Field lab sponsor

Research Partner

Field lab: Exploring farmer-led approaches to monitoring and minimising waste in the blackcurrant sector

Final report

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Summary

In this WRAP-funded field lab, four blackcurrant growers collaborated with researchers to gather data during harvest 2020 to understand the key hotspots where blackcurrant losses/surplus occurs and drive discussion on how to mitigate production losses. Across the farms, losses were found to be between 22-39% of the total weight of blackcurrants produced, and mainly occur at the point of harvest. Based on the data collected, the optimisation of harvesting machinery and set-up may be the best place to focus further research efforts in order to best mitigate losses in blackcurrant production.

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1 Field lab aims and background

An estimated 7.2% of all food harvested in the UK is lost as waste or surplus in primary production. Some of this waste is due to supply chain structures and market fluctuations outside of farmers' control, however waste produced on-farm has not been widely explored.

In the past two years, a series of field labs have been set up to bring growers together to examine practical ways of measuring on farm waste and losses and identify potential opportunities for waste reduction. The blackcurrant sector was identified as a sector where on-farm losses have not been widely recorded. Four blackcurrant growers in the east of England took part in this WRAP-funded field lab, with research and coordination support from research consultancy 3Keel and Innovative Farmers.

Ninety percent of all blackcurrants grown across the UK supply LR Sunstory, manufacturer of Ribena. The structure of the industry made it possible to collaborate quite openly and allowed the group to benefit from the advice of the LR Sunstory agronomist, who already worked closely with all the growers involved.

2 Methodology and data collection

Initial interviews took place with interested growers to understand their motivations for taking part, their estimations of waste/surplus, the key hotspots where most losses occur and the drivers of this. The drivers of waste in blackcurrant production include:

- Weather, e.g. sun scorch, wind, warmer winters resulting in a lack of winter chill which is needed for uniform ripening
- Harvesting machinery/set-up preventing catching of bushes or causing berries to fall through gaps
- Unpredictability of weather meaning that in a good year, yields may exceed contracted tonnage
- Limited markets and storage capacity for surplus fruit

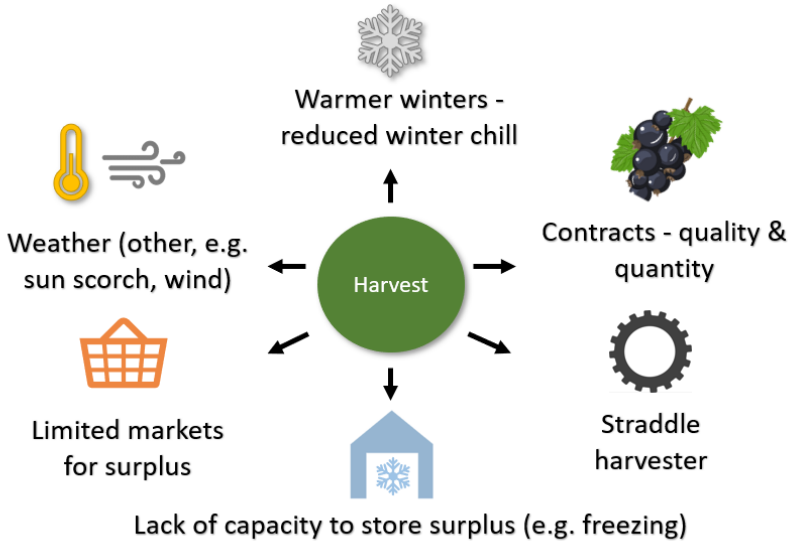


Figure 1 Drivers of losses in blackcurrant production and mitigation strategies

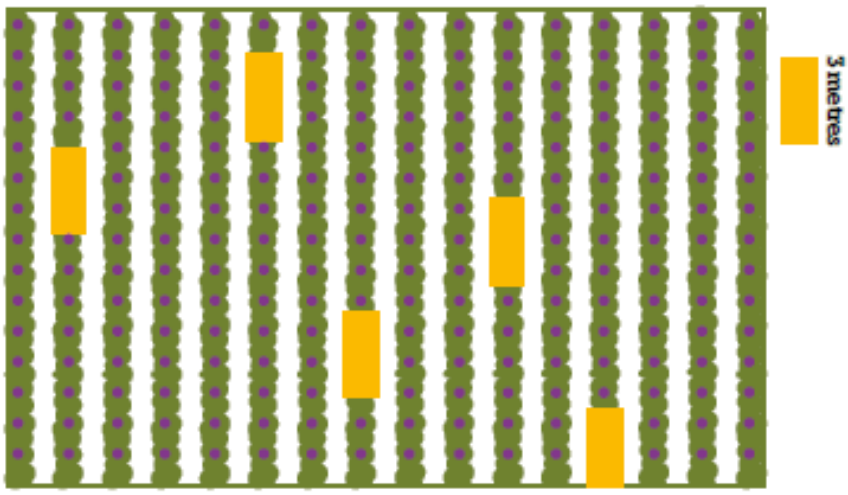
A group workshop took place in June, where the group of farmers, researcher and coordinator discussed this further and co-designed the methodology for data collection.

Data collection took place in July. As data collection needed to take place during the busiest time of the year - harvest, the researcher and coordinator visited the farms to undertake data collection.

Sampling and assessments

Prior to harvest, the farmers each chose five 3-metre long samples in the field that they considered to be roughly representative of the whole field. This included one sample at the end of a row, where the growers suspected that harvesting machinery pushed rather than caught branches therefore leading to greater losses. Due to restrictions in labour/time, this sample size was decided on to restrict the time for data collection to one day per farm. Further sampling would increase the statistical power of the results. To minimise the number of variables between sites, the group decided to focus on a variety which they all grew – Ben Klibreck.

Example:

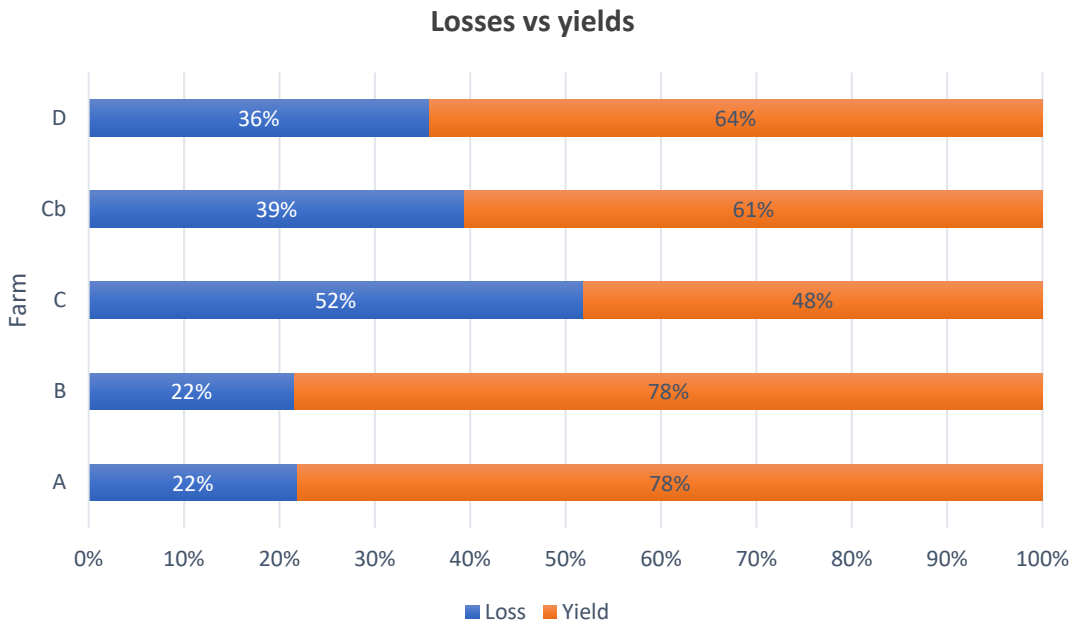


The growers laid down sheeting underneath the sample points a week or so in advance, to collect any berries that had fallen pre-harvest. The researchers visited the sample points on the morning of harvest, weighed these berries, then returned to the sample points immediately after harvest to collect and weigh berries that had been knocked off the bushes or remained on the bush.

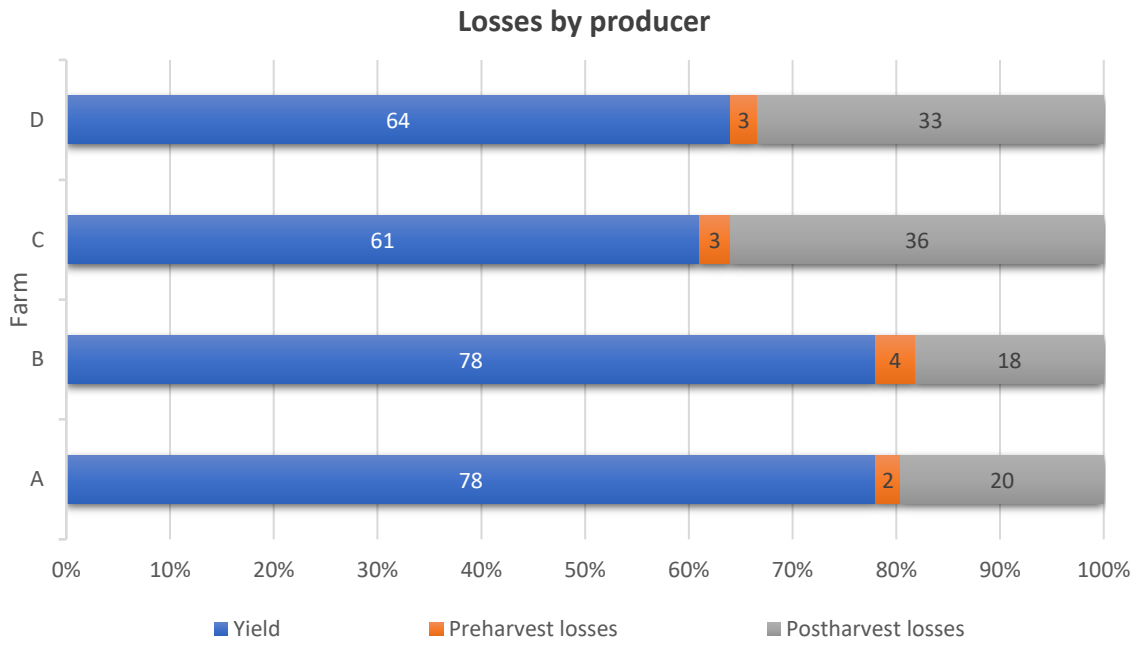
Average losses across each field were calculated, taking into account anomalies or possible 'edge effect'. Pre- and post-harvest losses were compared to yield data to come up with a figure for losses.

Instead of choosing five sample points, one farm (farm A) laid down a 15-metre strip of sheeting. They were able to accurately measure losses and yield by starting and stopping the harvester and weighing the total amount of berries collected over the 15-metre strip.

3 Results and discussion

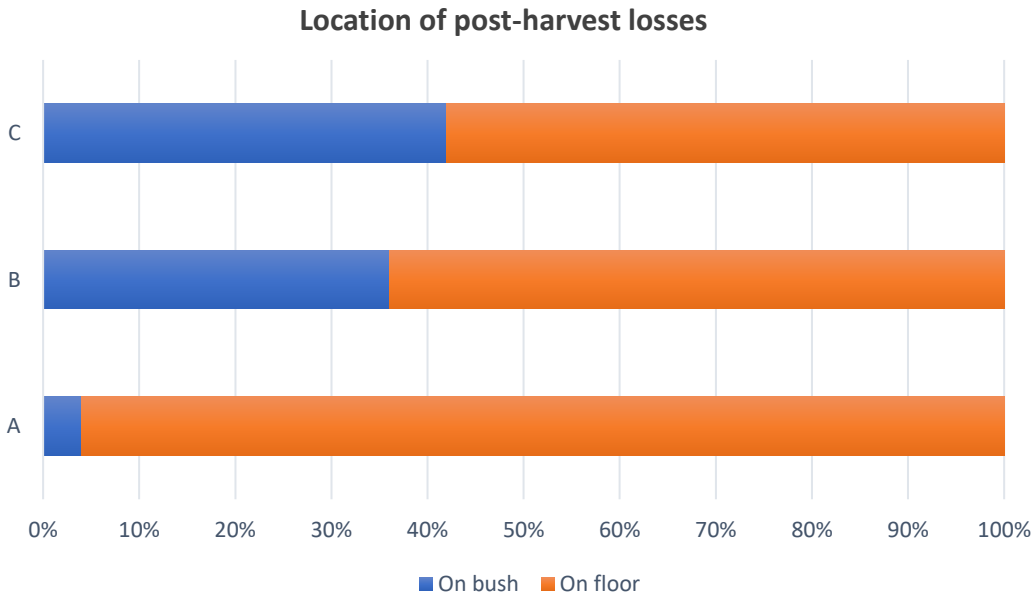


- The results indicated a surprising level of losses – over 4x the expectation of most growers
- The level of losses ranged from 22-39% of the total weight of blackcurrants produced. This increased to an average of 52% losses at farm C, when including a sample point where almost no berries were harvested, because bushes were not sufficiently shaped/pruned, therefore were pushed rather than caught by the machinery (Cb in above diagram)
- There were no unharvested fields at the end of the season at any of the four farms



Most losses occurred at the point of harvest rather than prior to harvest. Harvesting losses occur where blackcurrants are missed or pushed by the harvester and remain on the bush or are knocked off the bush but fall through a small gap in the machinery

- Few berries were lost due to sun scorch, botrytis or early ripening and premature dropping. There were also very few underripe berries – these were initially recorded but amounted to several grams per sample and required more time to sort through, so were not separated out of the data
- Losses did not appear to be significantly higher at the ends of rows



4 Discussion

At a results meeting, the growers compared and discussed their individual farm data. Many expressed shock at the level of losses, which exceeded their expectations considerably – from initial phone interviews prior to data collection, growers' estimates of losses were around 5-8%. It should be noted that the results above reflect one blackcurrant variety, Ben Klibreck, over the 2020 harvest. Whilst production met contracted tonnage this year, in other years or varieties, differences in losses and surplus may occur due to weather, bush shape (e.g. how low to the ground the bush lies), and the characteristics of the variety (e.g. how easily berries drop from wind exposure, winter chill requirements) . The sample size was relatively small because picking, collecting and weighing blackcurrants by hand was a time-consuming process.

There was a wide variance between losses at each farm. The group discussed what variables may have contributed to this variation, e.g. speed of harvest machine, shaker speed, application of bud-break treatment, age of bush.

The number of blackcurrants remaining on bushes appeared to be lower at farms that had more thoroughly pruned/shaped the blackcurrant bushes. However, one grower noted that over pruning/shaping could reduce photosynthetic opportunities, potentially impacting yields in the following year.

It is unclear whether the type of harvester affects the level of yields vs. losses. Both farmers A & B had 22% losses and used different types of harvester. Similarly, both the farm with the lowest losses (A) and the farm with the highest losses (C) used the same harvester and mode of picking - vertical, as opposed to splitting the bush to facilitate separation of the berries. Some aspects of harvester set up may explain the difference in losses between farms; at the farm with the highest losses, tractor speed was 4kmph, whereas for both farms with the fewest losses, tractor speeds were very similar at 1.6 and 1.5 kmph respectively, as were shaker speeds, 1600 and 1500 rpm respectively. Further research is needed to understand optimal set up.

The industry currently mitigates losses in several ways:

- Continuous learning and optimisation of harvesting time, to reduce the amount of underripe or overripe berries
- Breeding programme (partnership between LR Sunstory and the James Hutton Institute) to select for characteristics such at thicker skins (longer shelf life) and more climate resistant varieties. It takes a minimum of 13 years to establish a new variety.
- Innovate UK-funded project comparing winter chill requirements of 20 varieties
- Processed lines for surplus berries, as blackcurrants are highly perishable. For example, one farm started up their own cassis line; a large farm run a frozen berry line and some growers sell surplus fruit to be made into jam. However, the investment required to pursue these opportunities is a barrier for small-medium sized farms. To the best of our knowledge, only one farm businesses has the financial resources to invest in frozen storage capacity. Additionally, one grower interviewed explained that when the market for these processed lines increases, farms may need to use external contractors for processing. As annual surplus is difficult to predict and contracted processors often require minimum quantities of product for processing, growers may need to grow extra in order to guarantee that the contracted

quantity will be met, thereby effectively reintroducing the problem of possible surplus yield with no definite destination for use.

- Some food recovery takes place, with some farms accepting individuals/gleaning organisations to harvest surplus fruit. However, this only takes place on a small scale, can be sporadic and is labour intensive, meaning that a large amount of surplus fruit would likely remain on bushes even post-gleaning.

The results indicate that most of the blackcurrant waste for the fields studied in this project occurred due to harvester machinery set up. Therefore, it would be sensible for the growers to focus efficiency efforts on optimising the harvesting process, as this is an area where waste is likely to be more predictable and controllable than waste/surplus caused by climactic variables.

5 Conclusions/Recommendations and next steps

The results of this farmer-led data gathering project have highlighted that waste in blackcurrant production is an important area to focus grower efforts in improving efficiency and margins. Waste across all four farms in this project farms was between 22% and 39% of total blackcurrant production and mostly occurred at the point of harvest, either by berries being knocked off the bush but failing to be caught by the harvester, or by being missed by the harvester or shaker equipment. The data from farm C also demonstrates the importance of pruning blackcurrant bushes for achieving yields.

Further research is required to understand the ideal harvester set up, including tractor speed, shaker speed, harvester/shaker height and width, type of machinery. As a result of this field lab, the growers involved hope to conduct this research in 2021 (at one farm only, in order to reduce the number of variables influencing losses). The farmers are taking their idea to the next annual industry board R&D meeting to propose this line of research as a next step to minimising on-farm losses in blackcurrant production.

6 Further reading

WRAP, 2019. Food waste in primary production in the UK. Available at: <https://www.wrap.org.uk/content/food-waste-primary-production-uk> [Accessed 16/12/2020]

Farming UK, 2019. 'New varieties and tech to improve UK blackcurrant harvest', 19th July 2019. Available at: <https://www.farminguk.com/news/new-varieties-and-tech-to-improve-uk-blackcurrant-harvest_53448.html> [Accessed 04/01/2020].