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THE APPLICATION OF SCIENTIFIC MANAGEMENT TO AGRICULTURE

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THERE seems to be some confusion among agricultural economists as to the meaning of what has come to be known as 'scientific management' in industry and as to the importance of applying methods of scientific management to farming. Is 'scientific management' to be considered a separate science? And, if so, which are the problems 'scientific management' has to solve in respect to farming? Is there any distinction between the methods of scientific management and those of that applied science, the name of which is familiar to all of us as 'farm management science'?

J. D. Black and his associates, in their recently published book on *Farm Management*, call special attention to the difference between industry and agriculture with respect to specialization by tasks. Concluding their discussion on that point, they state that 'scientific management' has been introduced much more on the larger estates of Germany on which much labour is hired and much of the work is done by gangs or crews, and more recently on the collective farms in Russia. But they finally concede that 'work simplification'—which has come to be used as a substitute term for scientific management in agriculture—may contribute much to easing the labour burdens of the family-size farmer too, and to increase the capacity of his labour force.

L. W. Ries, an outstanding German scholar, in his extensive work *Labour in Agriculture*, published during the Second World War (1943), blames farm management for having developed primarily along the lines of applied economics. According to Ries, treating the problems one-sidedly from the viewpoint of production costs resulted in an undue scarcity of studies dealing with the technical side of management. Likewise studies dealing with the human factor were neglected even more. That there is good reason for farm management being challenged on this ground seems to be practically admitted by A. W. Ashby.

In his paper 'Management in British Agriculture, with special reference to Management in Large-Scale Farming', presented to

the Eighth C.I.O.S. Congress in Stockholm this summer, Ashby says:

'During the last twenty-five years there have been a few British studies in management in the more technical sense in which the term is used in industrial management. . . . Studies of greater and wider interest in the financial structure and results of farming provided broader bases for critical and constructive approaches to problems of farm management and exercised far great influences on practices.'

In a preliminary report of his recent special investigation into systems of management in large-scale farming, Ashby states that research investigations more frequently apply their calculations to new crops and enterprises than to new techniques in already established enterprises. Perhaps a brief review of the development of scientific management as applied to farming may help us to settle this controversy.

There is no question that the application of scientific management to farming is much younger than the applied science of farm management; though the French claim to have started with it as early as 1600. According to them the beginning of scientific farm management goes back as far as Olivier de Serres, who is called the father of French agriculture.

There is certainly much exaggeration in what the French claim. At least we might as well argue that there is no reason why Thaer, Thünen, and the respective fathers of agriculture of divers nations should not be equally referred to as pioneers of scientific management. But there is some truth to be found in the French statement. The French, as a matter of fact, never developed a farm management science of their own as did the Americans, British, Germans, and other nations. Instead they got more interested in technical problems of management and this interest may be traced far into the past.

French investigations on the technical problems of management were for a long time distributed among different technical bulletins dealing with general agronomy, animal husbandry, animal nutrition, and so on. And thus they could not be of great value for building up a science of farm enterprise on an international scale.

But as soon as the principles outlined for industry by Frederick W. Taylor were recommended by the U.S.A. Interstate Commerce Commission (1910) and supplemented by Taylor's associates, including Henry Gantt, Carl Barth, Harris L. Cooke, and the Gilbreths, the French became eager to follow in the steps of the Americans. Their interest concentrated originally around business administration. It

was Henri Fayol who outlined and defined for the first time different functional groups in the operation of any enterprise, including both large and small family-sized farms. The functional groups he defined are: production, marketing, finance, insurance, accounting, and administration respectively.

Despite the great interest the French have in studies of technical management problems, they cannot pretend to have made the first organized effort to promote such studies for the benefit of agriculture. Instead, the Germans were the first. May I cite, certainly as an unprejudiced witness, a publication of the French Institute for Scientific Management of Labour, issued just after the Second World War, under the auspices of the French Government (Ministry of Agriculture)? There we find (p. 42) the interesting assertion that independent action of individuals was responsible for the realization of aims of scientific management in France as far as agriculture is concerned prior to the Second World War. Investigations were confined, respectively, to lowering costs of production by employment of machinery (started in 1915 by Dr. Javal and M. J. Fangeras), to analysing farm accounting results, and to developing labour-saving devices following the principles outlined by Frederick W. Taylor. Farm accounting research was initiated by M. Petit and Henri Girard and development of labour-saving devices was started by Professor MacRingelmann, both not earlier than 1926.

At the same time, we notice on p. 33 of the French publication mentioned above that Dr. Seedorf, University of Jena, Germany, at the close of the First World War had already called the attention of his country to the necessity to apply the principles of Taylorism to German farming. From application of these principles he expected much success in trying to allay the privations resulting from the war. And he then suggested the creation of a special Institute devoted entirely to research of labour methods along the principles advocated by Frederick W. Taylor.

Following the suggestions of Seedorf and due mainly to action on the part of Professor Falke, Leipzig, the first Experimental Station for Farm Labour was founded in 1920 in Pommritz, Saxony, and the second one in 1927 in Bornim, Prussia. Dr. G. Derlitzky and Dr. L. W. Ries became the leading scientists and heads of the respective Institutes. Problems concerning labour both from the business and technical viewpoints were to be studied.

May I remind you that a paper on 'Methods and Results of Research Work on the Efficiency of Human Labour on German Farms' was presented to this Conference on the occasion of its second meeting,

held in 1930 at Cornell University. That is where I find the following statements :

'Methods of job analysis have long been effectively employed in German industry. However, the possibility of employing similar methods as a means of increasing the efficiency of labour in agriculture has been overlooked by German farmers, and as I have learned since coming here [i.e. U.S.A.], by American farmers as well.'

And farther on :

'There are wide differences in the way in which the same farm operation is performed in different parts of Germany. This is true to a lesser extent in the United States. Some of these differences are due, of course, to differences in natural conditions. However, for the most part they appear to be largely due to the fact that farmers in the various parts of the country have merely become accustomed to performing a given task in a certain way, and continue to use methods which their fathers used before them.'

L. W. Ries, in his previously mentioned book, gives evidence enough for the correctness of the latter statement. We shall confine ourselves here to only one of the numerous examples he mentions.

Whether we shall perform the task of harvesting, say, wheat by using a scythe, a reaper, a binder, or a combine, will depend primarily upon which pays under given conditions. But taking it for granted that we choose the scythe as the most economical implement, we are still confronted with the problem of which of the diverse types of scythe should be used. According to Ries, Germany alone possesses about 1,500 types of scythe, differing in length and width of the blade as well as in the grip (handle). But of the 1,500 types, only two proved to be satisfactory and efficient under present conditions. All the remaining ones were just a survival from times long past when any region, and sometimes any village, developed its own type of scythe. Nevertheless farmers were still using all these types as their fathers and grandfathers used to do.

Examples of farmers sticking to old-fashioned methods, due to traditions that have become obsolete, might be multiplied almost at will. They are very common with the smallholder in the old settled countries. And at this point we raise the question as to whether methods outlined by Taylor and his followers correspond to the needs of farming in general or rather to large-scale farming!

I think the answer to this question has been partly given already. But in addition let us raise some other problems concerning primarily the management of smallholdings.

One of the weakest points in management of family farms in

practically any country on the European continent, a problem unknown to the Anglo-Saxons, is the considerable employment of farmers' wives and children in farming. In most cases they seem to be badly overworked. Unfortunately we lack investigations going deeply enough into this subject and at the same time covering a large enough number of farms to get a sufficient basis for generalization. But relying upon some research monographs from Würtemberg and Saxony and on some preliminary studies made in my department at Cracow, we may distinguish three lines in which farmers' wives used to be engaged. These are, respectively: first, looking after the farm livestock (cows, pigs, and poultry); second, home management, including cooking and taking care of the children; and finally doing some seasonal fieldwork, particularly at harvest time, along with some regular work in the home garden.

The percentage ratio between the three lines in question seems to vary considerably according to the size of the family. The more children the less fieldwork, of course, does not make one surprised. But what strikes one is that with the enlargement of the family it is not the upkeep of livestock which has to suffer. It is the home management and upkeep of children. Constant employment in the cow-barn apparently goes on at the expense of carrying out the main job of a wife with reduced time and less care. What should be undertaken to ameliorate these conditions and to improve the situation of the farmer's wife? Here is where the human factor enters and calls for at least as much attention as is being given to shortening hours of factory workers. And the problem lends itself to solution by developing the technical side of management to which rightly or wrongly has been applied the term 'scientific management'.

A somewhat related problem consists in seasonal fluctuations of labour requirements during busy work periods. These fluctuations may have a great effect on seasonal unemployment on the one hand and on seasonal overworking on the other hand. Careful studies of seasonal labour requirements of cropping systems and rotations in diversified farming areas—as demonstrated by R. Weber, Pommritz—may be of great assistance in the rationalizing of labour on small farms. Where no shifts in the acreage devoted to particular crops are practicable, such investigations help the agricultural instructor (county agent) to assist the farmer in figuring out whether it would be worth while in individual cases to employ a machine to reduce possible peaks of labour requirement. Similar studies may be directed towards increasing the efficiency of feeding and even of manuring.

The adaptability of methods of scientific management to small-

scale farming might be supported by further proofs. But let us not lose any time on discovering what—it may be said—has been discovered some time ago. Let us rather return to the general theme of my paper.

Using again as a reference the publications issued in 1945 by the French Institute for Scientific Management of Labour, we may confirm the following statements:

Following the first and second International Congresses of Scientific Management at Prague (1924) and Brussels (1925) respectively, and following the foundation of a permanent International Institute of Scientific Management, Belgium provided for a special agricultural section within her national committee. Several other countries followed, some of them even creating independent institutes for carrying out investigation on the principles outlined by Taylor.

In 1924 Russia started an institute of scientific rationalization of labour in the region of her most important sugar-beet plantations (Kiev, Ukraine). Here the physiological and hygienic side of labour rationalization seems to be of greatest concern.

In 1924-6 four northern countries, i.e. Sweden, Finland, Denmark, and Norway, founded special societies for initiating studies on technical problems of farm management. At the same time leading representatives of farm management of the respective four countries reached an agreement for mutual aid in carrying out investigations. Advancement of research on labour problems was made one of the prime objects of the agreement. Labour time studies, tool investigations, and labour efficiency studies, both in agriculture and forestry, were particularly encouraged by the Finnish association for promoting studies on the productivity of farm labour. The Swedish association for developing technique in agriculture assisted in carrying out similar studies. But it seems to be primarily interested in normalization movement and in promoting labour-saving devices and adaptation of modern machinery and electric power to small and middle-sized farms. The latter were the prime object of investigations carried out by the Swedish Institute of Agricultural Engineering, High School of Agriculture, at Ultuna, near Uppsala.

Due to Professor Adamiecki, a pioneer of Taylorism in Poland, a special agricultural section within the Polish Institute of Scientific Management launched in 1925 exerts a vivid activity. It is visibly manifested by adopting Adamiecki's harmonograms, corresponding to Gantt's charts in industry, for planning in advance current farm-labour requirements and later checking them up with labour which was spent for the particular job. Adamiecki's harmonograms are

certainly very useful in managing large-scale and experimental farms. And they have recently become subject to a considerable improvement by Jean Piel-Desriusseaux, managing director of the newly created (1945) French Institute for Scientific Management of Farm Labour. Moreover, this improvement indicates that the harmonograms are capable of application to small-scale farming.

The pre-war activity of other national groups of the International Institute of Scientific Management was demonstrated on the occasion of the following five International Congresses of Scientific Management respectively: Rome 1927, Paris 1929, Amsterdam 1932, London 1935, and Washington, D.C., 1938. Some useful contributions to our knowledge of technical management problems were delivered at almost all of those meetings. But a careful study of the respective reports reveals that technical problems of management were constantly mixed up with business problems, which resulted in a gradual increase in confusion as to what should be called scientific management of labour as distinguished from farm management. And one becomes constrained to admit that such a divorce is quite unnatural.

And then we arrive at the Second World War.

The interest in purely technical problems of management rises along with the growth of planned economy and perhaps even more along with state intervention and planning directed by non-economic reasons like waging wars. With the Germans invading their neighbour countries and introducing to them the policies of a totalitarian state, we notice three points of prime interest with their scholars dealing in agricultural economics. These are respectively:

1. Building up of efficient chains linking the entire agricultural production to make it a really working wheel fitting into the system of a planned war economy.
2. Building up of a compulsory farm accounting system suitable for supervising production.
3. And, last but not least, introducing scientific methods to get the highest yields with a simultaneous material lowering of labour requirements enabling the economy to draw freely on the stored-up surplus power of human energy.

It is not a pure accident that Ries had become the head of the Labour Research Department within the Polish Scientific Institute of Agriculture in Pulawy under German Occupation. His standard work on *Labour in Agriculture* bears a signature which is an unmistakable proof that it was finally accomplished in occupied Poland. And the Introduction bears witness that it was done primarily for the benefit of Hitler's régime.

But Germany was not the only centre confronted during the war by technical problems and particularly by the labour problem. All belligerent nations were. Fortunately the Allies understood the necessity of making extensive use of the methods of scientific management. The war gave the latter a real opportunity.

'At the request of the War Department [we read in the paper "Progress in Industrial War Simplifications", presented by A. H. Magensen, H. B. Maynard, and D. B. Porter] thousands of officers and men in the South-west Pacific and Mediterranean theatres as well as in the United States were able to apply the principles of work simplification to the elimination of millions of man-hours of work in loading and unloading ships, warehousing in various depots, and welter of paper work, and substantial reductions were made in the time required in communications.'

And D. M. Braum, U.S.A. Department of Agriculture, in his report to the Eighth International Congress of Scientific Management, writes: 'During the war the farmer operated under tremendous pressure. This pressure came on the farmer from all sides.' How did he manage to face it successfully? 'The National Farm Work Simplification Laboratory established late in 1942 at Purdue University at Lafayette, Indiana, succeeded in developing a broad programme of farm work simplification.' The paper read before this Conference by a representative of the laboratory makes it superfluous to discuss here in detail what I call the renaissance of Scientific Management methods in American agriculture.

We must wait and see which of the war experiences will prove to be of durable value under peace conditions. Some may fail. But we may reasonably expect that many of them will continue. Some reports presented to the International Congress at Stockholm are already demonstrating this.

But does this support the claims that study of technical problems of farm management and particularly of the labour problem—as Ries is emphasizing it—should be considered as requiring a separate scheme, divorced from farm management schemes? I do not see any reason why. Any improved technical method must formally be subjected to the judgement of how it affects returns, though not necessarily aiming at the highest returns, to the farmer as employer.

Thus I am rather inclined to call scientific management a movement—like the co-operative movement—a very important movement though it certainly has become, and what we as representatives of farm management schemes particularly learn from the scientific management movement is to investigate management problems less one-sidedly. Investigations into technical management problems

cannot be carried out exclusively for the benefit of the farmer as employer. Studies on benefits for the employee in a broad sense—including the farmer's wife and children—must go alongside.

I learned while in Sweden that one of the most important management problems they are confronted with there at present is the problem of substituting machinery for hand-milking on small farms. It certainly does not pay to use a milking-machine on a farm with a herd of five cows only, but it is the human factor—keeping the daughters on farms and allaying the burden of the farmer's wife—which nevertheless calls for it.

Rehabilitation of highly devastated countries may raise many problems to be solved by improving the technical side of management. In our country, for instance, milk has long been the cheapest source of protein feed for hog litters. But with dairy cattle at so low a level there is the great danger of infants being undernourished. Then shifting to fish-meal must be recommended even if it might be more expensive for a while.

Finally, I wish to recommend as follows: What has come to be known as applying scientific management in agriculture may become a separate subject of teaching like farm accounting, co-operation, and so on. And we can afford special institutes of scientific management to be run as in France. But study of the technical side of management should nevertheless remain an integral part of farm management schemes, and its methods must fit in.