



Evaluation of web sites for contents on regional recommendations on coconut farming in India

K. Muralidharan*, C. Thamban, C. Palaniswami, R. Dhanapal, and Anil Rai¹

Central Plantation Crops Research Institute, Kasaragod
¹Indian Agricultural Statistics Research Institute, New Delhi

Abstract

The web sites providing information on coconut cultivation in India were compared for information content and examined the architecture followed by the sites for providing region wise recommendations. The database approach followed in the Integrated National Agricultural Resources Information System (INARIS) site, which is a part of the data warehouse of national agricultural resources, is suitable for providing information selectively up to district level. Based on the scores assigned to information made available in the sites, Shannon's evenness index was used to compare the sites and found that sites of INARIS, Pondicherry, and Karnataka provide more information.

Key words : Content analysis, web sites, INARIS, database, coconut, production technologies

Introduction

The productivity of coconut varies significantly between major coconut growing regions in India. While the productivity is 4400 nuts/ha in Karnataka, it is 10000 nuts/ha in Andhra Pradesh. Besides agro-climatic conditions, the management practices followed in different regions too contribute towards variability in the productivity of coconut. Considerable variation in productivity is observed even within a state, chiefly because of differential total factor productivity. For instance, the relative advantages of different inputs on coconut yield were reported to be varied between the three districts viz., Thiruvananthapuram, Ernakulam and Kochi of Kerala State (Muralidharan *et. al.* 2004). In the absence of any replanting strategies with high yielding cultivars/hybrids, increased productivity can only be achieved by means of management of natural resources on a sustainable basis. Efforts for refining crop management strategies suitable to different agro-climatic zones in India are coordinated under the All India Coordinated Research Project on Palms. Besides,

the state agricultural universities also develop location specific technologies. These technologies are to be disseminated among the extension personnel and farmers on a regular basis. The extension literature in the print format has certain limitations in this regard as it has little scope for incorporating modifications of technologies as and when such recommendations emerges and also involve high cost for printing and distribution. Consequent to the advances in information technology, now it is possible to use Internet, which offers much scope and flexibility, as a channel for technology transfer. Efforts in this direction are initiated in India by hosting websites/portals by respective agencies such as research institutions, development departments, etc. To what extent these sites offer region wise recommendations on coconut cultivation is examined in this paper and suggestions are made for improvement in application development.

Materials and Methods

Since Agriculture is a State subject in India, the crop management strategies specific to a State is provided in

* For correspondence

public domain by the respective State Department of Agriculture/Horticulture. Selected websites were assessed for their coverage on agrotechniques and related aspects of coconut farming. Broadly the agrotechniques has been classified into cultivars/hybrids, nursery management, planting and juvenile care, nutrient management, irrigation scheduling, soil and moisture conservation, multiple cropping, pest management, and disease management. Important components of the aforesaid agrotechniques were scored for the presence in the sites so as to make objective evaluation (Table 1).

Table 1. Components of agrotechniques considered for comparison of websites

Agrotechnique	Components considered for scoring
Cultivars/ hybrids	Nut yield, copra yield, and age at first flowering
Nursery management	Mother palm selection, seed nut selection, method and time of sowing, irrigation, plant protection, weed control, and seedling selection
Planting and juvenile care	Different spacing suggested for planting, making of pits, planting season, fertilizer requirement in the juvenile phase, basin management, and irrigation
Nutrient management	Organics (types and quantity); inorganic fertilizers; time of application; split doses; specific fertilizer recommendations for different situations; green manure crops; fertigation; amendments and micro nutrients; organic recycling; and biofertilizers.
Irrigation scheduling	Types of irrigation, frequency, quantity of water requirement, and recommendations for different soil types and cropping systems
Soil and moisture conservation	Mulching, inter cultivation, contour bunds, trenches, bioengineering measures, and other water harvesting structures
Pest management	The damage caused by the pests and respective integrated pest management practices for eriophyid mite, Rhinoceros beetle, Leaf eating caterpillar, red weevil, and root grub
Disease control	Symptom, control measures, and pathogen of the following diseases: root (wilt) disease, Tanjaore wilt, stem bleeding, and leaf rot
Farming system	Description of scope; list of crops for rain fed and irrigated situations, livestock components, and economics

The coverage on a particular agrotechnique in a Site is expressed as per cent components included against it, which is equivalent to Russel and Rao's index. If the i^{th} agrotechnique has M_i components and the score obtained for the j^{th} Site is F_{ij} , then the Russel and Rao index is given by F_{ij} / M_i .

The evenness of information provided under each agrotechnique by respective sites was assessed by means

of Shannon's index (Shannon, 1948). Shannon's evenness index for the j^{th} Site is defined as

$$H_j = \{ N_j \log N_j - \sum_i F_{ij} \log F_{ij} \} / N_j$$

where $N_j = \sum_i F_{ij}$

To express the similarity among sites for information content, the Hamann's similarity measure defined for binary data as the number of matches minus the number of non-matches, divided by the total number of items, was used and results summarized in the form of a dendrogram. SPSS v.12.0 was used for data analysis.

Comparison among sites were also made in terms of presentation of visuals, correctness of the information, inclusion of location specific recommendations, use of local language, page setup, arrangement of subject matter sequences, appearance, and inclusion of hyperlinks to locate the information within a site.

Results and Discussion

Websites covering coconut cultivation practices

Information from internet, on websites in particular, can be accessed either by the use of search engines (e.g., google) or by directly entering the website address. The usefulness of search engine is limited as it usually provides thousands of sites against a search term. For instance, the *google-search* on "coconut cultivation India" enlisted more than 136000 links. Among the first 10 search results, only the website of Coconut Development Board, Kochi was found to be the relevant. An information seeker may find it difficult to choose the appropriate links for his specific requirements, especially for technical guidance on location specific farming. Hence it is imperative that the potential clientele are to be made aware about the websites on coconut farming by the respective agencies.

The list of websites providing information on technology recommendations on coconut cultivation in India is provided in Table 2. Besides these websites, information on coconut cultivation can also be seen from sites hosted by research institutes (e.g., www.cpcri.ernet.in, <http://www.kau.edu>), private

Table 2. Selected web sites providing technology recommendations on coconut farming in India

Site address	Targeted region	Language
http://www.karsheekakeralam.org	Kerala	Malayalam, English
http://www.horticulture.kar.nic.in	Karnataka	English
http://www.tnau.ac.in	Tamil Nadu	English
http://www.aphorticulture.com	Andhra Pradesh	English
http://agri.and.nic.in	Andaman & Nicobar Is.	English
http://pondicherryagri.org	Pondicherry	Tamil
http://coconutboard.nic.in	India (General)	English
http://inaris.gen.in	India (Different States)	English

organizations (e.g., <http://www.jfarmindia.com>). The sites of the research institutes are of academic nature and information provided in such sites may not be directly providing the package of practices recommendations. The private sites often are not in public domain and access right is restricted to registered users only.

The four States contributing more than 90% coconut production in India viz. Kerala, Karnataka, Tamil Nadu, and Andhra Pradesh are having own websites. Besides, the sites of Pondicherry and Andaman & Nicobar Is. also deal with information on coconut cultivation. Information in respective local language is provided in the sites of Kerala, Karnataka, and Pondicherry. It may be mentioned here that, extension literature in respective local language is readily available for other sites, but efforts are required to provide the same in the websites. All these sites are hosted by the respective state department of agriculture/horticulture except for Tamil Nadu for which information on package of practices is made available in the site of Tamil Nadu Agricultural University.

Important components of coconut cultivation technology are provided by most of the sites, but easiness in accessing the information varied between the sites. In most of the sites, the coconut cultivation aspects are furnished in a single page. Providing information in a single page has the advantage that no other pages need to be accessed by the user for further information. It also has the advantage for easily incorporating new recommendations made by the research agencies from time to time. The disadvantage of providing information in the aforesaid format is that the user is forced to scroll from top to bottom of the page to seek information, which increases the chance of missing certain items. Besides, the process of scrolling of a lengthy page demands more browsing time, which increases with inclusion of more number of photographs in the page. To benefit the user who approaches the site for specific information, the contents are to be arranged in different pages with

appropriate hyper links. For instance, an experienced coconut farmer may not be interested to know the planting aspects and juvenile care, but may be looking for recommendations on control of a pest of recent origin. There is an attempt in the site of Kerala (in English) to organize contents according to major components of farm practices, but that of different crops are appearing in a single page, making it more difficult to access the information. The information provided in the TNAU site is in the *pdf* format which is only an digital version of the package of practices in the printed form, and hence not supporting any navigation or information search in the document.

Coverage of various items of recommended coconut cultivation practices

Similarity in information contents provided by the sites based on the Hamann's measure based on the scores for all the agrotechniques revealed that the sites of Andhra Pradesh, Pondicherry, and Karnataka were similar and grouped together while Tamil Nadu, Andaman & Nicobar Is. and Kerala followed a different way of organizing the information. The INARIS and CDB sites are distinct from the rest.

Among the websites, maximum information content was observed for the site of Pondicherry (with Shannon's index 4.55) closely followed by Karnataka site with index of 4.49 (Table 3). Among the sites compared, Andaman & Nicobar Is. and Tamil Nadu have lowest information content on coconut cultivation.

Sannon's index was also computed for each agrotechnique to observe whether information content across sites is uniform or not and shown in the last column of Table 3. Most of the sites provided information on disease control and pest management as evidenced from higher values of Shannon's index as 5.0 and 4.7 respectively. Only few websites provided information on soil and moisture conservation. Average percentage of inclusion of salient components was found to be 44.34%, indicating that the sites are not providing all the necessary information to the browsers. The lowest

Table 3. Shannon's index for comparing the sites and per cent inclusion of items under different agrotechniques

	Kerala	Karnataka	Tamil Nadu	Andhra Pradesh	Andamans	Pondicherry	CDB	INARIS	Shannon's index
Cultivars/ hybrids	11.1	72.2	25.0	82.4	27.8	72.2	33.3	66.7	4.3
Nursery management	70.0	70.0	50.0	70.0	0.0	80.0	20.0	20.0	3.7
Planting and juvenile care	71.4	42.9	71.4	57.1	42.9	85.7	100.0	14.3	3.6
Nutrient management	64.3	61.5	57.1	42.9	42.9	57.1	78.6	21.4	4.1
Irrigation scheduling	42.9	42.9	42.9	28.6	0.0	57.1	28.6	71.4	3.2
Soil and moisture conservation	16.7	16.7	16.7	16.7	0.0	33.3	16.7	0.0	2.8
Pest management	42.9	78.6	21.4	29.6	4.8	67.9	53.6	89.3	4.7
Disease control	64.0	76.7	16.7	48.0	0.0	83.9	64.5	96.8	5.0
Farming system	11.1	55.6	0.0	33.3	0.0	55.6	44.4	0.0	3.0
Shannon's index (for sites)	4.13	4.49	3.70	4.15	2.81	4.55	4.26	4.38	

percentage was for the site of Andamans and Nicobar Is. (12.27%) and maximum for Pondicherry site (72.43%). It was revealed that items such as soil and moisture conservation and farming system, two important components of sustainable production were not adequately covered in the sites.

Besides the production related techniques, data on production and trade as well as value addition are also required for many agencies including the farmers. Only in the INARIS site the crop statistics are provided. Information of value added products and process are provided in four sites viz., INARIS, Pondy cherry, Karnataka and CDB with respective scores as 30, 14, 12, and 10. A unique feature of the INARIS site is the theme maps derived from the geographical information system. On considering the aforesaid three features, the information content of the INARIS site becomes 4.7, which is followed by the Pondy cherry site (4.6).

Improved varieties: Information on locally adapted cultivars and recommended hybrids is inadequate in the sites of Kerala, Tamil Nadu, Andaman, and CDB (index less than 35%) compared to other sites (index more than 66%). Relevant characters such as age at first flowering, and nut and copra yield were not mentioned in these sites. Though the INARIS site provides a detailed description, including photographs on cultivars, the hybrids are not included. The sites also failed to mention special features of the cultivars/hybrids and also the specific locations for which they were recommended by research agencies.

The importance of selection of parents for production of planting material is critical for perennial crops as replacing non-performing trees at a later stage is difficult and the inputs made for such trees will fail to fetch any returns making even the entire project a failure. Selection of mother palms is described in sites except Andamans, CDB and INARIS. The coverage of nursery management is fairly good in the other sites (index > 70%). The plant protection in nurseries, selection of hybrid seedlings etc. are to be included in all the sites. Diagrammatic illustration of planting is provided only in the CDB site. Basin management and irrigation aspects in the juvenile phase are not mentioned in most of the sites except CDB.

Nutrient management: Information on nutrient management provided by the sites is more or less similar (index ranges from 42.9 to 78.6), except for INARIS in which no mention is made on organics and green manures. Only the sites of Karnataka and Tamil Nadu provide details on vermicomposting. Information on biofertilizers is not provided by any site. Though the nutrition requirement varies within a state for different

soil types, the sites are not providing such information except Kerala. The sites are also not utilizing the opportunity for fertilizer recommendation for given soil test values and organic inputs. An attempt towards this can be seen in the site www.kissankerala.net that provides fertilization recommendation for different soil types of Kerala based on soil test values.

General recommendations on irrigation are provided in all the sites, but for different agro-climatic zones only in two sites viz., Kerala and INARIS. The sites did not give adequate importance to soil and moisture conservation. Only method of mulching and inter cultivation are mentioned in the sites. In the wake of drought experienced at different coconut growing tracts in the country, more emphasis has to be given for soil and water conservation.

Farming systems: The sites were not given adequate importance for coconut based cropping/farming systems as well as product diversification. There is a requirement of providing a list of suitable inter crops for different agroclimatic zones within a state and also separate lists for irrigated and rainfed situations. Details about value added products in the sites are far from satisfactory.

Plant protection: Plant protection aspects are covered adequately by the Karnataka and INARIS sites (index > 70). The control measures for eriophyid mite are surprisingly missing in many sites. This in other words indicates the delay in communication between the department and its web-application developers.

Location specific technology recommendations

Technological recommendations on coconut cultivation related to plant protection, nutrition, and irrigation are subjected to frequent modification. There is a scope for refining these cultivation aspects best suited for different agroclimatic zones or different soil types within a State. For example, one can see different fertilizer recommendations for laterite soil, problem soils of Kuttanad and the rest in the site 'karshikakeralam'. Since there are only few distinct recommendations, the same is provided in a Table in that site. However, this simplified format will not be adequate to describe refinements in technologies at district level or for specific soil types etc.

The site for Karnataka attempts to provide package of practices of various crops cultivated in six districts under the link, 'agro-climatic planning and information bank'. In this site too, all the information on coconut cultivation is provided in a single *html* page. Though the page is set to display different cultivation aspects on selection, no separate pages are provided for different

districts which limit its utility. A unique feature of this site is the interactive selection of cultivars suitable for a region. Details on many value added products from coconut are also provided in this site.

From the foregoing, it is evident that all the regional (State) sites are providing information at macro level only, and their present structure is not suitable for providing information pertaining to different agroclimatic zones or districts within the State. To achieve this, a database approach needs to be followed as in the case of Integrated National Agricultural Information System (INARIS). The website of INARIS is a part of the data warehouse having 13 subject specific marts dealing with field crops, horticulture crops, plantation crops, spices, livestock, plant genetic resources, soil, agro-meteorology, agro-forestry, socio-economic, water resources, fisheries, farm machinery. Coconut cultivation aspects are provided under the link "plantation crops". The important cultivation aspects are grouped under 'Nursery Details', 'Irrigation', 'Nutrition', 'Pests', 'Diseases', 'Cultivars', 'Value Added Products' and 'Statistics'. These are further distributed into sub sections which provide description, products, climatic condition, management of pests, management of diseases, etc. Though the structure of the site is capable of providing information specific to districts, currently State-wise information only made available. This site is creating reports from the database at every time a browser asked and in that sense termed as dynamic reports. The advantage of such reports is that updated information on cultivation techniques can be made available to the browsers without any delay. However, the reports displayed from the site need to be improved and an option for selecting the desired region need to be included.

Usage of visuals

The importance of appropriate visuals for effective transfer of farm technologies needs no special mention. However, most of the sites under analysis did not incorporate visuals adequately. Inclusion of pictures in the web pages will no doubt increase the access time, but it can be reduced to a certain extent by organizing the contents in different pages. Description of cultivation practices without any visuals will be more of an academic

interest than catering the needs of the farmers. Efforts are therefore required in the regional sites to include more visuals.

How far the State wise recommendations as provided in the respective sites are in agreement with the latest technology recommendations? This is a matter of serious concern. Continuous monitoring of the sites by the experts in the field is required to assure correct information to the farming community. Compared to the conventional extension literature, where the accountability is fixed with the author who compiled the information, the web-based literature often is based on published literature from many sources without looking into the authenticity. This fact is evident in many sites. For instance, the control measure for stem bleeding disease in local language in the Kerala site is different from the English version. Another example is the control of eriophyid mite. The recommendation is appeared only in the English version. Similarly, the plant protection measures mentioned in the Andhra Pradesh site include only chemical control methods, where as it is generally accepted that integrated approaches are more effective. In this site too, there was no mention of control measures for eriophyid mite, a pest of recent origin.

Conclusion

The scope of Internet as a media for technology transfer is enormous and the efforts made in the direction by department of Agriculture/Horticulture of various states to provide information on coconut cultivation practices is appreciable. However, the full benefit from this to the farmers can only be achieved if the information is made available in local languages supported by appropriate visuals. A database based report generation is required to provide package of practices specific to district level for which design developed under INARIS may be utilized as a model.

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