

Evaluation of India's Soil Health Card from Users' Perspectives

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Introduction

The [Soil Health Card](#) (SHC) scheme was launched by the Government of India in February 2015. Under the scheme, the government has mandated the provision of soil health cards to all farmers. These cards will carry crop-wise recommendations of nutrients and fertilizers required by an individual farmer to improve soil productivity through the judicious use of inputs. All soil samples are required to be tested in a soil testing lab, with an expert then assessing the soil quality and suggesting measures to address any deficiencies. The SHC displays the test results and recommendations, along with the farmer's personal details such as Aadhaar card numbers and plot details. The program operates under the assumption that soil health cards will inform recipients of the status of their soil health and provide recommendations on the appropriate application of key nutrients with respect to the specific crops being grown. The program's reliance on an [A4 size card](#) to alter farmer behavior necessitates the careful assessment of the card's content and user-orientation. Designing effective behavior-change communication products involves evaluating whether a particular design is effective at generating understanding among diverse end users. This study aimed to evaluate an existing SHC design and identify any existing limitations or opportunities for improvement.

The purpose of testing communication materials is to confirm that the target audience understands them and sees them as culturally relevant. A user test solicits feedback from target audiences and invites participants to identify unclear, improper or irrelevant content, including in the language used. User tests also allow participants to suggest alternative formats if necessary. Revising communications products during the testing phase is easier and more cost effective than after materials have been disseminated (C-Change 2012). For products like the SHC that will be used countrywide, it must be designed for effective implementation across significant cultural and language barriers. Even within states, different dialects exist, so the card must be produced by each state in the most widely shared language, ensuring comprehensibility by those with varying levels of language fluency, literacy and numeracy.

Design

Visual communication plays a key role in facilitating learning and incubating behavioral change. Elements such as line, form, shape, tone, color, space and structure can facilitate message transmission while visually engaging the end user. Imposing an order and structure to the content can ease learning, increasing the likelihood that messages will be received and understood by the end user.



The Cereal Systems Initiative for South Asia (CSISA) is a regional initiative to sustainably increase the productivity of cereal-based cropping systems, thus improving food security and farmers' livelihoods in Bangladesh, India and Nepal. CSISA works with public and private partners to support the widespread adoption of resource-conserving and climate-resilient farming technologies and practices. The initiative is led by the International Maize and Wheat Improvement Center (CIMMYT), implemented jointly with the International Food Policy Research Institute (IFPRI) and the International Rice Research Institute (IRRI), and is funded by the US Agency for International Development (USAID) and the Bill & Melinda Gates Foundation.

CSISA employed graphic design principles to propose a few alternative redesigns of Bihar's current soil health card, recognizing that the card is intended to provide technical information (status of the soil and recommendations for improving soil quality) to farmers so they can understand how to address soil health problems and improve crop production. To improve the likelihood that farmers will understand the card's content, designers used icons, illustrations, photographs and produced the card in Hindi, the most widely spoken language in Bihar. Pre-testing of the SHC helped CSISA identify images and symbols that would be relevant and familiar to the end users. The design team applied the following concepts while redesigning Bihar's SHC:

1. Colors, space, objects and textures were balanced to enhance visual symmetry.
2. Icons were emphasized to provide contrast with areas different in size, shape or color.
3. Symbols and icons were used repeatedly to help generate a sense of 'unity' across the card. Repeating images creates a visual rhythm and organizes eye movement, which can facilitate learning.
4. Negative spaces were created throughout the design to help focus the reader on the importance of the existing content.
5. Design elements and text were clustered together to 'declutter' the overall design.
6. To increase stakeholder receptiveness and generate a sense of harmony across the SHC scheme's visual representations, designers used colors included in the Government of India's Soil Health Card logo.

One of the key principles of user-oriented design is to involve key stakeholders, which in this case are the farmers. CSISA conducted a series of SHC user tests in Bihar and Odisha in 2017 to solicit feedback from farmers directly on card content, language and presentation, according to the following criteria:

Criteria for SHC evaluation	Description
Usefulness	The ways in which the card will be used, anticipated benefits, anticipated problems, and ways to enhance its utility
Attractiveness	The image's visual appeal including color, illustrations, and the card's capacity to catch and hold the reader's attention
Reader comprehension	The reader's understanding of the main ideas and the identification of any confusing aspects
Relevance	The level to which users feel the messages are appropriate for them
Persuasiveness	Whether messages are motivational and participants intend to follow the recommendations
Users' recommendations	Additional needs identified by users or changes suggested in card design

Source: Doak et.al., 1985

Assessment Process

Sequence	Description
Round 1: May–June 2017	<p>Objective: To identify key concerns about the SHC and ways to improve its effectiveness. Involve end users in the development process to generate more ‘ownership’ of the cards.</p> <p>Participant selection criteria: Sex, literacy level, progressive/marginal farmers and farmers who have previously received a soil health card.</p> <p>Methods: 16 focus group discussions (FGDs) with farmers, 12 key informant interviews with block agriculture officers, <i>Krishi Salahkar</i>, and KVK scientists conducted in two districts in Bihar and two districts in Odisha.</p>
Round 2: September 2017	<p>Objective: To test three alternative designs created by CSISA based on Round 1 feedback and identify any barriers to their interpretation.</p> <p>Participant selection criteria: Sex, literacy level, progressive/marginal farmers</p> <p>Methods: In-depth interviews with 36 farmers and 6 farmer FGDs conducted in one district in Bihar. Odisha was excluded due to project constraints.</p>
Round 3: December 2017	<p>Objective: To test further-redesigned cards based on farmers' Round 2 feedback</p> <p>Participant selection criteria: Literacy level, progressive/marginal farmers</p> <p>Methods: 7 FGDs with farmers conducted in 2 districts in Bihar</p>

In each feedback round, the group assessed three key sections: soil test results table, table of secondary and micronutrient recommendations and the table of nutrient recommendations for a reference yield.

Initial Findings

Overall, the CSISA research and design team found that while the design of the original template was relatively simple, the large amount of text on the card and small font used made it difficult even for literate farmers to read and comprehend. Farmers were often unable to distinguish between the different sections and required support and explanation to read the text and derive inferences. The concerns observed in the specific sections are reported below and more images from the cards can be found [here](#):

Section 1: Soil test results

Most respondents found it difficult to understand the technical terms used in the card. For example, ‘pH’, ‘EC’, ‘OC’ are some of the most crucial elements for soil health, but not one farmer in our sample was aware of their relevance. Participants required help in understanding what the table meant, especially the test result values that were mentioned in Hindi in Bihar. The Hindi terms were formal [results - *parinam*, unit - *manak* and rating - *nishkarsh/sthar*] and hence not quite familiar to speakers of the local dialect. Most participants understood the terms low (*nimn*), medium (*madhyam*) and high (*uchch*) in reference to the parameters, but a few needed these explained.

सौख्यल परीक्षण परिणाम				
क्र. सं.	उपलब्ध कार्यक्रम	परिणाम	मानक	निष्कर्ष / उत्तर
1	पी एच (pH)	7.6	6.5 - 7.5	द्वारीय
2	ई ई (EC)	0.78	1 से कम	सुरक्षित
3	जैविक कार्बन (OC)	0.74	0.5 - 0.75	मध्यम
4	नाइट्रोजन (N)	225	250 - 500	निम्न
5	फॉस्फेट (P)	31.12	25 - 50	मध्यम
6	पोटेशियम (K)	171.28	125 - 300	मध्यम
7	साल्फर (S)	—	10 से अधिक	परीक्षण नहीं
8	जिङ्क (Zn)	—	0.78 से अधिक	परीक्षण नहीं
9	बोरोन (B)	—	0.50 से अधिक	परीक्षण नहीं
10	आयरन (Fe)	—	7.00 से अधिक	परीक्षण नहीं
11	मैंगनीज (Mn)	—	3.00 से अधिक	परीक्षण नहीं
12	कॉपर (Cu)	—	0.60 से अधिक	परीक्षण नहीं

Soil test result values

Participants felt the soil test results table was relevant to them since it provided information on the health of their soil. Improving the presentation and content in this table allowed this section to prove to be key to referring to the other sections in the card since the recommendations are based on the result presented in this section.

Section 2: Secondary and micronutrient recommendations

Respondents did not understand the difference between the translated Hindi words for 'organic manure' and 'bio-fertilizer.' However, they understood organic manure when researchers explained it to them using specific examples and 'bio-fertilizer' when researchers used the name of the most commonly available bio-fertilizer in that region. For farmers who received test results for micronutrients, specific recommendations for micronutrients were not also included so the information seemed incomplete to them. In fact, most farmers who had received the SHC as part of the national scheme did not receive test results for micronutrients. Either the columns were left blank or the value '0', '0.00', or '-' was mentioned, which confused users further. Participants recommended that only complete cards be issued.

दूसरे एवं सूक्ष्म पोषक तत्वों संबंधी सिफारिशें		
नमांक	परामीटर	सॉयल अनुपयोग संबंधी सिफारिशें
1	सल्फर (S)	
2	ज़िन्क (Zn)	
3	बोरोन (B)	
4	आयरन (Fe)	
5	मैग्नीज (Mn)	
6	कॉपर (Cu)	
General Recommendations		
1	जविक खाद	
2	जव उवेरक	
3	चूना/जिम्सम	

Secondary and micronutrient recommendations

Section 3: Fertilizer recommendations for reference yield

Values in the 'reference yield' column, wherever present, were unclear to Bihar participants. In some cards, this column had been left blank. The columns containing nutrient recommendations were labeled as options 1 and 2, but the distinction between them was not clear to many participants. Some farmers even though those were different application rates instead of alternative recommendations. The reference yields where mentioned were not in line with the current yields that some farmers were reaping.

"The soil health card has given me recommendations on how to obtain 4 tonnes of paddy per hectare. However, I am already reaping 6 tonnes per hectare" – respondent in Bhojpur district of Bihar.

तथा ग्राम के बहुतायत पोषक तत्व/उत्पाद के अनुशयकता एवं एकड़ मूलि के लिए					
कृषि	अपेक्षित उत्पाद g/ha	वर्मी कम्पोस्ट	नाइट्रोजन 80%	फास्फट 100%	पोटाश 100%
Paddy	40	17.28	69	24	4
Wheat	40	12.16	49	33	4
Potato	300	32.16	129	113	41
Mustard	40	18.21	73	22	6

लमी मात्रा किलोग्राम में

Recommendations option 1

तथा ग्राम के लिए अनुशयकता लिए गए					
Crop	COMPOST	DAP 18:46:00	UREA	SSP 16	MOP 60
Paddy	4320	53	130	0	7
Wheat	3040	73	77	0	7
Potato	8040	247	183	0	69
Mustard	4552	47	140	0	10

Recommendations option 2

A recommendation emerged from the discussions that, instead of providing a set yield value, the card could provide a yield range that allows farmers to choose their yield targets based on their current yields. However, this is more of a technical recommendation that we have not incorporated in our redesign process. Quantity units used were also not familiar to participants, who suggested that 'acres' be used instead of 'hectares,' and 'quintals' be used instead of 'tons.'

Design Iteration I

Using the initial findings, the CSISA research and design team redesigned the Bihar SHC in collaboration with Bihar Agricultural University (BAU), Sabour. The team developed three different cards, varying the presentation and sequence of the content in response to the feedback received in

the first round. For example, in one of the cards, recommendations were presented before the test results, while the order was reversed in another. The font size was increased and the visuals were modified to make the SHC more user-friendly. These redesigns were tested in Rohtas district of Bihar with support from KVK Rohtas in September 2017. The retest exercise focused on the content presentation as well as overall design of the cards. Feedback was recorded so it could be used for further iterations. Key findings are summarized below.

Semantics

The test results table presented information on the presence of soil nutrients. Most of the farmers were unaware of the constituents of the most commonly used fertilizers. Most participants expressed awareness of nitrogen (97% of farmers), phosphorus (83% of farmers), potash (100% of farmers) and sulphur (89% farmers), but they were unaware of others, including micronutrients such as boron (19% of farmers), manganese (3% of farmers) and iron (11% of farmers), and the importance of these elements for soil health. In response to this feedback, the test results table was reorganized so that the most familiar parameters were listed on top followed by the less familiar ones (such as 'pH', 'EC' and 'OC') to sustain reader interest (refer to revised test results table 1 [here](#)). This change encouraged farmers to read the table and at least draw basic inferences from the information.

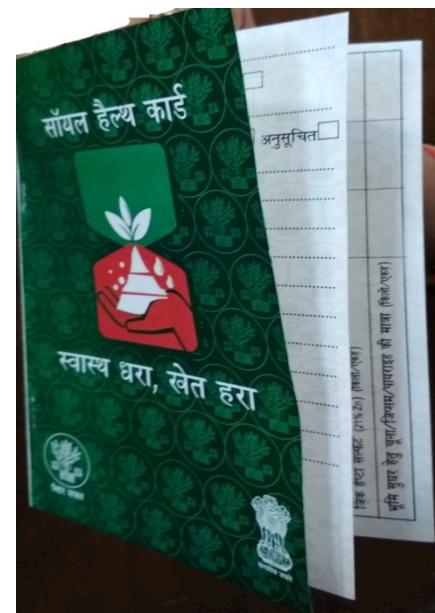
Farmers had difficulty differentiating between the nutrient recommendation and fertilizer recommendation tables. Often, farmers just assumed that nitrogen implies the use of urea and potash refers to 'MOP' (the common abbreviation of Muriate of Potash). In reality, urea also contains potassium and phosphorous in differing ratios. The research team found that nutrient recommendations often caused confusion.

After researchers explained the recommended fertilizer application values, farmers read them carefully. Participants felt that wherever their existing practices fell within the recommended range, the assessment had been done correctly. They found the recommended range for each nutrient relevant, although they agreed that not all farmers would look at or understand them. Participants who could understand them believed that, for those who could understand the values but did not agree with the recommendations, the information would allow them to calculate the amount of inputs they wanted to use instead.

Semiotics

Out of three designs – passport-style, A4 vertical and A4 horizontal – participants appreciated the passport-style design the most, but the vertical A4-sized card was best for displaying the soil test results table. A larger font size was used on all of the new cards and participants found it large enough to read well.

One proposed design had replaced soil test result values with symbols and colors that depicted the level of nutrient present in the soil. This modification was intended to facilitate comprehension by less educated users. However, the majority of respondents preferred the actual nutrient values in the tables rather than symbols depicting low, medium and high. Respondents believed that test results that did not reveal values would be unreliable. The research and design team concluded that using both values and symbols would convey the most information about soil health to the most users.



Passport-style card

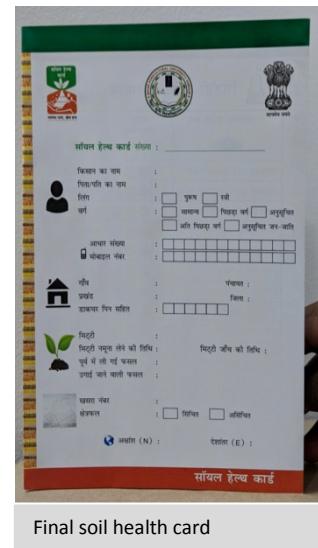
Design Iteration II

CSISA used the key findings from 'Round 2' to redesign the card once again. The content remained the same but the team changed the design to modify how information was presented. Participants liked the passport-sized card although it was too small for displaying tables, so the team retained the passport-like appearance by folding an A4 sheet horizontally (flip-type as against a flat A4 sheet), allowing the card to accommodate and give prominence to the test results table, the fertilizer recommendations table and the micro nutrient recommendations table. Photographs and illustrations of fertilizers and micronutrients were used since all farmers could recognize the fertilizer images, but only the educated farmers could read the reference text. As per the feedback from the two previous rounds, test results were displayed as values but high, medium and low levels were also indicated using arrows and thumbs up and thumbs down symbols. This new design was retested in Muzaffarpur and Bhagalpur districts in December 2017.



Single Super Phosphate

Field testing showed that the new design was well received by stakeholders. Users appreciated that there was considerably less text and more relevant illustrations in this design compared to the original card. However, some aspects of the presentation were still unclear to the respondents, such as the use of arrows and directions to display levels of nutrient availability within the soils. The up arrow was interpreted as referring to a lower value present in the soil and suggesting increasing the application of that nutrient. Most farmers easily understood the fertilizer recommendation table and appreciated the images with few suggestions for improvement. The final card contains several iterations and minor corrections suggested by BAU, which also conducted user tests with farmers. Several iterations of the final design were retested in two rounds in Bihar in coordination with BAU to determine the optimal colors and symbol designs. A final design that farmers found attractive and easy to understand was provided to BAU for use in their SHC-related activities. The Union Minister of Agriculture, Shri Radha Mohan Singh, [launched](#) the new design in Bihar on February 24, 2018.



Final soil health card



Conclusion and Remaining Challenges

Aside from challenges observed in users' understanding of the card, key informants also identified other implementation barriers that have affected the successful uptake of recommendations presented in the cards. In practice, soil health cards are often distributed to farmers without an explanation of the content. Our key informants, who are often also in charge of distributing the cards, at times faced difficulties explaining some of the sections in the card, since they had not been trained themselves. Feedback revealed that most farmers had not received their cards before the sowing season, when they were most valuable. Since soil samples were being collected on a grid level and not at the level of the individual farmer, farmers were also concerned about the site-specificity of the recommendations, undermining their trust in the card's relevance for their own farm. Finally, in India, not all soil testing labs have the capacity and infrastructure to test for all 12 relevant nutrients and micronutrients contained in the card. This is why certain sections often were left incomplete, thereby increasing confusion and sometimes undermining farmer trust in the cards.

Overall, the CSISA research and design team found that farmers perceived the cards as important as they believed that accurate recommendations would guide them towards cost-reducing practices and high yields. However, most farmers would likely consider testing and validating recommendations on small plots of land before they adopt the card's recommendations more broadly. Training programs that educated extension officers and others on how to interpret and explain the cards could help enhance the end user's understanding of the cards. Since this program's ultimate objective is to bring about a change in input application behavior, end users need to receive information in a manner they understand and from a source they trust.

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