



## Science behind user friendliness of agricultural mobile apps: A study on readability

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### ABSTRACT

With the virtual world buzzing with heavy information load, it is often confusing for 21<sup>st</sup> century users to decide which information is needful for them. The information givers in order to attract audience, views and make profit margins dump irrelevant information. As a results, users often end up receiving wrong information or even misinterpreting or not comprehending the information. Agriculture sector has not remained untouched by this heavy inflow of information through ICT. The need for right information at right time and at right place is of prime importance in this sector for better and quick decision making by different stakeholders. The introduction of ICT in agriculture in form of mobile phones resulted in shrinking the information gap. The present study was carried out in Pantnagar, Uttarakhand in 2019 to analyse the readability scores of three different mobile apps, viz. Plantix, Kisan Suvidha and Apni Kheti launched by three different organizations and compare them. The results reveal that overall readability score of agricultural apps calculated using Gunning Fog Index is 10.77. The individual average GFI scores of Plantix, Kisan Suvidha and Apni Kheti are 11.27, 11.16 and 9.88, respectively, indicating moderate difficulty level when we take into consideration the end users reading level, who are mostly farmers in this case. The ultimate aim of launching mobile apps in agriculture will be fulfilled directly or indirectly if we take into consideration the readability of the apps along with focusing on user's reading level.

**Keywords:** Agriculture, Comprehension, Gunning Fog Index, Mobile apps, Readability

Agriculture being the basic means of livelihood for approximately two-thirds of Indian population is a major pillar of country's Gross Domestic Product. Past few years experienced speckled rates of crop yields in different agro-ecological zones of India. The reasons comprise lack of access to inputs and credit at the right time in right amount, smallholder farmers' inability to bear risks, information and skill gap and inappropriate management practices. Public extension programs are often underfunded, untimed, based on weak agricultural research and lack adequate contact to farmers. Farming has become a time-critical and information-intense business. A momentum towards higher productivity will require an information-based decision-making agricultural system. ICT and mobile technologies are often considered revolution inducer in smallholder agricultural systems. The benefits comprise access to market, weather information, monitoring plant health, education, other agro-advisory services etc. The multi-dimensional paybacks of mobile phone use account

for country wide explosion in the number of mobile apps (World Bank 2012). Government of India as well as various other organizations have launched a number of web and mobile based applications for dissemination of information on agriculture related activities. Although several researches have been conducted concerning effectiveness and usage of mobile apps in agriculture, there are almost no researches related to readability analysis of these apps. Use of redundant and complex information in the apps sometimes makes it difficult to understand. The legibility of the print or the ease of reading due to the pleasantness of writing is of prime importance. The current study aims to analyse the readability of agricultural mobile apps which basically tells the ease of reading any information. Readability is a vital component because the ultimate end users of mobile apps are the farmers who are either illiterate or have received minimal education. Providing this information on readability at an appropriate literacy level may help the developers and the agro-experts to bring about suitable changes and much needed upgradations. Hence, the present study was conducted to analyse the readability of three apps, viz. Plantix, Kisan Suvidha and Apni Kheti.

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### MATERIALS AND METHODS

For the present study (2019), three agriculture based

Table 1 Information about the selected apps (N=3)

App	Year of launch	Ownership	Developed by	App Size	Last Updated On	Rating (out of 5)
Plantix	2015	International	ICRISAT, Hyderabad	7.5 MB	24 June, 2020	4.4
Kisan Suvidha	2016	Public	Government of India	11 MB	19 Feb, 2019	3.8
Apni Kheti	2016	Private	Cogneesol	25 MB	28 Feb, 2020	4.7

apps were purposively selected from Android Google Play platform. The search strategy included identifying three apps which were developed by international, public and private organizations and are extensively used in India. The ratings and app size was also kept in mind before choosing the apps. It was ensured that the chosen apps were recently launched and provided information in English. Based on the above considerations, the following three apps were selected: Plantix App, Kisan Suvidha and Apni Kheti (Table 1). For the test of readability, Gunning Fog Index (GFI) was used. The GFI estimates the number of years of formal education required to understand the text on first reading. Individual selected apps were studied and content maps were generated for the same. The very first thing done was content mapping of the three apps which portrays sections and sub-sections clearly (Fig 1). The sub-sections with a high text volume were purposively selected.

*Gunning Fog Index formula: Grade level = 0.4 (ASL + PHW)*

To calculate the Gunning Fog Index, we downloaded each of the apps and selected a body of text with at least 100 words from the selected sections of each app. The number of exact words and syllables were counted. Then, we divided the total number of words in the sample by the total number of sentences. This resulted in the Average Sentence Length (ASL). Next, we counted the number of complex words which were not proper nouns, combinations of easy or hyphenated words, or two-syllable verbs made into three by adding -es and -ed endings. Then, that number was divided by the total number of words in the sample passage. This gave us the Percent Hard Words/Complex Words (PHW or PCW).

GFI scores range from 0 to 19+. Scores of 0 to 6 correlate with low-literacy resources, 7 to 8 with resources comprehensible by junior high school students, 9 to 12 by

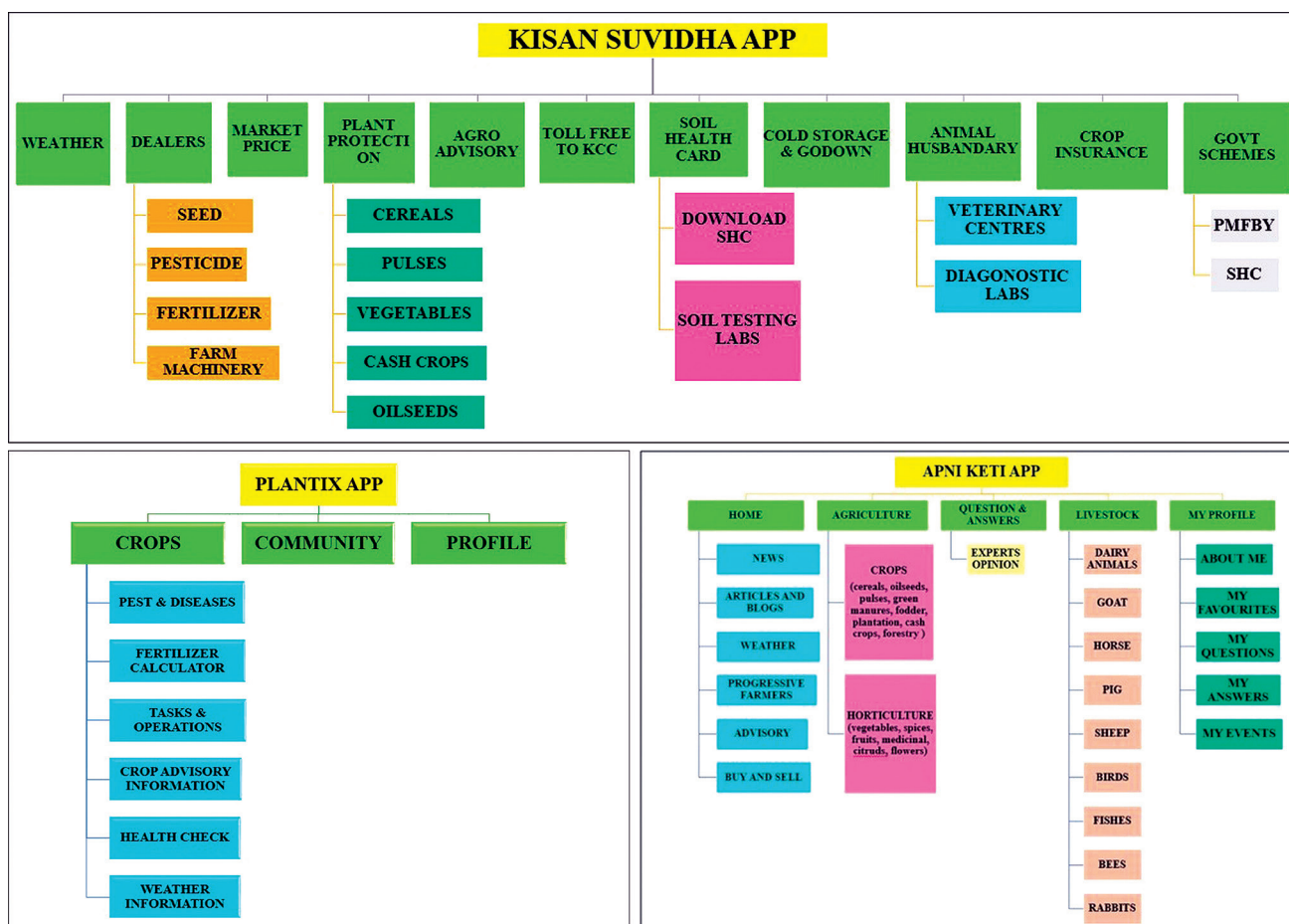


Fig 1 Content maps of Kisan Suvidha, Plantix and Apni Kheti App.

high school students, 13 to 16 by college students, 17 to 18 by graduates, and 19 + by those with higher professional qualifications. GFI scores were computed for every section and then took an average for obtaining the overall readability score of the apps. The readability evaluation was carried out initially by one of the researcher and then repeated by one of the other members of the research team with verification occurring from cross-checking for consistency. Once all researchers had completed their assessment, results were pooled and where differences in the scoring existed, agreement was reached via consensus. This is in keeping with similar studies looking at readability of online information.

RESULTS AND DISCUSSION

Gretchen (1998) stated that readability is the “ease of reading words and sentences” and an attribute of clarity. Readability provides insights into communication. It addresses whether an audience will "understand" a text, read it "at optimum speed," and "find it interesting" (Dale 1949). The present study operationalizes readability as the ease with which farmers, agricultural traders and other users of agricultural mobile apps can comprehend the written text portions in the agricultural mobile apps.

*Readability of Plantix App:* Table 2 throws light on the individual section and overall readability scores of Plantix app. Out of three sections, only “Your Crop” and “Community” section were considered for calculating GFI Scores and "Your Profile" section was discarded due to lack of text content. Under Your Crop section, five crops were nominated as representatives of different categories of crops and readability scores were calculated. The highest readability score of 13.52 was recorded for information related to potato crop followed by 13.36 for sugarcane, 13.30 for chickpea, and 12.97 for sorghum and melon with minimum score of 11.55. The scores ranged between the reading level categories of high school junior to college sophomore. The scores are more inclined towards greater difficulty level because texts for a wide audience generally needs a Fog Index Score less than 12 (Robert, 1952). The higher values of readability scores of this section are mainly because of the nature of the text which contained more scientific terms, names of the chemicals etc. This section basically deals with the plant protection issues, their control and measures. The overall readability score of Plantix App is 11.275 which comes under the reading level of high school junior.

*Readability of Kisan Suvidha App:* Data (Table 2) also shows the readability scores of Kisan Suvidha. In the similar fashion like the previous app, out of overall 11 sections only 2 sections were chosen for calculating GFI because the remaining sections were devoid of appropriate text content. Under plant protection section, five representative crops of different categories were chosen for Fog Index calculation. The scores ranged from 9.15 to 11.31 with sugarcane having the lowest readability score of 9.15 and mustard having the highest score of 11.31. Similarly, the overall readability score of Government Scheme section was found to be

Table 2 Comparison of GFI Scores of Plantix, Kisan Suvidha and Apni Kheti App

I. Readability scores of Plantix app							
	A. Your crop					B. Community	
	Melon	Potato	Sugar-cane	Chick-pea	Sorghum	Discussion	
Seedling	16.78	19.14	12.03	15.32	12.14	9.61	
Vegetative	16.14	13.39	19.08	15.64	14.23		
Flowering	16.72	17.12	13.96	11.89	16.44		
Fruiting	10.20	14.39	11.71	14.60	13.72		
Harvesting	10.11	16.68	12.47	16.00	10.96		
Mean	11.55	13.52	13.36	13.30	12.92	9.61	
Overall readability score : 11.275							
SD Value: 1.53							
II. Kisan Suvidha app							
	A. Plant protection					B. Government schemes	
	Sugar-cane	Soya bean	Mustard	Brinjal	Sorghum	PMF-BY	SHC
Vegetative	8.38	11.01	11.63	11.12	10.07	17.51	10.54
Reproductive	9.92	11.12	10.99	9.94	11.76		
Mean	9.15	11.06	11.31	10.53	10.91	14.02	
Overall readability score: 11.16							
SD Value: 1.60							
III. Readability scores of Apni Kheti app							
	A. Home	B. Agriculture	C. Livestock	D. Q/A			
Mean	9.89	9.93	9.87	9.86			
Overall readability score: 9.88							
SD Value: 0.03							

SD, Standard Deviation; PMFBY, Pradhan Mantri Fasal Bima Yojana; SHC, Soil Health Card.

14.02. There is a large variation in the readability scores of individual sub sections of Kisan Suvidha App which is prominent from the SD value of 1.60 (Table 2). The overall readability score of Kisan Suvidha app was 11.16 which fell in the reading level category of high school junior. Since text portions were majorly found in the Plant Protection and Schemes section, they contained more complex terms and long sentences that lead to higher readability score. Higher scores make it difficult for the users to easily comprehend the text portions and in this case a large portion of the users are mainly farmers.

*Readability of Apni Kheti App:* Readability of Apni Kheti app can be inferred from Table 2. Out of five major sections of this app only four sections having sufficient text volume were chosen for calculating GFI. The results revealed overall score of 9.88 which came under the reading level of

high school freshmen (easier). The agriculture section had maximum readability score of 9.93 followed by the home section with score of 9.89 and livestock section with score of 9.87. The question answer section was having the least value of 9.86 which is similar to that of Plantix app where the scores of "community" section was less as compared to "your crops" section. This is because most of the time during discussions, use of simple and common terms are more prevalent. Data also provides an overall comparison of readability scores of three selected mobile apps along with the SD values. Among the three apps, Plantix app has the highest readability score followed by Kisan Suvidha app and Apni Kheti App with least score. These readability scores clearly point out that Apni Kheti app is more user friendly and effective to the farmers who are the end users of these agricultural mobile apps because farmers can easily comprehend its contents. The findings of this study are similar to the study of Parviz and Mehdi (1991) regarding readability of journals which pointed out journals with lower Fog index were easily comprehended by the users as compared to those with higher index values. This may be one indirect reason behind the popularity of this app which we can relate with its higher ratings (Table 1).

The highest Fog Index value of Plantix app may be attributed to its co-operation with the international organizations like ICRISAT, CIMMYT and CABI. Because of its use at a global level, it's easier for the farmers of developed nations to easily comprehend the text portions of the app with Fog Index score of 11.275. But for developing countries like India, where majority of the farmers are small and marginal there is a problem of its easy understanding. Besides this, another main reason for its highest value is the particular function which this app serves: plant protection and management. In this aspect we mainly deal with diseases, pests, deficiencies, symptoms and control measures where scientific and technical terms are used more often.

In case of Kisan Suvidha and Plantix, we noticed a great variation among its scores which is clear from its SD value. The major reason is Kisan Suvidha App deals with different dimensions of agriculture and the nature of text varies accordingly; some use more technical or scientific terms and some use general terms. One similarity among the three apps is that the readability score value of the discussion section is lower as compared to other specific sections. This is because that in that section farmers mostly ask opinions and solutions from other farmers or experts where explanation is given in simple language and less complex terms are used. Table 2 depicts the overall readability scores of these three apps as 10.77. The findings of present study are in parallel with the findings of Bahadori *et al.* (2019) and Hammes *et al.* (2016) on medical studies, which pointed that higher fog index value of patient information and consent documents made it difficult for the target audience to comprehend the information easily. The analysis of the readability of agricultural mobile apps

using Gunning Fog Index gives the overall scoring at a higher reading level of high school senior. Although the value is lesser than 12 which is required for easy and better understanding of a wider audience but still in the context of rural India and agriculture its value is still at higher end. The poor literacy rate in rural India of 67.8% (2011 Census Report) makes it difficult for majority of small and marginal farmers to effectively comprehend and ultimately use these ICT tools.

The readability analysis of the agricultural mobile apps will help us get a first-hand knowledge on the effectiveness and user-friendliness of these agricultural mobile apps. ICT applications in agriculture in the form of these mobile applications is supposed to bring about revolutionary changes in this field in terms of easy and quick information dissemination, creating awareness and knowledge and finally better and sustainable livelihood. But the very basic point of consideration is that we have to know our target in a better way with whom we are going to communicate. In apps with higher readability score it will be difficult for the farmers to comprehend textual portion and derive the actual meaning thereby affecting its usage in actual terms. While launching any agricultural apps in developing countries should strive for an easier level of reading difficulty and change in the presentation format. Hence, the intentions with which mobile apps were launched in agriculture will be fulfilled directly or indirectly if we take into consideration the readability of the apps along with focussing on user's reading level.

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