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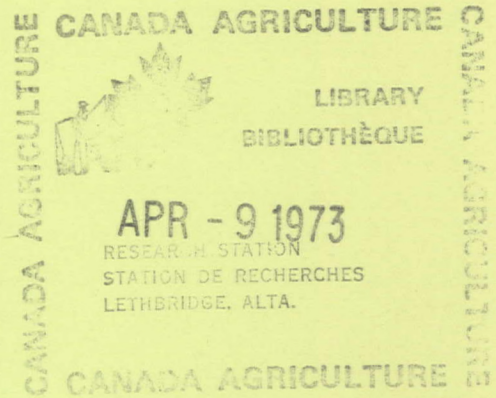
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REPORT 7302

JANUARY 1973



Preliminary Survey of Equipment for Harvesting Broad Beans, Carrots, Radishes
and Shallots

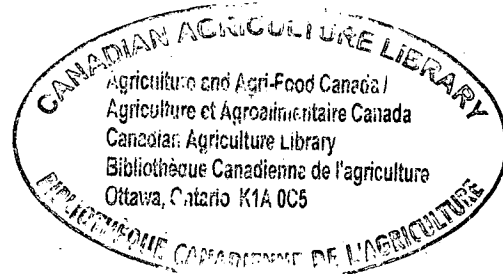
by

W. S. Reid

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Contribution No. 355 from Engineering Research Service, Research Branch,
Agriculture Canada, Ottawa, Ontario, K1A 0C6.

1.0 Introduction

While in the U.K., the writer investigated methods being used there in carrying out the following phases of crop processing. Time available for the survey was limited, so it cannot be considered comprehensive or complete.

1. Bed seeding and harvesting carrots
2. Harvesting baby carrots
3. Seeding broad beans
4. Harvesting and depodding broad beans
5. Harvesting broad bean pods for fresh human consumption
6. Marketing techniques for radishes, shallots (spring onions) and carrots

2.0 Establishments Visited and Contacts Made

1. National Institute of Agricultural Engineering (N.I.A.E.),
Wrest Park, Silsoe, Bedfordshire.

Mr. F.R. Brown, S.S.O. Head, Fruit and Vegetable Machinery
Development Section.

Mr. W. Boa, S.E.O. Engineer, Fruit and Vegetable Machinery
Development Section.

Mr. J.F. Kemp, E.O.

Mr. P. Richardson, S.E.O. Crop Seeding Development.

Mr. E.T. Chitty, E.O. Crop Thinning Development.

Dr. D.S. Boyce, Systems Department, Linear Programming.

2. Pea Growing Research Organization Ltd. (P.G.R.O.),
The Research Station,
Great North Road,
Thornhaugh, Peterborough PE8 6HJ.

Mr. A.J. Gane, Director of Research and Secretary.

Mr. R.P. Handley, Technical Assistant.

3. National Vegetable Research Institute (N.V.R.I.), Wellesbourne.

Dr. Bleasdale, Head, Plant Physiology Section.

3.0 Information Collected

1. Bed seeding and harvesting carrots

a) Bed seeding

General comment by Dr. Bleasdale, with current methods of seeding only 70% of crop is of marketable quality with once over harvesting. If previously chitted seed is used, this can be increased to 91%.

Seeding - N.I.A.E. indicate 4" row width with 12 rows to bed using precision seeder.

- N.V.R.I. (Dr. Bleasdale) indicates 1" row width with 1" spacing in the rows at 3 m.p.h. is also suitable.

- For this spacing a Stanhay triple belt precision seeder with triple coulters is used.

- Some interesting work is being done at N.V.R.I. with a fluid drill using chitted seed in a thixotropic gel to improve germination and harvesting uniformity.

Harvesting - Opinion seems imprecise at present.

- N.I.A.E. states topping with forage harvester or buckrake has been used. I would like to see a buckrake at work.

- Harvesting is usually done by digger elevators either topped or untopped. Further processing being done by hand or machine depending on end product required, e.g. bunched for direct marketing by hand, or topping, washing, drying, grading, bagging, by machine.

2. Harvesting baby carrots

In general, the comments item 1 apply for this specialized crop.

3. Seeding broad beans

The P.G.R.O. had ~~the~~ most experience in this field with the N.I.A.E. or N.V.R.I. having little to contribute. Mr. Handley indicated that they had little trouble with precision seeding, and recommended a drill, Model No. SU68, manufactured by Russells (Kirbymoorside) Ltd., York YO6 6DJ, Tel. No. Kirbymoorside 31381. His second choice was a drill manufactured by Horstine Farmery Ltd., North Newbald, York YO4 3SP, Tel. No. North Newbald 209. In U.K. conditions a row width of 18" with a 6" spacing in the row is used. At present, the P.G.R.O. are preparing Vol. 2 of their Pea and Bean Growing Handbook for Broad Beans. Vol. 1 covers Peas.

4. Harvesting and depodding (vining) broad beans

The most important aspect of harvesting broad beans and depodding is the rapid cooling of the bean to prevent blackening and discoloration. Some suitable equipment is recommended in the Machinery Supplement, page 5, Vol. 1 of the Pea and Bean Growers Handbook. Cooling is achieved by immersion in a cold water flume, packing in ice or flake ice, and finally, use of a cold air blast to achieve a temperature of 36 - 37^oF.

Vining can be achieved using a conventional pea viner with some modifications, usually available from the manufacturer. The crop is usually cut and windrowed 10 rows/windrow and allowed to wilt for 24 hours and then vined.

Readiness for harvest is usually determined by the use of the pea tenderometer at a grid fill of 5 ozs., reading 120 for freezing, or a grid fill of 2 ozs., reading 130 for canning.

It should be noted that the more mature bean has developed the distinctive taste of the broad bean to a greater degree than the more tender and earlier harvested bean for freezing. The reason the more mature and presumably higher yielding bean is not harvested is due to the loss of tenderness of the outer skin of the seed. In the writer's opinion, the loss of taste is more disappointing than the slightly increased toughness of skin of the maturer bean.

Of the viners, the latest unit, manufactured by Mather and Platt., the MX Mark II Super Mobile, is considered to be very good and costs ~~L~~10,000 approximately in the U.K. for the bean version. Mather and Platt have a Canadian subsidiary, Mather and Platt (Canada) Ltd., 705 Progress Ave., Scarborough, Ontario (Mr. Robert Bell). Other viner manufacturers are as follows:

- a) August Herbolt (Canning Machinery), Hamburger Strasse 268, Braunschweig (Germany).
- b) The F.V.R. - Frank and Van Remoortere S.A., Windmolenstraat 88 B2710 Hoboken, Belgium.
- c) Chisholm-Ryder Co. Inc., Niagara Falls, New York 14305.
- d) F.M.C. Scott. Dennis Schultz, Managing Project Engineer, 103 East Maple St., Hoopeston, Illinois 60942.

A more comprehensive list of equipment manufacturers is given in the Pea and Bean Growing Handbook.

5. Harvesting broad beans in the pod for fresh human consumption

This is, at present, done by hand. Mr. Gane did mention that they had been to a demonstration of a pea pod picker about two years ago. It did not work, but he considered it might work with beans. The designer or manufacturer's name was "Thurn", but they were unable to locate the relevant letter or address of the manufacturer. In any case, it is not being manufactured now.

6. Marketing techniques for radishes, shallots (spring onions) and carrots with special reference to bundling.

None of the establishments visited knew of machines being used for bundling these crops, and the most significant comment was that the elastic band had proved to be a major advance. These are all high value crops, and hand bundling was not considered to be too great a charge. Also, quality is improved as a result of low crop damage. The season for these crops tends to be rather short, and the use of special machines may not be warranted in the U.K. at present. Suitable machines may be available, but much further investigation would be required to find them.

New methods of marketing are being tried for radishes and carrots, where the crop is presented in a plastic bag or punnet in a cleaned and topped condition. Customer preference, acceptance and training required as well as the carton cost, must be compared with simplicity of hand bunching and increased transportation cost. It would seem that cleaning and topping is a simpler and more effective method of presentation, but may involve customer resistance.

In the case of spring onions, bundling seems to be the only solution, and since this crop is very easily damaged, hand bunching may be the most economic method of packing.

General: Mr. F.R. Brown at the N.I.A.E. indicated that the N.I.A.E. Universal Vegetable Harvester, although a good and versatile machine, had failed to be accepted commercially because in the design stage the system requirements of the various crops had not been considered. The result was that such varied crops as carrots, beets, turnips, onions, cabbage, cauliflower, sprouts, lettuce, could be collected from the ground easily, but subsequent processing requirements, where most of the bottle neck lay, were usually impeded.

As a result, I contacted Dr. D.S. Boyce, P.S.O. Head of the Systems Department, who has done some work on linear and dynamic programming to determine the most economic method for harvesting apples. These techniques could well be utilized for early economic analysis of proposed machine harvesting systems. Dr. Boyce indicated his programmes could be made available if required, and that programming and debugging from scratch could easily take 7 months.

4.0 Summary

1. Considerable progress has been made in the U.K. in mechanization of broad bean cultivation and harvesting for canning or freezing. At present, no machine is available for harvesting pods.
2. Work is being carried out on new methods of seeding and/or chitting carrots for conventional or bed planting.

Harvesting and packaging does not seem to have reached a high level of mechanization.
3. In general, although presentation in the shops is quite good for radishes, shallots (spring onions), carrots, the requirements for the fresh, frozen and canning markets are quite different, and as yet this has resulted in considerable hand labour in preparation.
4. The following companies have been contacted to supply their latest literature and price lists.
 - a) Mather and Platt, U.K. - bean viners and vegetable processing equipment, washers, blanchers, etc.

This seems to be the principal U.K. company in this field.

b) Russels (Kirbymoorside) Ltd. - bean planter

c) Horstine Farmery Ltd. - bean planter

5. Since our research resources are strictly limited, it is essential an analysis of the structure of the vegetable processing industry is undertaken to determine the area or areas of greatest need for research effort. Bearing in mind the following: a) improvement of presentation and local market sales; b) increase in product export potential; c) possible potential for local and export sales of equipment designed.

5.0 References

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