Adaptation of public digital soil maps for practical use in agriculture

Söderström M, Piikki K., Cordingley J.

Afsoilgrids250m

Resolution and extent:

Horisontal:
-The African continent (except deserts)
-250 m × 250 m

Vertical:
-six intervals (within 0–200 cm)[a]
-two intervals (within 0–200 cm)[b]

Mapped soil properties:

SOC [a], pH [a], sand [a], silt [a], clay [a], bulk density[a],CEC [a], total nitrogen[b], exchangeable acidity [a] , Al content[b], exchangeable bases (Ca, K, Mg, Na)[b].

Publication:

PloS one 10.6 (2015): e0125814

Map availability:

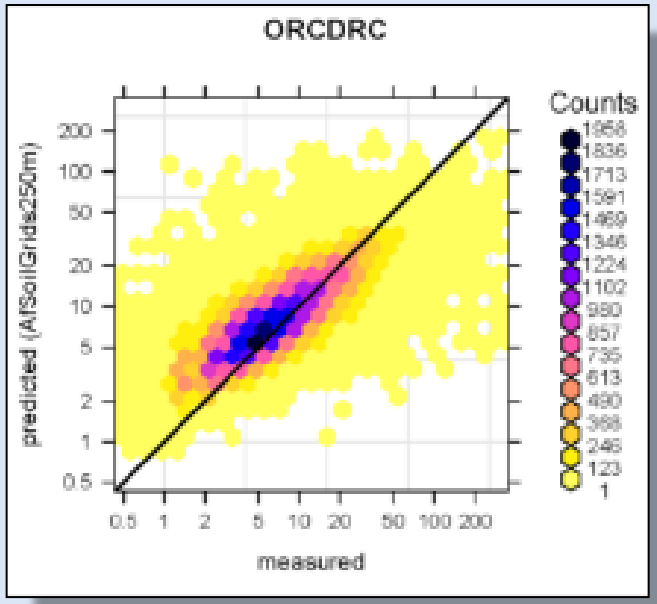
Public (CC-BY) through ISRIC:
http://www.isric.org/data/AfSoilGrids250m

Questions:

1. How accurate are Rwandan pH and SOC farm averages and Sector averages derived from AfSoilgrids250m?

2. Can we combine the AfSoilgrids250m with available local soil samples and get an even better map?

AfSoilgrids 250 m



Pan-African five-fold cross validation:
64 010 samples

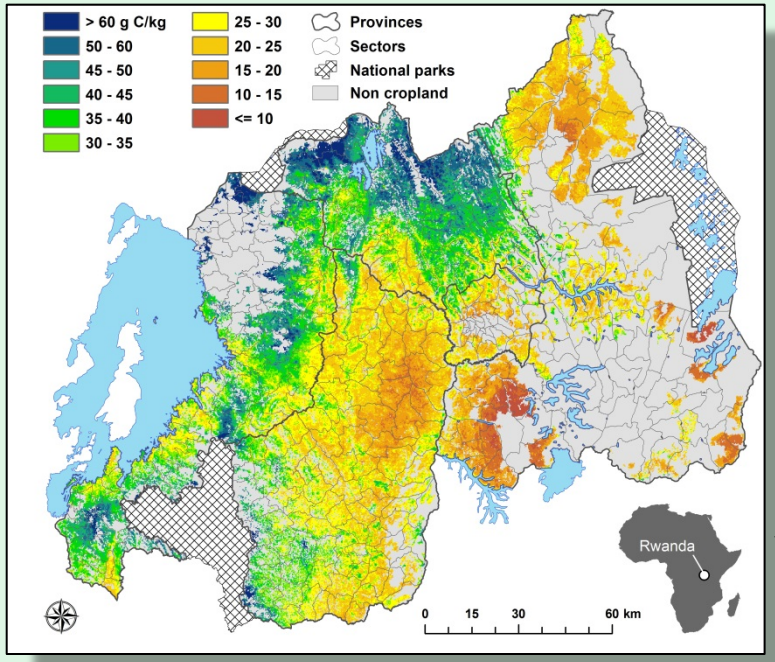
http://isric.org/content/mapping-accuracy-afsoilgrids250m

Code	*Soil property name*	*Units*	*Sample size*	*Range (99% prob.)*	*RMSE*	*% variance explained*
ORCDRC	Soil organic carbon concentration	g kg^{-1}	64,010	0.9–42‰	10.6	61.3

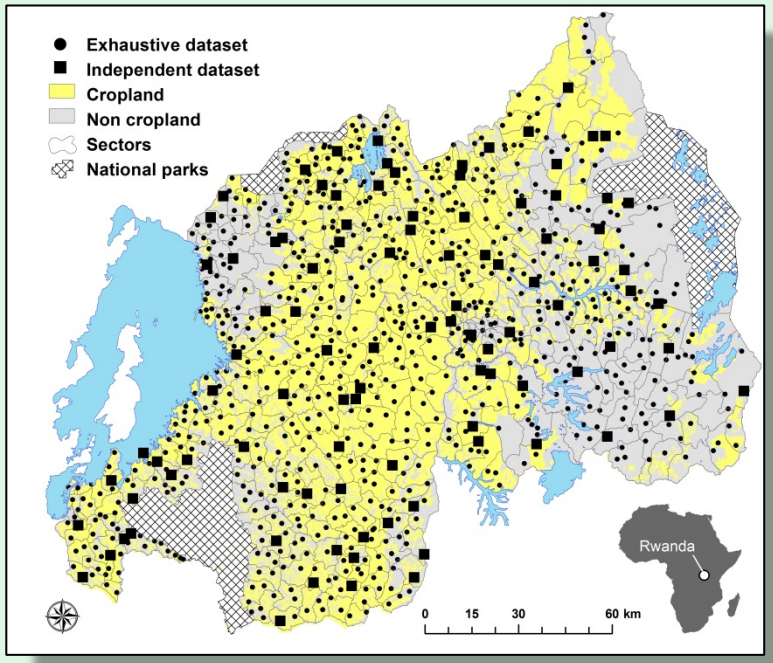
From: Söderström, Piikki, Cordingley 2016

Rwanda:

Comparing local data and AfsoilGrids250



topsoil SOC according to AfsoilGrids250m

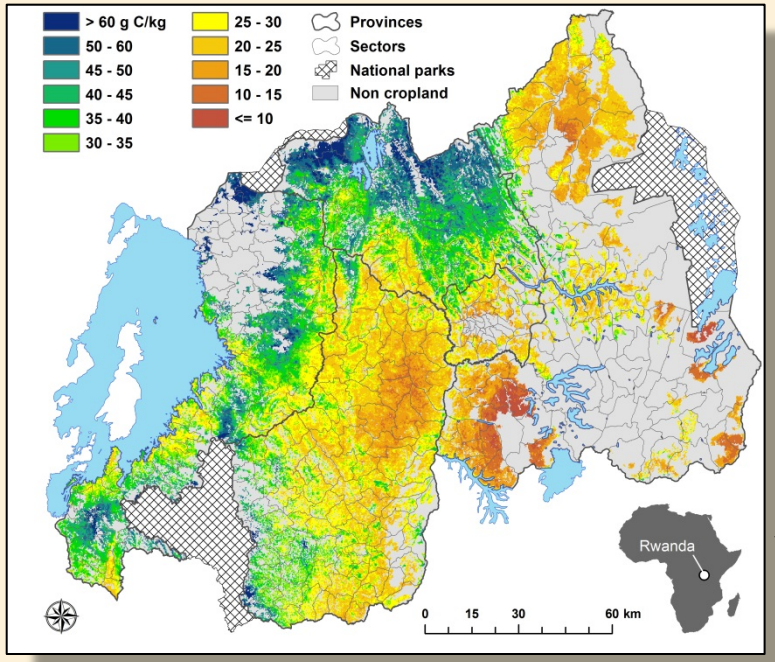


900 soil analyses from IFDC and CropNuts

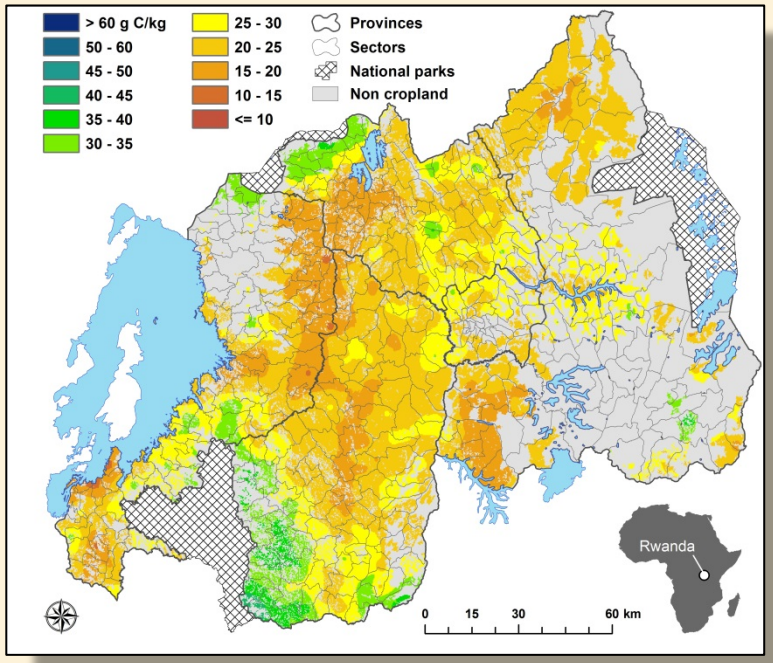
From: Söderström, Piikki, Cordingley 2016

Rwanda:

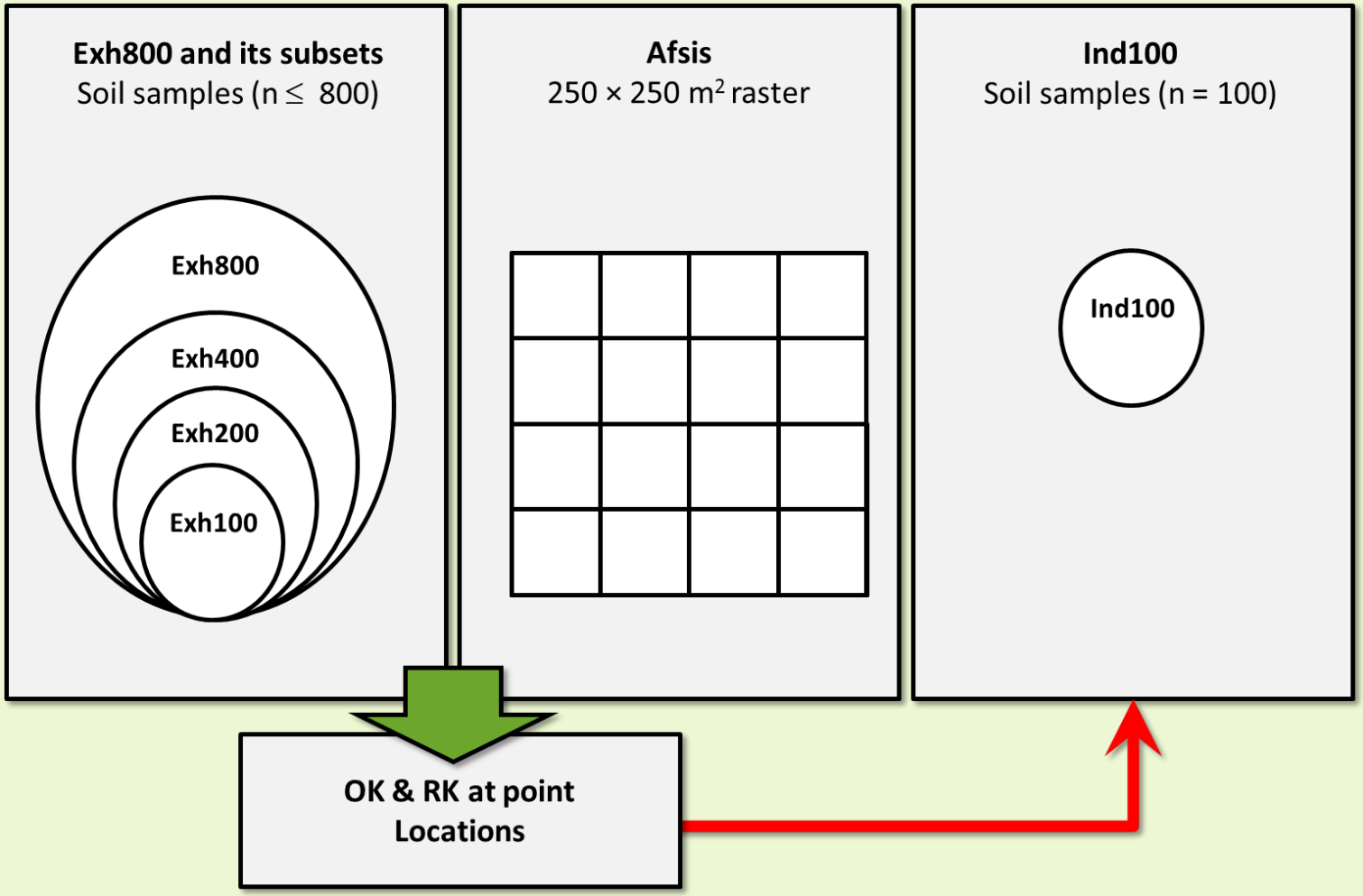
Comparing local data and AfsoilGrids250



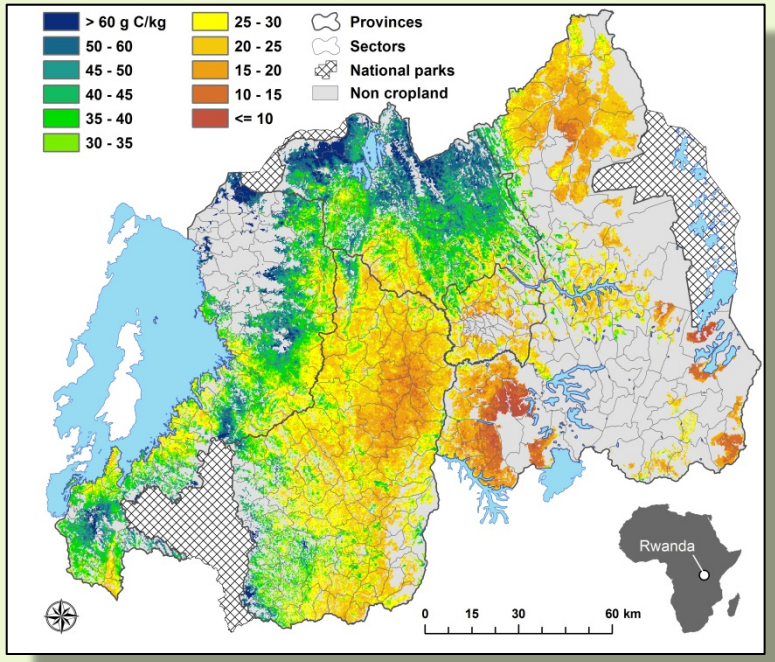
topsoil SOC according to AfsoilGrids250



topsoil SOC according to interpolation of 800 soil samples

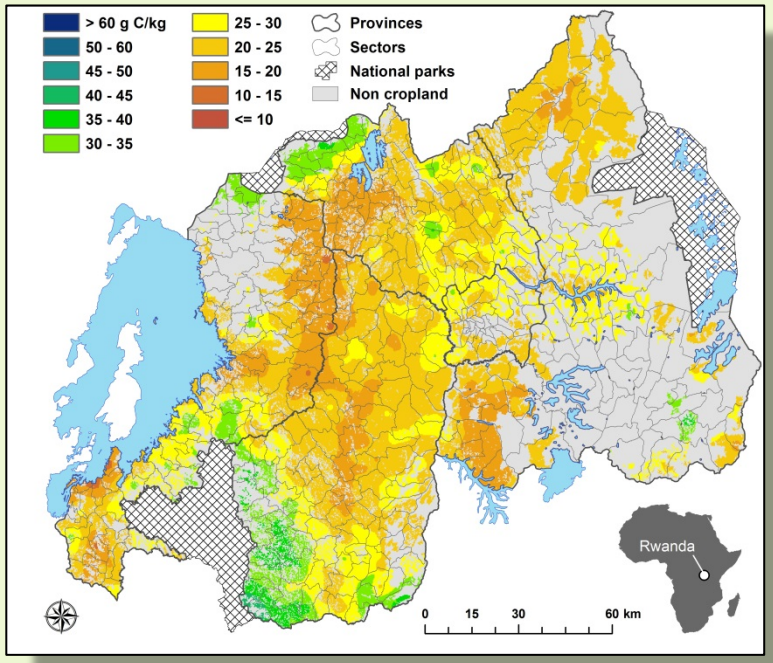

Exh800 and its subsets
Soil samples (n ≤ 800)
Exh800
Exh400
Exh200
Exh100
Afsis
250 × 250 m² raster
Ind100
Soil samples (n = 100)
Ind100
OK & RK at point
Locations

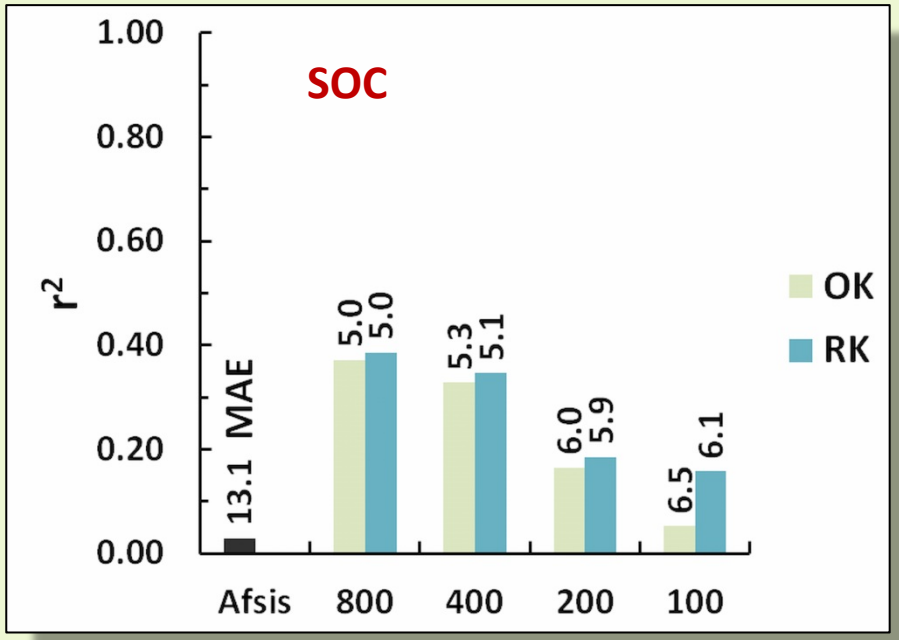
From: Söderström, Piikki, Cordingley 2016



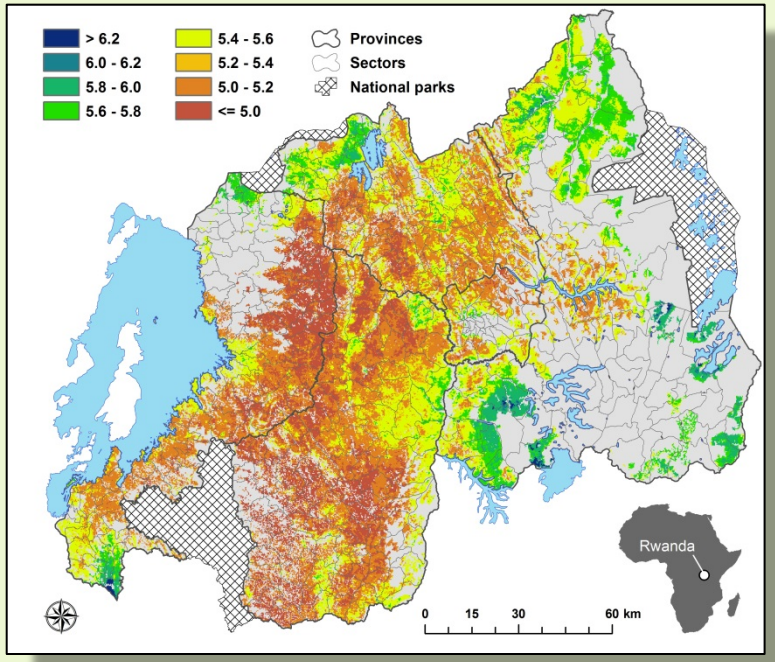
Validation at soil sample locations

'Truth': the 100 soil samples





From: Söderström, Piikki, Cordingley 2016



Validation at soil sample locations

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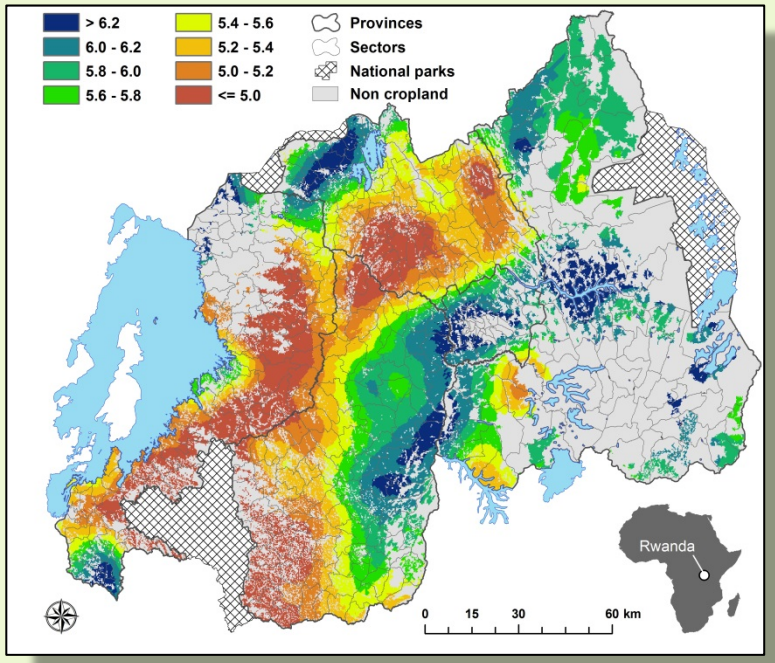

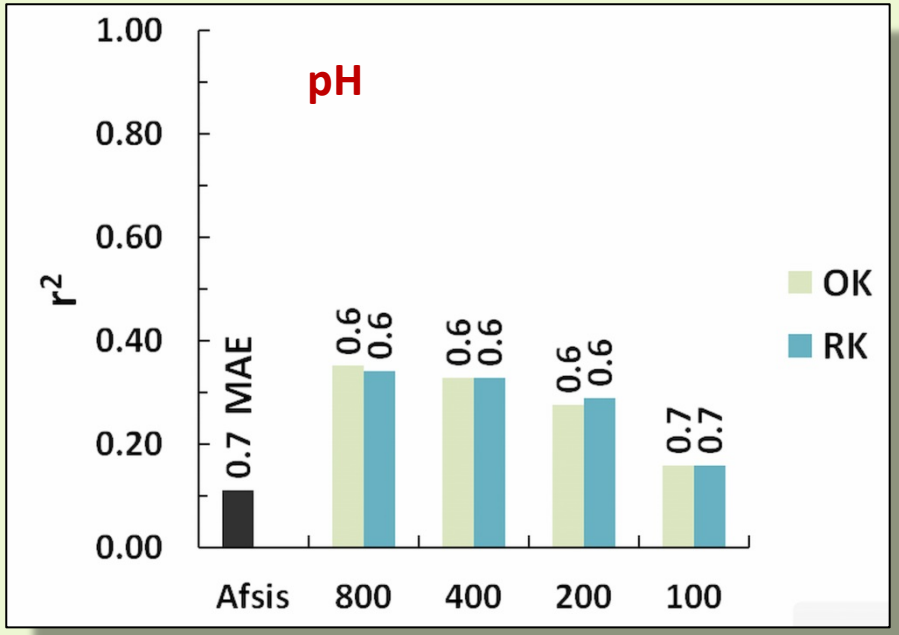

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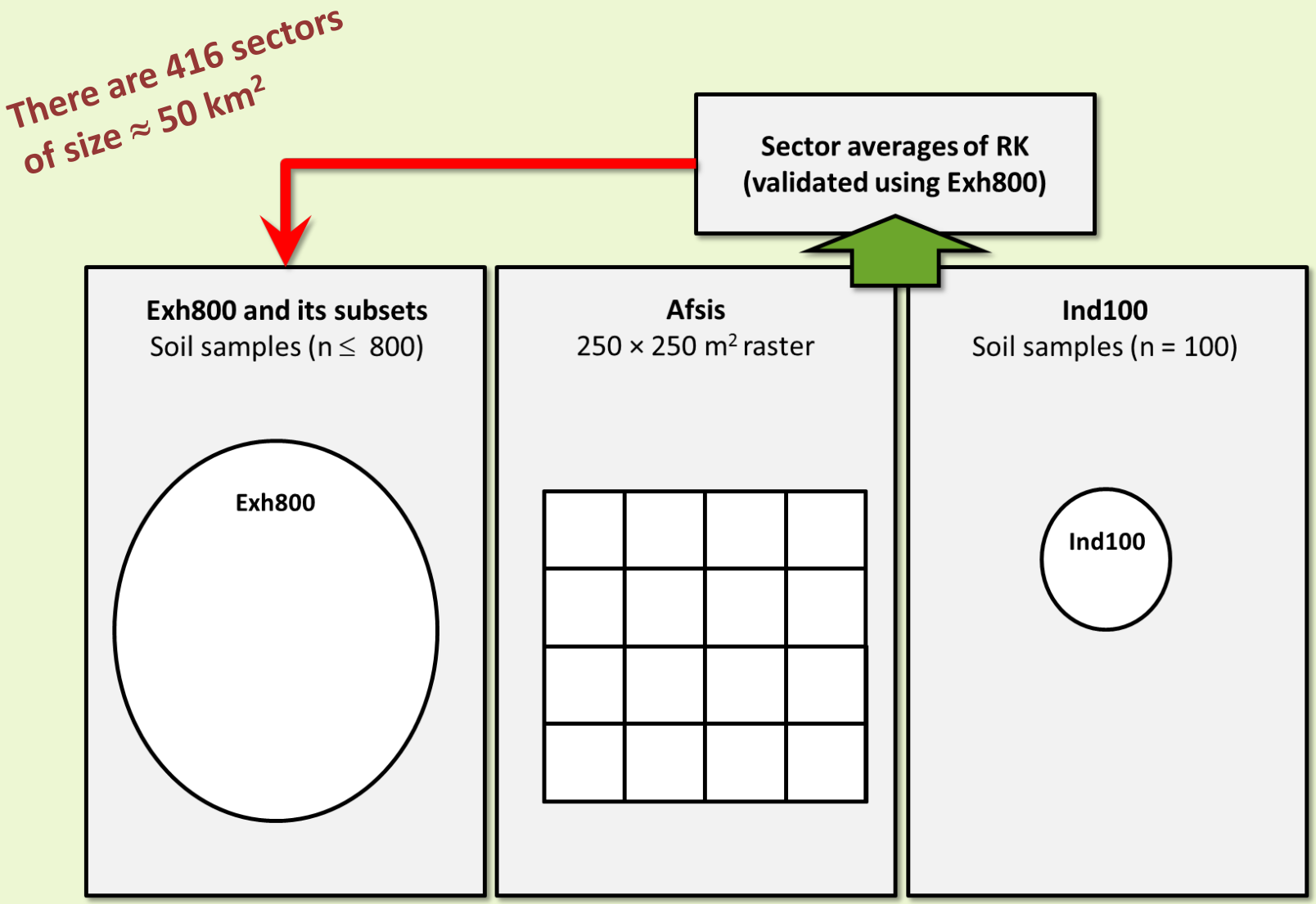
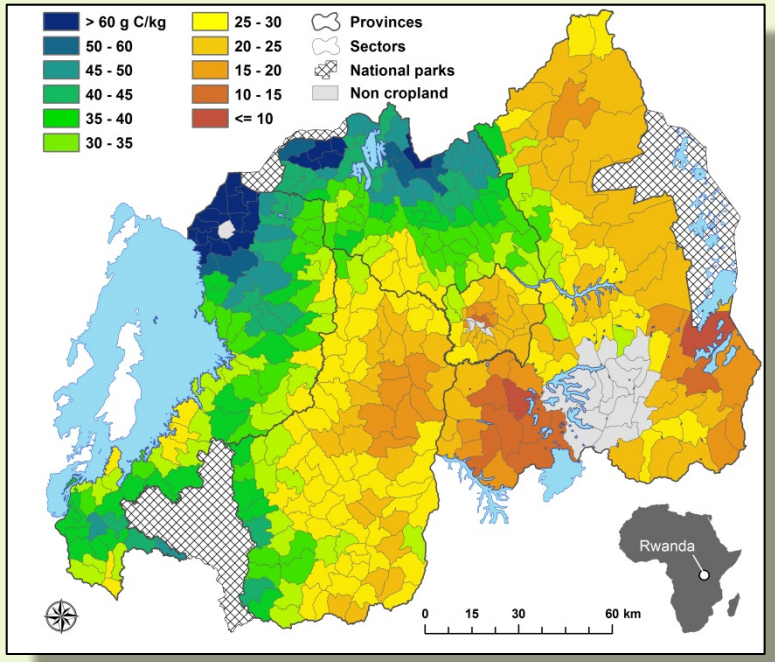


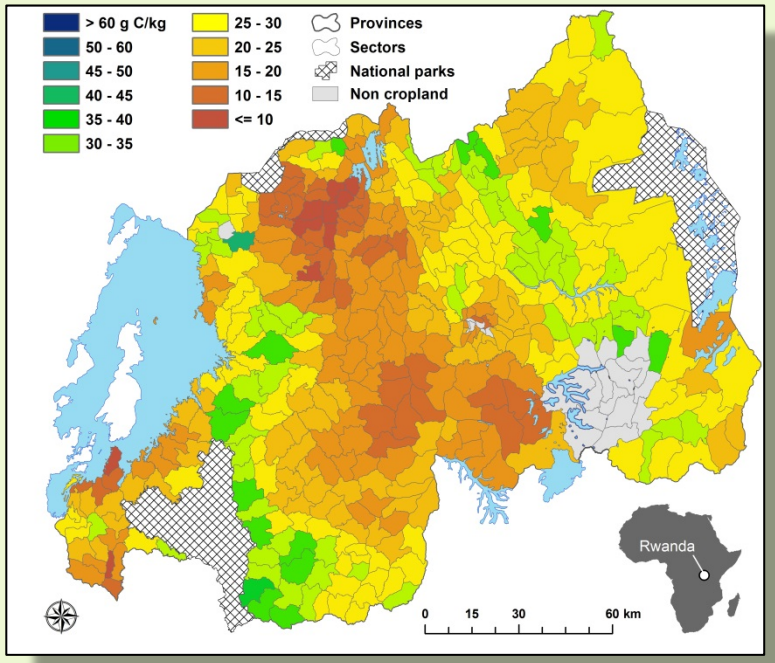
OK = ordinary kriging; RK = residual kriging

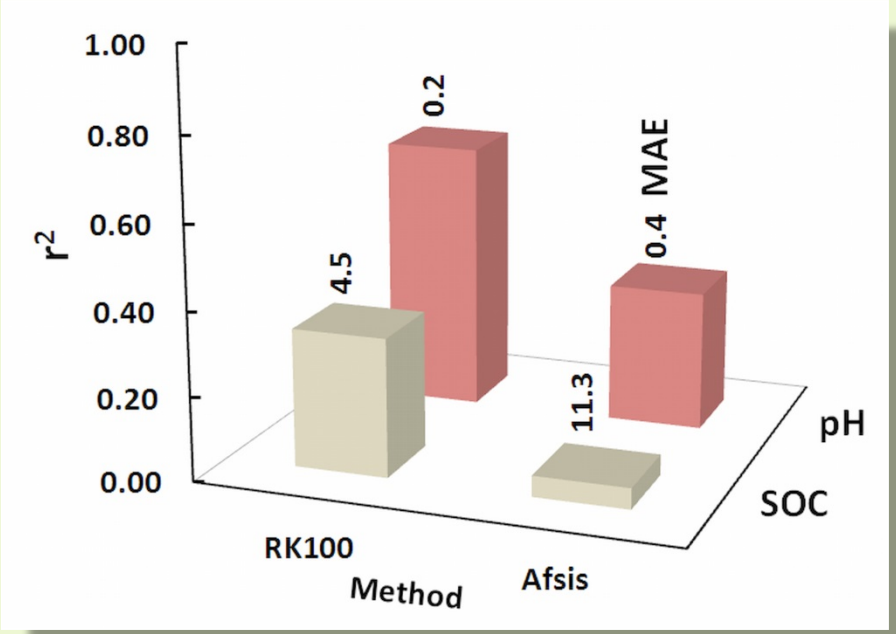
From: Söderström, Piikki, Cordingley 2016

Validation of Sector averages

'Truth': Sector means of the 800 Rwandan soil samples







Questions:

1. How accurate are Rwandan pH and SOC farm averages and Sector averages derived from AfSoilgrids250m?
   -Local validation was needed to judge.

2. Can we combine the AfSoilgrids250m with available local soil samples and get an even better map?
   -Yes.

Summary:

- In order to promote accurate use (or rather prevent inadvertent misuse) of published soil data, the **DSM community must help users assess** whether the map data are appropriate for their intended use.

- If a large-extent map is found to be too uncertain for a specific application (e.g. regional sector level fertiliser recommendations), it may be **possible to improve** it by, for example, regression kriging, if local soil observations are available.

- We recommend further studies on approaches for **interactive validation and local improvement** of global and continental data sets and call for innovative ideas on how map uncertainties can be made accessible and understandable to general users.

Acknowledgements:

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