UNIVERSITY OF NOTTINGHAM

Department of Agriculture and Horticulture

# FIELD BEANS AS A BREAK CROP

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UNIVERSITY OF NOTTINGHAM
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# FOREWORD

## AGRICULTURAL ENTERPRISE STUDIES IN ENGLAND AND WALES

University departments of Agricultural Economics in England and Wales have for many years undertaken economic studies of crop and livestock enterprises. In this work the departments receive financial and technical support from the Ministry of Agriculture, Fisheries and Food.

A recent development is that departments in different regions of the country are now conducting joint studies into those enterprises in which they have a particular interest. This community of interest is being recognised by issuing enterprise reports in a common series entitled "Agricultural Enterprise Studies in England and Wales", although the publications will continue to be prepared and published by individual departments.

Titles of recent publications in this series and the addresses of the University departments are given at the end of this report.

## Acknowledgement

This report presents the results of a study of the economics of field beans as a break crop initiated by Economics Branch of the Ministry of Agriculture in 1968. The University of Nottingham agreed to co-ordinate the study, analyse the data and prepare the report, and to collect survey data in the East Midlands Province. The Universities of Cambridge and Reading assisted in the design of the survey and undertook the collection of data in the Eastern and Southern Provinces.

The Ministry and the Universities would like to express their gratitude to all the co-operating farmers for the time and trouble which they freely devoted to providing the data on which the report is based.

The scheme for the survey was drawn up in consultation with Miss Sonia Lindsey, R. Babington, J. A. L. Dench, A. K. Giles and W. L. Hinton ; data collection was undertaken by C. W. O. Brooks (Cambridge), R. Babington (Nottingham) and Miss W. Brooker, Miss M. R. Gardner and Miss E. C. Hunt (Reading).

## Introduction

The increasing specialisation on cereal growing which has been taking place on many farms during the last twenty years has been accompanied, at least during the latter part of this period, by a considerable interest in alternative crops which offer a 'break' in the succession of cereal crops and yet can be grown with the labour and equipment available on cereal growing farms. Many farmers would grow such a break crop if they could find one which, in a rotation with cereals, seemed likely to be more profitable than cereals alone. Their evaluation of a break crop involves three primary factors :

(i) the crop's effect on subsequent cereal crops

(ii) its effect on the farm's fixed costs

and (iii) the gross margin of the crop itself.

Information on the first of these points is more sensibly determined by controlled experiments than by farm surveys. Survey results can, however, provide useful information on the gross margins which have been achieved from the field bean crop, and on the demands which the crop appears to have made on the fixed resources of the farms concerned. This report attempts to provide such information, in Sections 2 and 3, and to assist in the evaluation of this information Section 1 presents descriptive data concerning the farms from which it was obtained. Finally Section 4 gives an example of the type of calculation which might be helpful to farmers who are considering beans as a break crop.

SECTION 1

## The Farms in the Survey

Agricultural advisers in the areas covered by the survey were asked for names and addresses of farmers who were known to grow field beans as a break crop and who were thought likely to co-operate in the survey. All these farmers were asked to provide information for the survey, and a very high proportion agreed to do so. The results presented may not be representative of all bean growers. Nevertheless, they may give a better indication than a random sample would provide of the results to be expected from the bean crop by a cereal grower who introduces them as a break crop and who takes advantage of the advice available.

All farmers providing information in 1968 were asked to do so again in 1969. The number of farms and acreage of beans surveyed in each province in each year of the investigation is shown in Table 1, and Table 2 gives the distribution of farms by counties. The distribution of farms between spring and winter bean crops is shown in Table 3. Their distribution by acreage of beans is shown in Table 4. All the farms included in Tables 1 to 4 provided full information on variable costs and output (and hence gross margins) and almost all of them provided adequate information regarding operations performed and labour required. Some records were incomplete in respect of supplementary information, but on the few occasions where a table is based on less than 80 per cent of the farms the actual number or proportion from which it is derived is shown within that table.

Almost ninety per cent of the acreage on the survey farms was under arable cropping, and about two thirds of this arable acreage was under wheat and barley.(1) The oat crop accounted for less than 4 per cent of the arable acreage of the survey farms. The field bean crop occupied rather more than 10 per cent of their arable acreage, and the distribution of farms around this average figure is shown in Table 5. Over the four-year period 1965-68 the average of the spring barley yields on these farms was 30 cwt. per acre and of the winter wheat yields was 34 cwt. per acre.

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(1) The distribution of farms by arable acreage size groups is given in Appendix Tables 1 and 2, which also show, within arable size groups, the degree of specialisation in wheat and barley.

TABLE 1

NUMBER OF FARMS AND ACREAGE OF BEANS IN SURVEY

| PROVINCE | NO. OF FARMS | AVERAGE SIZE OF FARMS | BEAN ACREAGE | | | AVERAGE BEAN ACREAGE PER FARM |
|---|---|---|---|---|---|---|
| | | | SPRING | WINTER | TOTAL | |
| | | (acres) | | | | |
| 1968 | | | | | | |
| EASTERN | 61 | 553 | 2,462 | 1,395 | 3,857 | 63 |
| EAST MIDLAND | 47 | 518 | 1,267 | 413 | 1,680 | 36 |
| SOUTHERN | 37 | 1,056 | 2,526 | 327 | 2,853 | 77 |
| TOTAL | 145 | 670 | 6,255 | 2,135 | 8,390 | 58 |
| 1969 | | | | | | |
| EASTERN | 48 | 577 | 2,227 | 1,041 | 3,268 | 68 |
| EAST MIDLAND | 31 | 508 | 960 | 111 | 1,071 | 34 |
| SOUTHERN | 29 | 1,144 | 2,235 | 225 | 2,460 | 85 |
| TOTAL | 108 | 707 | 5,422 | 1,377 | 6,799 | 63 |

TABLE 2

DISTRIBUTION OF CROPS SURVEYED BY COUNTIES

| PROVINCE AND COUNTY | SPRING FARMS 1968 | WINTER FARMS 1968 | S & W FARMS 1968 | SPRING FARMS 1969 | WINTER FARMS 1969 | S & W FARMS 1969 |
|---|---|---|---|---|---|---|
| EASTERN | | | | | | |
| Bedfordshire | 10 | - | 1 | 10 | - | - |
| Cambridgeshire | - | - | 1 | - | - | 1 |
| Essex | 1 | - | - | 1 | - | - |
| Huntingdonshire | 4 | - | 2 | 3 | 1 | - |
| Norfolk | 10 | 2 | - | 5 | 2 | - |
| Soke of Peterborough | 1 | - | - | - | - | - |
| Suffolk | 17 | 7 | 5 | 14 | 3 | 8 |
| EAST MIDLAND | | | | | | |
| Derbyshire | 1 | - | - | 1 | - | - |
| Leicestershire | 9 | 2 | 1 | 8 | 1 | - |
| Lincolnshire | 8 | 5 | 3 | 4 | 5 | 1 |
| Northamptonshire | - | 2 | 2 | 1 | 1 | - |
| Nottinghamshire | 13 | 1 | - | 9 | - | - |
| SOUTHERN | | | | | | |
| Berkshire | 4 | 1 | - | 3 | - | - |
| Buckinghamshire | 1 | - | - | - | - | - |
| Dorset | 2 | - | - | 2 | - | - |
| Gloucestershire | - | 1 | - | - | 1 | - |
| Hampshire | 13 | - | - | 10 | - | - |
| Oxfordshire | 2 | 1 | 1 | 2 | - | 1 |
| Sussex | 2 | - | - | 1 | - | 1 |
| Warwickshire | - | 1 | - | - | - | 1 |
| Wiltshire | 6 | - | - | 6 | - | - |
| Worcestershire | 1 | - | 1 | 1 | - | - |

TABLE 3

DISTRIBUTION OF FARMS BETWEEN SPRING AND WINTER CROPS

| PROVINCE | SPRING BEANS ONLY | | WINTER BEANS ONLY | | SPRING AND WINTER BEANS | | |
|---|---|---|---|---|---|---|---|
| | FARMS | ACRES PER FARM | FARMS | ACRES PER FARM | FARMS | SPRING ACRES PER FARM | WINTER ACRES PER FARM |
| 1968 | | | | | | | |
| EASTERN | 43 | 39 | 9 | 74 | 9 | 87 | 81 |
| EAST MIDLAND | 31 | 34 | 10 | 32 | 6 | 35 | 16 |
| SOUTHERN | 31 | 78 | 4 | 71 | 2 | 46 | 22 |
| TOTAL | 105 | 49 | 23 | 55 | 17 | 64 | 51 |
| 1969 | | | | | | | |
| EASTERN | 33 | 46 | 6 | 32 | 9 | 79 | 95 |
| EAST MIDLAND | 23 | 40 | 7 | 15 | 1 | 42 | 4 |
| SOUTHERN | 25 | 78 | 1 | 91 | 3 | 98 | 45 |
| TOTAL | 81 | 54 | 14 | 28 | 13 | 80 | 76 |

TABLE 4

FREQUENCY DISTRIBUTION OF FARMS BY BEAN ACREAGE GROUPS

1968

| BEAN ACREAGE | EASTERN | EAST MIDLAND | SOUTHERN | TOTAL |
|---|---|---|---|---|
| 5.0[1] - 9.9 | 4 | 6 | - | 10 |
| 10.0 - 19.9 | 4 | 8 | 2 | 14 |
| 20.0 - 29.9 | 15 | 7 | 3 | 25 |
| 30.0 - 39.9 | 8 | 9 | 2 | 19 |
| 40.0 - 49.9 | 7 | 8 | 4 | 19 |
| 50.0 - 74.9 | 7 | 4 | 10 | 21 |
| 75.0 - 99.9 | 7 | 3 | 6 | 16 |
| 100.0 - 149.9 | 4 | 2 | 7 | 13 |
| 150.0 - 199.9 | 2 | - | 2 | 4 |
| 200.0 - 540.0 [1] | 3 | - | 1 | 4 |

1969

| BEAN ACREAGE | EASTERN | EAST MIDLAND | SOUTHERN | TOTAL |
|---|---|---|---|---|
| 4.5[1] - 9.9 | 1 | 5 | - | 6 |
| 10.0 - 19.9 | 9 | 8 | 1 | 18 |
| 20.0 - 29.9 | 8 | 3 | 2 | 13 |
| 30.0 - 39.9 | 4 | 3 | 2 | 9 |
| 40.0 - 49.9 | 5 | 4 | 3 | 12 |
| 50.0 - 74.9 | 9 | 5 | 8 | 22 |
| 75.0 - 99.9 | 3 | 1 | 3 | 7 |
| 100.0 - 149.9 | 3 | 2 | 7 | 12 |
| 150.0 - 199.9 | 3 | - | 2 | 5 |
| 200.0 - 415.0[1] | 3 | - | 1 | 4 |

[1] The smallest acreage and the largest acreage have been used in this and subsequent tables as the limits of the appropriate acreage groups.

TABLE 5

DISTRIBUTION OF SURVEY FARMS BY PROPORTION OF ARABLE ACREAGE OCCUPIED BY THE BEAN CROP, 1968

| BEANS AS PROPORTION OF ARABLE ACREAGE | DISTRIBUTION OF FARMS | | | |
|---|---|---|---|---|
| | EASTERN | EAST MIDLAND | SOUTHERN | ALL PROVINCES |
| | % | % | % | % |
| 1.7 - 4.9 | 11 | 26 | 23 | 19 |
| 5.0 - 9.9 | 30 | 42 | 40 | 36 |
| 10.0 - 14.9 | 28 | 14 | 26 | 23 |
| 15.0 - 19.9 | 20 | 14 | 6 | 14 |
| 20.0 - 24.8 | 11 | 4 | 6 | 8 |

Section 2 (a)

## Spring Beans - Output, Variable Costs and Gross Margins

The average results obtained on the survey farms are summarised by provinces for 1968 in Table 6 and for 1969 in Table 7. Some growers were able to omit some of the items listed under variable costs, and these tables also show the number of growers using each item and the average expenditure on these items of those growers who did use them. In each of these years growers in the Southern province incurred slightly higher variable costs per acre than growers in the Eastern and East Midland provinces. In 1968 the average gross margin per acre in the Eastern province was lower than in the Southern and East Midland provinces, due to low average yield, but in 1969 the average gross margin per acre was very similar in all three provinces.

The farms which provided information for both years were ranked in order of their two-year average gross margin in order to select, for each province, the upper quartile farms for which results are presented in Tables 8 and 9. The success of these upper quartile farms is clearly due to their ability to achieve above average yields. As is usual in comparisons of this type, variable costs per acre on the upper quartile farms are similar to the "all farms average", i.e. their higher yields cannot be attributed to any differences in expenditure on variable cost items. In 1968 the average gross margin per acre on these farms was some £10 per acre higher than the "all farms average", but in 1969 their advantage was less marked, at roughly £6 per acre. Frequency distributions of yields, outputs, variable costs and gross margins are set out in Tables 10 to 17 and the ranges in these items can be seen from the extremes of the class intervals in these tables.(1) Standard deviations for these items are presented in Table 18.

(1) The very low yield of 1.7 cwts. per acre recorded on one farm in 1968 occurred when only 2 acres of an 18 acre crop were combined, and 'pigeons took the rest'; the case in which variable costs totalled only £2.8 per acre was a crop for which the only variable costs item was seed (and which yielded 17 cwts.per acre).

TABLE 6

OUTPUT, VARIABLE COSTS AND GROSS MARGIN PER ACRE OF SPRING BEANS, BY PROVINCES, 1968

| ITEM | EASTERN | | | EAST MIDLAND | | | SOUTHERN | | | ALL PROVINCES | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ALL FARMS | THOSE USING ITEM | | ALL FARMS | THOSE USING ITEM | | ALL FARMS | THOSE USING ITEM | | ALL FARMS | THOSE USING ITEM | |
| | | No. | | | No. | | | No. | | | No. | |
| No. of Farms | 52 | | | 37 | | | 33 | | | 122 | | |
| Acreage of beans | 2462.5 | | | 1267.4 | | | 2526.4 | | | 6256.3 | | |
| Yield (cwt per acre) | 16.77 | | | 19.72 | | | 21.34 | | | 18.90 | | |
| Price (£ per cwt) | 1.49 | | | 1.53 | | | 1.56 | | | 1.52 | | |
| Gross Output | £ per acre | | | | | | | | | | | |
| Sales | 20.58 | | | 22.83 | | | 31.37 | | | 24.18 | | |
| Retained on Farm | 4.41 | | | 7.35 | | | 2.01 | | | 4.65 | | |
| Subsidy | 5.00 | | | 5.00 | | | 5.00 | | | 5.00 | | |
| Total | 29.99 | | | 35.18 | | | 38.38 | | | 33.83 | | |
| Variable Costs | | | | | | | | | | | | |
| Seed | 4.08 | | | 3.71 | | | 4.30 | | | 4.03 | | |
| Fertiliser | 1.61 | 34 | 2.46 | 2.61 | 33 | 2.92 | 4.14 | 32 | 4.27 | 2.60 | 99 | 3.20 |
| Sprays - Herbicides | 2.91 | 45 | 3.36 | 2.21 | 30 | 2.72 | 2.14 | 30 | 2.35 | 2.49 | 105 | 2.89 |
| - Aphicides | 0.61 | 26 | 1.23 | 0.29 | 8 | 1.32 | 0.97 | 21 | 1.52 | 0.61 | 55 | 1.35 |
| Contract Work | 0.48 | 19 | 1.30 | 0.37 | 10 | 1.39 | 0.40 | 13 | 1.02 | 0.42 | 42 | 1.23 |
| Miscellaneous | 0.24 | 14 | 0.88 | 0.24 | 9 | 1.00 | 0.13 | 7 | 0.63 | 0.21 | 30 | 0.85 |
| Farm Yard Manure | 0.87 | 9 | 5.04 | 0.33 | 3 | 4.10 | 0 | | | 0.47 | 12 | 4.79 |
| Total | 10.80 | | | 9.76 | | | 12.08 | | | 10.83 | | |
| Gross Margin | 19.19 | | | 25.42 | | | 26.30 | | | 23.00 | | |

TABLE 7

OUTPUT, VARIABLE COSTS AND GROSS MARGIN PER ACRE OF SPRING BEANS, BY PROVINCES, 1969

| ITEM | EASTERN | | | EAST MIDLAND | | | SOUTHERN | | | ALL PROVINCES | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | ALL FARMS | THOSE USING ITEM | | ALL FARMS | THOSE USING ITEM | | ALL FARMS | THOSE USING ITEM | | ALL FARMS | THOSE USING ITEM | |
| | | No. | | | No. | | | No. | | | No. | |
| No. of Farms | 42 | | | 24 | | | 28 | | | 94 | | |
| Acreage of beans | 2226.7 | | | 959.6 | | | 2234.7 | | | 5421.0 | | |
| Yield (cwt per acre) | 20.64 | | | 19.98 | | | 21.87 | | | 20.84 | | |
| Price (£ per cwt) | 1.49 | | | 1.52 | | | 1.50 | | | 1.50 | | |
| Gross Output | £ per acre | | | | | | | | | | | |
| Sales | 25.71 | | | 21.69 | | | 28.02 | | | 25.37 | | |
| Retained on Farm | 5.09 | | | 8.75 | | | 4.73 | | | 5.92 | | |
| Subsidy | 5.00 | | | 5.00 | | | 5.00 | | | 5.00 | | |
| Total | 35.80 | | | 35.44 | | | 37.75 | | | 36.29 | | |
| Variable Costs | | | | | | | | | | | | |
| Seed | 3.90 | | | 4.13 | | | 4.64 | | | 4.18 | | |
| Fertiliser | 1.29 | 20 | 2.70 | 2.68 | 22 | 2.97 | 3.52 | 26 | 3.79 | 2.31 | 68 | 3.19 |
| Sprays - Herbicides | 2.56 | 36 | 2.99 | 1.50 | 17 | 2.12 | 2.09 | 25 | 2.34 | 2.15 | 78 | 2.59 |
| - Aphicides | 1.13 | 31 | 1.53 | 0.83 | 12 | 1.60 | 1.62 | 26 | 1.75 | 1.20 | 69 | 1.63 |
| Contract Work | 0.75 | 28 | 1.12 | 0.60 | 8 | 1.72 | 0.62 | 18 | 0.96 | 0.67 | 54 | 1.17 |
| Miscellaneous | 0.17 | 12 | 0.61 | 0.03 | 3 | 0.25 | 0.14 | 6 | 0.65 | 0.12 | 21 | 0.56 |
| Farm Yard Manure | 0.93 | 10 | 3.92 | 0.11 | 1 | 2.66 | 0 | | | 0.44 | 11 | 3.79 |
| Total | 10.73 | | | 9.83 | | | 12.63 | | | 11.07 | | |
| Gross Margin | 25.07 | | | 25.61 | | | 25.12 | | | 25.22 | | |

(1)

TABLE 8

UPPER QUARTILE FARMS: OUTPUT, VARIABLE COSTS AND GROSS MARGINS PER ACRE OF SPRING BEANS BY PROVINCES, 1968

| ITEM | EASTERN | | EAST MIDLAND | | SOUTHERN | | ALL PROVINCES | |
|---|---|---|---|---|---|---|---|---|
| | ALL FARMS | THOSE USING ITEM | ALL FARMS | THOSE USING ITEM | ALL FARMS | THOSE USING ITEM | ALL FARMS | THOSE USING ITEM |
| | | No. | | No. | | No. | | No. |
| No. of Farms | 10 | | 6 | | 6 | | 22 | |
| Acreage of beans | 394.0 | | 204.0 | | 372.0 | | 970.0 | |
| Yield (cwt per acre) | 22.20 | | 26.93 | | 28.30 | | 25.15 | |
| Price (£ per cwt) | 1.52 | | 1.58 | | 1.59 | | 1.56 | |
| Gross Output | £ per acre | | | | | | | |
| Sales | 25.46 | | 31.15 | | 37.01 | | 30 16 | |
| Retained on Farm | 8.21 | | 11.30 | | 7.89 | | 8.97 | |
| Subsidy | 5.00 | | 5.00 | | 5.00 | | 5.00 | |
| Total | 38.67 | | 47.45 | | 49.90 | | 44.13 | |
| Variable Costs | | | | | | | | |
| Seed | 3.52 | | 3.47 | | 4.03 | | 3.65 | |
| Fertiliser | 1.11 | 5 2.23 | 2.47 | 5 2.96 | 4.45 | | 2.39 | 16 3.29 |
| Sprays - Herbicides | 3.08 | 9 3.42 | 2.03 | 5 2.44 | 2.51 | | 2.64 | 20 2.90 |
| - Aphicides | 0.58 | 4 1.45 | 0.60 | 2 1.80 | 1.35 | 4 2.02 | 0.80 | 10 1.75 |
| Contract Work | 0.29 | 3 0.96 | 0.63 | 2 1.90 | 0.25 | 2 0.75 | 0.37 | 7 1.17 |
| Miscellaneous | 0.12 | 3 0.39 | 0.12 | 1 0.70 | 0.13 | 1 0.80 | 0.12 | 5 0.54 |
| Farm Yard Manure | 0.95 | 3 3.17 | 0 | | 0 | | 0.43 | 3 3.17 |
| Total | 9.65 | | 9.32 | | 12.72 | | 10.40 | |
| Gross Margin | 29.02 | | 38.13 | | 37.18 | | 33.73 | |

(1) Ranking based on two year average gross margin per acre.

(1)

TABLE 9

UPPER QUARTILE FARMS: OUTPUT, VARIABLE COSTS AND GROSS MARGINS PER ACRE OF SPRING BEANS BY PROVINCES, 1969

| ITEM | EASTERN | | EAST MIDLAND | | SOUTHERN | | ALL PROVINCES | |
|---|---|---|---|---|---|---|---|---|
| | ALL FARMS | THOSE USING ITEM | ALL FARMS | THOSE USING ITEM | ALL FARMS | THOSE USING ITEM | ALL FARMS | THOSE USING ITEM |
| | | No. | | No. | | No. | | No. |
| No. of Farms | 10 | | 6 | | 6 | | 22 | |
| Acreage | 436.5 | | 209.4 | | 457.0 | | 1102.9 | |
| Yield (cwt per acre) | 23.43 | | 25.78 | | 26.31 | | 24.86 | |
| Price (£ per cwt) | 1.48 | | 1.54 | | 1.48 | | 1.49 | |
| Gross Output | £ per acre | | | | | | | |
| Sales | 26.17 | | 29.34 | | 24.81 | | 26.66 | |
| Retained on Farm | 8.42 | | 10.27 | | 14.19 | | 10.50 | |
| Subsidy | 5.00 | | 5.00 | | 5.00 | | 5.00 | |
| Total | 39.59 | | 44.61 | | 44.00 | | 42.16 | |
| Variable Costs | | | | | | | | |
| Seed | 3.78 | | 4.30 | | 4.53 | | 4.13 | |
| Fertiliser | 0.64 | 3 2.12 | 2.66 | 5 3.20 | 3.52 | 5 4.22 | 1.98 | 13 3.34 |
| Sprays - Herbicides | 1.70 | 6 2.84 | 1.91 | 5 2.29 | 1.80 | 5 2.16 | 1.78 | 16 2.45 |
| - Aphicides | 0.95 | 7 1.36 | 1.94 | 5 2.33 | 1.67 | | 1.42 | 18 1.73 |
| Contract Work | 0.64 | 6 1.06 | 1.28 | 4 1.91 | 0.63 | 4 0.95 | 0.81 | 14 1.28 |
| Miscellaneous | .0 | | 0.04 | 2 0.13 | 0.26 | 3 0.52 | 0.08 | 5 0.36 |
| Farm Yard Manure | 1.01 | 2 5.04 | 0.44 | 1 2.66 | 0 | | 0.58 | 3 4.25 |
| Total | 8.72 | | 12.57 | | 12.41 | | 10.78 | |
| Gross Margin | 30.87 | | 32.04 | | 31.59 | | 31.38 | |

(1) Ranking based on two year average gross margin per acre.

TABLE 10

YIELDS PER ACRE OF SPRING BEANS

DISTRIBUTION OF FARMS AND ACREAGE, BY PROVINCES, 1968

| YIELD CWT PER ACRE | EASTERN | | EAST MIDLAND | | SOUTHERN | | ALL PROVINCES | |
|---|---|---|---|---|---|---|---|---|
| | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES |
| 1.7 - 4.9 | - | - | 1 | 18 | - | - | 1 | 18 |
| 5.0 - 9.9 | 4 | 373 | - | - | 1 | 12 | 5 | 385 |
| 10.0 - 14.9 | 16 | 885 | 8 | 251 | 7 | 525 | 31 | 1,661 |
| 15.0 - 19.9 | 17 | 649 | 10 | 301 | 5 | 338 | 32 | 1,288 |
| 20.0 - 24.9 | 10 | 392 | 11 | 535 | 6 | 704 | 27 | 1,631 |
| 25.0 - 29.9 | 5 | 163 | 4 | 88 | 10 | 578 | 19 | 829 |
| 30.0 - 36.3 | - | - | 3 | 74 | 4 | 370 | 7 | 444 |

TABLE 11

YIELDS PER ACRE OF SPRING BEANS

DISTRIBUTION OF FARMS AND ACREAGE, BY PROVINCES, 1969

| YIELD CWT PER ACRE | EASTERN | | EAST MIDLAND | | SOUTHERN | | ALL PROVINCES | |
|---|---|---|---|---|---|---|---|---|
| | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES |
| 6.7 - 9.9 | 1 | 47 | 1 | 60 | 1 | 60 | 3 | 167 |
| 10.0 - 14.9 | 2 | 54 | 4 | 110 | 3 | 182 | 9 | 346 |
| 15.0 - 19.9 | 13 | 875 | 9 | 354 | 4 | 452 | 26 | 1,681 |
| 20.0 - 24.9 | 17 | 898 | 3 | 140 | 13 | 896 | 33 | 1,934 |
| 25.0 - 29.9 | 8 | 335 | 7 | 296 | 7 | 644 | 22 | 1,275 |
| 30.0 | 1 | 17 | - | - | - | - | 1 | 17 |

TABLE 12

OUTPUT (INCLUDING SUBSIDY) PER ACRE OF SPRING BEANS

DISTRIBUTION OF FARMS AND ACREAGE, BY PROVINCES, 1968

| OUTPUT PER ACRE | EASTERN | | EAST MIDLAND | | SOUTHERN | | ALL PROVINCES | |
|---|---|---|---|---|---|---|---|---|
| | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES |
| 7.5 - 9.9 | - | - | 1 | 18 | - | - | 1 | 18 |
| 10.0 - 19.9 | 4 | 373 | 1 | 10 | 2 | 62 | 7 | 445 |
| 20.0 - 24.9 | 10 | 623 | 3 | 90 | 6 | 474 | 19 | 1,187 |
| 25.0 - 29.9 | 12 | 458 | 7 | 199 | 1 | 69 | 20 | 726 |
| 30.0 - 34.9 | 13 | 548 | 7 | 273 | 3 | 149 | 23 | 970 |
| 35.0 - 39.9 | 8 | 297 | 6 | 323 | 3 | 361 | 17 | 981 |
| 40.0 - 49.9 | 4 | 126 | 9 | 278 | 13 | 1,016 | 26 | 1,420 |
| 50.0 - 57.7 | 1 | 37 | 3 | 77 | 5 | 395 | 9 | 509 |

TABLE 13

OUTPUT (INCLUDING SUBSIDY) PER ACRE OF SPRING BEANS

DISTRIBUTION OF FARMS AND ACREAGE, BY PROVINCES, 1969

| OUTPUT PER ACRE | EASTERN | | EAST MIDLAND | | SOUTHERN | | ALL PROVINCES | |
|---|---|---|---|---|---|---|---|---|
| | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES |
| 15.0 - 19.9 | 1 | 47 | 2 | 70 | 2 | 107 | 5 | 224 |
| 20.0 - 24.9 | 2 | 106 | 1 | 46 | 2 | 135 | 5 | 287 |
| 25.0 - 29.9 | 3 | 206 | 4 | 117 | - | - | 7 | 323 |
| 30.0 - 34.9 | 13 | 751 | 7 | 290 | 3 | 413 | 23 | 1,454 |
| 35.0 - 39.9 | 14 | 765 | 1 | 25 | 4 | 153 | 19 | 943 |
| 40.0 - 49.9 | 7 | 275 | 8 | 367 | 17 | 1,427 | 32 | 2,069 |
| 50.0 - 55.5 | 2 | 77 | 1 | 44 | - | - | 3 | 121 |

## TABLE 14

### VARIABLE COSTS PER ACRE OF SPRING BEANS

### DISTRIBUTION OF FARMS AND ACREAGE, BY PROVINCES, 1968

| VARIABLE COSTS £ PER ACRE | EASTERN | | EAST MIDLAND | | SOUTHERN | | ALL PROVINCES | |
|---|---|---|---|---|---|---|---|---|
| | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES |
| 3.2 - 3.9 | - | - | 3 | 78 | - | - | 3 | 78 |
| 4.0 - 5.9 | 2 | 42 | 1 | 30 | - | - | 3 | 72 |
| 6.0 - 7.9 | 7 | 327 | 5 | 128 | 3 | 195 | 15 | 650 |
| 8.0 - 9.9 | 17 | 903 | 10 | 437 | 6 | 172 | 33 | 1,512 |
| 10.0 - 11.9 | 11 | 694 | 11 | 366 | 7 | 560 | 29 | 1,620 |
| 12.0 - 13.9 | 7 | 255 | 4 | 194 | 7 | 531 | 18 | 990 |
| 14.0 - 15.9 | 3 | 70 | 2 | 23 | 7 | 697 | 12 | 790 |
| 16.0 - 20.0 | 5 | 161 | 1 | 12 | 3 | 372 | 9 | 545 |

## TABLE 15

### VARIABLE COSTS PER ACRE OF SPRING BEANS

### DISTRIBUTION OF FARMS AND ACREAGE, BY PROVINCES, 1969

| VARIABLE COSTS £ PER ACRE | EASTERN | | EAST MIDLAND | | SOUTHERN | | ALL PROVINCES | |
|---|---|---|---|---|---|---|---|---|
| | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES |
| 2.8 - 3.9 | 1 | 31 | - | - | - | - | 1 | 31 |
| 4.0 - 5.9 | 2 | 59 | 2 | 80 | - | - | 4 | 139 |
| 6.0 - 7.9 | 6 | 767 | 5 | 191 | 4 | 239 | 15 | 1,197 |
| 8.0 - 9.9 | 11 | 492 | 9 | 462 | 1 | 122 | 21 | 1,076 |
| 10.0 - 11.9 | 8 | 400 | 4 | 153 | 5 | 462 | 17 | 1,015 |
| 12.0 - 13.9 | 7 | 283 | 2 | 22 | 10 | 1,028 | 19 | 1,333 |
| 14.0 - 15.9 | 4 | 86 | 1 | 44 | 4 | 229 | 9 | 359 |
| 16.0 - 19.9 | 3 | 108 | 1 | 8 | 4 | 154 | 8 | 270 |

TABLE 16

GROSS MARGINS PER ACRE OF SPRING BEANS

DISTRIBUTION OF FARMS AND ACREAGE, BY PROVINCES, 1968

| GROSS MARGIN £ PER ACRE | EASTERN | | EAST MIDLAND | | SOUTHERN | | ALL PROVINCES | |
|---|---|---|---|---|---|---|---|---|
| | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES |
| -3.2 - -0.1 | 1 | 27 | 1 | 18 | - | - | 2 | 45 |
| 0.0 - 9.9 | 6 | 391 | 1 | 40 | 5 | 422 | 12 | 853 |
| 10.0 - 14.9 | 8 | 557 | 4 | 148 | 3 | 131 | 15 | 836 |
| 15.0 - 19.9 | 13 | 558 | 6 | 93 | 1 | 52 | 20 | 703 |
| 20.0 - 24.9 | 16 | 682 | 6 | 255 | 4 | 269 | 26 | 1,206 |
| 25.0 - 29.9 | 4 | 120 | 8 | 373 | 3 | 337 | 15 | 830 |
| 30.0 - 34.9 | 2 | 76 | 2 | 39 | 10 | 838 | 14 | 953 |
| 35.0 - 39.9 | 1 | 14 | 7 | 252 | 4 | 309 | 12 | 575 |
| 40.0 - 47.9 | 1 | 37 | 2 | 50 | 3 | 168 | 6 | 255 |

TABLE 17

GROSS MARGINS PER ACRE OF SPRING BEANS

DISTRIBUTION OF FARMS AND ACREAGE, BY PROVINCES, 1969

| GROSS MARGIN £ PER ACRE | EASTERN | | EAST MIDLAND | | SOUTHERN | | ALL PROVINCES | |
|---|---|---|---|---|---|---|---|---|
| | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES |
| 6.3 - 9.9 | 2 | 109 | 1 | 10 | 3 | 219 | 6 | 338 |
| 10.0 - 14.9 | - | - | 2 | 106 | - | - | 2 | 106 |
| 15.0 - 19.9 | 6 | 355 | 4 | 107 | 4 | 354 | 14 | 816 |
| 20.0 - 24.9 | 15 | 699 | 5 | 270 | 3 | 211 | 23 | 1,180 |
| 25.0 - 29.9 | 11 | 747 | 3 | 37 | 12 | 1,008 | 26 | 1,792 |
| 30.0 - 34.9 | 4 | 128 | 6 | 343 | 3 | 239 | 13 | 710 |
| 35.0 - 39.9 | 2 | 112 | 2 | 42 | 3 | 204 | 7 | 357 |
| 40.0 - 41.5 | 2 | 79 | 1 | 44 | - | - | 3 | 121 |

TABLE 18

STANDARD DEVIATIONS BY PROVINCES, SPRING BEANS 1968 AND 1969

| ITEM | CROP | EASTERN | EAST MIDLAND | SOUTHERN |
|---|---|---|---|---|
| Yield per acre | Spring 1968 | 5.08 | 6.93 | 7.26 |
| | Spring 1969 | 4.36 | 5.99 | 5.46 |
| Total output per acre | Spring 1968 | 7.80 | 10.23 | 11.80 |
| | Spring 1969 | 6.77 | 9.59 | 8.45 |
| Total variable costs per acre | Spring 1968 | 3.26 | 3.18 | 3.00 |
| | Spring 1969 | 3.28 | 2.88 | 3.21 |
| Gross Margin per acre | Spring 1968 | 8.44 | 10.64 | 11.44 |
| | Spring 1969 | 7.18 | 7.88 | 7.80 |

Instability

The field bean crop has a reputation for extreme yield variability, both between years and between farms in any one year. Although the average yields in the Eastern province for 1968 and 1969 support the first aspect of this reputation, the average yields in the East Midland and Southern provinces were similar in each of these two years. The standard deviations of yields, which were roughly 30 per cent of the average yield in 1968 and less than this in 1969 support the second aspect of this reputation. The average figures for total variable costs per acre are similar in each of the two years, and the standard deviations of total variable costs per acre are in most cases almost 30 per cent of these average figures. These rather high standard deviations appear to be due mainly to variations in manurial practices and in methods of weed and aphicide control.

The unstable yields give rise to unstable gross margins. In spite of the similarity of average gross margins for 1968 and 1969 in both the East Midland and Southern provinces it is noteworthy that, of the 47 farmers in these two provinces who provided records for both these years, 21 farmers had gross margins which differed by over £10 per acre between the two years, and on 6 of these farms the variation between the two years was over £20 per acre. In the Eastern province the average gross margin in 1969 was £6 per acre higher than in 1968, but three of the 38 farms found their individual gross margin higher by over £20 per acre and three found their gross margin per acre lower by over £10 per acre.

Prices

Spring bean prices showed little variation either between these two years or between provinces. In 1968 almost 80 per cent and in 1969 more than 90 per cent of the recorded sales fell into the price range £1.3

to £1.65 per cwt. The price obtained for beans grown on contract was similar to that for beans which had not been contracted, but in the few cases where sales were known to be for seed a premium of roughly 25p. per cwt. was paid.

Seed

The cost of seed is the largest single item in the variable costs of growing beans.

Minor was the predominant variety in the Eastern and East Midland provinces in 1968 but Maris Bead was the most favoured variety in each year in the Southern province and in 1969 it rivalled Minor in the other provinces. These two varieties accounted for two thirds or more of the acreage in each province in each year.(2) The leaflet on "Recommended Varieties of Field Beans" issued by the National Institute of Agricultural Botany in 1971 shows Maris Bead as the highest yielding spring bean variety with a five per cent yield advantage over Minor.

On farms where the whole crop was sown in the same way six per cent of crops were ploughed in after broadcasting or shallow drilling, and 20 per cent (1968) to 25 per cent (1969) were drilled in rows of eight inch width or more. The remainder were drilled in rows narrower than eight inches, with the majority on seven inches.

The average seed rates used are shown in Table 19. Sixty per cent of the crops surveyed were grown from seed rates of less than 200lb. per acre, but only twenty five per cent from seed rates of less than 180lb. per acre.

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(2) Further details are given in Appendix Table 3.

TABLE 19

AVERAGE SEED RATES FOR SPRING BEANS, BY PROVINCES, 1968 and 1969

| YEAR | EASTERN | EAST MIDLAND | SOUTHERN |
|---|---|---|---|
| | cwt per acre | | |
| 1968 | 1.80 | 1.76 | 1.64 |
| 1969 | 1.78 | 1.90 | 1.72 |

Fertiliser and F.Y.M.

The numbers of farms using fertiliser, and the numbers using farm-yard manure, are shown in Tables 6 and 7, and additional information on fertiliser practice is given in Table 20.

TABLE 20

FERTILISER PRACTICE FOR SPRING BEANS BY PROVINCES, 1968 and 1969

| | 1968 | | | 1969 | | |
|---|---|---|---|---|---|---|
| | EASTERN | EAST MIDLAND | SOUTHERN | EASTERN | EAST MIDLAND | SOUTHERN |
| % of crops receiving N | 12 | 16 | 67 | 12 | 25 | 54 |
| " " " " P | 63 | 89 | 97 | 43 | 92 | 93 |
| " " " " K | 60 | 73 | 97 | 43 | 88 | 89 |
| | units per acre | | | | | |
| Average use of N | 21.22 | 24.00 | 31.94 | 15.14 | 12.46 | 27.66 |
| " " " P | 38.94 | 47.35 | 63.07 | 43.82 | 44.45 | 49.11 |
| " " " K | 44.39 | 43.25 | 62.03 | 50.25 | 42.57 | 52.98 |

Herbicides and Weed Problems

The numbers of farmers using herbicides are shown in Tables 6 and 7. The proportions of farmers reporting various weed problems on cereal and bean crops on these farms are shown in Table 21. In all provinces the

TABLE 21

(1)
WEED PROBLEMS REPORTED ON THE SURVEY FARMS, BY PROVINCES

| WEED | EASTERN | EAST MIDLAND | SOUTHERN |
|---|---|---|---|
| | percentage of farms | | |
| Wild Oats | 53 | 25 | 25 |
| Black grass | 40 | 17 | 19 |
| Twitch | 13 | 38 | 25 |
| Knot grass, redshank, bindweed | 8 | 12 | 8 |
| Chickweed | 3 | 8 | 8 |
| Other weeds | 1 | 11 | 16 |
| No problems | 31 | 31 | 34 |

(1) in cereal crops and/or spring bean crops and/or winter bean crops.

predominant herbicide used on the spring bean crop was simazine, and some 80 per cent of the crops which received herbicide were treated with this chemical. Barban was used by almost 10 per cent of the Eastern Province growers, often in addition to simazine. Ninety four growers were prepared to express an opinion regarding the effect of the bean crop on weed problems. Those on heavy land nearly all used simazine, and regarded the crop as beneficial. On medium land 15 out of 28 used simazine, and nine of these regarded the crop as beneficial, but six of the eleven who did not use simazine regarded the crop as detrimental. On light land the majority used simazine, and two thirds thought the crop beneficial, one third thought it detrimental. Few farmers regarded the crop as having no effect on weed problems.

Aphicides and Contract Work

It can be seen from Tables 6 and 7 that a higher proportion of crops received aphicide treatment in 1969 than in 1968, and that a very high proportion of crops in the Southern Province was treated, but that the proportion was lower in the Eastern Province and lower still in the East

Midlands. Most of the contract work carried out in the Eastern and Southern Provinces was contract spraying, and a high proportion of this was aerial spraying of aphicide.

SECTION 2 (b)

## Winter Beans - Output, Variable Costs and Gross Margins

The average results on the survey farms are summarised in Tables 22 and 23 in the same form as those for spring beans (Tables 6 and 7), but "upper quartile" results are not presented owing to the smaller number of winter bean growers in the survey. In each of the survey areas the gross margins were higher in 1969 than in 1968, and although the increases were small in the East Midland and Southern Provinces, in the Eastern Province the 1969 gross margin was more than double that obtained in 1968. The generally accepted explanation for at least part of this difference is the high incidence of chocolate spot in 1968, when weather conditions favoured this disease. In 1969 yields were higher than in 1968 in Eastern and Southern Provinces, and in each province the variable costs were lower in 1969, chiefly as a result of reduced expenditure on fertilisers and herbicides.

The Eastern Province results for these two years support the crop's reputation for yield instability even more markedly than in the case of spring beans.

Frequency distributions of yields, outputs, variable costs and gross margins are set out in Tables 24 to 31 and the ranges in these items can be seen from the extremes of the class intervals in these tables. Standard deviations for these items are presented in Table 32. The standard deviations of yields as percentages of the average yields were:

| | EASTERN | EAST MIDLAND | SOUTHERN |
|---|---|---|---|
| 1968 | 34 | 39 | 44 |
| 1969 | 16 | 44 | 14 |

These figures again support the reputation for yield instability even more markedly than in the case of spring beans, and on the evidence from these farms in these two years it seems that whilst spring bean yields are unstable those of winter beans are even more unstable.

### Seed

Almost all the winter crops were the variety Throws M.S., the exceptions being three crops of Maris Beaver in the Southern Province, and

TABLE 22

OUTPUT, VARIABLE COSTS AND GROSS MARGINS PER ACRE OF WI[illegible] BY PROVINCES, 1968

| ITEM | EASTERN | | EAST MIDLAND | | SOUTHERN | | ALL PROVINCES | |
|---|---|---|---|---|---|---|---|---|
| | ALL FARMS | THOSE USING ITEM | ALL FARMS | THOSE USING ITEM | ALL FARMS | THOSE USING ITEM | ALL FARMS | THOSE USING ITEM |
| | | No. | | No. | | No. | | No. |
| No. of Farms | 18 | | 16 | | 6 | | 40 | |
| Acreage | 1395.0 | | 412.7 | | 326.8 | | 2134.5 | |
| Yield (cwt per acre) | 14.07 | | 19.16 | | 15.88 | | 16.38 | |
| Price (£ per cwt) | 1.45 | | 1.36 | | 1.51 | | 1.42 | |
| Gross Output | £ per acre | | | | | | | |
| Sales | 13.71 | | 20.34 | | 22.36 | | 17.66 | |
| Retained on Farm | 6.68 | | 5.78 | | 1.57 | | 5.55 | |
| Subsidy | 5.00 | | 5.00 | | 5.00 | | 5.00 | |
| Total | 25.39 | | 31.12 | | 28.93 | | 28.21 | |
| Variable Costs | | | | | | | | |
| Seed | 3.90 | | 3.94 | | 4.36 | | 3.99 | |
| Fertiliser | 1.14 | 9 2.27 | 2.59 | 15 2.77 | 2.97 | 5 3.56 | 1.99 | 29 2.75 |
| Sprays - Herbicides | 2.36 | 16 2.65 | 1.93 | 11 2.81 | 2.39 | | 2.19 | 33 2.66 |
| - Aphicides | 0 | | 0.06 | 1 0.90 | 0.02 | 1 0.09 | 0.02 | 2 0.49 |
| Contract Work | 0.25 | 4 1.11 | 0.32 | 4 1.30 | 0.39 | 2 1.18 | 0.30 | 10 1.20 |
| Miscellaneous | 0.08 | 5 0.29 | 0.27 | 4 1.07 | 0.02 | 1 0.12 | 0.15 | 10 0.59 |
| Farm Yard Manure | 1.52 | 4 6.84 | 0.31 | 1 5.00 | 0 | | 0.81 | 5 6.46 |
| Total | 9.25 | | 9.42 | | 10.15 | | 9.45 | |
| Gross Margin | 16.14 | | 21.70 | | 18.78 | | 18.76 | |

TABLE 23

OUTPUT, VARIABLE COSTS AND GROSS MARGINS PER ACRE OF WINTER BEANS BY PROVINCES, 1969

| ITEM | EASTERN | | EAST MIDLAND | | SOUTHERN | | ALL PROVINCES | |
|---|---|---|---|---|---|---|---|---|
| | ALL FARMS | THOSE USING ITEM | ALL FARMS | THOSE USING ITEM | ALL FARMS | THOSE USING ITEM | ALL FARMS | THOSE USING ITEM |
| | | No. | | No. | | No. | | No. |
| No. of Farms | 15 | | 8 | | 4 | | 27 | |
| Acreage | 1041.5 | | 110.7 | | 225.0 | | 1377.2 | |
| Yield (cwt per acre) | 27.44 | | 17.40 | | 16.81 | | 22.89 | |
| Price (£ per cwt) | 1.46 | | 1.52 | | 1.46 | | 1.47 | |
| Gross Output | £ per acre | | | | | | | |
| Sales | 32.11 | | 21.68 | | 21.64 | | 27.47 | |
| Retained on Farm | 7.85 | | 4.78 | | 2.85 | | 6.20 | |
| Subsidy | 5.00 | | 5.00 | | 5.00 | | 5.00 | |
| Total | 44.96 | | 31.46 | | 29.49 | | 38.67 | |
| Variable Costs | | | | | | | | |
| Seed | 3.69 | | 3.83 | | 4.65 | | 3.87 | |
| Fertiliser | 0.48 | 3 2.42 | 1.68 | 5 2.69 | 2.55 | 3 3.41 | 1.14 | 11 2.80 |
| Sprays - Herbicides | 1.67 | 11 2.27 | 0.92 | 3 2.44 | 1.38 | | 1.40 | 18 2.11 |
| - Aphicides | 0 | | 0 | | 0 | | 0 | |
| Contract Work | 0.27 | 3 1.34 | 0.37 | 1 3.00 | 0 | | 0.26 | 4 1.76 |
| Miscellaneous | 0.57 | 7 1.23 | 0.25 | 1 2.00 | 0.09 | 1 0.35 | 0.41 | 9 1.21 |
| Farm Yard Manure | 0.10 | 1 1.43 | 0 | | 0 | | 0.06 | 1 1.43 |
| Total | 6.78 | | 7.05 | | 8.67 | | 7.14 | |
| Gross Margin | 38.18 | | 24.41 | | 20.82 | | 31.53 | |

TABLE 24

YIELDS PER ACRE OF WINTER BEANS

DISTRIBUTION OF FARMS AND ACREAGE, BY PROVINCES, 1968

| YIELD CWT PER ACRE | EASTERN | | EAST MIDLAND | | SOUTHERN | | ALL PROVINCES | |
|---|---|---|---|---|---|---|---|---|
| | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES |
| 7.1 - 9.9 | 6 | 334 | - | - | 2 | 155 | 8 | 489 |
| 10.0 - 14.9 | 3 | 220 | 6 | 143 | 2 | 63 | 11 | 426 |
| 15.0 - 19.9 | 6 | 719 | 4 | 95 | - | - | 10 | 814 |
| 20.0 - 24.9 | 3 | 122 | 3 | 103 | 1 | 86 | 7 | 311 |
| 25.0 - 29.9 | - | - | - | - | 1 | 22 | 1 | 22 |
| 30.0 - 37.0 | - | - | 3 | 72 | - | - | 3 | 72 |

TABLE 25

YIELDS PER ACRE OF WINTER BEANS

DISTRIBUTION OF FARMS AND ACREAGE, BY PROVINCES, 1969

| YIELD CWT PER ACRE | EASTERN | | EAST MIDLAND | | SOUTHERN | | ALL PROVINCES | |
|---|---|---|---|---|---|---|---|---|
| | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES |
| 7.5 - 9.9 | - | - | 2 | 24 | - | - | 2 | 24 |
| 10.0 - 14.9 | - | - | 2 | 33 | 1 | 91 | 3 | 124 |
| 15.0 - 19.9 | - | - | 1 | 15 | 2 | 94 | 3 | 109 |
| 20.0 - 24.9 | 4 | 509 | 1 | 4 | 1 | 40 | 6 | 553 |
| 25.0 - 29.9 | 8 | 448 | 2 | 34 | - | - | 10 | 482 |
| 30.0 - 36.1 | 3 | 84 | - | - | - | - | 3 | 84 |

TABLE 26

OUTPUT (INCLUDING SUBSIDY) PER ACRE OF WINTER BEANS

DISTRIBUTION OF FARMS AND ACREAGE, BY PROVINCES, 1968

| OUTPUT £ PER ACRE | EASTERN | | EAST MIDLAND | | SOUTHERN | | ALL PROVINCES | |
|---|---|---|---|---|---|---|---|---|
| | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES |
| 14.8 - 19.9 | 5 | 248 | 2 | 42 | 2 | 155 | 9 | 445 |
| 20.0 - 24.9 | 3 | 146 | 3 | 86 | - | - | 6 | 232 |
| 25.0 - 29.9 | 6 | 833 | 3 | 35 | 2 | 64 | 11 | 932 |
| 30.0 - 34.9 | 4 | 168 | 4 | 98 | - | - | 8 | 266 |
| 35.0 - 39.9 | - | - | 1 | 80 | 1 | 86 | 2 | 166 |
| 40.0 - 49.9 | - | - | 2 | 30 | 1 | 22 | 3 | 52 |
| 50.0 - 54.8 | - | - | 1 | 42 | - | - | 1 | 42 |

TABLE 27

OUTPUT (INCLUDING SUBSIDY) PER ACRE OF WINTER BEANS

DISTRIBUTION OF FARMS AND ACREAGE, BY PROVINCES, 1969

| OUTPUT £ PER ACRE | EASTERN | | EAST MIDLAND | | SOUTHERN | | ALL PROVINCES | |
|---|---|---|---|---|---|---|---|---|
| | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES |
| 15.9 - 19.9 | - | - | 1 | 12 | - | - | 1 | 12 |
| 20.0 - 24.9 | - | - | 2 | 20 | 1 | 91 | 3 | 111 |
| 25.0 - 29.9 | - | - | 1 | 25 | - | - | 1 | 25 |
| 30.0 - 34.9 | 2 | 159 | 1 | 15 | 3 | 134 | 6 | 308 |
| 35.0 - 39.9 | 1 | 30 | 1 | 4 | - | - | 2 | 34 |
| 40.0 - 49.9 | 9 | 769 | 2 | 34 | - | - | 11 | 803 |
| 50.0 - 59.6 | 3 | 84 | - | - | - | - | 3 | 84 |

TABLE 28

VARIABLE COSTS PER ACRE OF WINTER BEANS

DISTRIBUTION OF FARMS AND ACREAGE, BY PROVINCES, 1968

| VARIABLE COSTS £ PER ACRE | EASTERN | | EAST MIDLAND | | SOUTHERN | | ALL PROVINCES | |
|---|---|---|---|---|---|---|---|---|
| | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES |
| 2.4 - 3.9 | 2 | 109 | - | - | - | - | 2 | 109 |
| 4.0 - 5.9 | 1 | 188 | - | - | - | - | 1 | 188 |
| 6.0 - 7.9 | 5 | 426 | 4 | 105 | - | - | 9 | 531 |
| 8.0 - 9.9 | 4 | 212 | 5 | 211 | 2 | 113 | 11 | 536 |
| 10.0 - 11.9 | 2 | 339 | 6 | 81 | 3 | 128 | 11 | 548 |
| 12.0 - 13.9 | 1 | 36 | 1 | 15 | 1 | 86 | 3 | 137 |
| 14.0 - 15.9 | 2 | 59 | - | - | - | - | 2 | 59 |
| 16.0 - 17.6 | 1 | 26 | - | - | - | - | 1 | 26 |

TABLE 29

VARIABLE COSTS PER ACRE OF WINTER BEANS

DISTRIBUTION OF FARMS AND ACREAGE, BY PROVINCES, 1969

| VARIABLE COSTS £ PER ACRE | EASTERN | | EAST MIDLAND | | SOUTHERN | | ALL PROVINCES | |
|---|---|---|---|---|---|---|---|---|
| | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES |
| 2.2 - 3.9 | 3 | 210 | 2 | 13 | - | - | 5 | 223 |
| 4.0 - 5.9 | 3 | 194 | 2 | 16 | - | - | 5 | 210 |
| 6.0 - 7.9 | 5 | 503 | 2 | 40 | - | - | 7 | 543 |
| 8.0 - 9.9 | 1 | 21 | 1 | 30 | 4 | 225 | 6 | 276 |
| 10.0 - 11.9 | 2 | 71 | - | - | - | - | 2 | 71 |
| 12.0 - 13.9 | 1 | 42 | - | - | - | - | 1 | 42 |
| 14.0 - 15.6 | - | - | 1 | 12 | - | - | 1 | 12 |

TABLE 30

GROSS MARGINS PER ACRE OF WINTER BEANS

DISTRIBUTION OF FARMS AND ACREAGE, BY PROVINCES, 1968

| GROSS MARGIN £ PER ACRE | EASTERN | | EAST MIDLAND | | SOUTHERN | | ALL PROVINCES | |
|---|---|---|---|---|---|---|---|---|
| | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES |
| 1.6 - 9.9 | 5 | 248 | 1 | 12 | 1 | 65 | 7 | 325 |
| 10.0 - 14.9 | 3 | 140 | 6 | 143 | 1 | 90 | 10 | 373 |
| 15.0 - 19.9 | 5 | 564 | 1 | 8 | 2 | 64 | 8 | 636 |
| 20.0 - 24.9 | 2 | 314 | 4 | 98 | - | - | 6 | 412 |
| 25.0 - 29.9 | 1 | 20 | 1 | 80 | 1 | 86 | 3 | 186 |
| 30.0 - 34.9 | 2 | 109 | - | - | - | - | 2 | 109 |
| 35.0 - 39.9 | - | - | 2 | 30 | 1 | 22 | 3 | 52 |
| 40.0 - 45.7 | - | - | 1 | 42 | - | - | 1 | 42 |

TABLE 31

GROSS MARGINS PER ACRE OF WINTER BEANS

DISTRIBUTION OF FARMS AND ACREAGE, BY PROVINCES, 1969

| GROSS MARGIN £ PER ACRE | EASTERN | | EAST MIDLAND | | SOUTHERN | | ALL PROVINCES | |
|---|---|---|---|---|---|---|---|---|
| | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES | NO. OF FARMS | ACRES |
| 4.4 - 9.9 | - | - | 2 | 24 | - | - | 2 | 24 |
| 10.0 - 14.9 | - | - | - | - | 1 | 91 | 1 | 91 |
| 15.0 - 19.9 | - | - | - | - | - | - | - | - |
| 20.0 - 24.9 | - | - | 2 | 33 | 3 | 134 | 5 | 167 |
| 25.0 - 29.9 | 1 | 42 | 1 | 15 | - | - | 2 | 57 |
| 30.0 - 34.9 | 6 | 572 | 1 | 5 | - | - | 7 | 577 |
| 35.0 - 39.9 | 4 | 191 | 1 | 30 | - | - | 5 | 221 |
| 40.0 - 55.6 | 4 | 236 | 1 | 4 | - | - | 5 | 240 |

TABLE 32

STANDARD DEVIATIONS BY PROVINCES, WINTER BEANS 1968 AND 1969

| ITEM | CROP | EASTERN | EAST MIDLAND | SOUTHERN |
|---|---|---|---|---|
| Yield per acre | Winter 1968 | 4.89 | 7.80 | 7.33 |
| | Winter 1969 | 4.34 | 7.65 | 3.47 |
| Total output per acre | Winter 1968 | 6.87 | 10.45 | 11.30 |
| | Winter 1969 | 7.15 | 10.64 | 4.99 |
| Total variable costs per acre | Winter 1968 | 3.82 | 1.63 | 1.56 |
| | Winter 1969 | 2.91 | 3.72 | 0.56 |
| Gross Margin per acre | Winter 1968 | 8.89 | 10.52 | 10.62 |
| | Winter 1969 | 7.23 | 12.11 | 4.96 |

occasional crops of "own variety" or "variety not known". Between 20 per cent and 25 per cent of the crops were ploughed in after broadcasting or shallow drilling, and the remainder were drilled on row widths varying from 4½ inches to 24 inches, with roughly one third of all crops on 7 inch rows.

The average seed rates used are shown in Table 33.

TABLE 33

AVERAGE SEED RATES FOR WINTER BEANS, BY PROVINCES, 1968 and 1969

| YEAR | EASTERN | EAST MIDLAND | SOUTHERN |
|---|---|---|---|
| | | cwt per acre | |
| 1968 | 1.89 | 1.69 | 1.78 |
| 1969 | 1.75 | 1.64 | 1.82 |

Fertiliser and F.Y.M.

The numbers of farmers using fertiliser and the number using farm-yard manure are shown in Tables 22 and 23, and additional information on fertiliser practice is given in Table 34.

Herbicides and Weed Problems

The numbers of farmers using herbicides are shown in Tables 22 and 23, and the weed problems reported on the survey farms are shown in Table 21. Simazine was the dominant herbicide, accounting for 85 per cent of the winter bean crops which received herbicide treatment. In all cases where the spraying dates are known the simazine was applied in autumn or winter.

TABLE 34

FERTILISER PRACTICE FOR WINTER BEANS BY PROVINCES, 1968 and 1969

| | 1968 | | | 1969 | | |
|---|---|---|---|---|---|---|
| | EASTERN | EAST MIDLAND | SOUTHERN | EASTERN | EAST MIDLAND | SOUTHERN |
| % of crops receiving N | 6 | 25 | 50 | 0 | 25 | 50 |
| " " " " P | 50 | 94 | 83 | 13 | 63 | 75 |
| " " " " K | 50 | 75 | 83 | 20 | 63 | 75 |
| | units per acre | | | | | |
| Average use of N | 18.0 | 21.0 | 19.9 | 0 | 13.0 | 24.0 |
| " " " P | 46.1 | 59.6 | 79.9 | 44.0 | 41.2 | 45.2 |
| " " " K | 60.3 | 57.2 | 59.9 | 42.5 | 41.2 | 45.2 |

Of twenty eight growers of winter beans on heavy or medium soils who expressed an opinion, twenty two regarded the crop's effect on weed problems as beneficial, and only three regarded it as detrimental.

SECTION 3

## Demand on Fixed Resources - Spring and Winter Beans

The demand which a crop makes on the farm's fixed resources depends upon what is done, when and how it is done, and how long this takes, and some information on these points is presented in this section.

### Equipment

In the 1968 survey farmers were asked about any modifications which had been carried out (because of the bean crop) to drills, combine harvesters, driers or storage arrangements, and they were also asked whether they thought the bean crop resulted in additional wear and tear on equipment. Drills had been modified hardly at all, apart from adjustments for row width or for broadcasting (see pp. 18 & 30, under "Seed"). Of the 145 farmers surveyed three had fitted coulter weights, three had replaced disc coulters by Suffolk coulters, and two had made modifications to the seed box. Sixteen farmers thought wear and tear on drills was higher than when drilling cereals, but only four put the increase at more than ten per cent.

Combine harvesters had been modified by only nine farmers (apart from the fitting of appropriate sieves), five cases being modifications of dividers, reels or elevators and the others relating to the drum, concave or augers. Sixty per cent of the farmers thought the crop caused extra wear on combines, and although ten per cent was the most common estimate of this, several farmers suggested considerably higher figures. It was often pointed out that to clean the combine after it had worked in a crop of field beans had been a full day's job. Modifications to driers and storage arrangements were insignificant, but one farmer in four reported increased wear and tear on conveying equipment, although few were prepared to estimate the extent of this.

### Seedbed preparation

Since the time taken for operations such as ploughing and harvesting depends more on the size of machine and field conditions than on the subsequent crop (i.e. field beans) it seemed more useful to record the operations carried out (Tables 35 and 36) than to record the man hours

TABLE 35

SEEDBED PREPARATION FOR SPRING BEANS, BY PROVINCES, 1968 and 1969

| OPERATIONS PERFORMED | EASTERN | | EAST MIDLAND | | SOUTHERN | |
|---|---|---|---|---|---|---|
| | FARMS | ACRES | FARMS | ACRES | FARMS | ACRES |
| 1968 | | | per cent | | | |
| Ploughed once, no additional operation | - | - | - | - | 9 | 12 |
| Ploughed + 1 " " | 19 | 21 | 19 | 18 | 21 | 33 |
| Ploughed + 2 " " | 46 | 54 | 35 | 45 | 25 | 22 |
| Ploughed + 3 " " | 23 | 19 | 16 | 11 | 3 | 2 |
| Ploughed + 4 or more " " | 10 | 4 | 16 | 16 | 18 | 14 |
| Ploughed twice or three times | 2 | 2 | 3 | 1 | 15 | 10 |
| Not ploughed | - | - | 11 | 9 | 9 | 7 |
| 1969 | | | | | | |
| Ploughed once, no additional operation | 2 | 3 | 4 | 4 | 4 | 3 |
| Ploughed + 1 " " | 22 | 12 | 25 | 23 | 15 | 16 |
| Ploughed + 2 " " | 50 | 57 | 21 | 20 | 22 | 23 |
| Ploughed + 3 " " | 17 | 17 | 13 | 9 | 7 | 8 |
| Ploughed + 4 or more " " | 7 | 9 | 4 | 5 | 30 | 20 |
| Ploughed twice | - | - | 8 | 2 | 11 | 10 |
| Not ploughed | 2 | 2 | 25 | 37 | 11 | 20 |

TABLE 36

SEEDBED PREPARATION FOR WINTER BEANS, BY PROVINCES, 1968 and 1969

| OPERATIONS PERFORMED | EASTERN | | EAST MIDLAND | | SOUTHERN | |
|---|---|---|---|---|---|---|
| | FARMS | ACRES | FARMS | ACRES | FARMS | ACRES |
| 1968 | | | per | cent | | |
| Ploughed once, no additional operation | - | - | 12 | 12 | - | - |
| Ploughed + 1 " " | 11 | 5 | 25 | 15 | 50 | 74 |
| Ploughed + 2 " " | 33 | 42 | 38 | 50 | 17 | 12 |
| Ploughed + 3 " " | 22 | 15 | 19 | 13 | - | - |
| Ploughed + 4 or more " " | 17 | 7 | 6 | 10 | - | - |
| Ploughed twice | - | - | - | - | - | - |
| Not ploughed | 17 | 31 | - | - | 33 | 14 |
| 1969 | | | | | | |
| Ploughed once, no additional operation | 7 | 13 | 63 | 55 | 50 | 38 |
| Ploughed + 1 " " | 20 | 16 | - | - | 25 | 21 |
| Ploughed + 2 " " | 20 | 10 | 12 | 4 | - | - |
| Ploughed + 3 " " | 26 | 11 | - | - | - | - |
| Ploughed + 4 or more " " | 7 | 31 | 25 | 41 | - | - |
| Ploughed twice | 7 | 2 | - | - | - | - |
| Not ploughed | 13 | 17 | - | - | 25 | 41 |

expended on seedbed preparation. The most common practice, particularly for spring beans and in the Eastern Province, was to plough and carry out two subsequent cultivations. The proportion of farms on which ploughing and four or more subsequent operations were recorded may be a consequence of weed problems, or of a determination to avoid weed problems, rather than an indication of what was necessary to produce an appropriate seedbed.

Other operations

There are other operations, such as spraying, where the time taken is not greatly influenced by the crop, and the time taken for these operations was not recorded. Operations where the time involved was likely to differ between field beans and other crops were selected for recording, and Tables 37 and 38 give the average times for these operations. The footnote draws

TABLE 37

MAN HOURS AND MACHINE HOURS PER ACRE OF SPRING BEANS FOR SELECTED OPERATIONS, BY PROVINCES, 1968 and 1969

| OPERATION | 1968 | | | 1969 | | |
|---|---|---|---|---|---|---|
| | EASTERN | EAST MIDLAND | SOUTHERN | EASTERN | EAST MIDLAND | SOUTHERN |
| | Average (1) hours per acre | | | | | |
| Manual labour | | | | | | |
| Applying seed and fertiliser | 0.9 | 0.6 | 0.9 | 0.7 | 0.5 | 0.8 |
| Combine harvesting | 0.5 | 0.7 | 0.6 | 0.4 | 0.5 | 0.5 |
| Hauling beans | 0.4 | 0.4 | 0.3 | 0.3 | 0.2 | 0.3 |
| Drying beans | 0 6 | 0.3 | 0.8 | 0.3 | 0.3 | 0.4 |
| Haulm disposal | 0.6 | 0.3 | 0.4 | 0.5 | 0.4 | 0.5 |
| Machinery use | | | | | | |
| Tractor - applying seed and fertiliser | 0.7 | 0.6 | 0.8 | 0.6 | 0.5 | 0.8 |
| Combine harvester | 0.5 | 0.7 | 0.5 | 0.4 | 0.5 | 0.5 |
| Tractor or lorry - hauling beans | 0.4 | 0.4 | 0.3 | 0.3 | 0.2 | 0.3 |
| Tractor - haulm disposal(2) | 0.5 | 0.5 | 0.4 | 0.3 | 0.4 | 0.4 |

(1) Excluding farms on which the operation was not carried out, or was carried out by contractor, or not separately recorded.

(2) Excluding farms which did not use a tractor for haulm disposal.

TABLE 38

MAN HOURS AND MACHINE HOURS PER ACRE OF WINTER BEANS FOR SELECTED OPERATIONS, BY PROVINCES, 1968 and 1969

| OPERATION | 1968 | | | 1969 | | |
|---|---|---|---|---|---|---|
| | EASTERN | EAST MIDLAND | SOUTHERN | EASTERN | EAST MIDLAND | SOUTHERN |
| | Average hours(1) per acre | | | | | |
| Manual labour | | | | | | |
| Applying seed and fertiliser | 1.1 | 0.8 | 0.7 | 0.9 | 1.3 | 0.6 |
| Combine harvesting | 0.5 | 0.7 | 0.5 | 0.5 | 0.7 | 0.5 |
| Hauling beans | 0.3 | 0.4 | 0.3 | 0.4 | 0.3 | 0.4 |
| Drying beans | 0.4 | 0.5 | 0.2 | 0.4 | 0.5 | 0.1 |
| Haulm disposal | 0.5 | 0.5 | 0.4 | 0.8 | 0.5 | 0.3 |
| Machinery use | | | | | | |
| Tractor - applying seed and fertiliser | 0.9 | 0.8 | 0.7 | 0.8 | 1.3 | 0.6 |
| Combine harvester | 0.5 | 0.7 | 0.5 | 0.5 | 0.7 | 0.5 |
| Tractor or lorry - hauling beans | 0.3 | 0.4 | 0.3 | 0.4 | 0.3 | 0.3 |
| Tractor - haulm disposal(2) | 0.3 | 0.5 | 0.3 | 0.8 | 0.4 | 0.3 |

(1) Excluding farms on which the operation was not carried out, or was carried out contractor, or not separately recorded.

(2) Excluding farms which did not use a tractor for haulm disposal.

attention to the fact that some farms were able to omit some operations, these being "drying beans" and "haulm disposal". The extent to which this was done is shown in Table 39 for drying and in Tables 40 and 41 for haulm disposal. The methods used for haulm disposal are also shown (Tables 40 and 41), and it can be seen that there was considerable diversity, and that some farms used more than one method as some of the 'Farm" columns add to more than one hundred per cent. Storage methods were less diverse - roughly half the farms relied on bins, and a quarter on floor storage. Roughly seven per cent of the total sample relied on sacks (most of these being in the Eastern

TABLE 39

PROPORTIONS OF FARMS, AND OF ACRES, ON WHICH DRYING OF BEANS WAS OMITTED, BY PROVINCES, 1968 and 1969

| | EASTERN | | EAST MIDLAND | | SOUTHERN | |
|---|---|---|---|---|---|---|
| | FARMS | ACREAGE | FARMS | ACREAGE | FARMS | ACREAGE |
| | per cent | | | | | |
| Spring | | | | | | |
| 1968 | 35 | 25 | 8 | 8 | - | - |
| 1969 | 54 | 43 | 50 | 47 | 21 | 22 |
| Winter | | | | | | |
| 1968 | 39 | 31 | 6 | 2 | 16 | 20 |
| 1969 | 80 | 34 | 50 | 22 | - | - |

province) and the remainder had various combinations of two storage methods.(1) Information regarding moisture content of beans at harvest is presented in Tables 42 and 43. From Tables 39, 42 and 43 it is clear that

(i) in all provinces the 1969 bean harvest was carried out under better weather conditions than had been the case in 1968,

(ii) in both of these years harvest conditions in the Eastern Province were better than those in the East Midlands, which in turn appear to have been better than those in the South,

(1) Appendix Tables 4 and 5.

TABLE 40

RELATIVE IMPORTANCE OF DIFFERENT METHODS OF HAULM DISPOSAL AFTER SPRING BEANS, BY PROVINCES, 1968 and 1969

| METHOD | EASTERN | | EAST MIDLAND | | SOUTHERN | |
|---|---|---|---|---|---|---|
| | FARMS | ACREAGE | FARMS | ACREAGE | FARMS | ACREAGE |
| 1968 | per cent | | | | | |
| Burn | 23 | 15 | 18 | 9 | 7 | 1 |
| Burn after raking, swathing or baling | 59 | 56 | 4 | 4 | 10 | 10 |
| Cart | 10 | 10 | - | - | 3 | 2 |
| Chop or rotovate | 10 | 6 | 14 | 12 | 53 | 58 |
| No disposal(1) | 20 | 13 | 64 | 75 | 27 | 29 |
| 1969 | | | | | | |
| Burn | 72 | 84 | 39 | 41 | 12 | 11 |
| Burn after raking, swathing or baling | | | 4 | 12 | 8 | 6 |
| Cart | 11 | 7 | 26 | 17 | 4 | 3 |
| Chop or rotovate | 7 | 7 | 18 | 19 | 49 | 49 |
| No disposal(1) | 10 | 2 | 13 | 11 | 32 | 31 |

(1) i.e. no specific haulm disposal operation prior to normal cultivations which in most of these cases commenced with ploughing.

TABLE 41

RELATIVE IMPORTANCE OF DIFFERENT METHODS OF HAULM DISPOSAL AFTER WINTER BEANS, BY PROVINCES, 1968 and 1969

| METHOD | EASTERN | | EAST MIDLAND | | SOUTHERN | |
|---|---|---|---|---|---|---|
| | FARMS | ACREAGE | FARMS | ACREAGE | FARMS | ACREAGE |
| 1968 | | | per | cent | | |
| Burn | 49 | 38 | 12 | 20 | - | - |
| Burn after raking, swathing or baling | 39 | 54 | - | - | 16 | 26 |
| Cart | 19 | 5 | 19 | 20 | - | - |
| Chop or rotovate | - | - | 6 | 9 | 50 | 26 |
| No disposal(1) | 9 | 3 | 63 | 51 | 34 | 48 |
| 1969 | | | | | | |
| Burn | 74 | 82 | 37 | 32 | 17 | 3 |
| Burn after raking, swathing or baling | 7 | 10 | - | - | - | - |
| Cart | 13 | 6 | 13 | 4 | - | - |
| Chop or rotovate | - | - | 25 | 50 | 67 | 88 |
| No disposal(1) | 6 | 2 | 25 | 14 | 16 | 9 |

(1) i.e. no specific haulm disposal operation prior to normal cultivations, which in most of these cases commenced with ploughing.

TABLE 42

MOISTURE CONTENTS OF SPRING BEANS AS HARVESTED, BY PROVINCES, 1968 and 1969

| | EASTERN | | EAST MIDLAND | | SOUTHERN | |
|---|---|---|---|---|---|---|
| | FARMS | ACREAGE | FARMS | ACREAGE | FARMS | ACREAGE |
| 1968 | | | per cent | | | |
| Proportion of records supplying information | 79 | 87 | 46 | 54 | 55 | 57 |
| Moisture contents : | | | | | | |
| Under 20% | 37 | 36 | 24 | 13 | 6 | 1 |
| 20 - 25% | 42 | 52 | 59 | 71 | 61 | 63 |
| Over 25% | 21 | 12 | 17 | 16 | 33 | 36 |
| 1969 | | | | | | |
| Proportion of records supplying information | 100 | 100 | 75 | 84 | 32 | 33 |
| Moisture contents : | | | | | | |
| Under 20% | 83 | 76 | 67 | 64 | 67 | 51 |
| 20 - 25% | 17 | 24 | 28 | 30 | 22 | 34 |
| Over 25% | - | - | 5 | 6 | 11 | 15 |

TABLE 43

MOISTURE CONTENTS OF WINTER BEANS AS HARVESTED, BY PROVINCES, 1968 and 1969

| | EASTERN | | EAST MIDLAND | | SOUTHERN | |
|---|---|---|---|---|---|---|
| | FARMS | ACREAGE | FARMS | ACREAGE | FARMS | ACREAGE |
| 1968 | | | per cent | | | |
| Proportion of records supplying information | 72 | 77 | 69 | 81 | 33 | 33 |
| Moisture contents : | | | | | | |
| Under 20% | 54 | 52 | - | - | - | - |
| 20 - 25% | 38 | 42 | 45 | 44 | 50 | 27 |
| Over 25% | 8 | 6 | 55 | 56 | 50 | 73 |
| 1969 | | | | | | |
| Proportion of records supplying information | 100 | 100 | 38 | 54 | 75 | 80 |
| Moisture contents : | | | | | | |
| Under 20% | 93 | 96 | 100 | 100 | 33 | 27 |
| 20 - 25% | 7 | 4 | - | - | 34 | 51 |
| Over 25% | - | - | - | - | 33 | 22 |

and (iii) in the Eastern Province in each of these years winter beans were harvested at lower moisture contents than were spring beans.

Dates of drilling, and harvesting

Drilling was much earlier in 1968 than in 1969. In 1968 two thirds of the spring bean crops on heavy land, and eighty five per cent of those on light land, had been drilled by 7th March, and most of the remainder had been drilled before the last week of March. In 1969 although over sixty per cent of the light land crops were drilled by 7th March, on heavy land only eighteen per cent of the crops had then been drilled, and over seventy per cent were drilled after March 23rd, but drilling then proceeded quickly and was completed by the end of March. In the case of the winter bean crops, a quarter were drilled in September 1967, as against less then five per cent for that month in 1968. A further seventy per cent of the crops were drilled during October in 1967, and eighty per cent of the 1968 crops were drilled in that month.

Farmers were asked to record the dates when bean crops were ready to harvest, and this information is presented for spring beans in Table 44. It provides support for the common contention that lateness of ripening is a problem, especially in a difficult year and outside the Eastern Province, and that this often leaves very little time to make adequate preparations for a subsequent winter wheat crop. In the Eastern Province ninety per cent of the winter bean crops were ready by mid-September in both 1968 and 1969. Information on harvest readiness of winter beans in the East Midland and Southern Provinces was too rarely recorded to support any confident generalisations, but it appeared that winter beans were less likely to ripen by mid-September in the Southern Province than in the Eastern. In the East Midlands the majority of recorded crops in 1968 were not ready until late September, and often not until October.

TABLE 44

DISTRIBUTION OF SPRING BEANS BY DATES OF 'HARVEST-READINESS', BY PROVINCES, 1968 and 1969

| DATE BEANS READY FOR HARVEST | EASTERN | | EAST MIDLAND | | SOUTHERN | |
|---|---|---|---|---|---|---|
| | FARMS | ACREAGE | FARMS | ACREAGE | FARMS | ACREAGE |
| 1968 | per cent | | | | | |
| August | 4 | 1 | - | - | 3 | 4 |
| 1 - 15th September | 39 | 48 | 7 | 3 | 18 | 19 |
| 16 - 30th September | 47 | 45 | 48 | 40 | 44 | 44 |
| 1 - 15th October | 10 | 6 | 30 | 38 | 29 | 26 |
| 16 - 31st October | - | - | 11 | 10 | 6 | 7 |
| November | - | - | 4 | 9 | - | - |
| 1969 | | | | | | |
| August | - | - | 5 | 4 | 8 | 6 |
| 1 - 15th September | 69 | 66 | 19 | 23 | 61 | 61 |
| 16 - 30th September | 31 | 34 | 52 | 53 | 27 | 30 |
| 1 - 15th October | - | - | 24 | 20 | - | - |
| 16 - 31st October | - | - | - | - | 4 | 3 |

Farmers were also asked the dates when harvest actually took place. In 1969 ninety five per cent of spring bean crops and ninety per cent of winter bean crops were harvested as soon as they were ready. Harvest of 1968 spring bean crops took place as soon as the crop was ready on fifty four per cent of the Eastern farm, two thirds of the East Midland farms and three quarters of the Southern farms. In the East and East Midlands twenty

per cent of the crops were ready for more than 14 days before they were harvested, but delays of 14 days occurred on only six per cent of the farms in the Southern Province. On winter bean crops delays of more than 14 days were less common than on spring crops in the Eastern and Southern Provinces but much more common in the East Midlands. There were frequent comments that in 1968 the late harvested crops of both spring and winter beans were particularly difficult to harvest and suffered considerable shedding.

SECTION 4

## Field Beans as a Break Crop

'Barley barons' prospered in the late 1950s and early 1960s but continuous barley growing seems much less attractive to-day. The most successful practitioners scarcely achieve a reasonable return on the capital involved, and as the system is continued the problems of grass weeds, foliar diseases and soil structure seem to increase and make success less likely. Farmers with a large part of their acreage in barley show a keen interest in break crops, and budgetary calculations comparing continuous barley with rotations containing wheat after a break crop have been commonplace.

On the survey farms, yields averaged approximately 30 cwts. for barley and 34 cwts. for wheat. Some of the wheat was second or third cereal crop, and the barley was not all continuous. If continuous barley is assumed to yield 29 cwts. and first wheat crops assumed to yield 36 cwts. the gross returns per acre (1971 prices) are approximately £42 (barley) and £58 (wheat). Hence the return from two years' barley cropping would be £84, and as wheat following beans is assumed to return £58 the beans need only return £26 for the combination of wheat after beans to give a return similar to two years' barley. As the variable costs of beans plus the following wheat are also comparable to two years' barley, the yield of beans required to "break even", with beans at £1.5 per ton, is only $\frac{26}{1.5}$ or approximately 18 cwt. per acre. This simple arithmetic, in conjunction with the survey data, suggests that field beans as a break crop may merit serious consideration, at least by the less successful continuous barley growers.

The aggregated data may not be applicable to a particular farm, and this simple calculation was based on rather sweeping assumptions. But

Bullen [1] has pointed out that in the mid-60s at Boxworth Experimental Husbandry Farm "the margin achieved annually from a rotation [2] was likely to exceed that of continuous wheat by £5 per acre and of continuous barley by £7 per acre". At 1972 prices the figures become roughly £5 and £9. Gross margins are not the whole story - the effect of the break crop on fixed costs must be considered, and so must any advantages or problems of the break crops which have not been incorporated into the gross margins. There is no reason to expect any significant increase in fixed costs as a result of incorporating field beans into a rotation. Modifications to existing cereal equipment seem to be needed rarely, and when needed they are usually inexpensive. There is increased wear and tear, especially on the combine, which is hard to evaluate. But there should be some savings from a better seasonal spread of operations to offset against the increased wear and tear. On some farms the separation of wheat, barley and beans in store may present problems necessitating increased expenditure.

Weed populations may be reduced where residual herbicides are used, especially on heavy soils but the late harvest and straw disposal problems may make it difficult for growers to prepare the land in time for a winter wheat crop. This problem may not be adequately recognised in figures from Boxworth Experimental Husbandry Farm. A further disadvantage may be instability of the income from the bean crops - but this is offset to some extent by the diversification of income resulting from incorporating beans into the cropping programme.

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(1) Bullen, E. R. (1967) Break Crops in Cereal Production, J.R.A.S.E. Vol. 128 pp. 77-85.

(2) Wheat, wheat, wheat, barley, beans.

Other rotations are possible of course - for example wheat, wheat, oats, beans would often give higher annual gross margins than the rotation of three wheats followed by barley then beans. Also, the seasonal fluctuations in labour demand when the favoured rotation contains a high proportion of winter drilled crops may be minimised by retaining part of the farm for monocropping with spring barley. This would have the further advantage of preserving on that part of the farm any benefits which may have accrued from any possible "take-all decline" after a long run of barley crops. On farms where yield depression in the second, third or fourth cereal crop can be attributed to take-all, the practice of limiting a break crop system to only part of the farm may be more advantageous. The length of the cereal run between breaks could then be reduced and the remainder of the farm could be excluded from the rotational system and cropped with continuous barley. Growers who had confidence in take-all decline could then substitute wheat for barley on this area in years when favourable autumn weather made this feasible.

The extent and duration of the benefits from break crops vary with soil type, climate, weed problems etc. and adapting experimental results to the circumstance of any particular farm may be a daunting task. Better farm records of yields obtained at various points in the rotation would be helpful, especially if available for two or three years. Such records alone may not support very firm conclusions, even for the farm on which they were kept (due to the absence of control plots) but they can be a useful addition to other sources of evidence. When yield expectations have been formulated budgets based on them offer a simple and reliable way of comparing alternative rotations and selecting those most likely to increase profits on the farm concerned.

## APPENDIX TABLE 1

## NUMBER OF FARMS AND BEAN ACREAGE PER FARM, BY ARABLE ACREAGE SIZE GROUPS AND DEGREE OF CEREAL SPECIALISATION 1968

| Arable Acreage Size Group | Wheat and Barley as % of Arable | EASTERN | | EAST MIDLAND | | SOUTHERN | |
|---|---|---|---|---|---|---|---|
| | | No. of Farms | Average Bean Acreage/Farm | No. of Farms | Average Bean Acreage/Farm | No. of Farms | Average Bean Acreage/Farm |
| 44 - 199 | 80 - 100 | 1 | 20.0 | 2 | 9.5 | - | |
| | 70 - 79 | 5 | 22.3 | - | | - | |
| | 60 - 69 | 3 | 14.7 | 2 | 6.5 | 1 | 12.0 |
| | 23 - 59 | 1 | 5.0 | 4 | 11.2 | - | |
| | | 10 | | 8 | | 1 | |
| 200 - 499 | 80 - 100 | 2 | 24.5 | 2 | 54.3 | 1 | 14.0 |
| | 70 - 79 | 14 | 47.1 | 10 | 40.1 | 4 | 44.1 |
| | 60 - 69 | 9 | 35.5 | 6 | 28.0 | - | |
| | 39 - 59 | 7 | 25.2 | 4 | 23.2 | 1 | 59.0 |
| | | 32 | | 22 | | 6 | |
| 500 - 999 | 80 - 100 | - | | - | | 1 | 52.5 |
| | 70 - 79 | 6 | 108.2 | 4 | 34.9 | 3 | 27.7 |
| | 60 - 69 | 4 | 89.2 | 3 | 44.3 | 5 | 71.1 |
| | 32 - 59 | 2 | 37.0 | 3 | 60.0 | 3 | 109.3 |
| | | 12 | | 10 | | 12 | |
| 1,000 - 2,418 | 80 - 100 | - | | 1 | 63.0 | 1 | 25.0 |
| | 70 - 79 | 3 | 249.7 | 1 | 42.0 | 7 | 103.3 |
| | 60 - 69 | 3 | 190.0 | - | | 7 | 107.6 |
| | 45 - 59 | 1 | 27.0 | 1 | 103.0 | 1 | 51.0 |
| | | 7 | | 3 | | 16 | |
| All size groups | 80 - 100 | 3 | | 5 | | 3 | |
| | 70 - 79 | 28 | | 15 | | 14 | |
| | 60 - 69 | 19 | | 11 | | 13 | |
| | 23 - 59 | 11 | | 12 | | 5 | |
| | | 61 | | 43 | | 35 | |

## APPENDIX TABLE 2

### NUMBER OF FARMS AND BEAN ACREAGE PER FARM, BY ARABLE ACREAGE SIZE GROUPS AND DEGREE OF CEREAL SPECIALISATION, 1969

| ARABLE ACREAGE SIZE GROUP | WHEAT AND BARLEY AS % OF ARABLE | EASTERN | | EAST MIDLAND | | SOUTHERN | |
|---|---|---|---|---|---|---|---|
| | | NO. OF FARMS | AVERAGE BEAN ACREAGE/FARM | NO. OF FARMS | AVERAGE BEAN ACREAGE/FARM | NO. OF FARMS | AVERAGE BEAN ACREAGE/FARM |
| 44 - 199 | 80 - 100 | 1 | 20.0 | - | | - | |
| | 70 - 79 | 3 | 17.5 | - | | - | |
| | 60 - 69 | 2 | 16.7 | 2 | 8.7 | - | |
| | 23 - 59 | - | | 4 | 9.1 | - | |
| | | 6 | | 6 | | - | |
| 200 - 499 | 80 - 100 | 2 | 32.6 | 2 | 87.5 | - | |
| | 70 - 79 | 12 | 52.3 | 5 | 38.5 | 3 | 74.2 |
| | 60 - 69 | 8 | 37.4 | 5 | 24.5 | - | |
| | 39 - 59 | 5 | 24.1 | 3 | 21.5 | 1 | 51.0 |
| | | 27 | | 15 | | 4 | |
| 500 - 999 | 80 - 100 | - | | - | | - | |
| | 70 - 79 | 4 | 104.7 | 2 | 48.1 | 3 | 71.0 |
| | 60 - 69 | 3 | 80.3 | 1 | 42.0 | 4 | 44.9 |
| | 32 - 59 | 1 | 25.0 | 3 | 44.4 | 3 | 108.3 |
| | | 8 | | 6 | | 10 | |
| 1,000 - 2,418 | 80 - 100 | - | | 1 | 60.0 | 1 | 101.0 |
| | 70 - 79 | 3 | 246.7 | 1 | 30.0 | 3 | 157.8 |
| | 60 - 69 | 3 | 158.8 | - | | 6 | 69.3 |
| | 45 - 59 | 1 | 47.0 | - | | 2 | 80.0 |
| | | 7 | | 2 | | 12 | |
| All size groups | 80 - 100 | 3 | | 3 | | 1 | |
| | 70 - 79 | 22 | | 8 | | 9 | |
| | 60 - 69 | 16 | | 8 | | 10 | |
| | 23 - 59 | 7 | | 10 | | 6 | |
| | | 48 | | 29 | | 26 | |

APPENDIX TABLE 3
IMPORTANCE OF VARIOUS BEAN VARIETIES, BY PROVINCES, 1968 AND 1969

| VARIETY | EASTERN 1968 | | E. MIDLAND 1968 | | SOUTHERN 1968 | | EASTERN 1969 | | E. MIDLAND 1969 | | SOUTHERN 1969 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NO. OF GROWERS | % OF ACREAGE | NO. OF GROWERS | % OF ACREAGE | NO. OF GROWERS | % OF ACREAGE | NO. OF GROWERS | % OF ACREAGE | NO. OF GROWERS | % OF ACREAGE | NO. OF GROWERS | % OF ACREAGE |
| SPRING | | | | | | | | | | | | |
| Minor | 29 | 62.6 | 15 | 34.9 | 4 | 12.1 | 19 | 53.1 | 10 | 33.1 | 2 | 4.1 |
| Maris Bead | 17 | 20.7 | 12 | 31.5 | 18 | 53.3 | 21 | 32.4 | 9 | 38.7 | 20 | 71.8 |
| Blue Rock | 0 | - | 1 | 1.6 | 9 | 24.7 | 0 | - | 1 | 1.2 | 6 | 21.9 |
| Herz Freya | 1 | 0.4 | 5 | 14.2 | 0 | - | 0 | - | 2 | 10.6 | 0 | - |
| Francks Ackerperle | 1 | 1.1 | 1 | 1.2 | 2 | 3.1 | 2 | 3.0 | 4 | 16.4 | 0 | - |
| Tarvin | 0 | - | 0 | - | 1 | 1.3 | 3 | 6.2 | 0 | - | 2 | 2.2 |
| Throws | 0 | - | 1 | 2.4 | 0 | - | 0 | - | 0 | - | 0 | - |
| Own Variety | 4 | 2.7 | 0 | - | 0 | - | 3 | 2.2 | 0 | - | 0 | - |
| Horse Beans | 3 | 2.8 | 0 | - | 0 | - | 0 | - | 0 | - | 0 | - |
| Tick Beans (unspecified) | 7 | 9.7 | 4 | 14.2 | 2 | 5.5 | 2 | 3.1 | 0 | - | 0 | - |
| WINTER | | | | | | | | | | | | |
| Throws | 17 | 96.7 | 11 | 81.3 | 3 | 41.2 | 13 | 84.7 | 7 | 95.9 | 3 | 79.6 |
| Maris Beaver | 0 | - | 0 | - | 2 | 38.9 | 0 | - | 0 | - | 1 | 20.4 |
| Minor | 0 | - | 0 | - | 0 | - | 0 | - | 1 | 4.1 | 0 | - |
| Maris Bead | 0 | - | 0 | - | 1 | 19.9 | 0 | - | 0 | - | 0 | - |
| Own Variety | 1 | 3.3 | 0 | - | 0 | - | 1 | 12.9 | 0 | - | 0 | - |
| Unspecified | 0 | - | 5 | 18.7 | 0 | - | 1 | 2.4 | 0 | - | 0 | - |

## APPENDIX TABLE 4

## RELATIVE IMPORTANCE OF DIFFERENT STORAGE METHODS FOR SPRING BEANS BY PROVINCES, 1968 and 1969

| METHOD | EASTERN | | EAST MIDLAND | | SOUTHERN | |
|---|---|---|---|---|---|---|
| | FARMS | ACREAGE | FARMS | ACREAGE | FARMS | ACREAGE |
| | per cent | | | | | |
| 1968 | | | | | | |
| Bin | 34 | 39 | 43 | 37 | 58 | 61 |
| Floor | 26 | 32 | 36 | 40 | 24 | 21 |
| Bin and floor | 6 | 6 | 9 | 11 | 12 | 16 |
| Sacks | 22 | 10 | 6 | 9 | 3 | 1 |
| Bin and sacks | 2 | 1 | - | - | - | - |
| Floor and sacks | 4 | 7 | 3 | 2 | - | - |
| Nil | 6 | 5 | 3 | 1 | 3 | 1 |
| 1969 | | | | | | |
| Bin | 51 | 64 | 48 | 39 | 67 | 67 |
| Floor | 20 | 21 | 33 | 46 | 18 | 22 |
| Bin and floor | - | - | 9 | 13 | 11 | 10 |
| Sacks | 26 | 14 | 5 | 1 | 4 | 1 |
| Floor and sacks | - | - | 5 | 1 | - | - |
| Nil | 3 | 1 | - | - | - | - |

## APPENDIX TABLE 5

## RELATIVE IMPORTANCE OF DIFFERENT STORAGE METHODS FOR WINTER BEANS BY PROVINCES, 1968 and 1969

| METHOD | EASTERN | | EAST MIDLAND | | SOUTHERN | |
|---|---|---|---|---|---|---|
| | FARMS | ACREAGE | FARMS | ACREAGE | FARMS | ACREAGE |
| | per cent | | | | | |
| 1968 | | | | | | |
| Bin | 44 | 29 | 40 | 60 | 83 | 93 |
| Floor | 28 | 49 | 46 | 34 | 17 | 7 |
| Bin and floor | 6 | 2 | - | - | - | - |
| Sacks | 11 | 15 | 7 | 4 | - | - |
| Floor and sacks | 11 | 5 | - | - | - | - |
| Nil | - | - | 7 | 2 | - | - |
| 1969 | | | | | | |
| Bin | 43 | 38 | 14 | 31 | 100 | 100 |
| Floor | 29 | 31 | 57 | 56 | - | - |
| Bin and floor | 7 | 21 | - | - | - | - |
| Sacks | 21 | 10 | - | - | - | - |
| Nil | - | - | 29 | 13 | - | - |

# UNIVERSITY DEPARTMENTS

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|---|---|
| BRISTOL | Agricultural Economics Research Unit<br>University of Bristol<br>73 Woodland Road<br>Bristol BS8 1UT |
| CAMBRIDGE | Agricultural Economics Unit<br>Department of Land Economy<br>University of Cambridge<br>Silver Street<br>Cambridge CB3 9EP |
| EXETER | Agricultural Economics Unit<br>Department of Economics<br>University of Exeter<br>Lafrowda St. German's Road<br>Exeter EX4 6TL |
| LEEDS | Agricultural Economics Department<br>University of Leeds<br>34 University Road<br>Leeds LS2 9JT |
| LONDON | School of Rural Economics & Related Studies<br>Wye College (University of London)<br>Nr Ashford<br>Kent |
| MANCHESTER | Department of Agricultural Economics<br>The University<br>Manchester M13 9PL |
| NEWCASTLE | Department of Agricultural Economics<br>The University of Newcastle-upon-Tyne<br>Newcastle-upon-Tyne NE1 7RU |
| NOTTINGHAM | Department of Agriculture and Horticulture<br>University of Nottingham<br>School of Agriculture<br>Sutton Bonington<br>Loughborough, LE12 5RD<br>Leics |
| READING | Department of Agricultural Economics<br>University of Reading<br>Building No 4<br>Earley Gate<br>Whiteknights Road<br>Reading RG6 2AR |
| WALES | Department of Agricultural Economics<br>University College of Wales<br>Institute of Rural Science<br>Penglais<br>Aberystwyth<br>Cardiganshire |

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