

Point by point response - Referee #1

Plastic film residues on cropland: monitoring soil contamination through optical remote sensing

Alessandro Fabrizi, Peter Fiener, Kristof Van Oost, Florian Wilken

We appreciate, once again, the time and effort the reviewer dedicated to providing constructive feedback. We truly believe that the reviewer's feedback has been improving the quality of this work.

Please find below our detailed answers (in italics). Line numbers refer to the marked-up manuscript version.

Comments

Fabrizi and team report on a study conducted using remote sensing technologies in a controlled setting outdoors including on cropland to investigate the potential detection of residue from plastics used in farming. The work is part of the growing interest on the topic of using hyperspectral for spectral library and multispectral tools for classification or segmentation relying on very high pixel to improve the hotspotting of the agricultural plastic residue. The overall motivation of the work is highly relevant with a good effort to address the reviewer comments although some figures, presentation, text clarity still need attention before publication is considered.

1. Open science should be ideally made using guidelines that are widely used by the community even beyond the project SOPLAS as argued by the authors 'review conflict with SOPLAS' goals, and we would prefer to maintain the current data structure.' With that in mind the dataset could benefit from a revision to allow ease of reuse as proposed by the FAIR principles. Fabrizi and team are urged to carefully address the concerns raised by the first round reviewers (Referee #1 specifically comments 2) about the challenges with the current state of the shared dataset including metadata structure as

the revised version is still difficult to figure out and do quick looks. Alternativley, Fabrizi and team can clearly declare the dataset is supposed to be for reuse within the context of SOPLAS 'review conflict with SOPLAS' goals, and we would prefer to maintain the current data structure.' 'We would like to keep the structure as is to be harmonised with the rest of SOPLAS dataset.' Although this is conflicting the response 'We decided to share the pre-processed data in the repository to facilitate use for further analyses, especially for users outside the specific research field.' Challenges with dealing with the data were also raised in comment (2j) and the response was 'The issue may arise from the use of non-formatted .csv files. As the fields are not formatted as numbers, the data may be automatically ordered in alphabetical order.'

We attempt to summarise here the reviewer's concerns arising from the issues left open in comment 2 of the first round of reviews. Out of the 13 sub-comments regarding the dataset structure, the following three may not have been completely addressed:

2a. The excel sheet can be combined with the pdf instead of having to check five separate files.

2d. Suggestion is to have the metadata + source information provided as a single structured Excel sheet so that users can easily open and format as they see fit? Examples format can be found on PANGAEA or 4TU

2j. The wavelength ordering seems strange with the first value in column 2 being 1000?

Comments 2a and 2d suggest combining the spectral library and the metadata into a single structured Excel file with multiple sheets. We justified our choice by stating that the suggested changes would have conflicted with SOPLAS goals. We recognise that the reply may have been reductive, and we apologise for that. While a use in Excel is not completely excluded, the spectral library contains a 142599x9 matrix of data, totalising more than a million data entries. Such a data size discourages the use of Excel for the re-use of the data, whether for reproducing the results or producing new ones, which is the intended scope of the dataset. For such use, we believe that sharing spectral libraries through structured Excel sheets is quite unusual and could be counterproductive for the use within the specific research field, which

we expect to be the main user base. It is true indeed that we want to facilitate the use of the data for users outside of the specific research field. This is not only enabled by sharing the pre-processed data, but also by sharing .csv files instead of .asd raw data. At the same time, we do not want to hamper the use of the data for the expected main user base. Unfortunately, one-size-fits-all approaches are not possible in data stewardship, and it is only possible to identify principles (e.g., FAIR) rather than standardised data structures. In that regard, we could not identify principles that are currently violated by our data structure. However, we want to avoid further misunderstanding regarding the purpose of the data, and we want to meet users' needs, in case this becomes necessary. For this reason, we added the following statement to the metadata ESR02_02:

'The data are provided as csv files for use in programmatic data analysis tools. Part 1 contains more than one million data entries, and the use of spreadsheet software is discouraged. Please contact the authors if different data formats are needed.'

Regarding comment 2j, we apologise for not having addressed the issue. The wavelength ordering has been fixed in the updated version of the research data. We also removed the quote character ("") to ease the upload of the files in Excel. Please refer to the 'research_data_v2.zip' file uploaded in the supplementary material for reviewing purposes. The changes will be made permanent, if accepted, by updating the dataset on Zenodo.

2. Fabrizio and team argue 'Green plastic is rarely used for agricultural films,the proposed example may be outside the scope of the study, as it involves a type of plastic film that is rarely found in the catalogues of plastic film manufacturers and may still represent an experimental use of plastic films.'

Yet green is widely used for packing and storing of silage and is also contributing to the agricultural plastic residue.

<https://link.springer.com/article/10.1186/s40538-020-00201-8>

<https://onlinelibrary.wiley.com/doi/full/10.1046/j.1365-2494.2003.00375.x>

We acknowledge that our statement lacked some precision, and we should have referred to ‘agricultural plastic films used as crop covers, such as mulching films’. Within this group, however, ‘the main kinds of coloured plastic mulches used in different parts of the world for different crops are, black, white, and clear plastic mulches’ (<https://link.springer.com/article/10.1186/s40538-020-00201-8>). The other study proposed by the reviewer does not discuss the generation of residues from silage films, nor from packaging. In general, we are not aware of studies acknowledging plastic packaging or silage films as a major source of plastic contamination in agricultural soils, which is the focus of our study.

We clarified the use of plastic films at lines 397-398:

‘A spectral library of white, black, and transparent LDPE films was built, nearly covering all plastic film colours used in agriculture as crop covers.’

3. Unfortunately Point 5 was misunderstood and was specific to the use of the UAV drone determine the plastic which brought up the question about a green plastic vs green cloth, vs green leaf vs green grass. Using the RGB or multispectral data the example items will share the same spectral shape and depending on size if partly covered by soil there will be need for hyperspectral information to determine the possible different absorption features

We agree that absorption features are needed in case items with similar colours are present on the field. We added the following text at lines 507-509 to acknowledge that:

‘Plastic indexes enable unambiguous identification of plastic film residues on soil (Fig. 4), allowing their detection even when spectral features overlap with other regions of the spectrum, such as the visible range.’

4. The title should reflect what was done in the study despite Fabrizi and team arguing ‘However, in our view, this study design is not a classic “case study” in which, for example, the contamination of specific areas with macroplastic fragments is investigated’. If the study had been carried out in several different croplands with

various soil types it could have been given the general title. The geographic location should be included or the soil type otherwise the current version is misleading. Similar to several parts of the text it should clear what was done for example Fabrizi and team state 'A spectral library of white, black, and transparent LDPE films was built, nearly covering all plastic film colours used in agriculture.' Yet plastics green, red, yellow, brown is left out including the a diversity in manufacturer names that is not provided

<https://onlinelibrary.wiley.com/doi/full/10.1046/j.1365-2494.2003.00375.x>

<https://www.sciencedirect.com/science/article/pii/S0038092X20312184?via%3Dihub>

We agree that our study did not include all possible soils where plastic films could be found. However, we still believe that this is the common case for environmental studies, which cannot cover the diversity of ecosystems present at regional to global scales. Regarding the plastic films, we already discussed in comment 2 that plastic films used as crop covers are mainly black, white, or clear. To the best of our knowledge, other colours represent experimental uses, and we could not find evidence of a widespread use of these colours for agricultural practices. We rephrased the statement at lines 397-398 to reduce the ambiguity with plastic films used for silage films:

'A spectral library of white, black, and transparent LDPE films was built, nearly covering all plastic film colours used in agriculture as crop covers.'

We do not believe that this study should be framed as a 'case study', as it provides data and information that can be applied to the detection of the great majority of plastic films used as crop covers. Moreover, several parts of the manuscript use our findings to discuss how different soils would behave and what is needed to progress the field of plastic residue detection on soils. We truly believe that referring to our study as a 'case study' would be reductive.

However, if both reviewers and the editor agree that including 'case study' in the title is necessary, we would consider our study a case study of plastic contamination in soil. In that regard, our study uses the case study of agricultural plastic films used as crop covers to provide

information that can be used for the general monitoring of plastic on agricultural soils. In that case, we would change the title accordingly.

5. The ASD sentence should be verified 'The fiberoptic tip was placed 11 cm above the targets at the nadir position, providing a shadow-free conical field of view with a diameter of 4.9 cm.'. It would be important for Fabrizi and team to clarify the type of fore optic lense used considering at a distance of 12 cm using a lense 18° the diameter would be around 3.8 cm and for the bare fiber with 25° fov this will be about 5.3 cm circle diameter on the target.

No fore optics were used. The fibre optic cable was inserted in the pistol grip, which does not affect the 25° field of view of the bare fibre optic cable. We added the following text to specify this:

'The spectroradiometer was used with a fiberoptic cable mounted on a pistol grip (Fig. 1a), which does not affect the 25° field of view of the bare fiberoptic cable'

6. Figures with the spectra should be redone because the legend takes space that can be optimized to better visualize the plots. It is evident that the data processing by Fabrizi and team did not account for the jumps in the ASD that are now apparent in the supplementary material. After investigating all figures in the manuscript it is clear that the data must be re-analyzed to mitigate the effects of the jumps for example see in Supplement 5 (the soil spectra is just a line below 500nm) the jump around 1000nm and 1800nm also in Figure 3 this is somewhat hidden due to the way the figures are presented but visible after checking again at the wavelengths mentioned. A splice correction should be implemented otherwise discuss the jump see cited papers about the issues with ASD and the steps at the switch of detectors.

Thank you for the suggestion. We changed the legend in all the figures of the spectra in the manuscript (Figure 3) and in the supplements. Please find below the example of Figure 3.

Regarding Supplement 5 (now Figure S5), the beginning of the soil spectrum is just provided as a reference to understand the change of scale. However, it will not be possible to show the entire soil spectrum and, at the same time, have the right scale to appreciate black film spectra better than in the other figures.

We added the following text to mention the choice of not applying the splice correction at lines 170-173:

‘An additional splice correction step could be applied to remove jumps in the spectra caused by sensor transitions in the spectroradiometer at 1000 nm and 1800 nm. However, as these spectral regions were not analysed for fine-scale spectral variations, splice correction was not applied.’

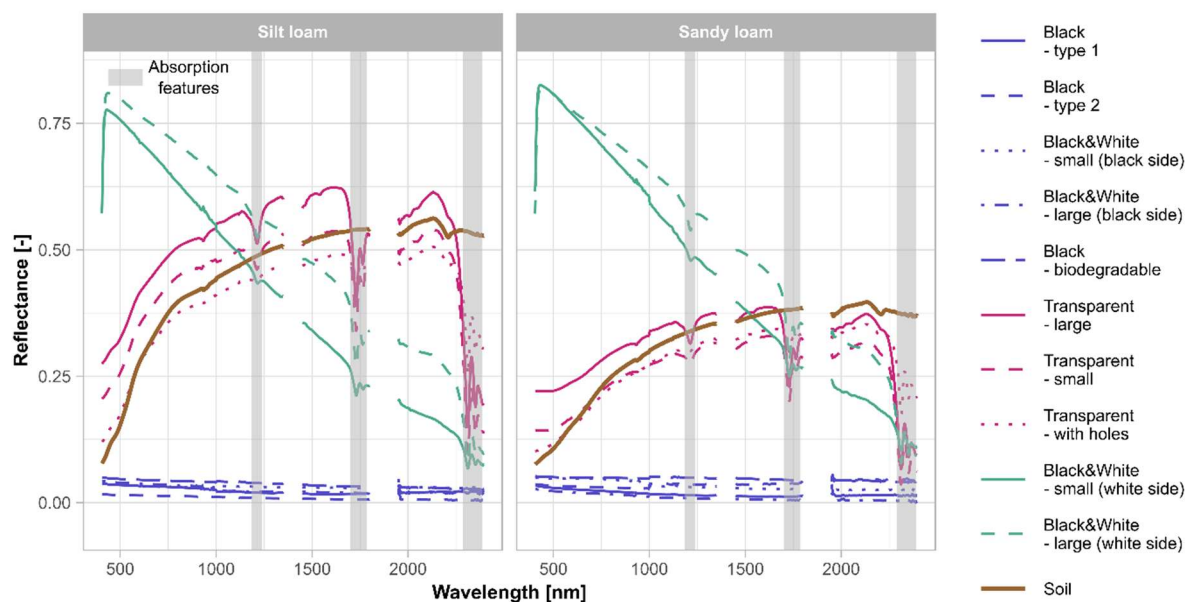


Figure 3 - Spectra of pristine plastic films and of soils used as background. On the left side, spectra acquired on silt loam; on the right side, spectra acquired on sandy loam. Film colours are represented by different colours, and variations within film colours are represented by line shapes. Regions of absorption features are highlighted in light grey. Film names refer to Table 1.

7. Fabrizi and team state ‘To the best of our knowledge, open-access hyperspectral remote sensing data are available for satellites only. As discussed in comment 54 and 60, we would not consider the use of satellites for plastic film residues detection on agricultural soils.’. A discussion or explanation has to be provided as to why the hyperspectral satellite or aircraft are not suitable for plastic film residue with the

consideration of a review of the following especially EnMAP website including the airborne campaigns by APEX and AVIRIS sensors typically validates using field datasets

Hyperspectral data from airborne + field datasets:

<https://apex-esa.org/en>

<https://apex-esa.org/en/data>

<https://specchio.ch/>

CHIME “Hypersense” Campaigns

https://www.enmap.org/data/1st_WS_Online/Session_III/2023_EnMAP_User_Workshop_M.Celesti.pdf

Hyperspectral sensors are generally not suitable for plastic residue detection on agricultural soils because of the size of the residues, which rarely exceed 100 cm² (Piehl et al. 2018; Stefano and Pleissner 2022; Wang et al. 2022). The increase in spectral resolution typically comes at the cost of decreased spatial resolution or areal coverage (Shaw and Burke 2003), which is fundamental in the case of plastic residues on agricultural soils because of their size. Among the proposed data sources, for instance, spatial resolution can be as high as 2 m in the case of APEX. This would mean, in the best-case scenario, that the biggest plastic residues could cover up to 5% of an image pixel. We believe that this strongly limits the application of hyperspectral sensors. We added the following text to discuss it at lines 517-521:

‘Plastic residues rarely exceed 100 cm² on agricultural land (Piehl et al., 2018; Stefano and Pleissner, 2022; Wang et al., 2022), placing high requirements on spatial resolution, which is traded off with spectral resolution and areal coverage in sensor technology (Shaw and Burke, 2003). This strongly limits the use of technologies with high spectral resolution, such as hyperspectral sensors, or large areal coverage, such as satellite data.’

8. In addition to the above point and based on the response ‘open-access hyperspectral remote sensing data are available for satellites only’ provided note that a reference was suggested yet it is reported only satellite data that is hyperspectral is in open-access

see the study including supplementary material previously suggested <https://doi.org/10.1016/j.rsase.2025.101802>

Although Fabrizi and team state ‘but as the study focuses on the use of hyperspectral satellite data to map plastic greenhouses, we do not think that it fits to the discussion of our work done with UAVs.’”

If we understand the comment correctly, the reviewer is referring to the presence of AVIRIS data in the cited work. These data are indeed airborne, but we would not consider AVIRIS as open data, since the mission planning and the data are typically obtained upon the submission of a formal request. Moreover, the same considerations drawn in the previous comment regarding spatial resolution apply to AVIRIS data. As discussed in the previous comment, we added the following text to discuss the trade off between spatial resolution, spectral resolution, and areal coverage (lines 517-521):

‘Plastic residues rarely exceed 100 cm² on agricultural land (Piehl et al., 2018; Stefano and Pleissner, 2022; Wang et al., 2022), placing high requirements on spatial resolution, which is traded off with spectral resolution and areal coverage in sensor technology (Shaw and Burke, 2003). This strongly limits the use of technologies with high spectral resolution, such as hyperspectral sensors, or large areal coverage, such as satellite data.’

Point by point response - Referee #2

Plastic film residues on cropland: monitoring soil contamination through optical remote sensing

Alessandro Fabrizi, Peter Fiener, Kristof Van Oost, Florian Wilken

We thank the reviewer for providing constructive feedback once again. We truly believe that the reviewer's expertise has been improving the quality and reproducibility of the study.

Please find below our detailed answers (in italics). Line numbers refer to the marked-up manuscript version.

Comments

Overall, the authors made considerable changes and significantly improved the manuscript. Adding the graphs in the supplementary materials is very helpful and will aid the scientific community. The authors should also be applauded for their significant work and improvements in their published open-source data.

1. However, after reading the revised manuscript, some changes are still required, mainly regarding the ML process. It is still unclear exactly how the process of training and validation was done. Therefore, I strongly suggest adding a flow chart explaining every single step of the process in detail and adding more explicit explanations.

We modified Figure 2 to include a flowchart of the UAV experiment (see below). We referenced Figure 2f throughout section 2.2 to assist the reader in understanding the workflow. Moreover, we added more explicit explanations of the UAV experiment at the points requested in the following comments.

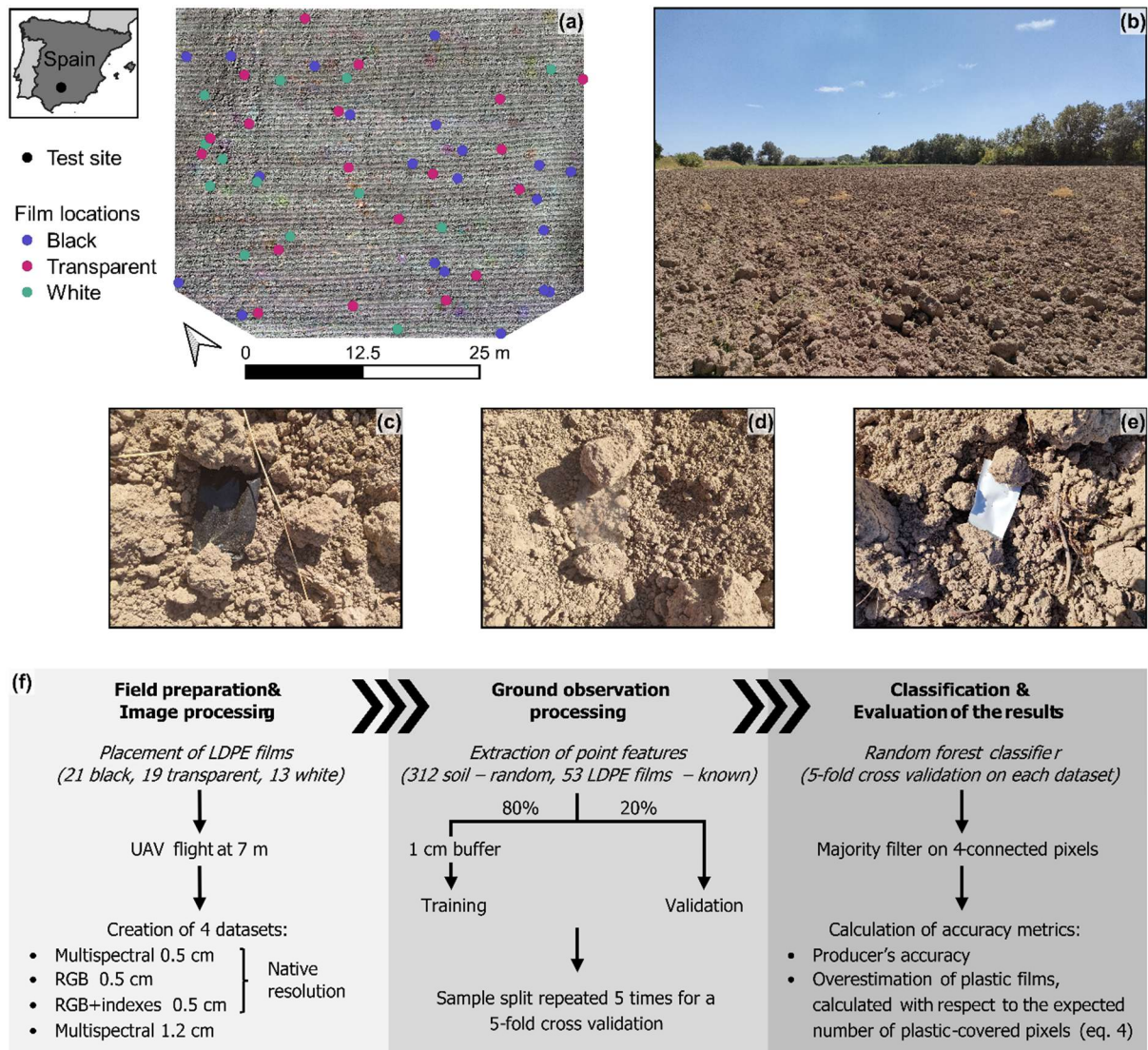


Figure 2 - Location of the study area, distribution of plastic films in the study area (a), field picture (b), and examples of black (c), transparent (d), and white (e) films placed on the field. On the bottom, workflow of the UAV experiment (f). The geometry of the study area was chosen to maximise the number of plastic films, which are represented by coloured dots (a). In the upper-left corner, the orthomosaic was obtained from the UAV images.

2. Some more specific comments follow regarding the ML process:

a) If there were 13 white films, and 80% were used for training- that means that 2 samples only were left for validation. As the authors comment, in most agricultural fields there will likely not be many pieces of plastic residue present on the field. Therefore, the machine learning approach may not be suitable for these 'realistic' scenarios, as they require a lot of training data. Especially as different type of plastics will appear in fields with differing soils, agricultural activities (type of tillage, conservation or conventional practices with or

without mulches, etc.), field topography and more. The authors should add an explanation as to why they opted to use ML.

We agree with the reviewer that machine learning approaches can be limited by the reduced size of training data. However, alternative approaches such as threshold selection or maximum likelihood typically rely on distinct spectral features that are not possible to identify with current sensor technologies. A hybrid method based on threshold selection was mentioned as a solution to the presence of shadows, according to (Iordache et al. 2022). However, 'their implementation and effectiveness may be site-specific' (line 464), especially in the absence of distinct spectral features. Non machine learning approaches could become increasingly important in presence of absorption features on a new sensor technology.

We added the following text to acknowledge that non machine learning approaches could have increased the detection accuracy in our study (lines 491-494):

'Machine learning approaches could be limited by the reduced size of training samples. At the same time, the absence of distinct spectral features on current sensor technology may hamper the application of traditional methodologies such as maximum likelihood or threshold selection based on spectral indexes.'

And the following text to mention that their effectiveness may be increasingly important in presence of plastic absorption features on a new sensor technology (lines 511-513):

'Traditional detection algorithms such as threshold selection on spectral indexes potentially enable overcoming the limitations of machine-learning-based methodologies related to the reduced size of training datasets.'

b) After reading the reply to the comment, I would still suggest adding a confusion matrix, at least in the supplementary material. This will allow the reader to understand how many samples were classified correctly and incorrectly per class, and in the case of incorrect classification, will allow the reader to better understand what they were misclassified as. For example- exactly how many 'black' plastics samples were misclassified as shadow?

We added the confusion matrix obtained with the multispectral 0.5 cm dataset to the supplementary material (Table S6, below). The confusion matrix represents the mean and standard deviation across the 5-fold cross-validation. However, the confusion matrix represents the class 'soil' as a unique class. 'The subclasses 'soil', 'shadow', and 'other' — mainly representing vegetation residues or unidentified classes — were created to allow a better interpretation of the results' (lines 252-253) after the classification algorithm. We modified this part of the text to make it clearer (line 250-261):

'The centre of each plastic film was found on the images and labelled according to film colour (Fig. 2f). Then, 312 random points were generated and labelled by visual interpretation. All the randomly generated points were labelled as 'soil' and, together with the plastic films, represented the ground observations. The ground observations were used for training and testing a pixel-based image classification algorithm with a 5-fold cross-validation (Fig. 2f). At each fold, 80 % of the observations is used for training and 20 % of the observations is used for validation. A buffer of 1 cm was applied on training points to increase training features (Fig. 2f). The buffer was applied after the division between training and validation data, to avoid the selection of validation data within the buffer. The subclasses 'soil', 'shadow', and 'other' — mainly representing vegetation residues or unidentified classes — were created after the classification to evaluate spectral features and allow a better interpretation of the results.'

Moreover, we added a text to explain the choice of not including a confusion matrix and added a reference to the supplementary material at lines 292-295:

'This approach was used to account for the low rate of plastic detection compared to soil, avoiding the inflation of user accuracy due to bias in the ground observations. An example of the confusion matrix for the multispectral 0.5 cm dataset is provided in Table S6 but is not included in the results.'

Table S6 - Confusion matrix of the classification algorithm obtained with the multispectral 0.5 cm dataset. Variations in accuracy represent the standard deviation within the 5-fold cross-validation.

		Classification					PA
		Soil	Black	Transparent	White		
Ground observations	Soil	61.6 ±0.8	0.8 ±0.7	0 ±0	0 ±0	98.7 ±1.2%	
	Black	1.2 ±1.2	3 ±0.9	0 ±0	0 ±0	71.4 ±24.8%	
	Transparent	0.6 ±0.8	0 ±0	3.2 ±0.7	0 ±0	84.2 ±20%	
	White	0.2 ±0.4	0 ±0	0 ±0	2.4 ±0.5	92.3 ±13.3%	
UA		96.9 ±2.9%	78.9 ±16.3%	100 ±0%	100 ±0%	96.2 ±2.8%	

c) In lines 273-280 it is mentioned that first PA was calculated as the ratio between number of plastics films correctly detected and number of plastics films placed on the field. If there were 13 white films, and 80% were used for training- that means that 2 samples only were left for validation. Therefore, there are only three options for validation results- 100% (both films accurately classified), 50% (1 accurately classified, 1 misclassified) and 0% (both were misclassified). PA would then be 0, 0.5 or 1. In formula 4, if PA equals 0, Npixels also equals 0. In that case, it is expected to have 0 number of plastic covered pixels? Why is PA related to expected number of covered plastic covered pixels?

The number of expected pixels was weighted by the producer accuracy (PA) to consider the performance of the classifier in recognising plastic films. Considering the case of PA=0 clarifies the necessity of the weight. PA=0 means that the algorithm is completely unable to detect plastic films. In this case, we would expect to find no pixels classified as plastic on the resulting map (expected number of plastic-covered pixels = 0). Any pixel labelled as plastic would therefore be a false positive. If PA were not included as a weighting factor, the formula would still predict a nonzero number of plastic-covered pixels, which would incorrectly suggest that some detections are valid. By incorporating PA, the estimate is properly adjusted to reflect the classifier's ability to recognise plastic. Not incorporating PA as a weight would reduce the actual overestimation of plastic. We modified the following text to clarify the calculation of the expected number of plastic-covered pixels and the role of PA as a weight in lines 283-289:

'The presence of false positives instead (i.e., pixels classified as plastic but not covered by plastic) was checked by comparing the actual and the expected number of plastic-covered

pixels. First, the expected number of plastic-covered pixels was calculated and weighted by the producer accuracy to account for the performance of the classifier in detecting the known plastic films. Then, the ratio between the actual number of pixels classified as plastic and the expected number of plastic-covered pixels was used to calculate the potential overestimation of plastic on the field (Fig. 2f).'

d) It should be clearly explained if the classification was pixel based or object based. If number of plastic films were the metric (lines 273-280)- it seems to be object based, but in the RGB classified map (Fig. 8), it is pixel based.

The classification is pixel-based. Only one point on each plastic film was used to calculate the accuracy metrics to avoid the selection of points that are spatially autocorrelated. We added the following text to specify that the classification is pixel-based at lines 254-256:

'The ground observations were used for training and testing a pixel-based image classification algorithm with a 5-fold cross-validation (Fig. 2f).'

e) It is good that the classified map was added in Figure 8. However, without zooming in, at first glance it seems that the entire map is classified as soil (brown color). Please change the colors of the classified map to make it clearer. One suggestion is perhaps using a more transparent color for the soil, or a less prominent color, such as white or light grey color for the soil, that will lead to a stronger emphasis for the plastic pixels. Additionally, the classified map does not provide information about where the original plastic pieces were placed, making it hard to judge the accuracy of the classification. Their locations should be added.

Thanks for the suggestion. We changed the soil colour to a light brown. However, including the location of the points would not allow to visualize the classification. The plastic films occupy a very small area, and a point would cover the actual classification. Instead, we would refer the reader to Figure 2a to retrieve the information on the plastic film location. We added the following text to the caption of Figure 8:

[...] The location of the plastic films placed on the field is highlighted in Fig. 2a.'

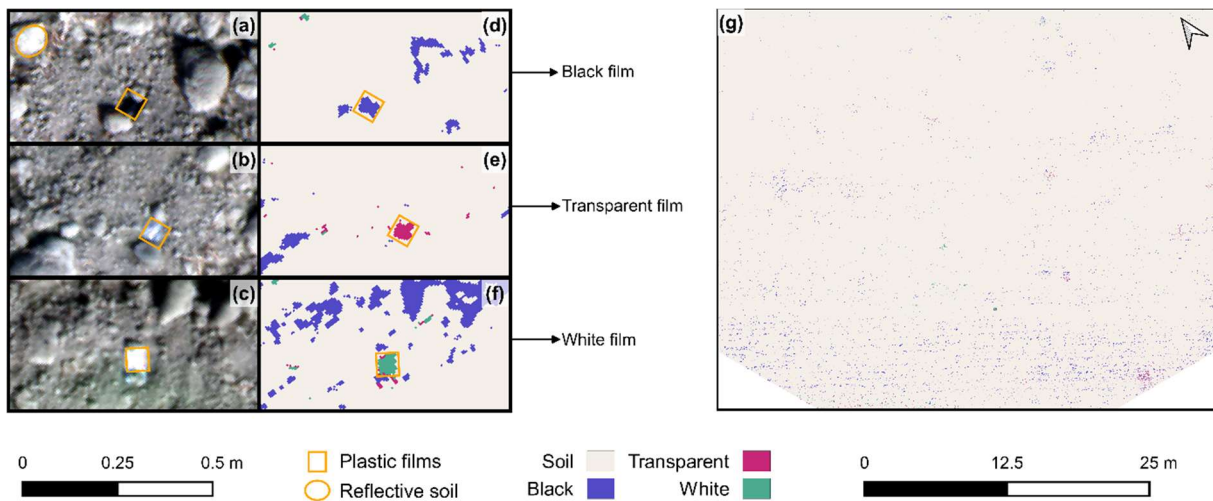


Figure 8 - Detail of the true colour images (a–c) and associated classification results (d–f) obtained with the multispectral 0.5 cm dataset. The classified map is shown in panel (g). In images (a–f), the exact location of the plastic films is highlighted. In image (a), the example of a highly reflective soil region is highlighted. The location of the plastic films placed on the field is highlighted in Fig. 2a.

Additional comments:

- In objective (i) it is claimed that the aim is to 'build spectral libraries for the most common plastic films used in agriculture'. LDPE is indeed a very common plastic in agriculture- but the claim that LDPE is the most common plastic film in agriculture should be supported by literature, or the sentences changed accordingly. See for example the report by the FAO with examples of many other plastics used in agriculture: <https://openknowledge.fao.org/server/api/core/bitstreams/d1b18314-562a-48bc-83d6-90610cdd6257/content> .

We agree that other types of plastic are used in agriculture. However, plastic films are mainly LDPE-based. We included a European report from the EIP-AGRI focus group as a reference at line 50:

'Plastic covers used in agriculture are mainly LDPE (low-density polyethylene) films (Eip-Agri Focus Group, 2021) [...]

4. Since the 'dirty' treatments were not applied in the same manner across all treatments, comparison between 'dirty' of different plastic types would be incorrect. In other words, the 'dirty' black film, cannot be compared to the 'dirty' white film- since the 'dirty' does not mean the same things for both samples as the amount of soil of the different plastics films was not equal. This should be mentioned clearly.

We agree that the comparability between dirty films is limited. However, Figure 1 highlights that white films had a lower soil particle retention, compared to black films. Despite that, 'Changes in plastic film reflectance were particularly evident for white films in the visible spectra, where the distance between the spectra of plastic films and soil is the highest (Fig. 3, Fig. 5).' (line 424-426). This would suggest that soil could generally influence films' reflectance more in white films compared to black films. We changed the text as follows to mention differences in dirty treatments more clearly, at lines 422-426:

'Plastic films retained soil particles differently after the dirty treatment, and the comparability between films may be limited in our experimental setup. However, black films appeared to have higher retention of soil particles compared to white films (Fig. 1), while changes in plastic film reflectance were particularly evident for white films in the visible spectra, where the distance between the spectra of plastic films and soil is the highest (Fig. 3, Fig. 5).'

Moreover, the difference in dirty treatments was already mentioned at lines 430-432:

'Our experimental setup did not allow for controlling the amount of soil placed on the films, but aimed at representing field conditions, where soil particle retention of the film surface varies based on film properties.'

5. Table 1 is still rather confusing as it remains unclear if the descriptions about the application mode, common use and duration use, are relevant for the plastics actually used in this study. When it says 'application mode', it is very hard to understand if that is how it was 'applied' in the study. I suggest changing those column headers in a way that makes it clear that what the table is describing is general or common use for these

plastics, but that those description do no not apply to the plastics actually used in the study.

Thank you for the feedback. We made the descriptions clearer in Table 1 (below).

Moreover, we added the following text to the caption of Table 1 to specify the source of information:

'[...] The characteristics of typical use in the field are obtained from the authors' knowledge and information provided by the manufacturing companies.'

Table 1 - Specifications of the LDPE plastic films used for the experiment. Thickness was obtained from the average of 10 measurements performed with a micrometre. The characteristics of typical use in plasticulture practices are obtained from the authors' knowledge and information provided by the manufacturing companies.

Name	Physical characteristics		Characteristics of typical use in plasticulture practices		
	Thickness (µm)	Colour	Application mode	Crop type	Duration use
Black - type 1	18 ± 2	black	On the soil surface	vegetables or fruits	one growing season
Black - type 2	18 ± 1				
Black - biodegradable	15 ± 2				
Black&White - small (black side)	99 ± 3	black/white	large tunnel film for greenhouses	asparagus	multiple growing seasons
Black&White - small (white side)					
Black&White - large (black side)	143 ± 5				
Black&White - large (white side)					
Transparent - with holes	44 ± 2	transparent	large tunnel film for greenhouses	vegetables or fruits	
Transparent - small	157 ± 1				
Transparent - large	185 ± 6				

References

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