

# Commissioning of nitrate survey of leafy green vegetables

## Summary of stakeholder responses

**23 June 2020**

### Introduction

This consultation was issued on 10 February 2020 and closed on 13 March 2020.

The Food Standards Agency (FSA) has funded the continuous monitoring of nitrate levels in leafy green vegetables for a period of more than eleven years. The results from the last survey period 2014 to 2019 and earlier monitoring surveys have been published on the FSA website. This ongoing monitoring has provided a snapshot of compliance with the levels established in legislation and a measure of progress on the adoption of codes of good agricultural practice by industry to further mitigate nitrate levels.

A new five-year survey has been commissioned to monitor tissue nitrate levels in domestically grown leafy green vegetables, for which there are maximum levels set in food safety legislation. As part of the commissioning process the FSA has published a four-week public consultation on the proposed survey design and objectives.

A total of six responses were received to the public consultation. Comments focused on various aspects of the survey design. These were:

- The need for datalogging of local weather and soil conditions to gather a more complete picture of the factors influencing observed seasonal fluctuations in nitrate levels;
- The survey should include representative geographical sampling of UK and regions by industry size;
- The recruitment of participating growers to the survey;
- The rationale for the selection of salad crop categories;
- Recommendations on the statistical approach as part of the survey design.

The Food Standards Agency's considered responses to stakeholders' comments are given in the last column of the table.

## Summary of substantive comments

Respondent	Comment	Response
<b>Individual 1</b>	All I can say is: “what a total waste of time & money” how on earth do you think you are going to monitor every back garden / allotment in the land? It would be more use putting a growing plan into place!	Nitrate levels can vary in commercially grown green vegetables and are influenced by a number of factors. Adoption of good agricultural practices can help to mitigate nitrate levels and help to ensure compliance with the maximum levels established in legislation. The new survey will build upon the previous surveys undertaken by the FSA by providing valuable data to bring about practicable improvements in agricultural practices, to further reduce nitrate levels in these crops.
<b>Vitacress Salads</b>	Hope you are keeping well. I’m sure you will have covered this in the design already, but will the growers be required to supply weather data for say the week leading up to harvest? It may be worthwhile to explain any anomalies.	The recording of soil and weather conditions data are routinely included as part of sample collection in the survey design.
<b>Individual 2</b>	Sir, I welcome the result from the testing for nitrates	The FSA will continue to publish annual occurrence datasets throughout the survey period on the FSA website.
<b>Individual 3</b>	I noted that you are asking for comments on the proposed survey of nitrates in leafy green vegetables.	FSA statisticians have been involved in the development of the survey design. A new sampling plan has been

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	<p>This used to be one of my responsibilities when I worked in the precursor to the FSA in the 1980s. Clearly there have been some improvements however the problem remains; the accumulation of nitrate is not only large but extremely variable.</p> <p>Having read the documents related to your request I am left wondering how the number of samples to be analysed is being determined. There is a rigorous way of doing this which should at least inform your final decision. Whoever is responsible for the survey needs to consider the following questions:</p> <p>1: what is the minimum difference in mean year on year nitrate levels I wish to detect? (10 mg per kilogram, 50 mg per kilogram?)</p> <p>2: with what certainty do I wish to be able to detect this difference? (90% or 95% or 99%?).</p> <p>3: therefore how many samples would I need to analyse to achieve this aim.</p> <p>This is a rigorous, statistically sound, defensible road to determining numbers of samples. In the final event</p>	<p>devised for the bulls blood lettuce, chard, land cress, baby leaf lettuce and kale categories. The sample size (50) per category is based on the following mean and confidence intervals projections:</p> <p>Low (1000 mg/kg); (840, 1160)</p> <p>Typical (2000 mg/kg); (1680, 2320)</p> <p>High (4000 mg/kg); (3400, 4600)</p> <p>Very high (6000 mg/kg; (5200, 6800).</p>

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	<p>compromises may need to be made on the grounds of cost or practicability however what I suggest should be the starting point.</p> <p>You had an ADAS statistician in the team undertaking the previous work doubtless this person could provide the statistical advice you need. You may even have an in-house statistics expert despite all the cuts to the FSA. Without this statistical rigour the number of samples included in the survey will have no firm basis in science. What I suggest is that whoever is responsible have a good hard look at questions 1-3 above and see what the answers are before taking the decision on the number of samples.</p>	
<p><b>Chilled Food Association</b></p>	<p>Thank you for inviting comment on this proposed invitation to tender.</p> <p>In plants nitrate breaks down to nitrite, this process step being controlled by the enzyme nitrate reductase.</p> <p>Nitrate reductase is a light-sensitive enzyme so there is considerable diurnal variation in its effects. For</p>	<p>The survey contractor has extensive experience in the collection of randomised field samples and the variables affecting nitrate tissue levels.</p> <p>The survey will include the routine recording of soil and weather conditions data as part of field sample collection, to give a comprehensive picture of local conditions.</p>

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	<p>example, trials on spinach samples taken in early morning (i.e. after period of dark and low enzyme activity) could be relatively high (1000+ppm),but on a bright sunny day within a few hours levels could be only 100+ ppm. However, if the day was cloudy/wet levels might not drop significantly.</p> <p>The challenge of any sampling for nitrate is to reflect the plant's natural physiology and reaction to natural conditions in the survey unless samples are taken from a field in uniform or at least known conditions.</p> <p>If crops were sampled in the early morning or in cloudy conditions high levels could be identified as an issue, but if taken from the same crop harvested at e.g. 2pm on a sunny day there might not be any issue with nitrate levels.</p> <p>Nitrate, unlike a pesticide residue which generally has a linear breakdown, does not do so linearly.</p> <p>For sampling to be done properly it should be done from field crops at harvest, specifying the time and weather conditions</p>	<p>All samples will be collected in the field rather than at retail.</p>

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	<p>(sun/cloud) the sample was taken, and not sampling at retail as otherwise one would not be able to identify whether it is the crop or growing conditions that are an issue.</p>	
<p><b>Bakkavor Ltd</b></p>	<p>I was interested to see that the FSA has opened a consultation on the commissioning of a new survey to monitor tissue nitrate levels in domestically grown leafy green vegetables. This is presumably in the context of the UK's exit from the European Union and the possibility of setting limits here independently of the EU. I have consulted with other colleagues with knowledge in this area and would provide the following in response to the request for comments:</p> <p>1. The recruitment of growers could lead to bias in the samples.</p> <p>a. The selection should cover an adequate geographic spread, due to the influence of soil type (and resulting fertiliser regimes), irrigation regimes, temperature and light levels on nitrate levels in the crops, particularly rocket, which shows a highly variable response.</p>	<p>The FSA has continuously monitored nitrate levels in leafy green vegetables for more than eleven years.</p> <p>This substantial body of occurrence data allows trending analysis to be used and this will be an important consideration of the current survey requirement i.e. to interpret the latest occurrence data against the long-term averages where available.</p> <p>The survey design includes well established protocols for representative sampling of the salad crop sector across the four countries of the UK.</p> <p>However, for the new survey the crop categories: will be widened to include bulls blood lettuce, chard, land cress, baby leaf lettuce and kale. These have been selected because of increasing market share and dietary consumption in recent years, with the</p>

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	<p>b. Locations of recruited growers should take account of the quantities of relevant crops grown in each region.</p> <p>c. Sampling protocols should take account of variability from these sources.</p> <p>2. Will spinach be sampled at different growth stages (i.e. baby leaf to mature plants), as all are available in the market and may have significantly different nitrate levels?</p> <p>a. Chard, bull's blood, land cress and kale are not covered by the EU/EC regulations. Why have they been selected?</p> <p>b. These are niche crops: do they provide a good selection to adequately represent national dietary exposure? Should more attention be given to, for example, head lettuce grown and harvested in different formats (e.g. hand-harvested whole head vs. machine-harvested multi-leaf)?</p> <p>c. Where different stages of plant growth are present in the market (e.g. chard, kale) will they be represented in the sampling plan?</p> <p>3. The current limits are to some extent arbitrary (the limits for rocket are up to twice those for spinach).</p>	<p>growing popularity of plant-based diets.</p> <p>The survey will include routine datalogging of soil and weather conditions as part of field sample collection. The data will be used to identify potential mitigation steps for further investigation.</p>

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	<p>There are health benefits to nitrate in the diet (as indeed there are in consuming leafy vegetables), as well as potential disbenefits. Any future changes to limits should take account of all the available evidence on the overall effects on human health.</p> <p>4.The results of the survey should be analysed alongside agronomic information provided by the growers in order to identify good agricultural practices that might help to mitigate nitrate levels in the crops.</p>	