

Cost-effectiveness of various machinery for growing and harvesting of cranberries

S. Ivanovs, D. Viesturs and J. Bergs

Latvia University of Agriculture, Research Institute of Agricultural Machinery, Instituta1, Ulbroka, LV-2130, Latvia; e-mail: semjons@delfi.lv

Abstract. The amount of growing cultivated cranberries in Latvia is increasing, and it is expected that in the year 2008 the total area of the plantations will exceed 140ha. As the areas of the plantations on individual farms are growing, particularly acute becomes the issue how to mechanize the labour-consuming technological processes and operations. The report presents a review of the cranberry growing technologies applied in Latvia depending on the amount of production and its provision with adequate means of mechanization. The costs are analyzed for laying out plantations, the production of the products and the technical means for harvesting, as well as their payback at various volumes of output. In Latvia growing cultivated cranberries is perspective; it has good prospects for its development. The areas of cranberry plantations in Latvia continue to increase. Several operations, including planting, combing and cutting of tendrils and harvesting of berries should be mechanized even on small areas 0.2–0.5ha. Machines for the harvesting of berries, combing and cutting of tendrils are not available in the Latvian market. It is necessary to organize designing and making of the equipment that is adapted to the Latvian conditions.

Key words: technological processes, cranberry growing technologies.

INTRODUCTION

Growing the Canadian big-berry cranberries is recognized as one of the most perspective subbranches in agriculture. The main cranberry growing countries in the world are the USA and Canada where the harvested product is consumed in a fresh and processed way, mainly on the spot. The demand for cranberries and the products of their processing on the European market is not still satisfied.

Latvia is the only country of the European Union which grows cultivated cranberries to a considerable extent (Fig. 1). This opens good prospects for the export of cranberries and the products of their processing. Since Latvia has sufficient areas, including cultivated peat bogs, about 10,000ha, growing cultivated cranberries is one of the non-traditional branches of agriculture in Latvia which becomes more and more popular, and the number of farms and the areas are increasing from year to year, as it is evident from Fig. 2.

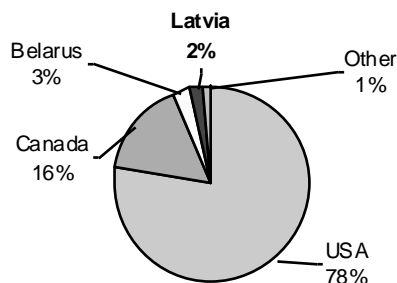


Figure 1. Distribution of the amount of growing cultivated cranberries in the world.

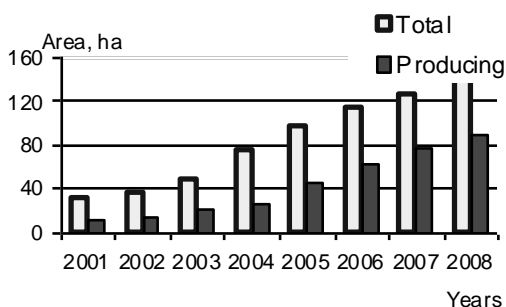


Figure 2. Dynamics of the increase in cranberry plantations.

MATERIALS AND METHODS

In order to determine the economic indices of the applied technologies and means of mechanization by means of the applied programme Excel, flowcharts were treated and the data obtained during the field experiments and time-keeping.

Taking into consideration the fact that the machines and implements are used every year on the existing areas for a comparatively short period of time, it was assumed in the calculations that their lifetime is 10 years. The gross wages were assumed as 5 Euro h⁻¹. The degree of the weed extermination and other indices of the quality of work were evaluated according to the standard methodologies of agrotechnical assessment.

RESULTS AND DISCUSSION

At the present time the cultivated cranberries are cultivated in Latvia on more than 40 farms of different sizes, most of which are joined into the Latvian Cranberry Growers' Association. As it is obvious from Fig. 3, the small cranberry growers, who grow the berries mainly for domestic consumption, occupy about 2% of the areas whereas the farms with the plantations over 2ha, who grow commodity products for the

market, occupy about 90%, and are still developing. These farms cannot operate and develop successfully without appropriate means of mechanization. Significant investments are necessary in order to lay out and extend the cranberry plantations, including the purchase of the planting material and its planting. By manual planting the consumption of the planting material is less but it requires considerable labour consumption in a comparatively short period of time in order to ensure adequate agrotechnical terms.

The graph in Fig. 4 indicates that mechanized planting by scattering the planting material (tendrils) and digging them in by disks or soil cutters pays off already when the areas are not large though the consumption of the planting material is considerably greater (by manual planting 400–600kg ha⁻¹, by scattering and mechanized introduction into soil 2,000–2,500kg ha⁻¹).

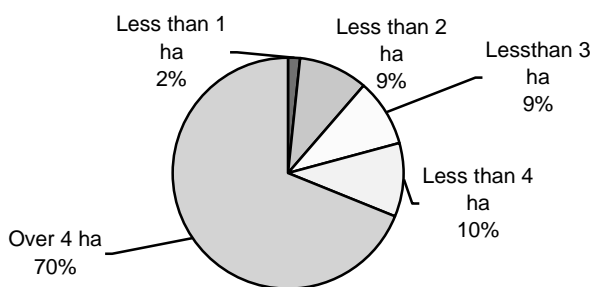


Figure 3. Distribution of the cultivated cranberry plantations in Latvia by their size.

On the farms which produce the planting material themselves by cutting the tendrils its consumption in order to extend the areas of plantations is not so significant, and the economic efficiency of mechanization increases.

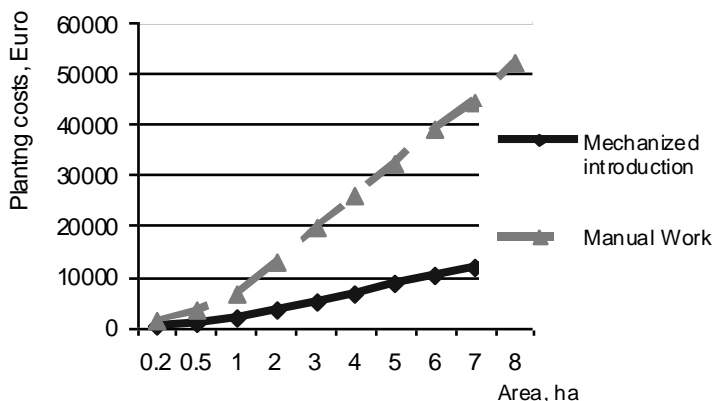


Figure 4. The planting costs, including the consumption of the planting material.

The weed control begins already with agrotechnical methods when the field is prepared for planting. After the cranberries have reached a certain plant density, they can partly overwhelm the weeds themselves. The tall weeds are exterminated with the use of the application (touch) method by applying herbicides (roundup and analogs) on their leaves. If the areas are not large and there are few tall weeds, a manual applicator can be used. On larger areas an applicator is used with a rotary roll, which is approximately 2 m long, continuously wetted with the herbicide liquid. It is used with a machine

It can be seen from the graph in Fig. 5 that the use of a self-propelled applicator becomes economically profitable when the areas exceed 7ha, yet this facilitates the hard work and prevents the drops of herbicides from entering the soil when the applicator stops at the ends of the field, etc.

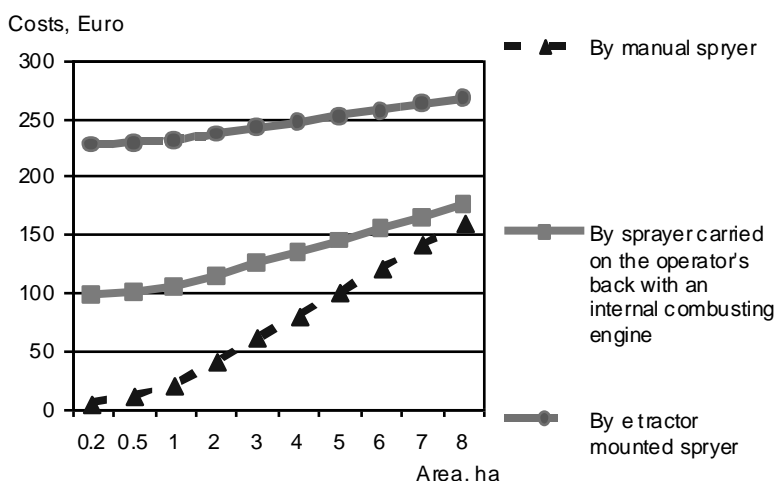


Figure 5. Costs of spraying (fertilization and pest control) of the plantations.

During the vegetation period periodic additional fertilization is required by sprinkling the nutrient solution and, possibly, the plant protection measures by sprinkling or dusting pesticides. For small areas manually operated sprinklers are used which are carried on the operator's back, for larger areas – portable or tractor mounted, engine operated sprayers. It appears from the graph in Fig. 5 that the lowest costs, even for comparatively large areas, are when a manual sprayer is used. However it should be taken into account when choosing a method that the work with a tractor mounted sprayer is less dangerous for the operator's health.

Every year cranberries develop tendrils, which are about half a meter long and on which no berries appear. At the beginning of summer, before the plants put forth berries, the tendrils should be cut off and the plants combed.

Cutting tendrils raises the harvest of berries and makes it easier to perform the other operations of plant cultivation. Cutting without combing leaves 30% of the tendrils. The selling price of tendrils – the planting material is 2.14 Euro kg⁻¹, therefore their cutting and collecting is profitable even at higher costs.

The graph shows that, due to the great labour consumption, the cutting of tendrils by hand tools is possible only on small areas of plantations (Fig. 6). The use of two separate machines – a comb and a cutter needs two passes, which may have a negative effect on the harvest. Unless the tendrils are cut off and combed, no harvesting of berries is possible by a combine harvester.

It pays off to use a self-propelled cranberry harvester (combine) in spite of its cost (the combine harvester costs approximately 50,000 Euro) even on small areas. When the berries are gathered by hand, the work is dragged out for an unreasonably long time, and they are affected by weather conditions, which results in the losses of the yield. The problems – the combine is not available in the Latvian market, it needs preparation of the plantations – combing and cutting.

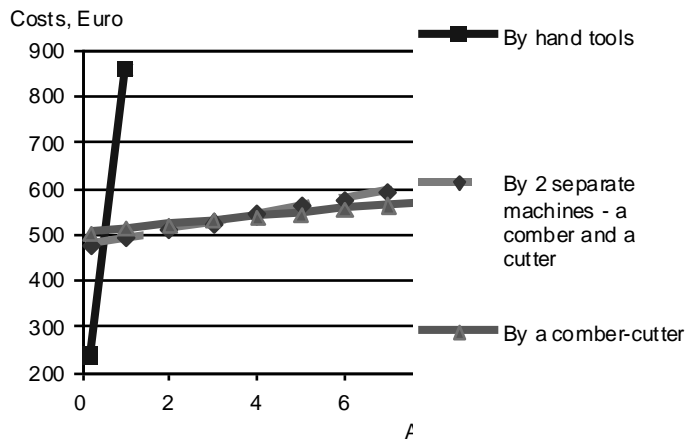


Figure 6. Costs of combing, cutting and collecting tendrils.

CONCLUSIONS

1. In Latvia growing cultivated cranberries is perspective; it has good prospects for its development.
2. The areas of cranberry plantations in Latvia continue to increase.
3. Several operations, including planting, combing and cutting of tendrils and harvesting of berries should be mechanized even on small areas 0.2–0.5ha.
4. Machines for the harvesting of berries, combing and cutting of tendrils are not available in the Latvian market. It is necessary to organize designing and making of the equipment that is adapted to the Latvian conditions.

REFERENCES

- Ivanovs, S., Bergs, J., Viesturs, D. 2005. Research and designing of machines for sand application and weed control of cultivated cranberries in Latvia. In *Mat. XI International symposium 'Ecological aspects of mechanization of plant production'*, Warszawa, 13–14. 09.2005, 91–95.