Answer to reviewer 1

Position in manuscript	Reviewer's comments	Authors' answer	Changes on new manuscript
page 3	the technical knowledge is highlighted because it facilitates international communication. Keeping this in mind, I wonder, why the authors do not try to present some information about the soil classification (reference groups and qualifier) according to FAO of the studied soils. The system is applied in Namibia and thus, from my perspective, this seems to be necessary.	We agree with this concern. However, given the lack of diagnostic properties, the WRB is poorly informative in this context.	Page 20 Table A1 (Appendix A): Add three soil descriptions, including pictures and WRB; Page 10, L 8: Add a short chapter following "International classification". Page 13 Table 6: Added table, in which all soil profiles are classified using the WRB.
General	Both variables in the SQ toolbox (sand content and color shade) are not independent and are known by the local farmers in its indicative value.	Despite the dependency between these variables, we can use both to evaluate SQ because meaningful variability remains. The indicative value of these properties is known by the farmers. As explained in the introduction, farmers' knowledge is valuable but lack of standardisation, which can be brought by technical assessment.	
General	Although SOC is undoubtedly a very relevant variable for SQ, the direct link to color shade with one unit discriminating between the qualifier + and – is an overinterpretation of the possibilities of soil color interpretation. As given in figure 3, there is a significant overlap of SOC between neighboring color shade classes. Thus, in the field very slight differences in color divide between the qualifier + and –, if the evaluator cannot decide, the qualifier becomes 0.	It must be emphasized that this toolbox is a suggestion that would require further developments.	Page 16 L30.

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		Considering the comment and the low accuracy of Munsell colour evaluation, we modified the colour shade classes defined in the toolbox in order to include more soil colour values in the neutral class (0). This result in more soils classified into this class, 1) avoiding an over-interpretation of changes to be undertaken and 2) corresponding better to the farmers SQ evaluation. The values are then adapted to avoid over-interpretation of field data collected.	Page 17 Table 10: Change the SQ evaluation classes of Colour shade.
General	The Munsell Soil Color Charts do not present colors (also not figure 3) for the broken classes as given in figure 4.	The broken classes suggested in figure 10 are defined based on theoretically-calculated optimal colour shade values.	
General	The combination of the variables fine particles and color is relevant, however, it is not promising to distinguish between 29 classes, as has been proposed in the toolbox by the authors.	The toolbox leads to 29 classes possibilities. However, this classification is constructed as a combination of 5 KwSUs, 4 texture classes and 3 colour classes. Each level has a specific meaning and can be evaluated without the other (e.g. "-" for colour value indicates a need for organic fertilisers, no regards with KwSU or texture.	Page 18 L. 3-17: emhasize that all classification levels can be used separately.

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General	The general problem of smallholder agriculture in the studied region is: i) Soils best suitable for cropping become scarce, thus expansion in the pristine woodlands will become increasingly restricted. ii) In the consequence, also those soils are cultivated, of which the farmers know their lower productivity. iii) the ongoing crop production is especially restricted by the lack of nutrient inputs, here N and P, and – off course – years with low rainfall.	Known to be limiting nutrients in most agricultural land, particularly in sub-Saharan Africa, nitrogen and phosphor availability are most likely significant for plant growth. However, given the relation between these nutrients and the soil short-term fertilisation (e.g. manuring), we decided to not include these analyses in our study as it aims understanding and following longer-term soil fertility discussion.	Page 8 L 1-4 (Laboratory analyses): explains why these nutrients were not measured.
General	The future challenge is i) to concentrate crop production on the best suitable soils and ii) to improve nutrient inputs on these areas in an intensity, that yields are just water or management controlled and iii) to develop sustainable LU management techniques (e.g. conservation agriculture). This development needs help by the agriculture extension services.	This issue does not relate directly with the objectives of the current paper, which do not aim at suggesting management techniques to improve SQ. The aim is to suggest a SQ toolbox that helps to evaluate the conditions of a soil, in regard to its potential.	
General	The mapping of the best suitable soils should be oriented to technical knowledge for its comparability, however should include farmers views. The general objective of the paper just moves to the right direction, the presented toolbox however needs improvement (reduction in units).	Our objective is not to create a map or tools to map, it is to enable the farmers to optimise their SQ evaluation. However, for mapping purposes, each criterion used can be mapped separately, which presents the advantage to evaluate the various issues separately (organic matter availability, erosion, soil types).	
P3, Table 1, L pH	I suggest, that doing numerous measurements on soil pH is cheaper by application of the sensor technique instead of the Hellige test kit		Table 1 L pH

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P4, Table 2	add a row with information, for which sort of soils (types, region) and land use the soil quality indicators were proposed		Table 2: information added.
P4 L10	Verlinden and Dayot, 2005		
P6 L31	what is meant with color shade ? The standardized MUNSELL soil color charts are composed by the variables hue, value and chroma. Is shade identical with value ? Please explain.	Colour shade in common language would refer to colour value in the Munsell colour system. We use both to separate the perception of shade (dark or light) against the numeric evaluation of darkness (colour value).	
P7 L12	"two sample rings": defined volume? calculation of bulk density possible ? please explain or reformulate		Page 7 L. 12-13
P9 Table 4	hardness is an often mentioned indicator for soil quality. I suggest, that the hardness is related to the condition of the soil in the (almost) dry state, perhaps for that time of the year, when ploughing is done. Please add some explanations on the local farmers intention.	The consistence, or the concept of hardness, is understood under dry conditions, which impacts importantly the difficulty of ploughing (often performed as soon as possible in the season).	Page 8, L21-23 (beginning of the chapter 3 "Results and Discussion") and Caption Table reflab:4: Clarify the meaning of hardness/ consistence.
P10 L21	values of pH (8.4 to 10.1) are not existing in Table 5 !	These pH values are pH in water, while in Table 5 the values are pH in $CaCl_2$.	Page 10 L3-4 to clarify this difference.
P11 Table 5	in row <20 μm – sub data of sand are give and in row sand – sub data of <20 um are given. Check all data and compare with data in respective chapters.	It seems that some calculation errors are in the Table 5 and 7	modify the Table 5 and 7 in order to clarify the particle size content.
P11 Table 5	add row with WRB classification	WRB is not of first importance for evaluating SQ, but it can help understanding soils from an international perspective.	Table 6 added, which includes all WRB profiles' names.
P12 Table 6	same mistakes as for table 5		modify the Table 7 in order to clarify the particle size content

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P12 L6	acc. to tab. 6 the coefficient of variation is large for TOC, moist color value, < 20 μm fraction but not for pH (in both depth intervals CV < 0.2)	This is a good observation and we removed pH from the technical analyses that have a high CV	Page 10 L17
P13 Fig2	this graph pretends a precise depth distribution which was not analysed. Additionally this graph is redundant, please delete.	This remark is relevant	Table deleted
P13 L8	fragipan: delete term because of its vague definition		Page12 L6 replace fragipan by "hard soil layer"
P14 L8	"large variety of soils" -> large variety of soil properties	accept the change to "soil properties"	Page 12 L25
P14 L9	"standardize the assessment of the SQ at a specific location and time". Why time ? Soil quality assessments always results in a potential for intended land use. Different climatic conditions may be included in the potential. Thus the results are irrespective of time, however may be altered by changes in soil properties due to land use.	SQ is not only about a potential. It represent the potential in regards to various climatic conditions, but it is the consequence of various soil degradation or improvements techniques. Therefore, it is important the notion of time. The SQ of a specific site can change though agricultural activities.	

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P14 L9	What is meant with location in this context: Three villages were studied, should the SQ assessment by different for each village?	Not in this context. The assessment would be done following the same method in all villages. What we mean is that it is important to evaluate SQ at various location and to compare the results between the locations. The comparison is important in order to evaluate the potential that can be reached in specific regions (villages), there is no need to explain that a soil in Ekolola (woodland) is bad and in Omhedi (Oshana) it is good. It is more useful to differentiate bewteen various location in a same village, to evaluate the potentials.	
P14 L16	harder in dry conditions (?)	add "in dry condition" after harder	Page 14 L 4
P14 L21	this increase in < 20 μm can only be marginal	The increase in fine particle content can be significant by mining riverbeds for example, following researches from Kreike (2013), as explained in the manuscript (Page 14 L 9).	
P15 L12	Data presented by Blume et al 2011 cannot be transferred to Namibian soils.	It is a relevant comment given the origin of the soils used in Blume 2011, difficult to compare to the Namibian context. However, we did not find similar relations adapted to tropical soils. Moreover, the results indicate a relatively well-balanced repartition of SOC status in our soils, which therefore helps to analyse the SQ status of a soil in relation to other soils of the same region.	

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P16 L8	"indicates important degradation". Relevant forms of degradation (acidification, salinization, decline in nutrients, compaction) do not include the shift to more coarse particles.	Processes that can remove fine particles from the top soil are 1) eluviation related to dispersive salts; 2) overland flow erosion, 3) wind erosion.	Page 16 L 13.Add suggestions of processes leading to soil texture coarsening (e.g. overland flows, eluviation).
P16 L9	major soil improvements": see above.	The increase in fine particle content can be significant, following researches from Kreike (2013).	Page 14 L 9

Answer to reviewer 2

Position in manuscript	Reviewer's comments	Authors' answer	Changes on new manuscript
page3	From my point of view, it is an important paper, which could be improved significantly by using an international soil classification (WRB) and description of the different KwSUs, making it accessible for a wider audience and allow for international comparison and land management studies in other areas comprising comparable environmental conditions.	We agree with this concern. However, given the lack of diagnostic properties, the WRB is poorly informative in this context.	Page 20 Table A1 (Appendix A): Add three soil descriptions, including pictures and WRB; Page 10, L 8: Add a short chapter following "International classification". Page 13 Table 6: Added table, in which all soil profiles are classified using the WRB. Page 12 L 29-2: Comment concerning WRB results (in 3.5.1 "Importance of a soil quality evaluation toolbox").
General	Photographic documentation of soil profiles (if available) and profile descriptions seem appropriate making it more attractive and better accessible to the readers.		Page 20 Table A1 (Appendix A): Soil descriptions and pictures added.
P7 L23: I don't fully agree with the argument against the measurement of the Cations exchange capacity.		Page 7 L 31-31 (§ Methods): Change this section to clarify the decision.	
2.3.2 Laboratory analyses	As high contents of carbonates and salts are expected it could be important to know which kind of salts are present to be able to adapt land management.		Page 7 L28: Added this salt types.
general	It is not clear how soil fertility/chemical fertility, used in results and discussion, is defined in this study: Is it the potential of the soil to provide nutrients coming from natural sources or artificial with fertilizers? Or the plant available nutrients?	We should clarify what chemical refers to...	Page 10 L1 Chemical fertility definition clrarified.

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results and discussion	the authors refer to chemical fertility, I would suggest replacing chemical fertility with soil fertility, as chemical fertility includes available nutrient contents, which were not measured.	We always used "chemical fertility potential" to clearly indicate that it is not the actual chemical fertility (related to nutrient content) but an indicator for the potential that the soil could reach if sufficiently fertilised. We think that replacing "chemical fertility" by "soil fertility" will add confusion to the reader.	
§ 3.2, page 10	The authors suggest a high chemical fertility and chemical exchange capacity for the *omutunda* units. This is misleading since it gives the reader the feeling that this soil is highly fertile. It should be made clear that this is relatively seen.		§ 3.2, Page 10 L.1: "...the higher potential of *omutunda* to provide nutrients, coming from any sources, compared to the other KwSUs."
Fig. 1	needs a reference of the satellite image and hydrology data.		Page 6 figure 1: Add origin of the satellite images and hydrology data (caption).
Fig. 1	A little box indicating the section of the study area in the map of Namibia would be useful.		Page 6 figure 1: Add the suggested box.
Fig. 2	needs some clarification as it seems that pH and <20 μm content was measured in high resolution and vary in depth.	This figure was removed given the different depth resolution illustrated compared to the rest of the data used.	

Answer to Reviewer 3

Position in manuscript	Reviewer's comments	Authors' answer	Changes on new manuscript
	Including soil descriptions using WRB soil classification increases the relevance to the broader public.	We agree with this concern. However, given the lack of diagnostic properties, the WRB is poorly informative in this context.	Page 20 Table A1 (Appendix A): Add three soil descriptions, including pictures and WRB; Page 10, L 8: Add a short chapter following "International classification". Page 13 Table 6: Added table, in which all soil profiles are classified using the WRB. Page 12 L 29-2: Comment concerning WRB results (in 3.5.1 "Importance of a soil quality evaluation toolbox").
Table 10	The presented toolbox seems useful, but detecting very slight colour differences in the field will not be easy.	It must be emphasized that this toolbox is a suggestion that would require further developments (Page 16 L30) and Abstract L. 12. Considering the comment and the low accuracy of Munsell colour evaluation, we modified the colour shade classes defined in the toolbox in order to include more soil colour values in the neutral class (0)(Table 10). This result in more soils classified into this class, 1) avoiding an overinterpretation of changes to be undertaken and 2) corresponding better to the farmers SQ evaluation. The values are then adapted to avoid overinterpretation of field data collected.	Page 16 L30. Page 17 Table 10: Change the SQ evaluation classes of Colour shade.

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methods	As in many tropical agricultural soils, fertility in terms of N and P availability will be a severe limiting factor in this area (besides water limitation). It is however not taken into account in the soil quality evaluation. I realize that it may not be a property that can readily be measured by farmers, but it should at least be discussed as an important limiting factor.	Known to be limiting nutrients in most agricultural land, particularly in sub-Saharan Africa, nitrogen and phosphor availability are most likely significant for plant growth. However, given the relation between these nutrients and the soil short-term fertilisation (e.g. manuring), we decided to not include these analyses in our study as it aims understanding and following longer-term soil fertility discussion.	Page 8 L 1-4 (Laboratory analyses): explains why these nutrients were not measured.
Table 1	depth of topsoil can better be changed to soil depth or rooting depth, as depth of topsoil is defined by the user, not so much a soil property.	These properties have been copied from Wienhold et al. (2004), as suggested in the figure caption. We would therefore not change it.	
Table 1	Infiltration rate, or capacity?	Water infiltration rate	Table 1.
P3L7	Soil diversity: misleading term, soil variability is more apt.		Page 3 L.2
P3L14	How do you define the process of agricultural evolution?		Page 3 L.8: Changed into "evolution of agricultural practices".
P6L8	unclear why some farmers are visited more than once, while others are not.	The farmers who showed a broad soil and agricultural knowledge during the first interview and open to discussion were visited several times.	Page 5 L.27
P7L21	Further on only pHCaCl is shown/mentioned, so why also include pHH2O here? Better remove it if you don't show further results.	pHH2O removed from Methods.	
P10L2	chemical fertility is still low compared to many other soils. Differences are relative between local soils, which should be emphasized.		Page 10 L.1.

Position in manuscript	Reviewer's comments	Authors' answer	Changes on new manuscript
	Also the term chemical fertility may be a bit misleading; soil fertility may be better in this context.	We used "chemical fertility potential" to clearly indicate that it is not the actual chemical fertility (related to nutrient content) but an indicator for the potential that the soil could reach if sufficiently fertilised. We think that replacing "chemical fertility" by "soil fertility" will add confusion to the reader.	
Fig 2	doesn't seem to be very relevant for the story, not very comparable to the other data shown (more detailed). So I would suggest to remove it. Also values on x-axes of first and third pane are hard to understand (not in line with table above).	We would remove this figure, given the different depth resolution illustrated compared to the rest of the data used.	
P14L17-26	sentences are hard to understand. Wording can be improved/clarified.	Change wording for better clarity.	Page 16 L. 12
	Maybe replace "evolution" by "transition"?		Page 16 L.11
	Improvement in this context is are to follow, it seems to imply that improvement has taken place over time, but without reference in the past? What were the conditions before the improvement?	There is a lack of data to support the assumption of soil degradation or improvement. However, these processes were perceived and explained by some farmers during the interviews.	Page 18 15-17.
Technical/textual points			
P3L20	"have been developed and discussed, and yielded" ...	accepted	Page 3 L.13
P4L1	"farmers and technical assessments"	"between technical and farmers assessment".	Page 3 L.15
P6L2	remove space after "Sandveld"	accepted	
P6L15	insert second closing bracket after 2005.	accepted	
P7L26	replace "that" by "when"	accepted	Page 7 L. 30
P10L32	"various entities" ...	accepted	Page 12 L. 16.
P13L5	"meaning"	accepted	
P13L11	"play an important role in fixing"	accepted	Page 6 L. 6.