FEBRUARY 1973

REPORT 7302-2

Recommendations for Testing Mechanical Aspects of Growing Broad Beans for Processing in Quebec

G. B. Hergert

Recommendations for Testing Mechanical Aspects of Growing Broad Beans for Processing in Quebec[1]

Introduction

Growing of broad beans (Vicia fabae, Var. major) has been carried out in Quebec on a small scale for many years. Planting and harvesting has been done by hand. With the possibility of export markets for canned or frozen products, the growing of broad beans could be expanded, providing the planting and harvesting can be mechanized (7, 14, 22).

Broad beans are grown routinely in England. A list of planters used and available from the U.K. and Europe (4) is given in Appendix I. Harvesting in England is done with the same equipment as is used for peas.

Pea cutters are used to cut and windrow the crop. The crop is left to wilt for a period up to 48 hours and is then picked up and hauled to a stationary viner, or is vined in the field using a mobile viner (1, 3, 6, 8, 11, 12, 13, 14, 16, 17, 21, 23).

Little information is available on the adoption of pea or bean equipment to broad beans in North America. Seed plates are available for many conventional corn-soybean planters (2, 18) (Appendix 1). Viners used in England with the Fuare separation method appear to be of American design so one can assume that available American viners will work using the British expertise. Likewise, the pea cutters used for harvesting broad beans in England appear to be similar to those in use in North America for peas, hay, etc.

---

[1]Contribution No. 357 from Engineering Research Service, Research Branch, Agriculture Canada, Ottawa, Ontario, K1A 0C6.

Information enquiries have been made to North American manufacturers of pea and bean equipment to obtain suggestions and comments (5) (Appendix II).

A crop known as Southern Peas is grown in southern U.S.A. for canning or freezing. It is possible to harvest this crop using a conventional grain combine (9).

Maturity and freshness of broad beans is measured using a pea tenderness measuring equipment. From English experience a tenderometer reading from TR120 to TR130 is required (13, 17, 21). New methods of measuring tenderness of peas are under study and could be adapted to broad beans (24 - 34).

Winnowing of the vined product to remove trash is apparently important for broad beans, as the leaves and hulls of the bean plant in contact with the beans will cause blackening which cannot be removed in the plant washing process (12, 13, 17). Cooling is also required soon after harvesting.

Recommendations for Field Trials of Broad Beans to Test Equipment

Planting

Seed plates are available to fit currently available International Harvester vegetable planters (2). Plates will be ordered by E.R.S. on advise of seed size by St. Jean. A planter will be made available by E.R.S. An effort should be made by St. Jean to obtain at least one compact growing variety such as Compacta or Triple White. Many models of this type of planter are available so should not present any problems to commercial growers (Appendix I). Cultural practices are outlined by Soucy (22) and Gane (12).

Harvesting

Harvesting of broad beans on an experimental basis should follow the British experience unless information received from North American companies indicates a better method.

Cutting of the crop should be done 24 - 48 hours prior to vining. A self-propelled swather fitted with lip-less ledger plates and lifter fingers should be obtained on a rental basis (11). A mobile viner should be contracted to follow the cutter after a 24 hr wilting period. The viner should be of the Fuare type such as the FMC models. The viner must be fitted with screens having 3/4 to 7/8 mesh rather than the smaller screens used for peas. Following vining, the crop must be winnowed to remove any leaves, stems or pod pieces not removed in the viner (12).

Crop suitability for harvesting can be measured using a pea tenderometer. British experience (12, 13, 17, 21) indicates that the crop is ready for processing at a reading of TR120 to TR130.

To further experiment with harvesting dates and wilting times, a smaller walking type cutter should be made available to take random samples at different dates and sufficient to allow different wilting periods before vining. These samples can then be transported to a viner, either mobile or stationary, to be vined and evaluated. This will reduce the amount of time a viner would be required for the tests, although time must be allowed for changing screens. Tenderometer readings should be taken at each cutting and vining. Samples should be blanched and frozen at each vining to evaluate color suitability and change with cutting and wilting times. These samples could also be used for a test panel (10, 19).

A bean harvester, such as used for snap or string beans, should be tried as well to evaluate the possibility of harvesting the pods only prior to vining (20).

A grain combine-thresher should be tried because of the easy availability of this type of machine if shelling is possible without damage (9).

Two factors must be measured to test the effectiveness of the vining process. First, vining efficiency can be measured by collecting samples of expelled haulm from the viner and removing from the haulm any unthreshed pods or beans that are not removed inside of the viner. The second factor is breakage which can be measured by comparing samples from the viner with hand shelled samples (10).

References

1. Annual Report. 1970/71. Pea Growing Research Organization Ltd., Thornhaugh, England, PE8 6HJ.

2. Anonymous. Instruction manual I.H.C. No. 185 planter. International Harvester Co., Hamilton, Ont.

3. Anonymous. 1969. Notes on growing groad beans. Advisory Leaflet #2. The Pea Growing Research Organization Ltd., Thornhaugh, England, PE8 6HJ.

4. Anonymous. 1970. Drills for broad beans. Sup. to Tech. Bull. #21. The Pea Growing Research Organization Ltd., Thornhaugh, England, PE8 6HJ.

5. Anonymous. 1971. Fruit, nut and vegetable equipment manufacturers. ASAE Committee PM 48. ASAE, St. Joseph, Michigan.

6. Anonymous. 1971. Mechanization of vegetable cultivation and harvesting in open ground. United Nations Economic and Social Council. AGR/WP 2/137.

7. Archambault, L.J. 1972. Work on broad beans. Provincial AGricultural Research Station, La Pocatierre.

8. Bradford, R.A. 1970. The mechanical harvesting and handling of broad beans. P.G.R.O. Regional Symp. The Pea Growing Research Organization Ltd., Thornhaugh, England, PE8 6HJ.

9. Campbell, J.A., Windham, S.L. and Thomas, W.O. 1967. Once-over harvest and processing studies with certain vegetable crops. Bull. 750. Agricultural Experiment Station, State College, Mississippi.

10. Casimir, D.J., Mitchell, R.S., Lynch, L.J. and Moyer, J.C. 1967. Vining procedures and their influence on yield and quality of peas. Food Technology 21: 109A - 114A.

11. Gane, A.J., King, J.M. and Gent, G.P. 1971. Pea and bean growing handbook. Vol. 1. Peas. Pea Growing Research Organization Ltd., Thornhaugh, England, PE8 6HJ.

12. Gane, A.J. 1971. Recent trends in the production of peas and beans for processing. Agricultural Progress 46: 86 - 94.

13. Gent, G.P. 1968. Broad beans for processing. Agriculture 75 (6): 278 - 280.

14. Gent, G.P. 1968. The planning of sowing programmes for broad beans. Tech. Memorandum #16. The Pea Growing Research Organization Ltd., Thornhaugh, England, PE8 6HJ.

15. Jasmin, J.J. 1973. Correspondence to Dr. D.G. Hamilton January 18. C.D.A. Research Station, St. Jean.

16. King, J.M. 1970. Pointers for the pea harvest. Farmer & Stock Breeder 4. August.

17. Laflin, T. 1972. Broad beans for canning and quick freezing. Wellesbourne Agricultural Research Station, U.K.

18. Mansour, N.S. and Mack, H.J. 1972. Bean planter tested at Research farm. Veg. Crop Management 8 (11/12): 14.

19. Nonnecke, I.L., Strachan, G. and Anderson, D.T. 1959. A plot-size canning pea viner. Can. J. Plant Sci. 39: 402 – 404.

20. Paine, J.O. 1961. Harvesting lima beans mechanically. American Vegetable Grower 9 (3): 18, 20.

21. Reid, W.S. 1973. Preliminary survey of equipment for harvesting broad beans, carrots, radishes and shallots. Rept. 7203-1. Eng. Res. Service, Agriculture Canada, Ottawa, K1A 0C6.

22. Soucy, Y. 1972. Bibliography on the adaptation of broad beans in Quebec. Ministry of Agriculture and Colonization.

23. Wells, M.C. 1969. Machinery for peas and beans. Tech. Memorandum #21. Pea Growing Research Organization Ltd., Thornhaugh, U.K.

24. Voisey, P.W. and Nonnecke, I.L. 1971. Measurement of pea tenderness. 1. An appraisal of the F.M.C. pea tenderometer. J. Texture Studies 2: 348 - 364.

25. Voisey, P.W. and Nonnecke, I.L. 1971. The performance of the F.M.C. pea tenderometer with particular reference to its accuracy of measurement in the garding of peas to establish the price paid to the grower. Pres. 24th Ann. Conf. Ont. Food Processors Fieldman, Guelph. January. Rept. 6820. Eng. Res. Service.

26. Voisey, P.W. 1971. Pea tenderometer experiments 1969. Rept. 6820A. Eng. Res. Service. August.

27. Voisey, P.W. and Nonnecke, I.L. 1972. Supplementary report on the performance of the F.M.C. pea tenderometer - 1971 tests. Rept. 6820-1. Eng. Res. Service.

28. Voisey, P.W. and Nonnecke, I.L. 1972. Measurement of pea tenderness. 3. Field comparison of several methods of measurement. J. Texture Studies (in press).

29. Voisey, P.W. and Nonnecke, I.L. 1972. Measurement of pea tenderness. 4. Development and evaluation of the texture test cell. J. Texture Studies (in press).

30. Voisey, P.W. and Nonnecke, I.L. 1972. Measurement of pea tenderness. 2. A review of methods. J. Texture Studies (in press).

31. Voisey, P.W. 1972. Pea tenderometer experiments 1970 & 1971. Rept. 6820B. Eng. Res. Service.

32. Voisey, P.W. and Nonnecke, I.L. 1972. Measurement of pea tenderness. 5. The Ottawa Pea Tenderometer and its performance in relation to the F.M.C. Pea Tenderometer. J. Texture Studies (in press).

33. Voisey, P.W. 1972. Background information on techniques and apparatus to measure pea tenderness to establish the price paid to the grower. Rept. 6820C. Eng. Res. Service.

Appendix I

Planters Suitable for Broad Beans

1. European

Source - P.G.R.O., Thornhaugh, England, PE8 6HJ.

1. Russells (Kirbymoorside) Ltd.,
Kirbymoorside, York,
England, YO6 6DJ

Model SU-68

2. Scheby Maskin fabrik,
Bogense, Denmark.

Represented in Canada by: J.F. Farm Machinery,
Exeter, Ontario.

Model Fiona

3. Howard Rotavator Co. Ltd.,
West Hordon,
Essex, England.

Model Howard Smallford Rotaplanter

4. Exelsior N.V.,
Havenwey 15-17,
Bovenkarspell, Holland.

Model Exelsior Bulb Planter

5. Horstine Farmery Ltd.,
North Newbald,
York, England YO4 3SP.

6. Alpha-Accord Ltd.,
Alpha Works, Station Rd., Ampthill,
Bedford, England.

7. A.C. Bamlett Ltd.,
Station Rd.,
Thursk, Yorkshire,
England.

8. Carier (Brain tree) Ltd.,
East Street,
Braintree, Essex,
England.

2. North American

Source: Implement Tractor 1971 86 (8)

1. Allis Chalmers,
   Box 512,
   Milwaukee, Wisc. 53201,
   U.S.A.

2. J.I. Case Co.,
   700 State St.,
   Racine, Wisc. 53404,
   U.S.A.

3. W.F. Covington Planter Co.,
   Drawer 1947,
   Dothan, Alabama 36302,
   U.S.A.

4. Deere & Company,
   Hamilton, Ontario.

5. Farmax Div. of James S. Oppenheimer,
   Box 8523,
   Mobile, Alabama 36608,
   U.S.A.

6. International Harvester Co.,
   Hamilton, Ontario.

7. Massey Ferguson Ltd.,
   Toronto, Ontario.

8. Winslow Pacific Inc.,
   6100 Avenida Encinas,
   Carlsbad, California 92008,
   U.S.A.

Appendix II

Manufacturers of Pea & Bean Harvesting Equipment

1. European

1. Armer Agricultural Machinery,
Gt. Massingham,
Mr. Kings Lynn,
Norfold, England.

2. Benedict (Agricultural Ltd.),
5 Addison Ave.,
London W.11, England.

3. R. Bog Jorgenson Maskin fabrick A/S,
Denmark.

4. Carier (Braintree) Ltd.,
East St.,
Braintree, Essex,
England.

5. F.M.C. Corporation,
Varleys, Holt Road,
Fakenham, Norfold,
England.

6. Mather & Platt Ltd.,
Radcliffe, Manchester.

In Canada: Mather & Platt (Canada) Ltd.,
705 Progress Ave.,
Scarborough, Ont.

7. Rustons Engineering Co. Ltd.,
St. Germain Street,
Huntingdon.

8. William Reynolds & Sons (Bedford) Ltd.,
85 Newnham Ave.,
Bedford, England.

9. August Herbort (Cannning Machinery),
Hamburger Strause 268,
Brauschweig, Germany.

10. Frank & Van Remoortere S.A.,
Windmolenstraat 88,
B2710 Hoboken, Belgium.

2. North American

11. F.M.C. Corporation,
1224 Kinnear Rd.,
Columbus, Ohio 43212,
U.S.A.

12. Savannah Machine & Foundry Co.,
P.O. Box 2268,
Savannah, Georgia 31402,
U.S.A.

13. Nu-Way Harvester Co.,
221 N. LaSalle,
Chicago, Ill., U.S.A.

14. Porter Way Harvesting Co.,
Waterloo, New York,
U.S.A.

15. Magnuson Engr. Co.,
509 Emory,
San Jose, Calif.,
U.S.A.

16. Innes Co.,
Bettendorf, Iowa,
U.S.A.

17. Hughes Co. Inc.,
P.O. Box 8,
Columbus, Wisc.,
U.S.A.

18. Hart Carter Co.,
1209 W. Pioneer Pkwy.,
Peoria, Ill. 61614,
U.S.A.

19. Bidwell-Climax Corp.,
Box 151,
Batavia, New York 14021,
U.S.A.

20. Gaterman Mfg. Co. Inc.,
836 S. 15th St.,
Manitowoc, Wisc. 54220,
U.S.A.

21. Harris Harvester Co.,
190 Santa Fe Ave.,
Fresno, California,
U.S.A.

22. J.E. Love Co.,
Box 188,
Garfield, Washington 99130,
U.S.A.

23. Noll Bros.,
2053 - 59 S. Allis Street,
Milwaukee, Wisc. 53207,
U.S.A.

24. Stocker & Son,
1989 Jackson Ave.,
Elmont, L.1, New York 1003,
U.S.A.

25. Chisholm-Ryder Co. of Canada,
Niagara Falls, New York,
U.S.A.

26. Long Mfg. Co.,
Box 1139,
Torboro, N.C. 27886,
U.S.A.

27. Tiura Mfg. Co.,
Box 1087,
Patterson, California 95363,
U.S.A.

28. Henry Industries Inc.,
P.O. Box 976,
Salina, Kansas 67401,
U.S.A.

29. Heath Farm Equipment Inc.,
Box 312,
Fort Collins, Colorado 80521,
U.S.A.

30. Lockwood Corp.,
Highway 92,
East Gering, Nebraska 69341,
U.S.A.

31. H.D. Hume Co.,
Mendota, Ill., U.S.A.

32. Frank Hamarchek Machine Co.,
Kewaunee, Wisc., U.S.A.

33. American Machinery Corp.,
P.O. Box 3228,
Orlando, Florida 32802,
U.S.A.