain all operations essential to ensure the satisfactory condition and working of all the principal watercourses in certain regions, without which there could be no effective land drainage.

The new measures also make provision for direct State subsidies in certain cases.

Mention may be made here of the Agriculture Act of July 30, 1937 ⁽²⁾ which is intended "to assist farmers to increase the fertility of their land by the application of basic slag", and by means of drainage. The means contemplated

⁽¹⁾ ANNUAIRE INTERNATIONAL DE LÉGISLATION AGRICOLE, 1930, p. 612.

⁽²⁾ ANNUAIRE INTERNATIONAL DE LÉGISLATION AGRICOLE, 1937, p. 327.

consist actually in the allocation of subsidies. To meet costs of purchase and transport of lime and basic slag, subsidies are granted at the time of purchase, according to the Government's Land Fertility Scheme. These subsidies are to represent as nearly as possible half, in the case of lime, and in that of basic slag one fourth of the farmer's outlay. In regard to land drainage, the Act makes provision for State subsidies to the bodies undertaking the work. Special provisions are applicable to Scotland.

There are also other improvement measures of a more general character. The object of these Acts, the most important being that of 1864, the Improvement of Land Act, is to allow landowners to borrow for authorized improvements, the loan being amortizable by annual instalments constituting a first charge on improved lands. The list of authorized improvements is long and includes not only agricultural operations, such as drainage of lands, supply of water, provision of dwelling houses for farmers, accommodation for farm workers and farm buildings and construction of roads and of fences, but also various other operations essential for agricultural and other purposes. In any case, the special proposals require the approval of the Ministry, by order of which the annual repayment of the loan is made a charge on the land. The loans are not made from State funds, but, as a rule, from private undertakings empowered under the Act to promote the work.

* * *

A consideration of land reclamation as carried out in the countries considered shows that this activity has never been completely abandoned, not even in times of economic depression. This suggests that land reclamation meets certain fundamental needs which, as has been shown, are of an hygienic, economic or social character. Without dwelling at length on the economic and hygienic factors, the importance of which is indeed obvious, we notice at once that the urgency of the economic needs shows itself most clearly where the pressure of population is most intense, provided, of course, that the outlet of emigration is no longer available. A typical example of this is Italy, where the annual increase of population has made it necessary to extend the area under wheat in the reclaimed areas to 325,000 ha. In Italy indeed land reclamation appears as one of the means whereby food production may be expanded to the extent demanded by the increase of the internal demand.

But the economic requirements of a country cannot be met only by the cultivation of food products; industrial products must also be cultivated, and hence it is that these products have been especially cultivated in the reclaimed areas. Undoubtedly the new tendency towards autarchy leads to an increase in the areas under cultivation, areas which must often be won back from the marsh.

The ever increasing attention being devoted to land-reclamation can also be justified on social grounds deriving principally from the desire of land-workers

to gain possession of the soil they cultivate under some form or other of tenancy. Often these desires can only be satisfied by lands regained from swamp and marsh for purposes of colonisation, which thus becomes complementary to land reclamation.

Then again land reclamation is useful from the social viewpoint in that it provides work for the unemployed. Indeed in the public works plans adopted by many States during the depression to fight unemployment land reclamation works always occupied a prominent place.

Yet even when carried out on quite a modest scale land reclamation always needs the intervention of the State. This intervention may take the form of a control of the works or of the granting of financial aid to meet a part or the whole of the costs. The works of private individuals must be carried out according to plans drawn up in advance by technical experts and approved by the State, because they are always more or less closely bound up with considerations of public welfare; whilst these considerations in their turn justify the granting of public funds in the form either of a lump-sum payment or of a meeting of a part or the whole of the interest charges due on the loans contracted to carry out the works. Efforts should indeed be made to secure an ever-greater harmony between the action of the public authorities and of private individuals; and a revision of the laws regarding land-reclamation to adapt them to present-day requirements would seem especially desirable in the countries where this has not yet been done.

This revision should, as far as possible, be accompanied by such a grant of funds as would make it possible for land-reclamation to be carried out to the full extent desired. Finally it should prove possible to direct the savings of the agriculturalists themselves to this form of investment, where they would find both their surest guarantee and their fairest return in the land itself.

For it has been shown that wherever land-reclamation and improvement works have been carried out the gross product of the land has generally increased. In Germany, for example, the utilisation of lands previously uncultivated has increased the gross return by RM 350 per ha., whilst irrigation has increased it by RM 200. In Italy also there has been a noticeable increase in the gross and net product of farms in the reclaimed areas. Furthermore the introduction of more intensive systems of cultivation has led to a great increase in land values. For example, in the farms of the reclaimed zones in Venetia a hectare of land was worth about 2,500 lire before reclamation, whilst it reaches an average value of 10,000 to 13,000 lire per hectare now. Similarly in the reclaimed zones of the south, to the right of the Volturno and of the Sele, before reclamation the lands which served as pasture for buffaloes were valued at about 5,000 lire per hectare; but once these same lands were drained, sown and intensively cultivated they reached prices of 18,000 and 26,000 lire per hectare respectively (*).

(* GIUSEPPE TASSINARI, *ouv. cit.*

In Poland it has been calculated that the average increase in crops resulting from drainage has been 30 to 40 per cent. in the case of the cereals and leguminous crops and 50 to 60 per cent. for market-garden crops; whilst it is now possible to obtain an average of 40 to 50 quintals of good hay from each hectare of improved prairie land.

Quite clearly land reclamation works cannot adequately be considered from the standpoint of the monetary interest of the individual alone, for they are often bound up with hygienic and social interests of far greater importance than the merely financial ones and which greatly add to the vastness and complexity of the problem.

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