A NOTE ON A WHOLE-FARM "FEED-YEAR" PROJECT

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In 1950 the University of Sydney initiated field investigations of the problem of declining pasture productivity on the red basaltic soils of the Far North Coast of New South Wales. The Faculty of Agriculture Report No. 2[1] indicated that the growth of the summer growing, grass dominant pasture was being severely restricted by a deficiency of available nitrogen and that this deficiency was related to a low incidence of the naturalized white clover. Further it was clear that there were pronounced shortages of high quality feed throughout the autumn, winter and spring. Legumes were sought which would provide useful forage during this later period and also increase the productivity of the summer growing grasses by supplying additional nitrogen.

Research effort seeking these legumes was directed at: choice of the most promising species; finding methods of effectively nodulating these species under the acid soil environment; determining fertilizer requirements; developing a suitable seeding method; defining the time of sowing; studying the effect of insects and diseases on the species; and determining the most suitable management and utilization practices.

Detailed findings are presented elsewhere.[2] By the late 1950s it was considered that sufficient information had been provided to develop an improved farming system for the red basaltic soils area. The system aims at providing a continuity of high quality feed throughout the year (a "feed year") by integrating the production from the most promising sub-tropical and temperate species. The following feed year has been proposed:—

January to June—*Glycine javanica* supplemented by grass.
June to August—Subterranean clover and grass.
August to November—Vetch and grass.
November to December—Grass pastures (unreliable).

This note describes the Whole Farm Feed Year Project which has been designed to give an economic appraisal of this proposed farming system under commercial conditions. The approach used involves subsidized application of the feed year on three case-study farms.

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[1] *Seven Years Pasture Research on the Far North Coast of New South Wales.* University of Sydney, School of Agriculture, Report No. 2 (1959).

[2] University of Sydney, School of Agriculture *op cit.* and *Pasture Research for the Richmond-Tweed Region, Far North Coast of N.S.W.* The Tropical Grassland Society of Australia, Proceedings No. 1, February, 1964.

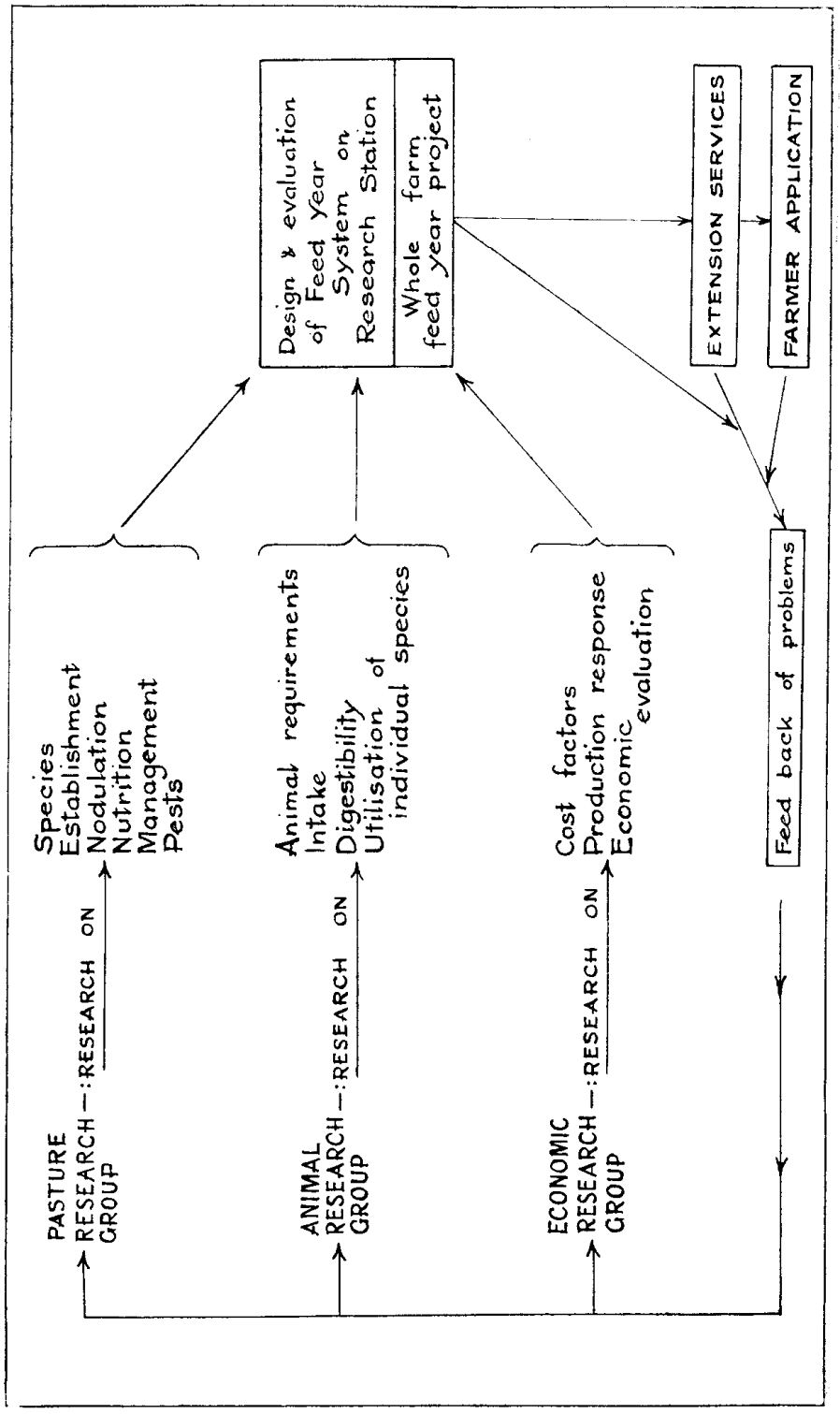

Fig. 1.—A Schematic Representation of the Research Programme at Wollongbar Agricultural Research Station,

There is a growing interest in the concept of the regional applied research centre.[3] The Whole Farm Feed Year Project forms part of a research programme in which each stage of the logical development of the work of such a centre has been demonstrated. The stages referred to are:—

(*a*) description of an economic problem; in this case the farmers' complaints that their incomes were falling with the decline in farm productivity;

(*b*) definition of the technical problem as described at the beginning of this note;

(*c*) development of a suggested solution to the technical problem; and

(*d*) economic analysis of this solution.

The later stages have necessitated inter-disciplinary co-operation of the type envisaged by Frankel.[4] This co-operation is illustrated diagrammatically in Figure 1 which is a schematic representation of the research programme at Wollongbar Agricultural Research Station. The role of the economist, which was also emphasized by Frankel, is illustrated.

PLANNING THE COMMERCIAL APPLICATION OF THE FEED YEAR

Farm management studies have indicated three important points for consideration in commercial application of the findings of pasture improvement research.

(i) There can be a substantial lag between time of initial investment and time when total cash outlays have been covered by extra returns. This lag period can lead to credit problems.

(ii) To avoid disruption of existing work commitments, and too great a loss of income in the early stages of the programme, it is essential to plan a relatively gradual change to the new farm organization.

(iii) Planning of a satisfactory system is not complete until there is some test of its profitability under commercial conditions.

The whole farm project was designed taking these points into account. It was decided that commercial potential should be tested by farm case studies involving supervised application of the plan on a minimum of three farms. But a profit was by no means assured so it was decided that these case studies should involve some form of subsidy. Accordingly, an approach was made to the Reserve Bank and a research grant was provided which permits provision to the farmers of seed and fertilizer, some contract charges, and some machinery on loan. This subsidy is to be accounted as a loan to the farmers in economic appraisal of the feed year plan. The only other assistance provided to the farmers is advice on techniques of pasture establishment and utilization and on farm planning.

[3] O. H. Frankel, "The Farrer Memorial Oration, 1962—The Social Responsibility of Agricultural Science", *Australian Journal of Science*, January, 1963. Also see O. H. Frankel, "Farrer Oration of 1962 (a synopsis)", *Agricultural Gazette*, Vol. 74, P. 1 (January, 1963).

[4] *Op cit.*

Taking account of withdrawal of land during establishment periods, it was considered that spreading the development over three years should be satisfactory on most farms in the red basaltic soils area. Details of this project are given in the following section.

THE WHOLE FARM FEED YEAR STUDIES

No formal procedure can be used in selection of co-operators for a project of this nature. But on experience with an earlier random sample farm-survey,[5] and with the help of the Department's District Agronomists, three farms and the attendant farmers were selected to represent:—

(*a*) the range of climatic and pasture conditions within the area;

(*b*) the typical farm problems of unsatisfactory farm shape and topography and the corresponding difficulties in subdivisional planning; and

(*c*) the range of district conditions in net income levels.

Thus the farms are located in three separate sub-districts of the red basaltic soils area, they all present difficulties in sub-divisional planning and one has areas of unworkable land. The pastures on this latter farm are carpet grass dominated and farm production has declined markedly over a long period. Pastures on the other farms include areas of kikuyu and thus present the typical problems associated with establishing and maintaining legumes in competition with this grass. The case farms are also examples of low, moderate and relatively high levels of net income.

Details of farm area, cow numbers and base level production are shown in Table 1. A physical budget setting out the main features of the development plan on Property 2 is presented in Table 2. Similar plans have been developed for the other two properties.

TABLE 1

Details of Feed Year Case Study Farms

Item	Property Number		
	1	2	3
Farm Area—Acres	100	117	156
Base Level Cow Numbers—No.	45	42	60
Base Level Farm Production—lb. bft.	7,250	5,450	9,010
Base Level per Cow Production—lb. bft.	161	130	150

[5] J. G. Bird, "The Dairy Industry on the Far North Coast of New South Wales", this *Review*, Vol. 30, No. 1 (March, 1962).

TABLE 2

The Development Programme on Property 2

Item	1962–63	1963–64	1964–65	1965–66
Glycine Javanica Established—Acres ..	7	6	5	..
Progressive Total—Acres	7	13	18	18
Subterranean Clover Established—Acres ..	5	10	5	..
Progressive Total—Acres	5	15	20	20
Vetch Areas—Acres	13	15	20	20
Cow Numbers—No.	42	46	49	54
Area Topdressed*—Acres	..	12	28	38

* Previous year's Glycine and Sub. Clover.

OTHER ASPECTS OF FARM MANAGEMENT

(i) *Animal Husbandry.* The guidance given on animal husbandry has been confined to ensuring that normal standards of good farm practice are maintained. The appearance of an infertility problem in one herd led to the adoption of artificial insemination. Otherwise, no important changes in animal management have been suggested. The philosophy is to avoid setting up management levels that are too far removed from those that would be adopted by farmers who may subsequently decide to use feed year planning.

(ii) *Business Management.* To provide the appropriate information on planting and grazing dates, farm costs and returns, etc., a system of farm records is being maintained. This involves a farm diary and a farm account book.

(iii) *Fencing and Farm Structures.* To keep costs to a minimum, additional fencing is suggested only when it becomes necessary to control grazing on the feed year pastures. Changes in other farm structures are left to the discretion of the owner.

(iv) *Machinery.* The feed year plan can be put into effect by a farmer equipped as a minimum, with a tractor, mower and some form of cultivating equipment.

FORM OF THE ECONOMIC ANALYSIS

The economic analysis will take the form of year by year partial budgets of costs and returns.[6] These budgets will be used to develop an appreciation of the effect of the plan on the farmer's debt load during the development period. Attention will be given to all costs associated with the development programme including extra farm overheads for buildings, fences and machinery, pasture establishment and maintenance costs, and the costs of maintaining extra cattle.

[6] Examples of budgetary analyses of pasture improvement programmes include: F. H. Gruen, "Financial Aspects of Pasture Improvement on Southern Wheat-Sheep Farms", this *Review*, Vol. 24, No. 4 (December, 1956) and Robert A. Pearse, "Financial Returns and Capital Requirements for Optimum Pasture Improvement Plans", this *Review*, Vol. 31, No. 4 (December, 1963).

In assessing production gains it is necessary to correct for seasonal variations in district production. For this reason production records are being obtained from 10 to 15 farms in the vicinity of each of the three properties. Farms are being selected which have had a fairly constant management programme over the last six years. For each group a five-year base level will be calculated and seasonal effect will be measured by percentage change in total group production from the pooled base level for the group. It will be assumed that this percentage change could have been achieved by the co-operators in the absence of the feed year development.

DISCUSSION

The research programme reported in this note is considered to be significant for at least three reasons.

(i) A new and promising system of farming has been devised for part of the important sub-tropical dairying region in Australia. The basis of this system is the planning of an adequate feed year for the lactating dairy cow with due regard to the problems of the environment. If this feed year plan is as successful as preliminary results indicate, potential will exist for a substantial improvement in dairy farm efficiency. It is believed, too, that success can be achieved with the development of feed year plans for the other soil types of the region. This could very substantially improve the ability of these areas to compete with the low cost production areas of Southern Australia.

(ii) A feature of the development of the feed year plan for the red basaltic soils, and the testing of its value under both controlled and commercial farm conditions, is the integrated, inter-disciplinary research approach. Research workers in microbiology, entomology, agronomy, animal husbandry and nutrition, and agricultural economics have been involved. The need for this type of co-operative attack on applied problems appears too logical to require elaboration; but there are few examples of its formal recognition in this country.

(iii) Careful evaluation of research results under commercial farming conditions, as an extension of an applied research programme, is all too rare in Australian agricultural science.

Some other approaches to the rounding out of applied research programmes with an economic evaluation should be mentioned. Of particular interest is "Operation Tin Tacks" of the Yass Valley Project.[7] This operation involves farm planning on the basis of research results for case study farms in the Yass Valley. The financing of the development programme is not subsidised but greater attention is given to long-term forward budgeting.

Geddes, Crofts and Carter[8] have reported the development of a feed year programme at Badgery's Creek. Their report is an outstanding example of the synthesis of results of agronomy research and is of great

[7] *Yass Valley Newsletter*, No. 2, Yass Valley Organization (1963).

[8] F. A. Crofts, H. J. Geddes and O. G. Carter, *Water Harvesting and Planned Pasture Production at Badgery's Creek*, University of Sydney, School of Agriculture, Report No. 6.

value to local farmers. However, the problems that would be encountered in the development stage of their system of planned pasture production on a commercial farm were not adequately discussed. The value of the report would have been enhanced by use of budgets setting out the costs, returns and overdraft situation during development, assuming a typical initial farm situation.

With reference to the principles applied in using the results of agronomic research to derive possible new farming systems, it is felt there is need to develop more formal methods for integrating data on pasture production, animal husbandry and costs in an effort to more precisely predict the outcome of the proposed system. Such effort could lead to some worthwhile refinements of the detail of the system and may sometimes save expenditure on experiments that have little hope of providing a positive result. One approach could be the development of static models which can be analysed by linear programming,[9] and work is proceeding along these lines. A more sophisticated model would include exploration of risk aspects. Thus consideration of an inventory model would prove fruitful. Such an approach would be similar to that used by Dillon and Lloyd[10] and Powell[11] in analysis of drought feeding strategies.

[9] R. J. McConnen, C. O. McCorkle, Jr., and D. D. Caton, "Feed—Livestock Relationships: A Model for Analysing Management Decisions", *Agricultural Economics Research*, Vol. XV, No. 2 (April, 1963).

[10] J. L. Dillon, and A. G. Lloyd, "Inventory Analysis of Drought Reserves for Queensland Graziers. Some Empirical Analytics", *Australian Journal of Agricultural Economics*, Vol. 6, No. 1 (September, 1962).

[11] Alan A. Powell, *A National Fodder Reserve for the Wool Industry*, University of Sydney, Department of Agricultural Economics, Mimeo. Report No. 3. 1963.