
Machinery--Capitalization, Organization and Management [and Discussion]

J. G. Jenkins and F. Coolman

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Machinery – capitalization, organization and management

BY J. G. JENKINS

Childerly Hall, Dry Drayton, Cambridge

Return on capital employed is the most important yardstick of efficiency for the farming business – as for any other business. Machinery is an increasingly large factor in this ratio and must be treated accordingly.

Substitution of machinery for labour will continue, but a proper investment appraisal should be made before accepting any proposition too easily. What is the return needed to justify this exercise? What are the facts of economies of scale?

Budgeting is an essential for adequate control of costs and for adequate control of capital spending. How far should machinery costs be broken down for analysis? What are the alternative systems of mechanization, for example, cooperation, contracting, etc.? There is need to think of farming systems as a whole when thinking of mechanization.

We are now moving from the problem of economics in farming to the sociological and environmental problems in the broadest sense. The situation in the 1980s are considered in relation to this and to the questions posed.

We are becoming more and more aware that there are yardsticks other than economic ones in business life today. I would like to come back to these later. But let us at least start the easy way by having a look at the economic criteria involved in machinery use. Because it might be reasonable to assume that a machine has less of a soul than some other of the ingredients in the costs make-up of farming today.

Capital consideration

The two most important inputs into any business are capital and labour. Any measurement of economic efficiency must therefore be related to these two inputs. Machinery has enabled us to increase output per £100 of labour quite dramatically over the past 30 years, and we are rightly proud as an industry of our record of increasing productivity – particularly relative to many other industries. But this is not an entirely satisfactory efficiency ratio. Because what if this increased productivity has been achieved at the cost of enormous capital input? Then we would not see nearly such an attractive picture.

In fact it is not possible to pick out any one ratio as the final indicator of efficiency; but I believe Sir Arnold Weinstock – and others! – are right in thinking that the most important ratio is ‘Return on Capital Employed’. As an industry we are guilty of not taking sufficient heed of this ratio. We think too much in terms of return per hectare – a nice simple (and not valueless) figure. But efficiency does not necessarily lie with high returns per hectare, nor inefficiency with low returns per hectare. Likewise, efficiency does not necessarily lie with low costs per hectare, nor inefficiency with high costs. Ideally of course, we would all like to see low costs and high returns. But, failing that impossible ideal solution, let us be prepared to concentrate on return on capital employed. By that I mean one’s own, or the shareholders, capital employed in the business. And, as I am not giving a talk on financial control as such, let me state, without substantiating the reasons for it here, that that rate of return needs to approximate to 25 % before tax.

I am sorry to have spent some time on what might be regarded as a non-machinery topic, but it is essential to establish overall financial objectives and criteria before discussing the

financial side of machinery. And, after all, that must be what machinery purchase is all about unless we are going quite mad in our desire to keep up with the Jones.

Using the desired objective figure of 25 % set out above, it is now possible to set out the calculation for the objectives involved in purchasing machinery. It is just not good enough for management to go out and buy new additional machinery (not new replacement machinery) without trying to make sure that there is going to be a 25 % return in it on your capital employed – after allowing for running costs, depreciation and for any gearing.

A typical calculation for assessing the necessary increased profitability after allowing for running costs and depreciation might then look like this, expressed as a percentage of the initial cost of the machinery:

(1) 10 % interest on the borrowed half of the initial capital	5 %
(2) 25 % return on one's own half of the initial capital	12.5 %
total	17.5 %

But, taking into account that the asset is being depreciated over the life of the project, these returns could be crudely reduced to half rate. However, this takes no account of the discounted cash flow factor involved, or of the fact that the asset is unlikely to be depreciated to nil over the period, and so our own calculation for practical purposes ends up as follows:

(1) 10 % interest on one third of the initial capital	3.3 %
(2) 25 % return on one's own third of the initial capital	8.3 %
total	11.6 %

This figure might vary slightly according to the expected cost of borrowed money and the period and amount of budgeted depreciation, but that is the sort of exercise it is essential to go through before purchasing additional machinery, and, may I add, it is equally essential to come up with the answer that the machine *will* provide this sort of return before making the purchase. It sounds obvious. It is obvious. But how many of us do it?

And how many of us take into account the further consequential capital expenditure which one purchased item can so frequently bring in its train? For example, a new larger combine will often require larger capacity intake pits, elevators, etc.

Inflation

All this is frightening enough in itself. When inflation is added into the equation, the exercise becomes truly terrifying. But obviously it must be taken into account. I am glad to see that the accountancy profession is at last coming up with some suggestions how depreciation should take account of increased monetary replacement values because of inflation. I am not at present informed of what these are. My own crude suggestion is that if inflation is not controlled at around 5 % levels, we should need to think in terms of a necessary 30 % return on our Capital Employed rather than 25 %. This would at least perhaps allow the position not to deteriorate.

As labour becomes a more expensive input in relation to output, so the need and justification for increased mechanization grows and becomes more apparent. But you may well ask where the capital for this increased mechanization is going to come from. If any business is to survive in the long term, the answer is that the capital must come in substantial measure from the retained profits of the business itself. It is for this reason – among others – that the figure of 25 % return before tax on capital employed is necessary and not over-generous. I cannot emphasize

too strongly that this 25 % return on capital employed is an essential key to the continuance of a thriving, successful business.

Financial control

The need to achieve these necessary targets makes budgeting essential. It is no use just piously hoping that somehow the accounts will in due course show that the necessary profit has been achieved over the past year. Expenditure and income must be planned in advance to achieve the objectives and machinery costs play a vital part in the calculation – particularly capital expenditure. This is one area of expenditure where manipulation is possible in significant quantities, both to achieve a desired profit, and to keep within the negotiated limits of a bank overdraft.

It is always fascinating and necessary for management to try to find out if their own expenditure in any one area of operations is in line with what is essential to the business and/or in line with that of their competitors – their fellow farmers. It is not always easy to get at external comparisons, although it is sometimes possible and is always rewarding – to both parties. What is often possible is to compare physical work rates with a like operation, and from this much can be deduced.

Apart from this, however, there is one other form of comparison which is always available to anybody at any time, and that is the internal comparison, comparison with one's own targets and one's own past performance. It is always immediately apparent through this method of analysis if expenditure in one branch of the operation is rising out of proportion to the rest, and then take searching remedial action if it is. Once again it is worth remembering that machinery costs per hectare do not mean much by themselves. Labour and machinery costs together are better; but a yardstick of labour and machinery costs together, related to output, is better still.

It is always difficult to know how far to break down the components of machinery cost: for management purposes of course the more the better, but to go too far can be a very time-consuming, and not always very rewarding chore. Costs must of course be broken down into major components, but our own feeling is that they should only be broken down into great detail when it is apparent from the initial breakdown that one of the major components of cost is going seriously wrong.

Some people may say – what is really the use of budgeting for a proper and acceptable rate for, say, machinery repairs; because, if they start to exceed that figure, what can you do about it? You cannot refuse to buy a part to repair a combine-harvester in the middle of harvest just because your repair costs are going over budget. That really *would* be cutting off your nose to spite your face. Well, that is true, but it is equally true that you cannot as a manager just shrug your shoulders at soaring machinery costs and say 'I am sorry, but that's the way it is, so that's the way it's got to be' – not if you want to stay in managerial circles, that is.

Once the budget forecast and actual figures show there is a problem, it is possible to do something about it in the longer term. We ourselves have over the years through this mechanism pinpointed – and done something about as a consequence – excessive expenditure on electricity, on tyres and of course on machinery capital expenditure. Who has not had to do something at some time or other about this last one?

This brings us on to the old argument about new or old machinery – high depreciation costs and low repair costs with new machinery, and vice versa with old machinery. Our own experience is that it does not matter all that much which course you follow. You will get about the same high costs whatever you do. But there is just one factor that many people overlook. With

new machinery there is more capital invested in the business. So, not only does the new machinery have to throw up an absolutely lower cost than the old machinery, but a sufficiently lower cost over and above that to improve the rate of return on the greater amount of capital employed. My own feeling is that it is worth while sensibly buying new machinery that introduces a new and better system of farming, or that clearly reduces another cost (usually labour), but that it is not worth while replacing old machinery with new just for the sake of having new machinery, not until the old machinery is really old.

Size of enterprise

Inevitably machines are going to get larger, and, broadly speaking, once they are operating effectively, bigger machines will reduce the costs of an operation. This is not because the capital cost or the running cost per hectare are any less, but because the labour cost is reduced. Three second-hand combines will cut as much corn as one new one and the machinery costs per hectare are very similar. But in one case the job is taking three men, and in the other case, one man.

So there are economies of scale, but perhaps not to as great an extent as some people would have us believe. On the one hand, at the bottom end of the scale, there are real economies which are often not made apparent because of the peculiar system A.D.A.S. have of talking of income in terms of 'management and investment income'. If the management cost – or, in the case of the smaller farmer, the total labour cost – is not taken properly into account, the smaller operator appears to be fully as efficient as the larger, often even in ridiculously small units. Here there is a real advantage of scale which is not being properly exposed, or even understood, it would seem, by many people.

But, on the other hand, at the top end of the scale, the advantages of scale are often more apparent – more satisfying to the ego? – than real. Parkinson's Law operates very efficiently. Secretarial costs, managerial costs and overheads of all sorts – all absolutely essential of course – pile on, one on top of another. If you doubt me, just look at the return on capital employed of some of the major national companies, and then look at your own. But do not let it leave you feeling complacent, but rather humble. To lay down a broad precept, my own feeling is that once an enterprise has become large enough to justify the purchase of the largest machinery in its field, it probably will not get much more 'efficient' by getting larger.

And this is where the smaller operator can make use of two tools to help him, cooperation and contracting. As productivity per man increases through the use of larger machinery, so the minimum justifiable size of enterprise must increase and cooperation cannot stop that happening. But what it can do is to allow the smaller farmer in conjunction with his colleagues to enjoy the benefits of the large machine through cooperative ownership, provided the basic size of their units is keeping their labour cost (their own cost) down to approximately the same as that on the larger unit. For example, let us assume that a 400 ha (1000 acre) farm justifies one large new combine and four men. Cooperation cannot really help 10 farmers with 40 ha (100 acres) each to purchase that combine, because their resultant labour cost is still too high, but it can help four farmers with 100 ha (250 acres) each to be just as efficient as the 400 ha farmer.

Similarly, contracting in its way can be equally useful to large and small farmers alike, in bringing in the benefits of large specialized machines at a reasonable cost. If you have labour available at off-peak periods, it is of course often possible to make use of it to do what would be a totally uneconomic job if the labour could have been more profitably employed; but so often today the capacity of really good modern machinery can offset this initial advantage. The

use of the specialist ditching and drainage contractor, or the ready-mixed concrete supplier are two examples that spring to mind.

General considerations of organization and management

And this does bring me to the obvious point that the best use of machinery, the lowest cost of machinery, is obtained when the whole year's farming is fitted into a system which allows the most productive use to be made of machines (and men) over the longest period. You do not really want a fantastic peak demand for 3 months in the autumn and then under-utilization for the rest of the year, even if it is what in practice you have to work round. But there are things you can at least think about. Wheat and sugar beet do not go so well together as barley and sugar beet for example. Winter rape follows better behind winter barley than spring barley, and both help to make the harvest start sooner – and spring beans help to make it last longer if you happen to want that too. My experience is that you should either aim for high output, high cost crops all the year round, or concentrate on low output, low cost crops. If you try and mix the two systems, you usually end up with high cost, relatively low output systems which do you no good at all.

What are the advantages, if any, of employing one's own mechanic? We have always firmly resisted the temptation. By the time you have paid his direct labour costs, paid for all the specialist machinery he needs to operate, paid for the stocks of materials he needs, paid for the outside specialist mechanic to come in and sort out the sophisticated machinery which your own mechanic cannot cope with anyway, where have you got to? We find it better to get our own tractor and combine drivers to be trained to the extent of doing their own simple repairs with some simple equipment, and buy in outside skills for the rest.

What should be our attitude to shift-working? I cannot make up my mind about this one. There is a clear case for it. With cultivating machinery costing up to £6000, it seems to be madness not to be working it for 24 h a day; not because the running costs will be significantly less per hectare but because the capital employed costs per hectare will be significantly reduced, and, as capital costs per hectare grow relatively more and more important, so the potential saving becomes more and more important as well.

But on the other hand it is not really so easy to organize work or plan for contingencies on a rain-swept field at 3 a.m. in the morning as it is on a well-lit, well-heated factory floor with plenty of colleagues and management around to deal with the problems as they occur, and to make the social environment of life in general more possible at that time of the day. And is it really a progressive or a retrogressive step in this enlightened day and age to expect men to work all through the hours of darkness and sleep through the day? I do not think I would like to do it myself as part of a *routine* way of working. Should that be sufficient answer?

The importance of tactical management

Perhaps a better way of trying to get the best out of our machinery is through more efficient organizational management at the tactical level. I always find it difficult to find the right words to use when talking about this particular subject. I sometimes use the phrase more ruthless management. But this does not mean ruthless in the sense of not caring about the men involved, driving them on regardless – far from it. It means ruthless in the sense of driving single-mindedly for the objective of the moment, not being distracted by all the temptations to do something else – or allowing other people to be distracted. It means organizing tactical

systems to get the top outputs out of men and machines at the vital peak periods. It means always being ready to start on the vital job first thing in the morning, being eager to start combining 15 min before you should. I believe this is one of the few important things this paper is trying to say. Some farmers achieve what seems to be fantastic outputs at the vital times. They do not achieve it by accident or luck; they achieve it by really first-class tactical management. We would do well to study them and their methods, and, as well as admiring them, realize that we too can achieve their outputs if we are prepared to think through our own management techniques.

I talked earlier in the paper about budgeting for financial targets in order to make sure of reaching them. Should we not be more ready to use the same technique to make more sure of achieving physical targets? We all know that manufacturers' estimates of the possible work-rate of their machines are inclined to be optimistic. But so often we seem to fail to achieve over a period what we really know ought to be possible. I am not talking about multiplying 1 h ploughing output by ten, say, to get the correct output for a day. But rather working out how much a ploughing outfit should plough in a day on average, dividing it into the area to be ploughed, and so getting the number of plough days required on the farm. Do this with all your operations and you suddenly find that you have twice as many men and tractors than you should need. Alright, I know it's not as simple as all that, but maybe it should not be quite as bad as it usually is either.

To achieve good work-rates, I believe one ought at least to plan out work targets more definitely, more theoretically if you like, make more use of the concept of labour and work profiles, and then do one's utmost not to be beaten off these targets more than possible by the whims of the weather and the soil, breakdowns or anything else. Having said that, of course, I do realize that some soils are more amenable than others. But it is amazing how, if the plan is correctly worked out, making proper allowance for contingencies, resources can be dovetailed and fitted in to achieve the desired overall pattern over the season as a whole. The great thing is for management to set out determined to get the maximum out of men and machines. But is determination enough? Wouldn't it help us in our frailty if we made more use of physical work rates and physical work targets?

I said that 'ruthless' was probably the wrong word to use to describe these more efficient management attitudes. The trouble is that 'efficient' is such an all-embracing, colourless, over-used adjective. But ruthless is the wrong word because it has the connotation of riding rough-shod over people; and nothing could be further from my thoughts. If machines are important, the men who operate them are far more important in every possible sense of the word.

Labour involvement

We have got to make the best use of machinery and the only conceivable way to do that is to involve the operator with the best use of that machinery. Here is another facet of that management technique that I find it so hard to put into words. In the older, simpler days, the problem hardly existed. The rural community was virtually self-contained; the single farm was almost self-contained. The unit was small; the farmer was himself part of the work force; the machinery was simple. The workers could all clearly see what the objectives were; they were all bound up together with the achievement of those objectives. There may have been economic and technical problems; there may even have been problems of survival; but the sociological problems of communication and involvement hardly seemed to exist.

Very different is the situation today – particularly outside farming. But even in our industry we face these problems as units become larger, and management becomes less involved with the actual physical work on the farm. I confess that I am not sure what the right solution is, but I do believe that for the general well-being of agriculture, and, particularly in the context of this paper, for the efficient use of machinery, we ought to be involving our workers more directly with the objectives – both long term and short term.

For the short term, there are all sorts of incentive schemes – none of them that I know of that are completely satisfactory. But everybody does get tremendous satisfaction from feeling and knowing that they have achieved or surpassed targets which they have either set themselves or had set for them by others. Is there not more scope for making use of this psychological facet in our make-up? Should we not make more use of an incentive to achieve known physical work targets to get the most out of our machinery and labour – in the best sense of the word ‘most’ – and in the mutual interests of workers, management and capital alike. With more liberal use of physical work targets, it would be possible to make use of internal and external comparisons to achieve optimum outputs, again of course in the interests of all involved.

I do not pretend it would initially be easy to introduce such a system. There would be suspicions that it was a hidden and cunning way of exploiting the labour force. There would be great difficulty in establishing the right targets. But of course the whole operation should not be imposed from above but introduced through agreement, and the targets mutually worked out together by labour and management so that people were only trying to achieve outputs which they themselves had agreed on. It would properly need to be made crystal clear that the strategic object of the exercise was not to pinpoint weaknesses in order to harrass the worker or workers involved, but to reinforce strengths and remove weaknesses to improve productivity as a whole; and that the fruits of that productivity would undoubtedly be shared between capital and labour.

Now I know it can be said there is nothing really very original in what I have just said. But we do not seem to have got as yet very far along the road of using this technique. Is it conceivably because our management has not been good enough to organize life efficiently enough to be able to think of its introduction as a practical possibility? Is it also perhaps because we are fearful that the achievement of mere physical targets is only very much part of the story, and that increased physical outputs might well be achieved through higher costs – to the negation of the original objective of a genuine improvement in productivity?

Both criticisms have validity. For the first, we can only hope for a self-critical managerial revolution induced by this paper, or more probably through better and more scientific management training schools and methods. For the second, it has long been my belief that, if capitalism is to survive, we must urgently seek methods of bringing together the interests of labour and capital if modern society is not to dissolve into an anarchic industrial chaos from which will emerge something definitely not in the interests of civilization, which means in the interests of all of us and those that make up civilization. This subject, you may feel with relief, is not within the scope of my paper. But it has real relevance to the problems of machinery management. Because, as I said in the original summary of my paper, we are now moving from the problems of economics in farming to the sociological and environmental problems in the broadest sense. This is a challenge which will make all our other problems academic if we do not meet it and find the answer.

My own inclination in this immensely difficult but vitally important field is to think along

the lines of both separating and uniting the tactical and strategic involvement of labour with the achievement of results. Separating, by limiting the tactical involvement to the achievement of physical targets without direct financial reward: uniting, by making that first objective part of a general strategic involvement of labour with the rewards of capitalism and private enterprise. I realize there are immense difficulties in achieving this solution, not least that of communication and understanding. But all other methods of involvement also seem to have immense built-in difficulties. And at least my suggestion has an overall 'wholeness' about it which appeals to me. Moreover, before rejecting out of hand this suggestion as too idealistic, just think what the ultimate alternative might be.

Conclusion

And so may I conclude by picking out what are to me the three most important things. First, the need for a proper appreciation of the interlinking of capital and machinery and the need to monitor their organic relationship. Secondly, the need to improve management efficiency to evolve tactical systems to make the best use of our machinery. Thirdly, above all else, to establish an involvement and a partnership between capital, management and labour in the mutual interests of all three, because without that we might as well all go home and pretend that all is well and no problem exists.

Having said that, you know and I know how wrong it is to pick one or two things out and say, that is the secret of management. In certain circumstances one dictum may be right, and in other circumstances it may be wrong. Good management requires the bringing together and the blending together in the right proportion of a whole range of ideas and techniques and not being side-tracked into a fanatical obsession with any one. And if to that you add the flair for instinctively picking out the most important ingredient at the right time and place, then you have the quality of management to which we all aspire but so very seldom achieve.

Discussion

F. COOLMAN (*Instituut voor Landbouwtechniek en Rationalisatie, Wageningen, Netherlands*). Farm sizes will increase in area with mainly smaller holdings according to the needed labour output. The typical family farm in Europe will become a real enterprise based on 1½ to 3 full-time labourers from one or two families. Cooperation between two or three of these farms in machinery and labour-use results in work-units big enough to use the main machinery. In a number of countries contractors will fill gaps; in Holland, for example, they are harvesting over 50 % of the total crop of cereals, potatoes and sugar beet. They are playing a very important role in the difficult question of the size of the farm and the machine capacities and their operational costs. A special aspect is the difference between the optimal load of a machine and the maximum capacity. In earlier days there was a reserve in working capacity (working-speed) by using a number of part-time labourers. A same type of reserve, e.g., in periods of bad weather, is now necessary in machine capacity. A 60 to 70 % load of the machine should not be called over-mechanization but good management. Moreover, in most cases machine costs per unit of production are not really higher at 60 % load.

Planning mechanization is a question of planning the whole enterprise. The operational costs (those for labour, machines, other technical aids, contractors) usually about 50 % of the total, are the most important ones in influencing the overall costs. The others – of seeds, fertilizers, pesticides, land rent, etc. – are mainly given data. Furthermore, there is a

strong relationship between labour and machine management on one side and the production plan on the other. This interaction needs special programming techniques, as now developed in different countries in research institutes, and handled as well by the advisory service and by firms. This is not only necessary for bigger enterprises; but also for the development of the often more complex small (or smaller) family farms, growing as fast as circumstances allow.

There is no optimal size for an enterprise; there are many. Dairy cow units of 150–250 seem to be closer to an ‘average optimum’ than 500 to 1000. In arable land-production there is a more straight relation between optimization and increasing size. Contractors can influence this strongly. Cooperation between neighbours can also lead to ‘optimal areas’ sometimes with more profit than contractor-use.