# SYSTEMATIC REVIEW PROTOCOL FOR ANIMAL INTERVENTION STUDIES

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**VERSION 2.0 (DECEMBER 2014)**

<table>
<thead>
<tr>
<th>Item #</th>
<th>Section/Subsection/Item</th>
<th>Description</th>
<th>Check for approval</th>
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<tbody>
<tr>
<td><strong>A. General</strong></td>
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<tr>
<td>1.</td>
<td>Title of the review</td>
<td>Systematic map of reproductive performance of female cattle in Africa</td>
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</table>
| 2. | Authors (names, affiliations, contributions) | Isla MacVicar\(^1\), Fiona K Allan\(^1\), Andrew R Peters\(^1\) and Christian Schnier\(^1\)  
\(^1\)Supporting Evidence Based Interventions in Livestock (SEBI-Livestock), The Royal (Dick) School of Veterinary Studies, The University of Edinburgh, Easter Bush Campus, Midlothian, EH25 9RG, UK | |
| 3. | Other contributors (names, affiliations, contributions) | - | |
| 4. | Contact person + e-mail address | Fiona K Allan: fiona.allan@ed.ac.uk | |
| 5. | Funding sources/sponsors | SEBI-L is funded by the Bill & Melinda Gates Foundation | |
| 6. | Conflicts of interest | No conflicts of interest | |
| 7. | Date and location of protocol registration | - | |
| 8. | Registration number (if applicable) | - | |
| 9. | Stage of review at time of registration | Searches completed  
Piloting of study selection process completed  
Formal screening of search results against eligibility criteria started | |
| **B. Objectives** | | | |
| 10. | What is already known about this disease/model/intervention? Why is it important to do this review? | Optimizing cattle reproductive performance is a crucial pillar in the strategy to achieve sustainable development goals. In high income countries, with mostly intensive production, there is reasonable agreement about optimum reproduction. In lower- and middle-income countries (LMICs), however, wide variation in production systems and environments mean that optimal reproductive performance is complex. A systematic evidence map of ruminant reproduction will help to define the current state of ruminant reproduction in different production systems and ecosystems, and will identify current trends, barriers to improvements, and highlight potential solutions. Solutions can then be developed into sustainable and targeted actions. | |
| **Research question** | | | |
### C. Methods

**Search and study identification**

17. Identify literature databases to search (e.g. Pubmed, Embase, Web of science)  
   - **MEDLINE via PubMed**  
   - **Web of Science**  
   - **SCOPUS**  
   - **Other, namely: Google Scholar, CAB Direct, Global ETD, Research4life**  
   - **□ EMBASE**  
   - **□ Specific journal(s), namely: CGIAR, Gates Open Research**

18. Define electronic search strategies (e.g. use the step by step search guide\(^\text{15}\) and animal search filters\(^\text{20, 21}\))  
   When available, please add a supplementary file containing your search strategy: [will be included in manuscript]

19. Identify other sources for study identification  
   - **X** Reference lists of included studies  
   - **X** Reference lists of relevant reviews  
   - **X** Conference proceedings, namely:  
   - **X** Contacting authors/ organisations, namely:  
   - **X** Other, namely: theses and reports

20. Define search strategy for these other sources  
   Screening the sources for relevant titles and screening the abstracts of relevant titles

**Study selection**

21. Define screening phases (e.g. pre-screening based on title/abstract, full text screening, both)  
   1) Screening based on title and abstract  
   2) Full-text screening of eligible articles

22. Specify (a) the number of reviewers per screening phase and (b) how discrepancies will be resolved  
   Each phase: 3 reviewers (IM, FA and CS) will screen all articles. A Kappa test will be used to measure inter-rater reliability on a sample to ensure cohesion, and differences will be resolved through discussion or by consulting a fourth reviewer

**Define all inclusion and exclusion criteria based on:**

23. Type of study (design)  
   - **Inclusion criteria:** observational  
   - **Exclusion criteria:** experimental (clinical trials), modelling

24. Type of animals/population (e.g. age, gender, disease model)  
   - **Inclusion criteria:** Female cattle, any age  
   - **Exclusion criteria:** Male cattle

25. Type of intervention (e.g. dosage, timing, frequency)  
   - **Inclusion criteria:** NA  
   - **Exclusion criteria:** NA

26. Outcome measures  
   - **Inclusion criteria:** age at first calving, age at first service, calving to conception, calving to first service, calving, calving interval, conception rate, culling due to infertility, number of services, pregnancy rate, repeat breeders, abortions  
   - **Exclusion criteria:** any other measure of fertility
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| 27. | Language restrictions | **Inclusion criteria:** English  
**Exclusion criteria:** all other non-English languages |
| 28. | Publication date restrictions | **Inclusion criteria:** 2012-2022 inclusive  
**Exclusion criteria:** all other dates |
| 29. | Other | **Inclusion criteria:** country: Eritrea, Ethiopia, Kenya, Nigeria, Somalia, Sudan, Tanzania, Uganda  
**Exclusion criteria:** any other country |
| 30. | Sort and prioritize your exclusion criteria per selection phase | **Selection phase:**  
1. Abstract only  
2. Duplicated data  
3. Country  
4. Experimental or modelling study |

### Study characteristics to be extracted (for assessment of external validity, reporting quality)

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<tr>
<td>31.</td>
<td>Study ID (e.g. authors, year)</td>
<td>Author, title, year</td>
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<tr>
<td>32.</td>
<td>Study design characteristics (e.g. experimental groups, number of animals)</td>
<td>Country of study, locality, agroecological zone, season, farming system, sampling method, study direction (prospective/retrospective), study type, data source, cover (AI, natural, both), synchronisation, number of cattle, number of herds</td>
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<td>33.</td>
<td>Animal model characteristics (e.g. species, gender, disease induction)</td>
<td>Breed, age, parity</td>
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<td>34.</td>
<td>Intervention characteristics (e.g. intervention, timing, duration)</td>
<td>NA</td>
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<tr>
<td>35.</td>
<td>Outcome measures</td>
<td>Age at first service, age at first calving, calving to first service, calving to successful conception, calving interval, successful conception rate after insemination, number of services per conception, repeated breeding, culling due to infertility, n pregnant adult female cattle, n calving adult female cattle</td>
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<td>36.</td>
<td>Other (e.g. drop-outs)</td>
<td>Data source (survey, records), publication type (journal, thesis)</td>
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### Assessment risk of bias (internal validity) or study quality

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<tr>
<td>37.</td>
<td>Specify (a) the number of reviewers assessing the risk of bias/study quality in each study and (b) how discrepancies will be resolved</td>
<td>Quality of included studies not typically appraised in systematic mapping, according to methodological guidance (James et al., 2016*)</td>
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| 38. | Define criteria to assess (a) the internal validity of included studies (e.g. selection, performance, detection and attrition bias) and/or (b) other study quality measures (e.g. reporting quality, power) | □ By use of SYRCLE’s Risk of Bias tool
□ By use of SYRCLE’s Risk of Bias tool, adapted as follows:  
□ By use of CAMARADES’ study quality checklist, e.g  
□ By use of CAMARADES’ study quality checklist, adapted as follows:  
□ Other criteria, namely: |

### Collection of outcome data

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| 39. | For each outcome measure, define the type of data to be extracted (e.g. continuous/dichotomous, unit of measurement) | Age at first service: months  
Age at first calving: months  
Calving to first service: days  
Calving to successful conception: days  
Calving interval: months  
Successful conception rate after insemination: proportion |
|   | Number of services per conception: continuous  
Repeated breeding: %  
Culling due to infertility: %  
n pregnant adult female cattle: continuous  
n calving adult female cattle: continuous |
|---|---|
| 40. | Methods for data extraction/retrieval (e.g. first extraction from graphs using a digital screen ruler, then contacting authors)  
Extraction from text and tables  
Contacting authors by email where any confusion |
| 41. | Specify (a) the number of reviewers extracting data and (b) how discrepancies will be resolved  
a) Two reviewers (FA and IM) will extract all data  
b) Discrepancies will be resolved by discussion between all 3 reviewers |

**Data analysis/synthesis**

|   | Specify (per outcome measure) how you are planning to combine/compare the data (e.g. descriptive summary, meta-analysis)  
Descriptive analysis of all outcome measures, including associations with study design variables |
|---|---|
| 42. | Specify (per outcome measure) how it will be decided whether a meta-analysis will be performed  
Systematic mapping reviews do not typically involve quantitative synthesis i.e. meta-analysis (Dicks *et al.*, 2014**)) |

If a meta-analysis seems feasible/sensible, specify (for each outcome measure):

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<tr>
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<th>The effect measure to be used (e.g. mean difference, standardized mean difference, risk ratio, odds ratio)</th>
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<tr>
<td>43.</td>
<td>The statistical model of analysis (e.g. random or fixed effects model)</td>
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<td>44.</td>
<td>The statistical methods to assess heterogeneity (e.g. I², Q)</td>
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<tr>
<td>45.</td>
<td>Which study characteristics will be examined as potential source of heterogeneity (subgroup analysis)</td>
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<td>46.</td>
<td>Any sensitivity analyses you propose to perform</td>
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<td>47.</td>
<td>Other details meta-analysis (e.g. correction for multiple testing, correction for multiple use of control group)</td>
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<td>48.</td>
<td>The method for assessment of publication bias</td>
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Final approval by (names, affiliations):
Fiona K Allan  
Isla MacVicar  
Andrew R Peters  
Christian Schnier  
All affiliations:  
Supporting Evidence Based Interventions in Livestock (SEBI-Livestock),  
The Royal (Dick) School of Veterinary Studies,  
University of Edinburgh  
Date: 23-11-2022