About the Journal

*Pertanika* is an international peer-reviewed journal devoted to the publication of original papers, and it serves as a forum for practical approaches to improving quality in issues pertaining to tropical agriculture and its related fields. *Pertanika* began publication in 1978 as *Journal of Tropical Agricultural Science*. In 1992, a decision was made to streamline *Pertanika* into three journals to meet the need for specialised journals in areas of study aligned with the interdisciplinary strengths of the university. The revamped *Journal of Science and Technology* (JST) is now focusing on research in science and engineering, and its related fields. *Other Pertanika* series include *Journal of Tropical Agricultural Science* (JTAS); and *Journal of Social Sciences and Humanities* (JSSH).

JST is published in English and it is open to authors around the world regardless of the nationality. It is currently published two times a year, i.e. in January and July.

Goal of *Pertanika*

Our goal is to bring the highest quality research to the widest possible audience.

Quality

We aim for excellence, sustained by a responsible and professional approach to journal publishing. Submissions are guaranteed to receive a decision within 12-16 weeks. The elapsed time from submission to publication for the articles averages 6 months.

Indexing of *Pertanika*

*Pertanika* is now over 33 years old; this accumulated knowledge has resulted in *Pertanika* JST being indexed in SCOPUS (Elsevier), EBSCO, Thomson (ISI) Web of Knowledge [CAB Abstracts], DOAJ, Google Scholar, ERA, ISC and MyAIS.

Future vision

We are continuously improving access to our journal archives, content, and research services. We have the drive to realise exciting new horizons that will benefit not only the academic community, but society itself.

We also have views on the future of our journals. The emergence of the online medium as the predominant vehicle for the ‘consumption’ and distribution of much academic research will be the ultimate instrument in the dissemination of the research news to our scientists and readers.

Aims and scope

*Pertanika* Journal of Science and Technology aims to provide a forum for high quality research related to science and engineering research. Areas relevant to the scope of the journal include: bioinformatics, bioscience, biotechnology and bio-molecular sciences, chemistry, computer science, ecology, engineering, engineering design, environmental control and management, mathematics and statistics, nanotechnology, physics, safety and emergency management, and related fields of study.

Editorial Statement

*Pertanika* is the official journal of Universiti Putra Malaysia. The abbreviation for *Pertanika* Journal of Science & Technology is *Pertanika J. Sci. Technol*.

Guidelines for Authors

Publication policies

*Pertanika* policy prohibits an author from submitting the same manuscript for concurrent consideration by two or more publications. It prohibits as well publication of any manuscript that has already been published either in whole or substantial part elsewhere. It also does not permit publication of manuscript that has been published in full in Proceedings. Please refer to *Pertanika’s* Code of Ethics for full details.
Editorial process
Authors are notified on receipt of a manuscript and upon the editorial decision regarding publication.

Manuscript review: Manuscripts deemed suitable for publication are sent to the Editorial Board members and/or other reviewers. We encourage authors to suggest the names of possible reviewers. Notification of the editorial decision is usually provided within eight to ten weeks from the receipt of manuscript. Publication of solicited manuscripts is not guaranteed. In most cases, manuscripts are accepted conditionally, pending an author's revision of the material.

Author approval: Authors are responsible for all statements in articles, including changes made by editors. The liaison author must be available for consultation with an editor of The Journal to answer questions during the editorial process and to approve the edited copy. Authors receive edited typescript (not galley proofs) for final approval. Changes cannot be made to the copy after the edited version has been approved.

Manuscript preparation
Pertanika accepts submission of mainly four types of manuscripts. Each manuscript is classified as regular or original articles, short communications, reviews, and proposals for special issues. Articles must be in English and they must be competently written and argued in clear and concise grammatical English. Acceptable English usage and syntax are expected. Do not use slang, jargon, or obscure abbreviations or phrasing. Metric measurement is preferred; equivalent English measurement may be included in parentheses. Always provide the complete form of an acronym/abbreviation the first time it is presented in the text. Contributors are strongly recommended to have the manuscript checked by a colleague with ample experience in writing English manuscripts or an English language editor.

Linguistically hopeless manuscripts will be rejected straightaway (e.g., when the language is so poor that one cannot be sure of what the authors really mean). This process, taken by authors before submission, will greatly facilitate reviewing, and thus publication if the content is acceptable.

The instructions for authors must be followed. Manuscripts not adhering to the instructions will be returned for revision without review. Authors should prepare manuscripts according to the guidelines of Pertanika.

1. Regular article
Definition: Full-length original empirical investigations, consisting of introduction, materials and methods, results and discussion, conclusions. Original work must provide references and an explanation on research findings that contain new and significant findings.
Size: Should not exceed 5000 words or 8-10 printed pages (excluding the abstract, references, tables and/or figures). One printed page is roughly equivalent to 3 type-written pages.

2. Short communications
Definition: Significant new information to readers of the Journal in a short but complete form. It is suitable for the publication of technical advance, bioinformatics or insightful findings of plant and animal development and function.
Size: Should not exceed 2000 words or 4 printed pages, is intended for rapid publication. They are not intended for publishing preliminary results or to be a reduced version of Regular Papers or Rapid Papers.

3. Review article
Definition: Critical evaluation of materials about current research that had already been published by organizing, integrating, and evaluating previously published materials. Re-analyses as meta-analysis and systemic reviews are encouraged. Review articles should aim to provide systemic overviews, evaluations and interpretations of research in a given field.
Size: Should not exceed 4000 words or 7-8 printed pages.

4. Special issues
Definition: Usually papers from research presented at a conference, seminar, congress or a symposium.
Size: Should not exceed 5000 words or 8-10 printed pages.

5. Others
Definition: Brief reports, case studies, comments, Letters to the Editor, and replies on previously published articles may be considered.
Size: Should not exceed 2000 words or up to 4 printed pages.

With few exceptions, original manuscripts should not exceed the recommended length of 6 printed pages (about 18 typed pages, double-spaced and in 12-point font, tables and figures included). Printing is expensive, and, for the Journal, postage doubles when an issue exceeds 80 pages. You can understand then that there is little room for flexibility.

Long articles reduce the Journal's possibility to accept other high-quality contributions because of its 80-page restriction. We would like to publish as many good studies as possible, not only a few lengthy ones. (And, who reads overly long articles anyway?) Therefore, in our competition, short and concise manuscripts have a definite advantage.

Format
The paper should be formatted in one column format with at least 4cm margins and 1.5 line spacing throughout. Authors are advised to use Times New Roman 12-point font. Be especially careful when you are inserting special characters, as those inserted in different fonts may be replaced by different characters when converted to PDF files. It is well known that 'µ' will be replaced by other characters when fonts such as 'Symbol' or 'Mincho' are used.
A maximum of eight keywords should be indicated below the abstract to describe the contents of the manuscript. Leave a blank line between each paragraph and between each entry in the list of bibliographic references. Tables should preferably be placed in the same electronic file as the text. Authors should consult a recent issue of the Journal for table layout.

Every page of the manuscript, including the title page, references, tables, etc. should be numbered. However, no reference should be made to page numbers in the text; if necessary, one may refer to sections. Underline words that should be in italics, and do not underline any other words.

We recommend that authors prepare the text as a Microsoft Word file.

1. Manuscripts in general should be organised in the following order:

   o **Page 1: Running title.** (Not to exceed 60 characters, counting letters and spaces). This page should only contain the running title of your paper. The running title is an abbreviated title used as the running head on every page of the manuscript.

   In addition, the **Subject areas** most relevant to the study must be indicated on this page. Select the appropriate subject areas from the Scope of the Journals provided in the Manuscript Submission Guide.

   A *list of number of black and white / colour figures and tables* should also be indicated on this page. Figures submitted in color will be printed in colour. See "5. Figures & Photographs" for details.

   o **Page 2: Author(s) and Corresponding author information.** This page should contain the full title of your paper with name(s) of all the authors, institutions and corresponding author's name, institution and full address (Street address, telephone number (including extension), hand phone number, fax number and e-mail address) for editorial correspondence. The names of the authors must be abbreviated following the international naming convention. e.g. Salleh, A.B., Tan, S.G., or Sapuan, S.M.

   **Authors' addresses.** Multiple authors with different addresses must indicate their respective addresses separately by superscript numbers:

   - George Swan\(^1\) and Nayan Kanwaj\(^2\)
     
     \(^1\)Department of Biology, Faculty of Science, Duke University, Durham, North Carolina, USA.
     
     \(^2\)Office of the Deputy Vice Chancellor (R&I), Universiti Putra Malaysia, Serdang, Malaysia.

   o **Page 3:** This page should repeat the full title of your paper with only the **Abstract** (the abstract should be less than 250 words for a Regular Paper and up to 100 words for a Short Communication). **Keywords** must also be provided on this page (Not more than eight keywords in alphabetical order).

   o **Page 4 and subsequent pages:** This page should begin with the **Introduction** of your article and the rest of your paper should follow from page 5 onwards.

**Abbreviations.** Define alphabetically, other than abbreviations that can be used without definition. Words or phrases that are abbreviated in the introduction and following text should be written out in full the first time that they appear in the text, with each abbreviated form in parenthesis. Include the common name or scientific name, or both, of animal and plant materials.

**Footnotes.** Current addresses of authors if different from heading.

2. **Text.** Regular Papers should be prepared with the headings Introduction, Materials and Methods, Results and Discussion, Conclusions in this order. Short Communications should be prepared according to "8. Short Communications." below.

3. **Tables.** All tables should be prepared in a form consistent with recent issues of Pertanika and should be numbered consecutively with Arabic numerals. Explanatory material should be given in the table legends and footnotes. Each table should be prepared on a separate page. (Note that when a manuscript is accepted for publication, tables must be submitted as data - .doc, .rtf, Excel or PowerPoint file- because tables submitted as image data cannot be edited for publication.)

4. **Equations and Formulae.** These must be set up clearly and should be typed triple spaced. Numbers identifying equations should be in square brackets and placed on the right margin of the text.

5. **Figures & Photographs.** Submit an original figure or photograph. Line drawings must be clear, with high black and white contrast. Each figure or photograph should be prepared on a separate sheet and numbered consecutively with Arabic numerals. Appropriate sized numbers, letters and symbols should be used, no smaller than 2 mm in size after reduction to single column width (85 mm), 1.5-column width (120 mm) or full 2-column width (175 mm).

Failure to comply with these specifications will require new figures and delay in publication. For electronic figures, create your figures using applications that are capable of preparing high resolution TIFF files acceptable for publication. In general, we require 300 dpi or higher resolution for coloured and half-tone artwork and 1200 dpi or higher for line drawings. For review, you may attach low-resolution figures, which are still clear enough for reviewing, to keep the file of the manuscript under 5 MB. Illustrations may be produced at extra cost in colour at the discretion of the Publisher; the author could be charged Malaysian Ringgit 50 for each colour page.
6. **References.** Literature citations in the text should be made by name(s) of author(s) and year. For references with more than two authors, the name of the first author followed by ‘et al.’ should be used.

Swan and Kanwal (2007) reported that …

The results have been interpreted (Kanwal et al. 2009).

- References should be listed in alphabetical order, by the authors’ last names. For the same author, or for the same set of authors, references should be arranged chronologically. If there is more than one publication in the same year for the same author(s), the letters ‘a’, ‘b’, etc., should be added to the year.

- When the authors are more than 11, list 5 authors and then et al.

- Do not use indentations in typing References. Use one line of space to separate each reference. The name of the journal should be written in full. For example:
  

- In case of citing an author(s) who has published more than one paper in the same year, the papers should be distinguished by addition of a small letter as shown above, e.g. Jalaludin (1997a); Jalaludin (1997b).

- Unpublished data and personal communications should not be cited as literature citations, but given in the text in parentheses. ‘In press’ articles that have been accepted for publication may be cited in References. Include in the citation the journal in which the ‘in press’ article will appear and the publication date, if a date is available.

7. **Examples of other reference citations:**


8. **Short Communications** should include Introduction, Materials and Methods, Results and Discussion, Conclusions in this order. Headings should only be inserted for Materials and Methods. The abstract should be up to 100 words, as stated above. Short Communications must be 5 printed pages or less, including all references, figures and tables. References should be less than 30. A 5 page paper is usually approximately 3000 words plus four figures or tables (if each figure or table is less than 1/4 page).

*Authors should state the total number of words (including the Abstract) in the cover letter. Manuscripts that do not fulfill these criteria will be rejected as Short Communications without review.*

**STYLE OF THE MANUSCRIPT**

Manuscripts should follow the style of the latest version of the Publication Manual of the American Psychological Association (APA). The journal uses American or British spelling and authors may follow the latest edition of the Oxford Advanced Learner’s Dictionary for British spellings.

**SUBMISSION OF MANUSCRIPTS**

Owing to the volume of manuscripts we receive, we must insist that all submissions be made electronically using the online submission system, ScholarOne.

ScholarOne, a web-based system by Thomson Reuters provides a comprehensive workflow management system for scholarly journals. For more information, go to our web page and click “Online Submission”.

Alternatively, you may submit the electronic files (cover letter, manuscript, and the Manuscript Submission Kit comprising Declaration and Referral forms along with the Copyright form) via email directly to the Chief Executive Editor. If the files are too large to email, mail a CD containing the files. The Manuscript Submission Guide and Submission Kit are available from the Pertanika's home page at [http://www.pertanika.upm.edu.my/home.php](http://www.pertanika.upm.edu.my/home.php) or from the Executive Editor's office upon request.

All articles submitted to the journal must comply with these instructions. Failure to do so will result in return of the manuscript and possible delay in publication.

Please do not submit manuscripts to the editor-in-chief or to any other office directly. All manuscripts must be submitted through the chief executive editor's office to be properly acknowledged and rapidly processed at the address below:

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Authors should retain copies of submitted manuscripts and correspondence, as materials cannot be returned. Authors are required to inform the Chief Executive Editor of any change of address which occurs whilst their papers are in the process of publication.

**Cover letter**

All submissions must be accompanied by a cover letter detailing what you are submitting. Papers are accepted for publication in the journal on the understanding that the article is original and the content has not been published or submitted for publication elsewhere. This must be stated in the cover letter.

The cover letter must also contain an acknowledgement that all authors have contributed significantly, and that all authors are in agreement with the content of the manuscript.

The cover letter of the paper should contain (i) the title; (ii) the full names of the authors; (iii) the addresses of the institutions at which the work was carried out together with (iv) the full postal and email address, plus facsimile and telephone numbers of the author to whom correspondence about the manuscript should be sent. The present address of any author, if different from that where the work was carried out, should be supplied in a footnote.

As articles are double-blind reviewed, material that might identify authorship of the paper should be placed on a cover sheet.

**Peer review**

*Pertanika* follows a double-blind peer-review process. Peer reviewers are experts chosen by journal editors to provide written assessment of the strengths and weaknesses of written research, with the aim of improving the reporting of research and identifying the most appropriate and highest quality material for the journal.

In the peer-review process, three referees independently evaluate the scientific quality of the submitted manuscripts. Authors are encouraged to indicate in the **Referral form** using the **Manuscript Submission Kit** the names of three potential reviewers, but the editors will make the final choice. The editors are not, however, bound by these suggestions.

Manuscripts should be written so that they are intelligible to the professional reader who is not a specialist in the particular field. They should be written in a clear, concise, direct style. Where contributions are judged as acceptable for publication on the basis of content, the Editor reserves the right to modify the typescripts to eliminate ambiguity and repetition and improve communication between author and reader. If extensive alterations are required, the manuscript will be returned to the author for revision.

**The Journal’s review process**

What happens to a manuscript once it is submitted to *Pertanika*? Typically, there are seven steps to the editorial review process:

1. The executive editor and the editorial board examine the paper to determine whether it is appropriate for the journal and should be reviewed. If not appropriate, the manuscript is rejected outright and the author is informed.

2. The executive editor sends the article-identifying information having been removed, to three reviewers. Typically, one of these is from the Journal's editorial board. Others are specialists in the subject matter represented by the article. The executive editor asks them to complete the review in three weeks and encloses two forms: (a) referral form B and (b) reviewer’s comment form along with reviewer’s guidelines. Comments to authors are about the appropriateness and adequacy of the theoretical or conceptual framework, literature review, method, results and discussion, and conclusions. Reviewers often include suggestions for strengthening of the manuscript. Comments to the editor are in the nature of the significance of the work and its potential contribution to the literature.

3. The executive editor, in consultation with the editor-in-chief, examines the reviews and decides whether to reject the manuscript, invite the author(s) to revise and resubmit the manuscript, or seek additional reviews. Final acceptance or rejection rests with the Editorial Board, who reserves the right to refuse any material for publication. In rare instances, the manuscript is accepted with almost no revision. Almost without exception, reviewers' comments (to the author) are forwarded to the author. If a revision is indicated, the editor provides guidelines for attending to the reviewers’ suggestions and perhaps additional advice about revising the manuscript.

4. The authors decide whether and how to address the reviewers’ comments and criticisms and the editor’s concerns. The authors submit a revised version of the paper to the executive editor along with specific information describing how they have answered the concerns of the reviewers and the editor.

5. The executive editor sends the revised paper out for review. Typically, at least one of the original reviewers will be asked to examine the article.

6. When the reviewers have completed their work, the executive editor in consultation with the editorial board and the editor-in-chief examine their comments and decide whether the paper is ready to be published, needs another round of revisions, or should be rejected.

7. If the decision is to accept, the paper is sent to that Press and the article should appear in print in approximately three months. The Publisher ensures that the paper adheres to the correct style (in-text citations, the reference list, and tables are typical areas of concern, clarity, and grammar). The authors are asked to respond to any queries by the Publisher. Following these corrections, page proofs are mailed to the corresponding authors for their final approval. At this point, only essential changes are accepted. Finally, the article appears in the pages of the Journal and is posted on-line.

**English language editing**

*Pertanika* emphasizes on the linguistic accuracy of every manuscript published. Thus all authors are required to get their manuscripts edited by professional English language editors. Author(s) must provide a certificate confirming that their manuscripts have been adequately edited. A proof from a recognized editing service should be submitted together with the cover letter at the time of submitting a manuscript to *Pertanika*. All costs will be borne by the author(s).

This step, taken by authors before submission, will greatly facilitate reviewing, and thus publication if the content is acceptable.
Author material archive policy
Authors who require the return of any submitted material that is rejected for publication in the journal should indicate on the cover letter. If no indication is given, that author's material should be returned, the Editorial Office will dispose of all hardcopy and electronic material.

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Authors publishing the Journal will be asked to sign a declaration form. In signing the form, it is assumed that authors have obtained permission to use any copyrighted or previously published material. All authors must read and agree to the conditions outlined in the form, and must sign the form or agree that the corresponding author can sign on their behalf. Articles cannot be published until a signed form has been received.

Lag time
A decision on acceptance or rejection of a manuscript is reached in 3 to 4 months (average 14 weeks). The elapsed time from submission to publication for the articles averages 5-6 months.

Hardcopies of the Journals and off prints
Under the Journal's open access initiative, authors can choose to download free material (via PDF link) from any of the journal issues from Pertanika's website. Under "Browse Journals" you will see a link entitled "Current Issues" or "Archives". Here you will get access to all back-issues from 1978 onwards.

The corresponding author for all articles will receive one complimentary hardcopy of the journal in which his/her articles is published. In addition, 20 off prints of the full text of their article will also be provided. Additional copies of the journals may be purchased by writing to the executive editor.