**Supplementary Information S1**

Footnotes from Table 3

1. Standardising measurement of cotton strip degradation used Adobe Photoshop for image analysis of strips - an expensive and complex piece of software (Nachimuthu *et al*., 2007). Development of a smartphone app would be a cheap alternative that could improve reliability across users, similarly to how the Akvo Caddisfly app has standardised readings from chemical test strips.
2. Currently no software available to the general public that enables calculation of vegetation cover using remote sensing techniques, but the satellite data used for this purpose is open access and online resources available that show how this method could be undertaken using simple code. This method could be developed into a more user-friendly program that could calculate a measure of vegetation (canopy) cover at a temporal resolution decided server-side, providing farmers and scientists with a data set that could then be used to approximate seasonal vegetation cover, yearly vegetation cover, or vegetation cover across a crop cycle. A similar piece of software has been developed by YARA, called Atfarm, using remote sensing techniques to provide advice on areas of fields that may require further application of chemical fertilisers.
3. Reliability is marked as “medium” because different brands of colourimetric solution tests are highly variable, and these reliabilities also vary depending on what nutrient is being tested for. Some brands would be considered “high” in terms of reliability (see Faber *et al.,* 2007).

Weblinks and references for tests listed in Table 3 ***(\* signifies where dollars have been converted to GBP using*** [***https://www.xe.com/currencyconverter/***](https://www.xe.com/currencyconverter/) ***(conversion accurate on on 29/10/2020); ‘N/A’ is used when no studies were found exploring the reliability/accuracy of the citizen science method in comparison to professional methods).***

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| --- | --- | --- | --- |
| **Test name** | **Time commitment (minutes)** | **Cost (£)** | **Link to website/method** |
| Bulk density | 30 | < 20 | <https://modirt.missouriepscor.org/sites/default/files/files/Soil%20Health%20Survey%20Manual_Master_double%20sided%285%29.pdf> (pp43) |
| Drop shatter test | 20 | < 15 | <https://orgprints.org/30582/1/VSA_Volume1_smaller.pdf> (pp10) |
| Infiltration rate | 20 | < 15 | <https://soils.vidacycle.com/soil-tests/equipment-how-to-make-an-infiltration-rate-tube/> |
| Slake test | 60 | < 15 | https://soils.vidacycle.com/soil-tests/1-2-slake-0-8/ and  <https://www.asec.purdue.edu/natural_resources/Soil,Health/Activities/SlakeTest,NRCS.pdf> |
| Spading ease | 5 | 0 | <https://soils.vidacycle.com/soil-tests/1-4-spading-ease/> |
| VESS (Visual Evaluation of Soil Structure) | 60 | < 15 | <https://orgprints.org/30582/1/VSA_Volume1_smaller.pdf> |
| Infiltration test  (proxy) | 10 | < 15 | <https://soils.vidacycle.com/soil-tests/equipment-how-to-make-an-infiltration-rate-tube/> |
| Active carbon test | < 30 | 5 | https://www.researchgate.net/publication/273919178\_Weil\_RR\_Islam\_KR\_Stine\_MA\_Gruver\_JB\_Samson-Liebig\_SE\_Estimating\_active\_carbon\_for\_soil\_quality\_assessment\_a\_simplified\_method\_for\_laboratory\_and\_field\_use\_Am\_J\_Alternative\_Agric\_18\_3-17 |
| Loss of Ignition field test | 90 (+ 3 - 4 hrs drying time) | < 15 | https://www.exploresoils.org.uk/explore/soil-organisms/exploring-soil-organisms-loss-of-ignition/ |
| MO DIRT Active carbon test | 15 | 5 | <https://modirt.missouriepscor.org/sites/default/files/files/Soil%20Health%20Survey%20Manual_Master_double%20sided%285%29.pdf> (pp55-57) |
| Nutrients  (proxy) | 30 | ~ 45 (for 40 tests) | Example using Rapitest: <https://modirt.missouriepscor.org/sites/default/files/files/Soil%20Health%20Survey%20Manual_Master_double%20sided%285%29.pdf> (pp50-52) |
| SOCit | 5 | 0 | https://www.hutton.ac.uk/news/new-soil-carbon-app-scottish-farmers |
| Soil colour protocol | 10 | < 15 | <https://modirt.missouriepscor.org/sites/default/files/files/Soil%20Health%20Survey%20Manual_Master_double%20sided%285%29.pdf> (pp26-28) |
| Soil texture  (proxy) | 30 | < 15 | <https://modirt.missouriepscor.org/sites/default/files/files/Soil%20Health%20Survey%20Manual_Master_double%20sided%285%29.pdf> (pp29-32) |
| Solvita Soil Respiration Test (proxy) | 24 hrs drying, 5 mins installation, 24 hrs incubation, 5 mins collection | 77\* | <https://solvita.com/fieldtest/> |
| USDA Active carbon test | 10 | > 150 | https://www.ars.usda.gov/ARSUserFiles/50701000/briefs/Brief-SQ-ActiveC.pdf |
| USDA Soil Respiration Test  (proxy) | 2 x 45 min readings with a 6-24 hr wait between | < 15 | https://www.nrcs.usda.gov/Internet/FSE\_DOCUMENTS/nrcs142p2\_051285.pdf |
| Bait lamina strips | 10 mins installation,  60-120 days incubation, 20 mins data collection | 3 (per strip) | <http://www.terra-protecta.de/en/bait_strips.html> |
| Cotton strip assay using imagery | 10 mins installation, 35 days incubation, 5 mins collection | < 15 | <https://www.sciencedirect.com/science/article/pii/S0167701207000553> |
| Earthworm watch | 60 | < 15 | <https://www.earthwormwatch.org/family-fun-science> |
| OPAL Soil and Earthworm Survey | 60 | < 15 | https://www.opalexplorenature.org/soilsurvey |
| Pitfall traps | 10 mins installation, 24 hrs incubation, 30 mins collection | < 15 | <http://www.fao.org/fileadmin/templates/nr/images/resources/pdf_documents/manual-soil_20bioassessment.pdf> (pp9-10) |
| Soil Your Undies | 10 mins installation, 60 days incubation, 5 mins collection | < 15 | <https://www.nrcs.usda.gov/wps/portal/nrcs/detail/or/soils/health/?cid=nrcseprd1470410> |
| Solvita soil respiration test | 24 hrs drying, 5 mins installation, 24 hrs incubation, 5 mins collection | 77\* | <https://solvita.com/fieldtest/> |
| Teabag index | 20 mins installation  90 days incubation,  10 mins collection | < 15 | <http://www.teatime4science.org/> |
| USDA soil respiration test | 2 x 45 min readings with a 6-24 hr wait between | < 15 | https://www.nrcs.usda.gov/Internet/FSE\_DOCUMENTS/nrcs142p2\_051285.pdf |
| Canopeo | ~15 mins, dependent on size of field, seasonal repeats | 0 | [www.canopeoapp.com](http://www.canopeoapp.com) and <https://acsess.onlinelibrary.wiley.com/doi/full/10.2134/agronj15.0150> |
| Remote sensing | Not feasible with current software available; scope for development to make the test very time efficient | 0 | Calculating NVDI in R: https://www.earthdatascience.org/courses/earth-analytics/multispectral-remote-sensing-data/vegetation-indices-NDVI-in-R/  Calculating FVC from NVDI: https://www.mendeley.com/reference-manager/reader/1db8a72e-3a69-3587-aefc-ab61dbebb59d/5a68a53f-c094-6e41-7fd1-35d2d111dd08/ |
| Visual assessment (step point) | <1 hr (for assessing 15 points), seasonal repeats | < 15 | https://mbfp.mla.com.au/pasture-growth/tool-22-assessing-groundcover/ |
| Visual assessment (quadrat) | <1 hr (for assessing 15 points), seasonal repeats | < 15 | https://mbfp.mla.com.au/pasture-growth/tool-22-assessing-groundcover/ |
| Colourimetric strips | ~30 mins, dependent on test kit | < 20 (exact price dependent on test kit) | https://www.nrcs.usda.gov/Internet/FSE\_DOCUMENTS/nrcs142p2\_050956.pdf |
| Colourimetric solution tests | 30 mins- 24 hrs (including incubation) dependent on soil type and test kit | < 20 (exact price dependent on test kit) | Example using Rapitest: http://www.lusterleaf.com/img/instruction/1601-soiltestkit\_instructions.pdf |
| Colourimetric solution tests with Akvo Caddisfly app | ~30 mins, dependent on test kit | < 15 (exact price dependent on test kit) | https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6848085/ |
| Weed and plant monitoring | 5 mins once every crop cycle | 0 | <http://landresources.montana.edu/nm/documents/NM9.pdf> and https://extension.arizona.edu/sites/extension.arizona.edu/files/pubs/az1106.pdf |