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Supplement of

Communicating uncertainties in spatial predictions of grain micronutrient concentration

Christopher Chagumaira et al.

Correspondence to: Christopher Chagumaira (christopher.chagumaira@nottingham.ac.uk, chris.chagumaira@gmail.com)

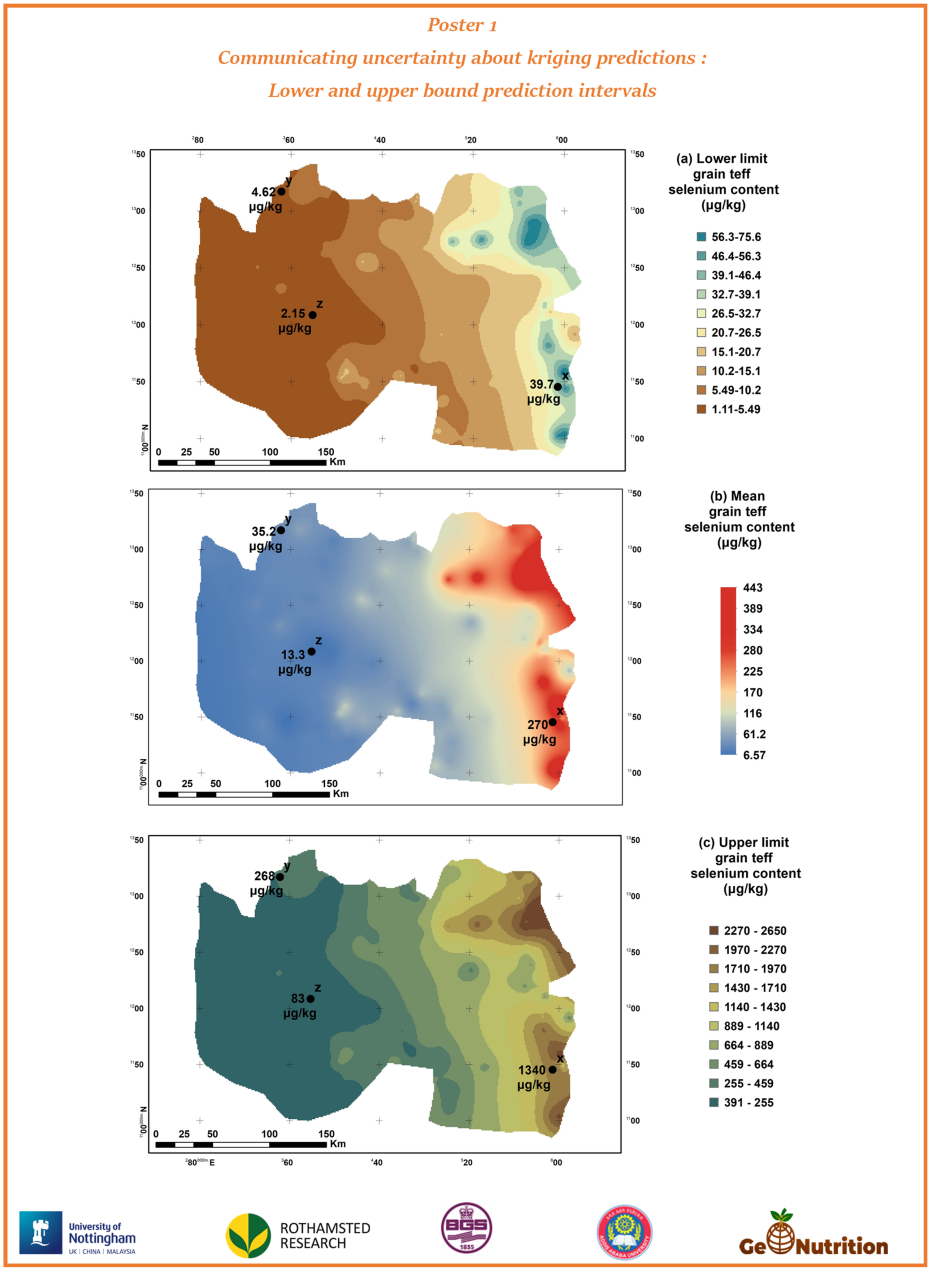

Figure S1. Poster showing the prediction intervals (lower and upper limit) and the predicted selenium concentration in teff grain in Amhara region, Ethiopia

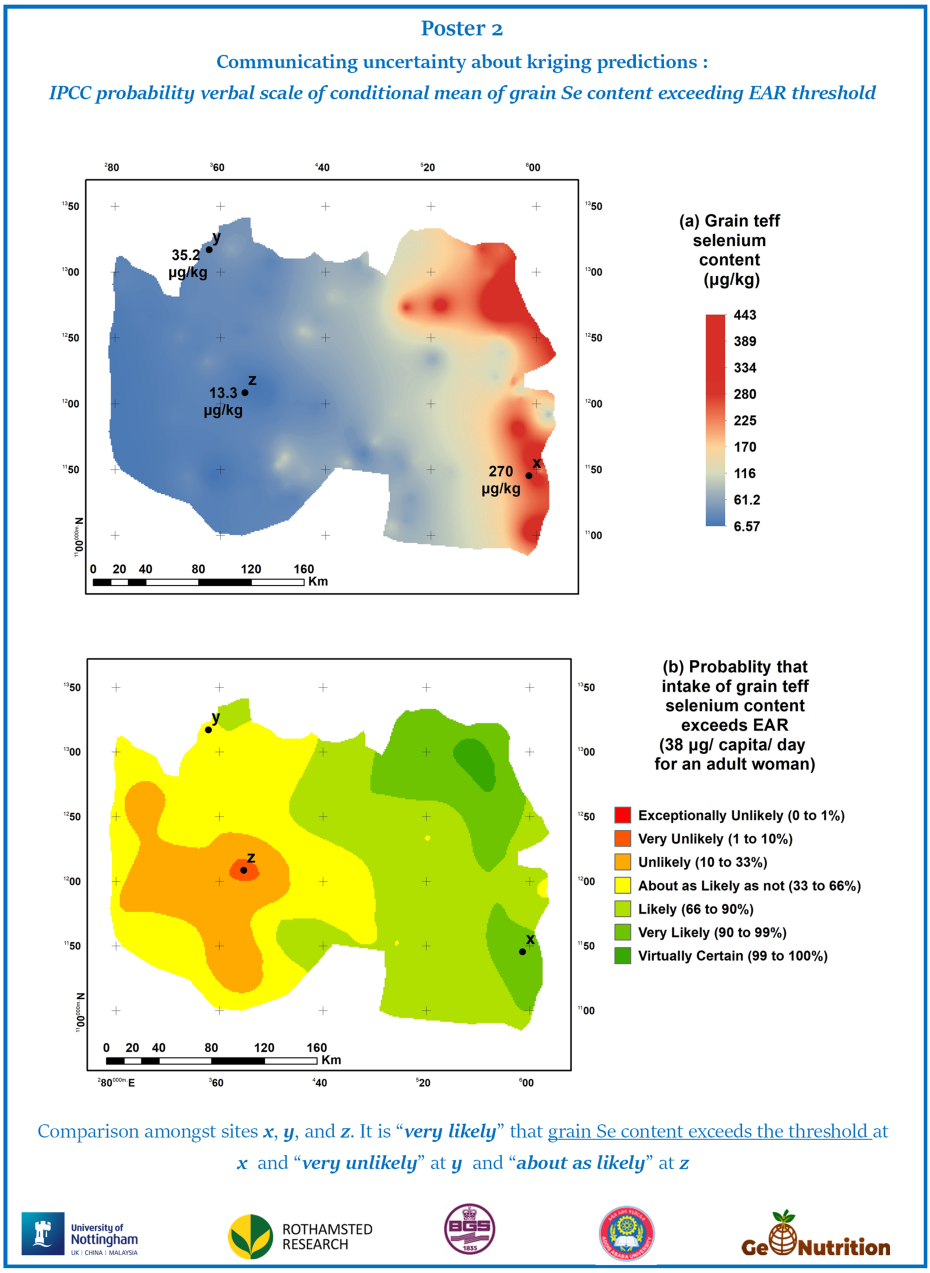

Figure S2. Poster on verbal probability scale (with probabilities indicated as percentages) of the probability that intake of grain teff selenium concentration is less than the threshold 38 µg kg^{-1} in Amhara region, Ethiopia

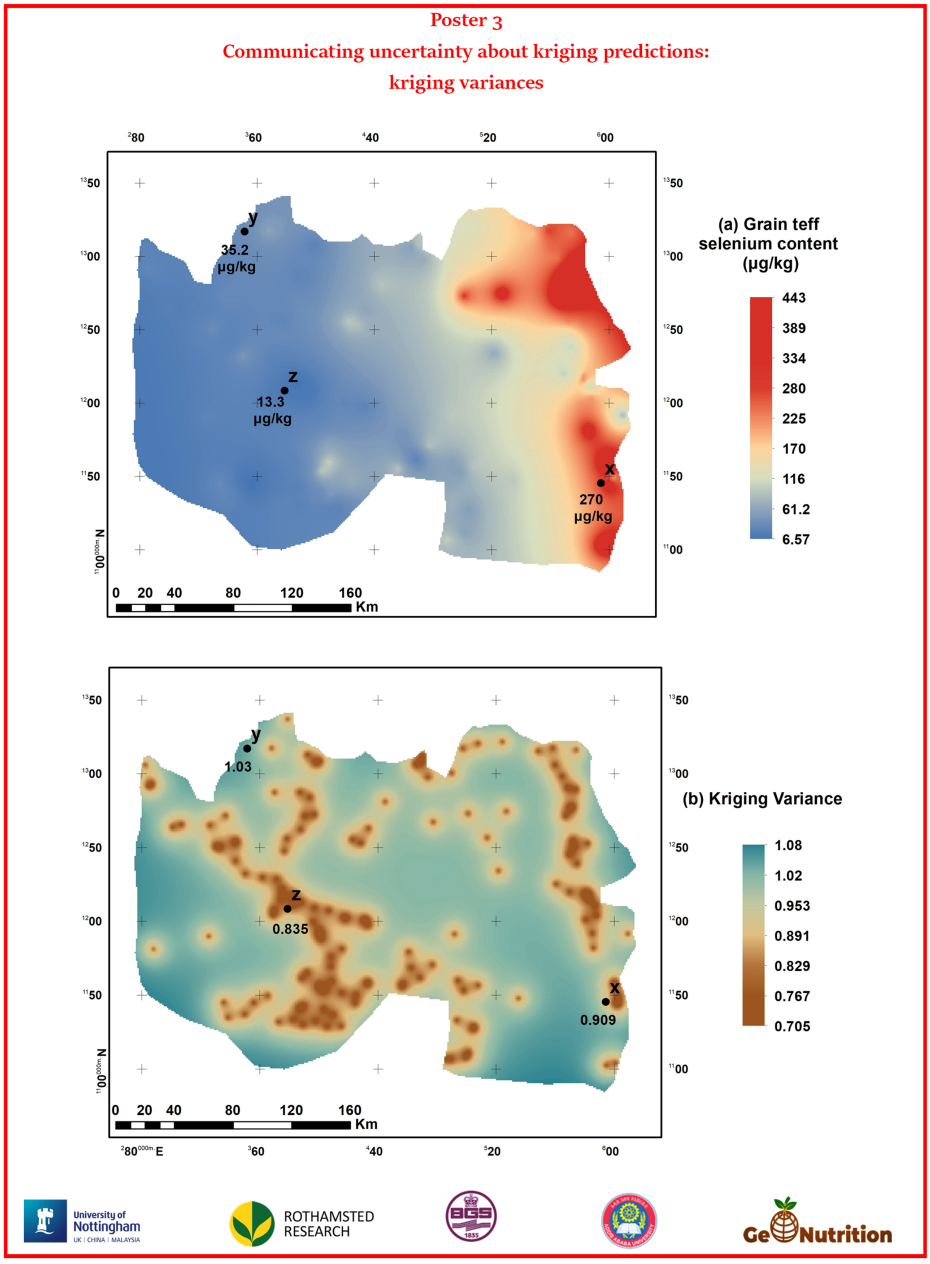

Figure S3. Poster showing (a) predicted selenium concentration in teff grain and (b) kriging variance (expected squared prediction error) in Amhara region, Ethiopia

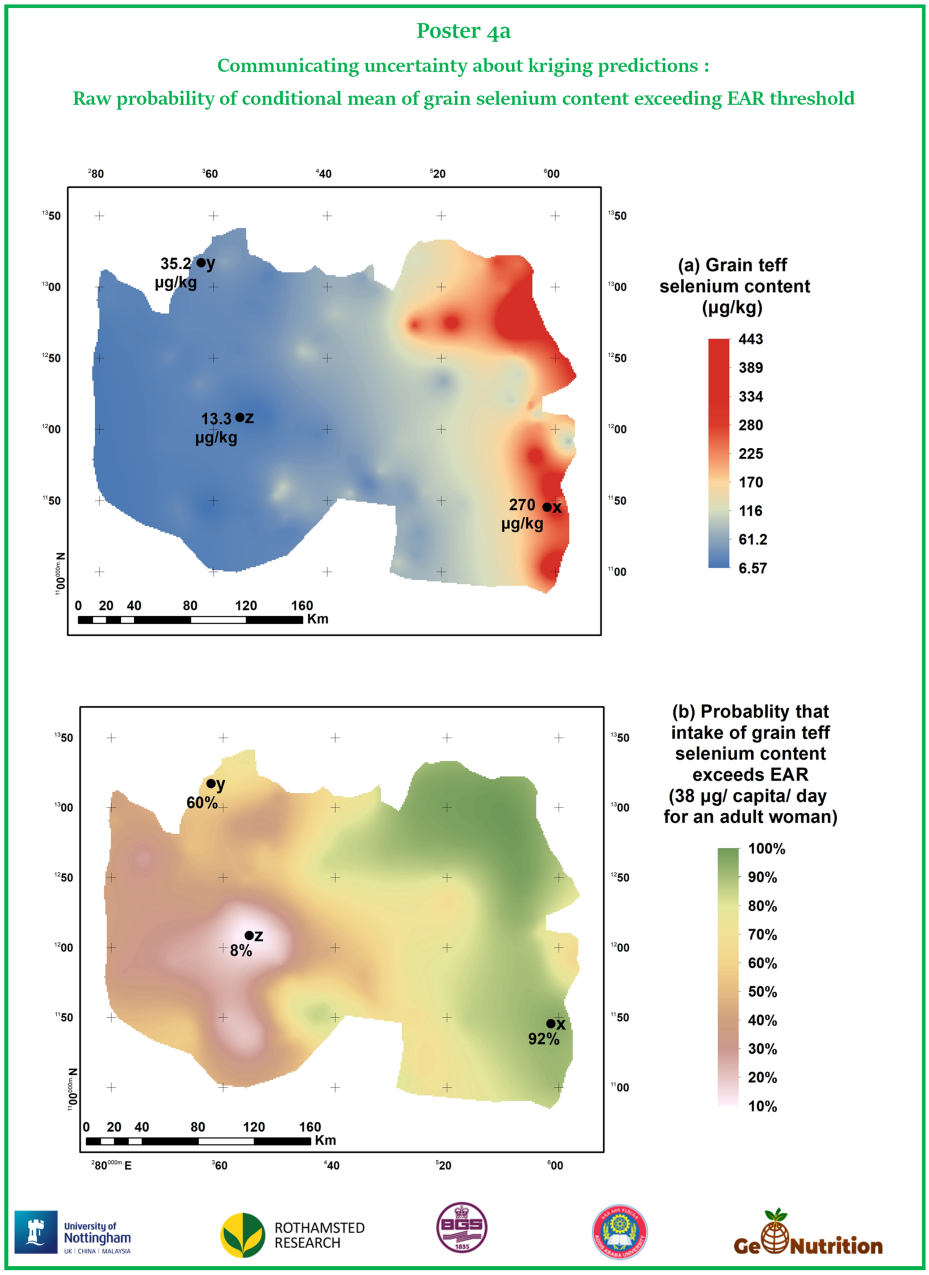

Figure S4. Poster on raw probability scale of the probability that intake of grain teff selenium concentration is less than the threshold 38 µg kg^{-1} in Amhara region, Ethiopia

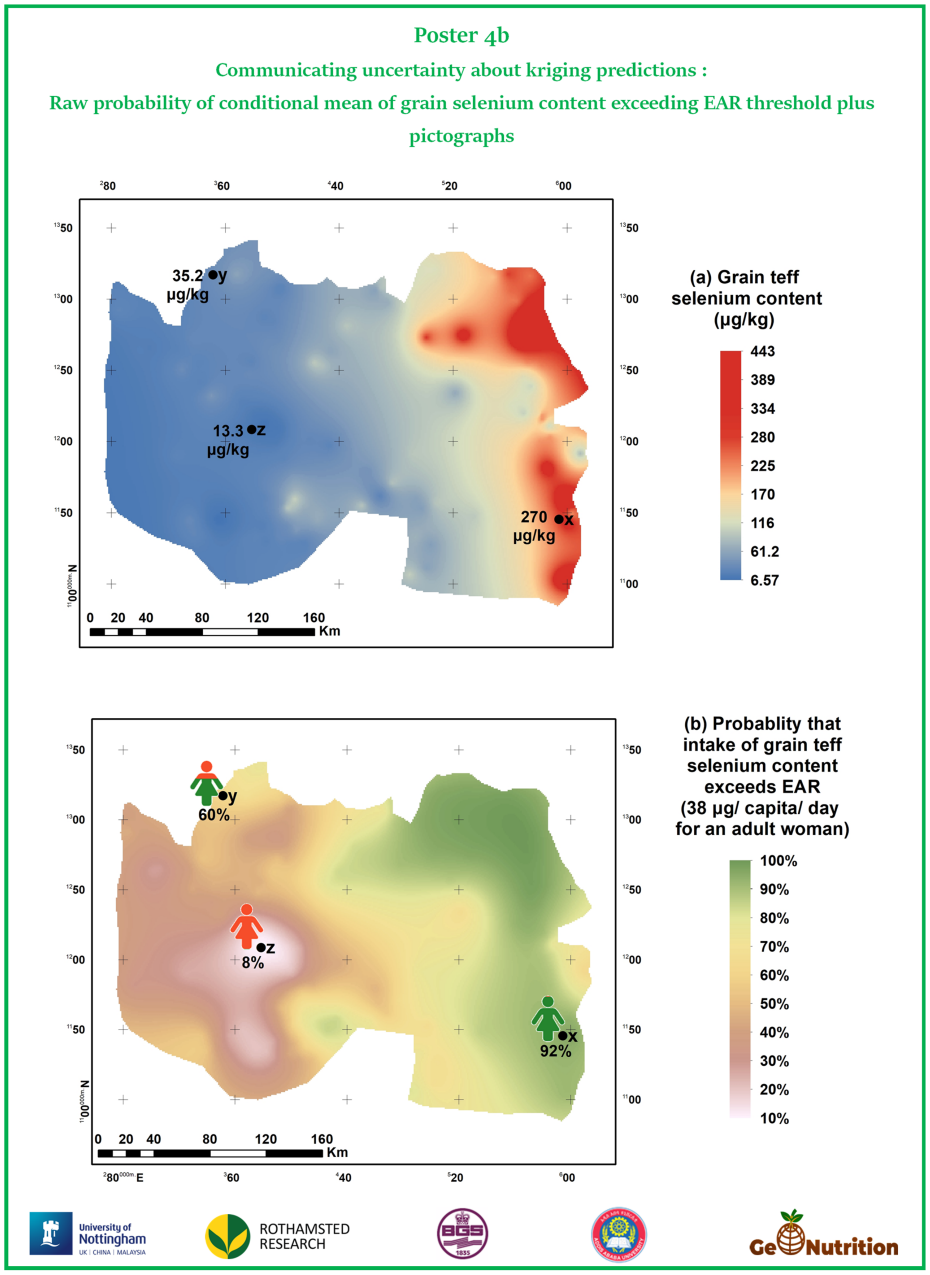

Figure S5. Poster on raw probability scale, with pictographs, of the probability that intake of grain teff selenium concentration is less than the threshold 38 µg kg^{-1} in Amhara region, Ethiopia

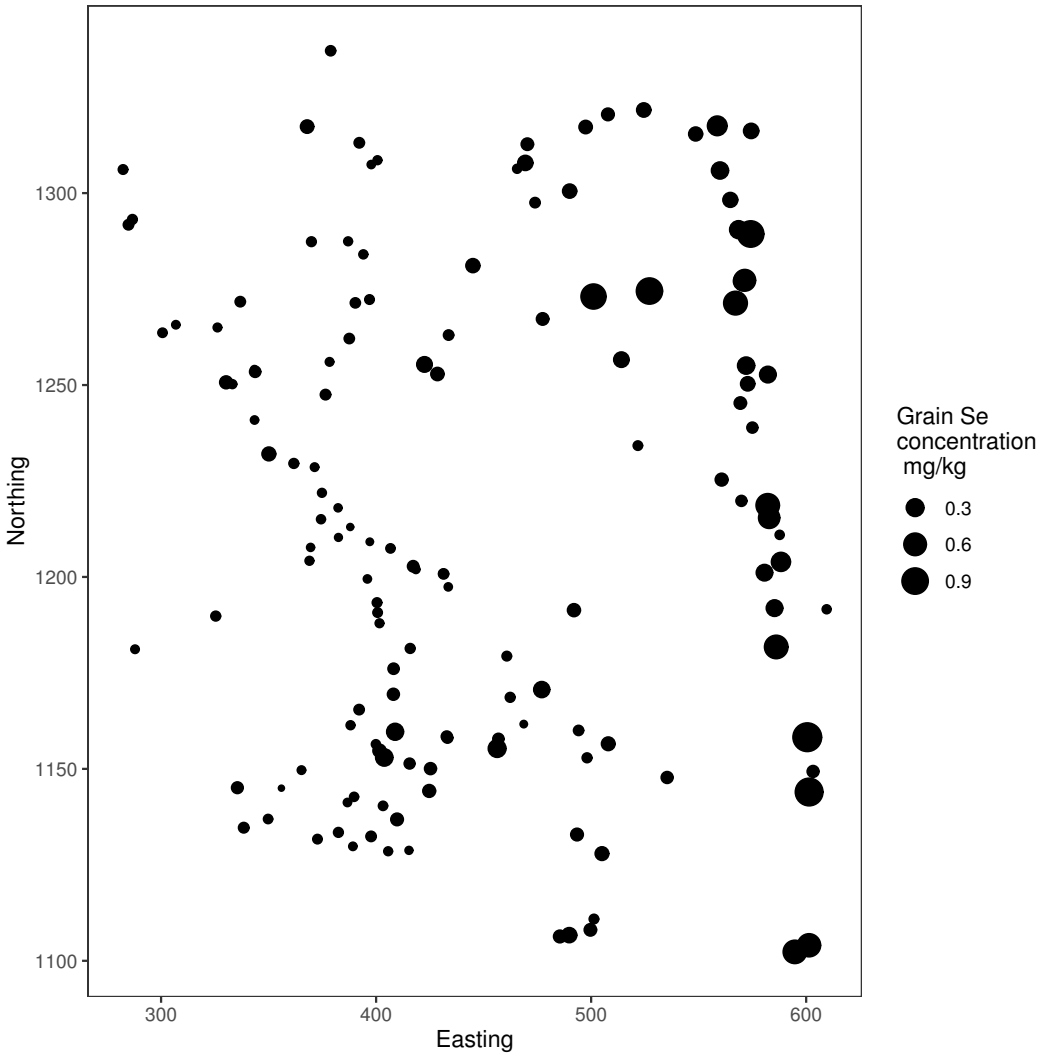

Figure S6. Post-plot of Amhara dataset

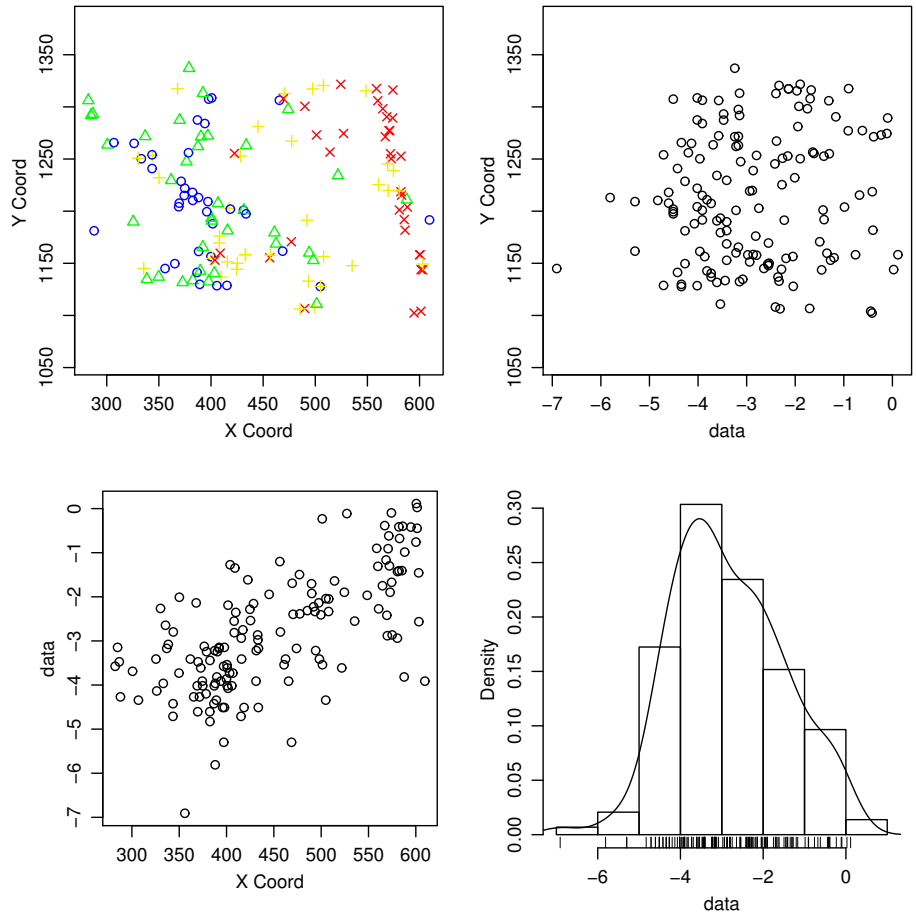

Figure S7. Post-plot of Amhara dataset

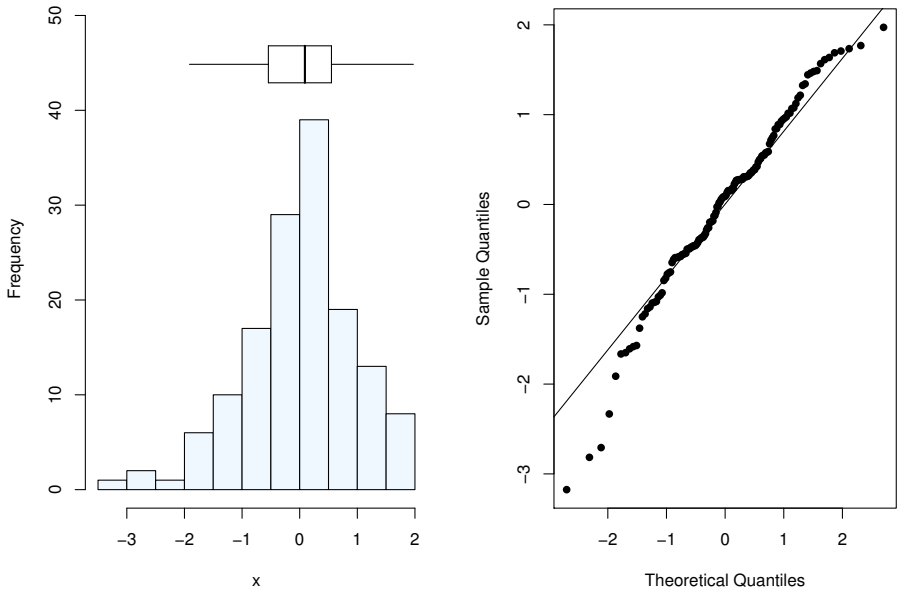

Figure S8. Post-plot of kriging errors in the cross-validated Amhara dataset

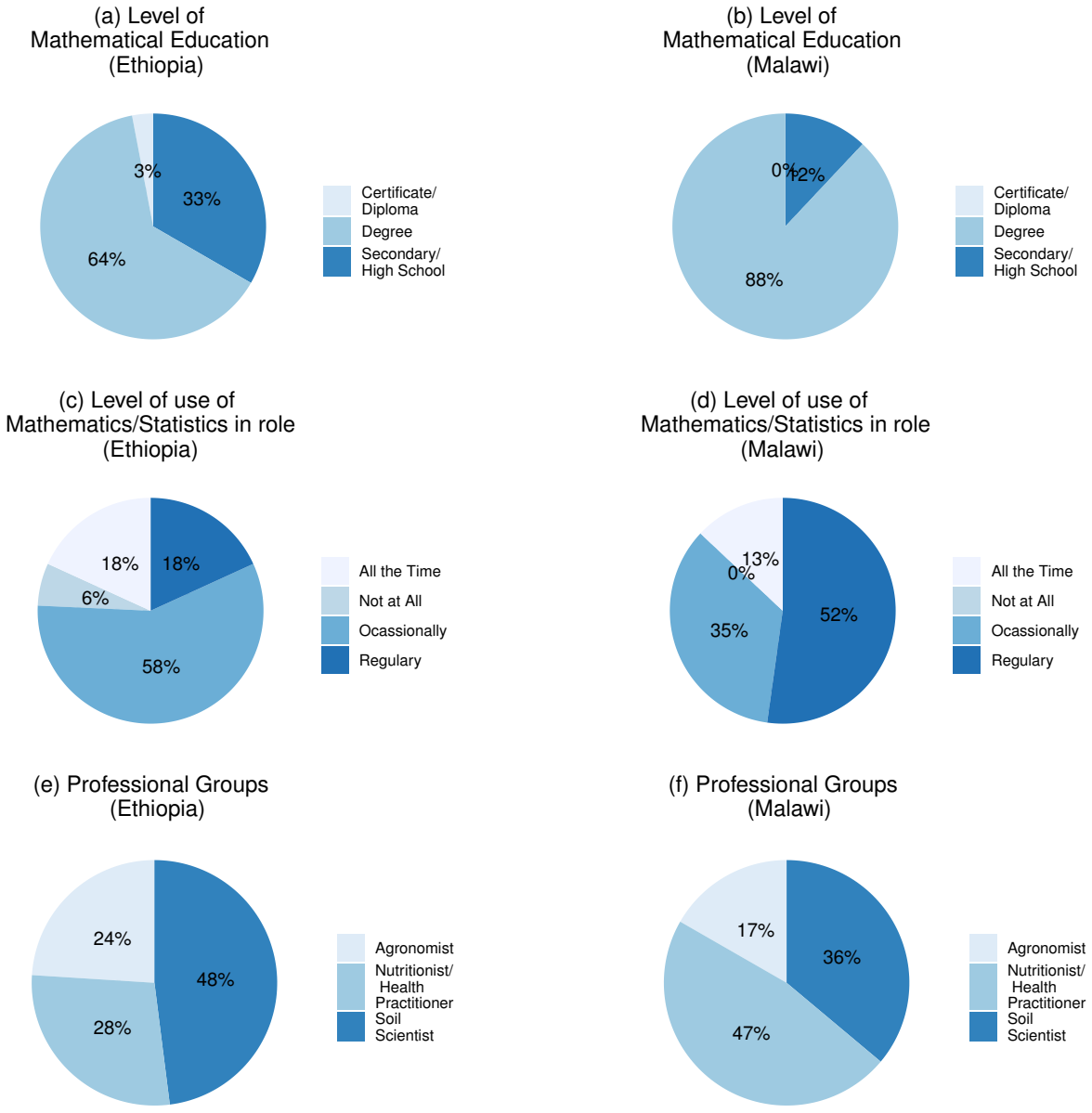

Figure S9. The percentage of participants by level of mathematical education and use of mathematics or statistics in their role.

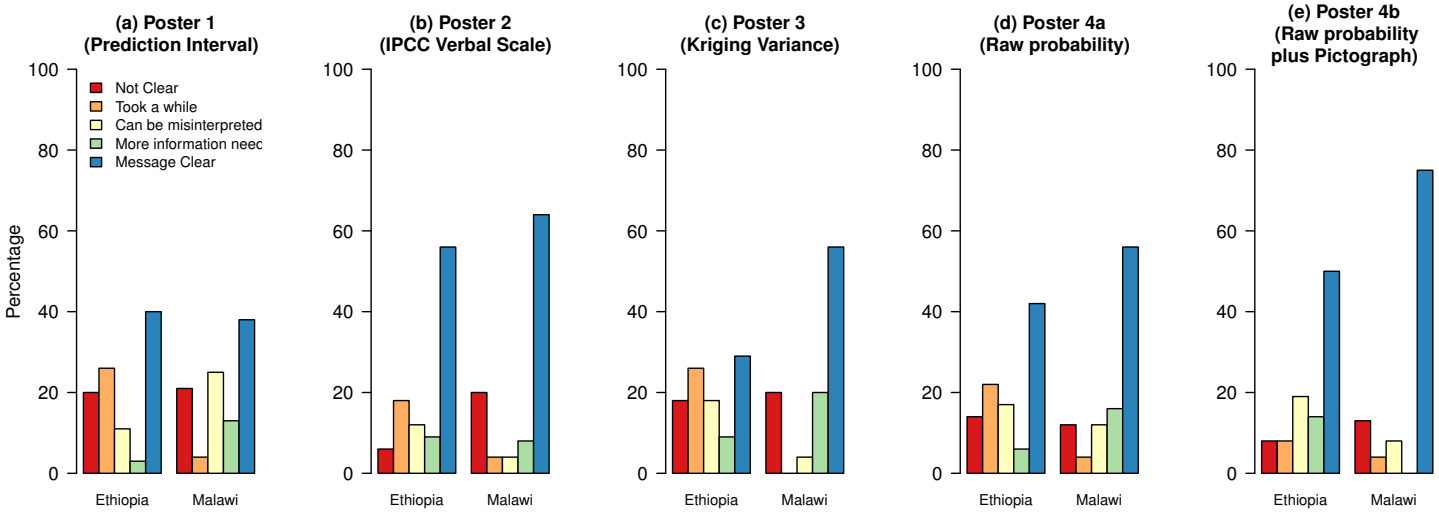

Figure S10. Bar charts showing how participants when pooled within location of meeting responded to the interpretive task on Question 2

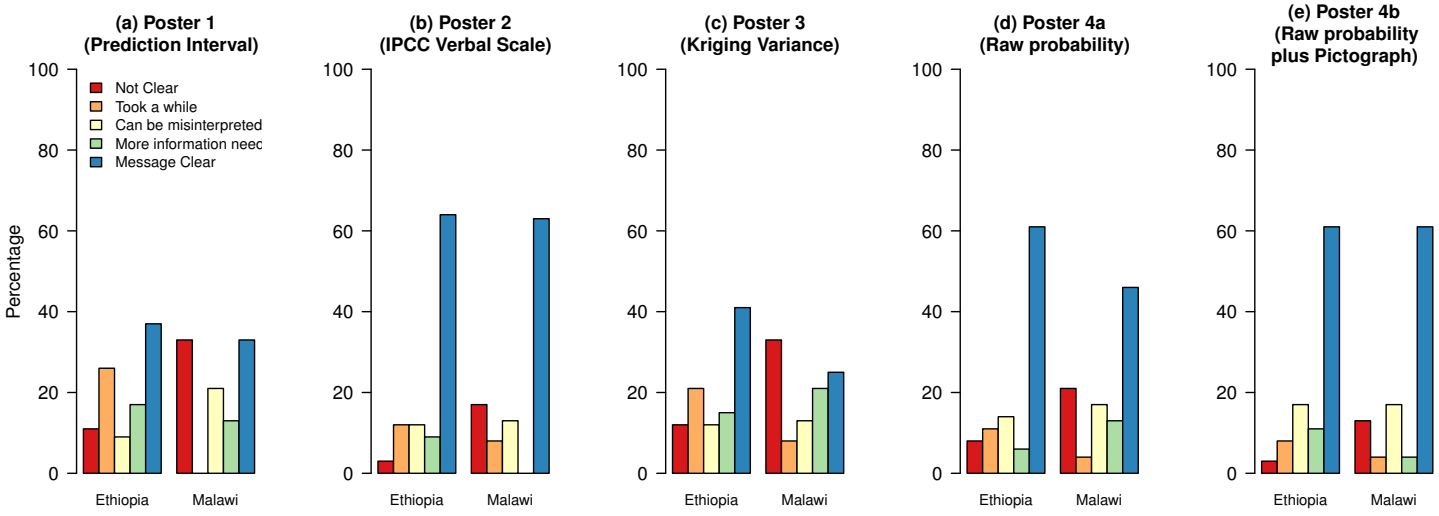

Figure S11. Bar charts showing how participants when pooled within location of meeting responded to the interpretive task on Question 3

Questionnaire

Purpose of Survey Spatial information is critical to many important decisions made by stakeholders in the area of food and nutrition, for example about whether and where interventions are required to address nutritional deficiencies. In this study we consider the example of information on micronutrient concentrations in staple crops. These concentrations vary spatially because of many factors. We can make direct measurements only at limited numbers of sites and use statistical models to make predictions elsewhere as a basis for mapping. Because of this the information presented in maps has attendant uncertainty. It is important that this uncertainty is communicated effectively to users of the information, and the objective of this exercise is to elicit information from stakeholder groups about the success or otherwise of different approaches to the problem.

This questionnaire aims to identify the best method(s) for communicating the uncertainty in spatial prediction of grain Se concentration. We hope to identify the most appropriate methods of communicating uncertainty for different groups, and so define the outputs we need from our uncertainty analysis.

We will show you five methods that could be used to communicate uncertainty. Please consider each in turn and answer the associated sets of questions. The two central questions ask:

1. Is the information that you need on uncertainty represented?
2. Is the method used to present uncertainty clear and not misleading?

Section A: Questions about you

1. Country where you work
2. Which group do you represent
   (a) Agronomist
   (b) Soil Scientist
   (c) Nutritionists/Health Practitioners
3. What level of mathematical education do you have?
   (a) Very Little
   (b) Secondary/ High school qualifications
   (c) Certificate/Diploma
   (d) Degree level and above
4. How much do you use mathematics or statistics in your role?
   (a) Not at all
   (b) Occasionally
   (c) Regularly
   (d) All the time

Section B: Questions about communicating uncertainty about spatial predictions of grain Se concentration

In all posters, the threshold Se concentration in grain to which we refer is 38 µg kg^{-1} (micrograms per kilogram), such that a serving of 330g of grain flour provides a third of the daily EAR of Selenium for an adult woman.

Poster 1

Please look at the poster and find locations x, y, and z

1. Is it clear from the poster, that the statement below is true? "Our confidence that grain selenium concentration exceeds 38 µg kg^{-1} is greater at x than at z"

   (a) No it is not clear at all
   (b) I understand it but took me a while to figure it out
   (c) I think it is good but can be misinterpreted
   (d) Good but needs more information
   (e) Message is clear

2. Is it clear from the poster, that the statement below is true? "Our confidence that grain selenium concentration does not exceed 38 µg kg^{-1} is greater at z than at y"

   (a) No it is not clear at all
   (b) I understand it but took me a while to figure it out
   (c) I think it is good but can be misinterpreted
   (d) Good but needs more information
   (e) Message is clear

3. Is it clear from the poster, that the statement below is true? "Our confidence that grain selenium concentration does not exceed 38 µg kg^{-1} is greater at y than at x"

   (a) No it is not clear at all
   (b) I understand it but took me a while to figure it out
   (c) I think it is good but can be misinterpreted
   (d) Good but needs more information
   (e) Message is clear

Suppose you would want to design programmes to address micronutrient deficiency in your region

4. Does the poster provide adequate information about the selenium content of grain for you to identify locations where programme is most needed?

   (a) Inadequate Information
   (b) Adequate information
   (c) More than what I wanted

5. Is the way this poster communicates the uncertainty about grain selenium content straightforward to interpret

   (a) No it is not clear at all
   (b) I understand it but took me a while to figure it out
   (c) I think it is good but can be misinterpreted
   (d) Good but needs more information
   (e) Message is clear

Poster 2

Please look at the poster and find locations x, y, and z

1. Is it clear from the poster, that the statement below is true? "Our confidence that grain selenium concentration exceeds 38 µg kg^{-1} is greater at x than at z"

   (a) No it is not clear at all
   (b) I understand it but took me a while to figure it out
   (c) I think it is good but can be misinterpreted
   (d) Good but needs more information
   (e) Message is clear

2. Is it clear from the poster, that the statement below is true? "Our confidence that grain selenium concentration does not exceed 38 µg kg^{-1} is greater at z than at y"

   (a) No it is not clear at all
   (b) I understand it but took me a while to figure it out
   (c) I think it is good but can be misinterpreted
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   (e) Message is clear

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   (a) No it is not clear at all
   (b) I understand it but took me a while to figure it out
   (c) I think it is good but can be misinterpreted
   (d) Good but needs more information
   (e) Message is clear

Poster 3

Please look at the poster and find locations x, y, and z

1. Is it clear from the poster, that the statement below is true? "Our confidence that grain selenium concentration exceeds 38 µg kg^{-1} is greater at x than at z"

   (a) No it is not clear at all
   (b) I understand it but took me a while to figure it out
   (c) I think it is good but can be misinterpreted
   (d) Good but needs more information
   (e) Message is clear

2. Is it clear from the poster, that the statement below is true? "Our confidence that grain selenium concentration does not exceed 38 µg kg^{-1} is greater at z than at y"

   (a) No it is not clear at all
   (b) I understand it but took me a while to figure it out
   (c) I think it is good but can be misinterpreted
   (d) Good but needs more information
   (e) Message is clear

3. Is it clear from the poster, that the statement below is true? "Our confidence that grain selenium concentration does not exceed 38 µg kg^{-1} is greater at y than at x"

   (a) No it is not clear at all
   (b) I understand it but took me a while to figure it out
   (c) I think it is good but can be misinterpreted
   (d) Good but needs more information
   (e) Message is clear

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4. Does the poster provide adequate information about the selenium content of grain for you to identify locations where programme is most needed?

   (a) Inadequate Information
   (b) Adequate information
   (c) More than what I wanted

5. Is the way this poster communicates the uncertainty about grain selenium content straightforward to interpret

   (a) No it is not clear at all
   (b) I understand it but took me a while to figure it out
   (c) I think it is good but can be misinterpreted
   (d) Good but needs more information
   (e) Message is clear

Poster 4a

Please look at the poster and find locations x, y, and z

1. Is it clear from the poster, that the statement below is true? "Our confidence that grain selenium concentration exceeds 38 µg kg^{-1} is greater at x than at z"

   (a) No it is not clear at all
   (b) I understand it but took me a while to figure it out
   (c) I think it is good but can be misinterpreted
   (d) Good but needs more information
   (e) Message is clear

2. Is it clear from the poster, that the statement below is true? "Our confidence that grain selenium concentration does not exceed 38 µg kg^{-1} is greater at z than at y"

   (a) No it is not clear at all
   (b) I understand it but took me a while to figure it out
   (c) I think it is good but can be misinterpreted
   (d) Good but needs more information
   (e) Message is clear

3. Is it clear from the poster, that the statement below is true? "Our confidence that grain selenium concentration does not exceed 38 µg kg^{-1} is greater at y than at x"

   (a) No it is not clear at all
   (b) I understand it but took me a while to figure it out
   (c) I think it is good but can be misinterpreted
   (d) Good but needs more information
   (e) Message is clear

Suppose you would want to design programmes to address micronutrient deficiency in your region

4. Does the poster provide adequate information about the selenium content of grain for you to identify locations where programme is most needed?

   (a) Inadequate Information
   (b) Adequate information
   (c) More than what I wanted

5. Is the way this poster communicates the uncertainty about grain selenium content straightforward to interpret

   (a) No it is not clear at all
   (b) I understand it but took me a while to figure it out
   (c) I think it is good but can be misinterpreted
   (d) Good but needs more information
   (e) Message is clear

Poster 4b

Please look at the poster and find locations x, y, and z

1. Is it clear from the poster, that the statement below is true? "Our confidence that grain selenium concentration exceeds 38 µg kg^{-1} is greater at x than at z"

   (a) No it is not clear at all
   (b) I understand it but took me a while to figure it out
   (c) I think it is good but can be misinterpreted
   (d) Good but needs more information
   (e) Message is clear

2. Is it clear from the poster, that the statement below is true? "Our confidence that grain selenium concentration does not exceed 38 µg kg^{-1} is greater at z than at y"

   (a) No it is not clear at all
   (b) I understand it but took me a while to figure it out
   (c) I think it is good but can be misinterpreted
   (d) Good but needs more information
   (e) Message is clear

3. Is it clear from the poster, that the statement below is true? "Our confidence that grain selenium concentration does not exceed 38 µg kg^{-1} is greater at y than at x"

   (a) No it is not clear at all
   (b) I understand it but took me a while to figure it out
   (c) I think it is good but can be misinterpreted
   (d) Good but needs more information
   (e) Message is clear

Suppose you would want to design programmes to address micronutrient deficiency in your region

4. Does the poster provide adequate information about the selenium content of grain for you to identify locations where programme is most needed?

   (a) Inadequate Information
   (b) Adequate information
   (c) More than what I wanted

5. Is the way this poster communicates the uncertainty about grain selenium content straightforward to interpret

   (a) No it is not clear at all
   (b) I understand it but took me a while to figure it out
   (c) I think it is good but can be misinterpreted
   (d) Good but needs more information
   (e) Message is clear

Comparing all methods

Once you have completed all the posters, which poster did you find easy to interpret and communicated uncertainty the best?

6. Do you think that the poster helped you understand the uncertainty in the predictions?
   (a) Poster 1
      i. Yes
      ii. No
   (b) Poster 2
      i. Yes
      ii. No
   (c) Poster 3
      i. Yes
      ii. No
   (d) Poster 4a
      i. Yes
      ii. No
   (e) Poster 4b
      i. Yes
      ii. No
7. Please rank the posters in order of their effectiveness, in your experience, at communicating uncertainty in the predictions, Rank1 being MOST effective and Rank 5 the LEAST
   (a) Rank 1 : Poster ....
   (b) Rank 2: Poster ....
   (c) Rank 3: Poster ....
   (d) Rank 4: Poster ....
   (e) Rank 4: Poster ....

Thank you for completing this questionnaire. If you have any further comments about the best ways to communicate uncertainty, please write below.