

University-based Systematic Review of Prevailing Trends and Information Gaps in Sarangani Research Using PRISMA: Pilot Testing for Feasibility

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Abstract

This paper discusses results of a pilot test applying PRISMA 2020 methodologies on research (inclusive years 1995- 2023) carried out by the Science Department of the Mindanao State University – General Santos (MSU – GenSan) to identify information gaps and research needs of Sarangani Province in Southern Philippines. Included in this study were undergraduate theses, peer-reviewed publications, conference proceedings, and terminal reports, and retrieved 153 studies on various topics surrounding Sarangani Province. Among these, biodiversity assessment and natural and agroecosystem studies predominated in undergraduate theses and published articles, respectively. Study representation across municipalities in the province was fairly adequate, except for Malungon which had notably fewer studies. Unfortunately, a good number of undergraduate theses had been irretrievably lost (years 1997, 2002, 2005, 2007, 2008, 2020, and 2021), along with the valuable information that they contained, resulting in significant data gaps. Spatio-temporal analyses of conducted studies were done to determine trends and gaps for the crafting of evidence-based policy and interventions as well as for future research directions. On the part of the Science Department of MSU – GenSan, this study recommends improved safekeeping and archival systems for undergraduate theses at the Science Department. Furthermore, it is envisaged that this pilot study will galvanize other researchers to carry out work along this line. This way, conducted studies that otherwise languish in neglect in academia will be used as bases for evidence-based planning and programming by local government units, thereby highlighting the important role of academic research in Southern Philippines.

Keywords: *information gaps, research needs, Sarangani Province, systematic analysis*

Sarangani province, situated in the southernmost of Mindanao Island, Philippines, is composed of seven municipalities, *viz.* Alabel, Malapatan, Glan, Malungon, Maasim, Kiamba, and Maitum, with Alabel as its capital. The province is divided into eastern and western sections, separated by General Santos City and Sarangani Bay [1]. In terms of its terrain, the province consists of flatlands, rolling hills, and steep, and is endowed with rich natural resources, including minerals, forests, coastal resources, and diverse floral and

faunal communities [2]. As for its people, 45% of the province's population is composed of an admixture of diverse tribal groups collectively known as Lumads. Among these, Blaans, T'bolis, and Tagakaulos dominate the Sarangani upland areas [3]. These tribal groups are dependent on traditional rice farming as part of their cultural heritage.

Over the years, several published and unpublished studies conducted have provided insight into the state of affairs in Sarangani

Province, its people, its resources, and its natural and agroecosystems. While these studies comprise a tiny fraction of the body of knowledge about Sarangani Province, information that they contain is vital in the policymaking process since these provide sound scientific bases upon which interventions can be based. Moreover, the fragmented and dispersed nature of these studies limit their utility for stakeholders, policymakers, and researchers.

The research-oriented nature of universities makes them ideal environments for creating new knowledge [4]. This knowledge, however, remains dormant and irrelevant if not used in a practical setting. Moreover, alliances between universities and other organizations allow access to knowledge embedded in scientific literature, students' theses, reports, and conference proceedings, and their subsequent utilization to provide solutions to real-world problems [5]. Synthesizing such information can provide a clearer understanding of the current knowledge landscape, reveal existing trends, and highlight priority areas for further research and targeted interventions. There are, however, knowledge gaps that prevent the optimal use of this information. Recognizing such gaps is crucial for the crafting of evidence-based policy and interventions tailored to meet a community's needs. This study was thus conducted to (1) review published, unpublished, and ongoing studies about Sarangani Province conducted by the Science Department of the MSU – GenSan from 1995 to 2023; (2) analyze trends along thematic, spatial, and temporal scales, and (3) identify information and research gaps for potential research and policy recommendations.

Materials and Methods

Data Sources and Inclusion Criteria

Studies eligible for inclusion in this review were those that provided information on the state of affairs in Sarangani Province, its people, resources, and ecosystems. Published studies in peer-reviewed journals, conference proceedings, and gray literature (e.g., undergraduate theses and terminal reports) spanning these inclusive years (1995 to 2023) were considered. Initially, this pilot testing was limited to research conducted by students and faculty of the Science Department of MSU – GenSan. Authorial affiliations were established through institutional metadata accompanying each publication. For journal articles and conference proceedings, affiliations were determined based on byline information, institutional repositories, and author information recorded in digital libraries. For theses and terminal reports, student authorship and

institutional affiliation were confirmed by examining thesis title pages and approval sheets. A systematic screening protocol was employed using Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 flow diagram to ensure the credibility and methodological rigor of the included studies [6].

Review of Historical to Recent Data

For peer-reviewed studies, a thorough literature review was performed using Harzing's Publish or Perish software to retrieve academic citations [7]. Google Scholar and Open Alex, as open-access databases integrated within the software, were primarily used. Additional manual searches in databases such as ResearchGate and Academia were conducted to ensure comprehensive coverage. This approach aligns with previous systematic reviews that utilized Harzing's Publish or Perish software to collect journal articles on specific topics and locations [8-10]. In contrast, gray literature, comprising undergraduate theses, conference proceedings, and terminal reports from the Science Department, was accessed manually.

To collect relevant studies about Sarangani Province, a set of search terms was developed, including combinations like "Sarangani province," "Sarangani Bay," "Mount Busa," "Southern Mindanao," "Alabel," "Malapatan," "Glan," "Malungon," "Maasim," "Kiamba," "Maitum," and "SOCSARGEN". These terms were used to identify a broad spectrum of studies. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 flow diagram was used to systematically screen and filter studies. Studies were organized based on keywords and further assessed to ensure they met the inclusion criteria.

A total of 2,558 studies were initially identified, comprising 2,421 studies documented through Harzing's Publish or Perish software and 137 unpublished studies categorized as gray literature, which were manually retrieved from the Science Department faculty office, Biology stockroom, and the university library. Subsequent filtering and screening removed 237 duplicates, resulting in 2,321 studies. These studies were then further filtered based on authorship criteria, excluding 2,179 studies that were not authored by faculty members or students of the Science Department, which reduced the records to 142 studies eligible for retrieval. Additionally, cross-referencing with published articles identified 11 new records not previously identified in the initial search using the Harzing's Publish or Perish software. Therefore, a total of 120 undergraduate theses and 33 published articles

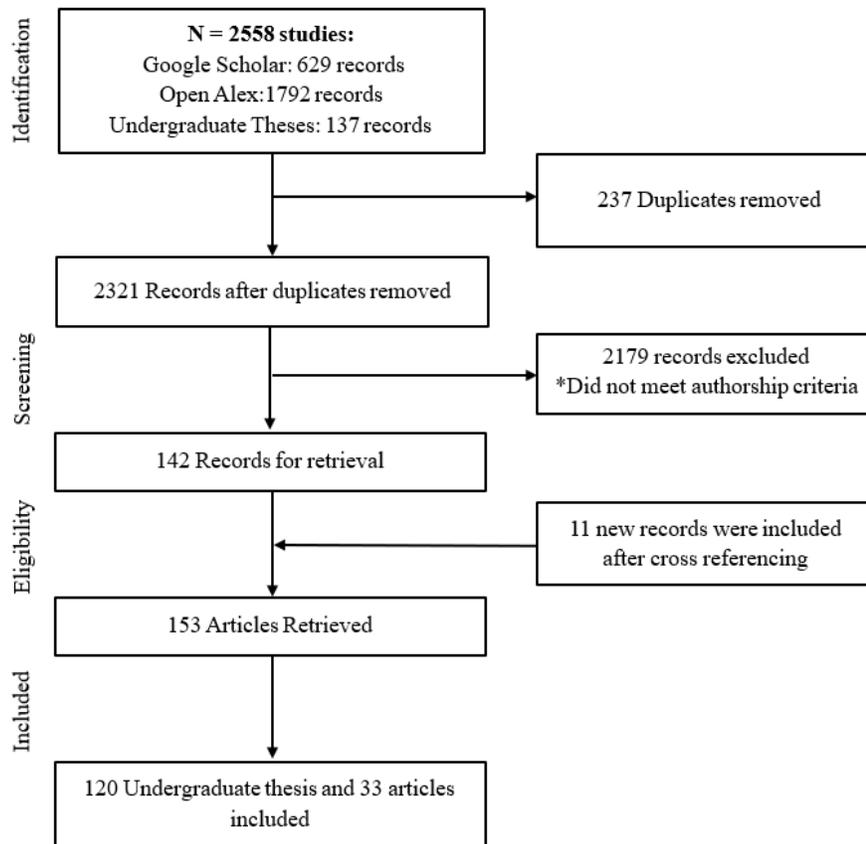


Figure 1. The flow diagram of study selection conducted in this study is based on Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020.

were found suitable for inclusion in this study (Figure 1).

Study Classification, Trend Ascertainment and Information Gap Identification

After study filtering, the final collection of studies was subsequently perused, sorted, then organized along thematic, temporal and spatial categories and encoded in Microsoft Excel. All relevant data were retrieved directly from the full-text documents of each study, including title pages, abstracts, and from metadata available in publication platforms. From the studies, pertinent information collected consisted of the author's name/s, the title of the report, year, source or the name of the journal, publisher, and type of report, DOI or ISSN (if available), as well as the area of science specialty and the location where the study was conducted. The scientific specializations identified across the dataset were categorized into agroecosystem and agrobiodiversity, biodiversity, environmental, human health, microbial diversity, and social research. These categorizations were based on the primary focus of each study, as stated

in the abstract, keywords, or objectives.

Study abstracts (whenever available) were extracted. After study classification, trends embedded in the data were determined, and projections (when data availability permitted) were made through extrapolation of results. Moreover, through inputted spatial data, the QGIS software generated a provincial map that reflected the dispersal of conducted studies in the different municipalities of Sarangani. On the other hand, temporally classified studies were presented as graphs and tables for easier understanding and interpretation. Subsequently, from the generated data representations, information gaps were determined to guide evidence-based interventions (through policy and programs) and potential future research directions.

Results

Finalization of studies to include in this paper yielded a total of 153 studies broken down as follows: undergraduate theses (120), scientific articles (18), terminal report (1), and conference

proceedings (14). A survey across study types and categories/areas revealed highest numbers of studies in 2019 followed by 2018 then 2014, 2004, 2013, and 2015 (Figure 2). Notably, there were no recorded studies for the years 1997, 2002, 2005, 2007, and 2021, possibly due to issues such as pilferage, misplacement, or inadvertent disposal. As for the study themes covered, most were about biodiversity (44.4%), agroecosystems (24.8%) and natural ecosystems (16.3%) with human health and social research done to a limited extent. For biodiversity studies, mangroves predominated (12%) followed by meiofaunals and mollusks (9%) while in traditional agroecosystems, the greatest bulk of research was about upland rice (51%) followed by abaca or Manila hemp (16%) and banana (14%). Other crops and functional plants of

the tribes covered were corn, coffee, sweet potato, cassava, and unidentified indigenous plants with functional uses. Moreover, quite a few studies (16.3%) focused on environment (pollution, carbon sequestration, and water quality assessment and indicator species) were also done. In addition, several studies about community health (rabies incidence, teenage pregnancy, Down syndrome and breast cancer) were also carried out while ethnomedicinal practices (centering on tribal medicines and the healers) of the Sarangani tribes were also conducted. Further, handful of studies explored microbial diversity, specifically focusing on isolates from upland rice. Lastly, a solitary study focusing on community resilience was done in several farming communities using qualitative and framework-based models.

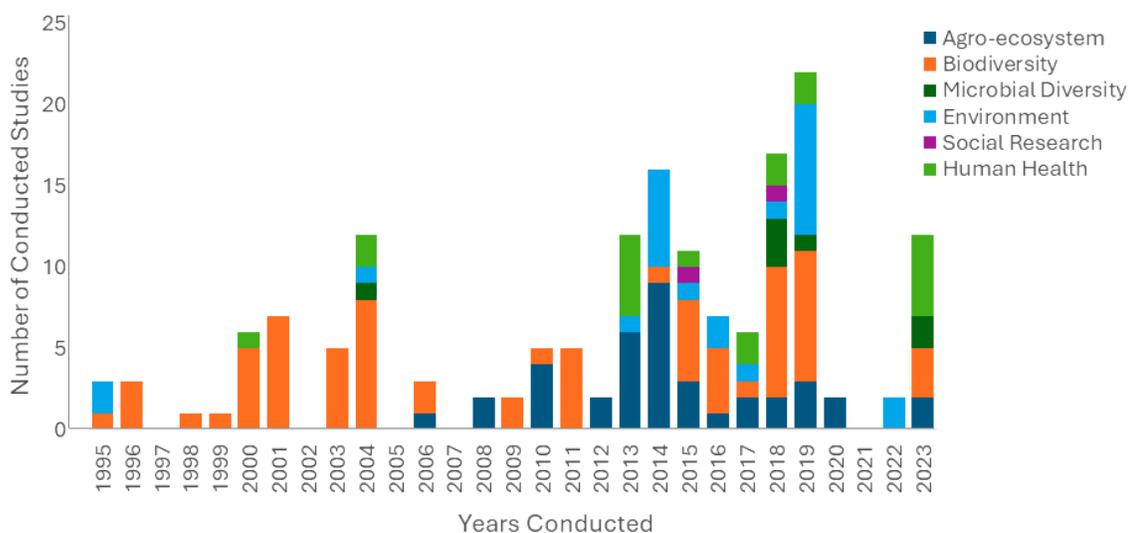


Figure 2. The numbers and topical focus of conducted studies by students and faculty members of the Science Department conducted from 1995-2023.

In Figure 3, the spatial dispersal of conducted studies in the different municipalities of Sarangani Province is shown. These studies (presented in decreasing numbers) were carried out in Maasim, Glan, Malapatan, Alabel, Maitum, Kiamba, and Malungon. It can be seen that Maasim had the greatest number of studies conducted while Malungon was the least studied area. In Maasim, conducted studies focused on biodiversity assessment and environmental evaluation while Malapatan was the main area of focus for agrobiodiversity studies (especially about upland rice).

Discussion

While this study does not generate new empirical data, it systematically analyzed existing

academic outputs to identify thematic, temporal, and spatial research trends related to Sarangani Province. Numerous studies about Sarangani Province, covering a wide range of topics, have been conducted over the years from 1995 to 2023. Owing to their fragmented nature, however, they cannot be utilized by the local government and its constituents who are in dire need of appropriate interventions.

Mangrove-related research emerged as the predominant focus of undergraduate biodiversity studies in Sarangani Province, particularly concentrated in Maasim. This aligns with previous reports of extensive mangrove forests spanning approximately 514 hectares along the inner side of Sarangani Bay, particularly in the municipalities of Glan, Maasim, Alabel, and Malapatan [11]. Similar

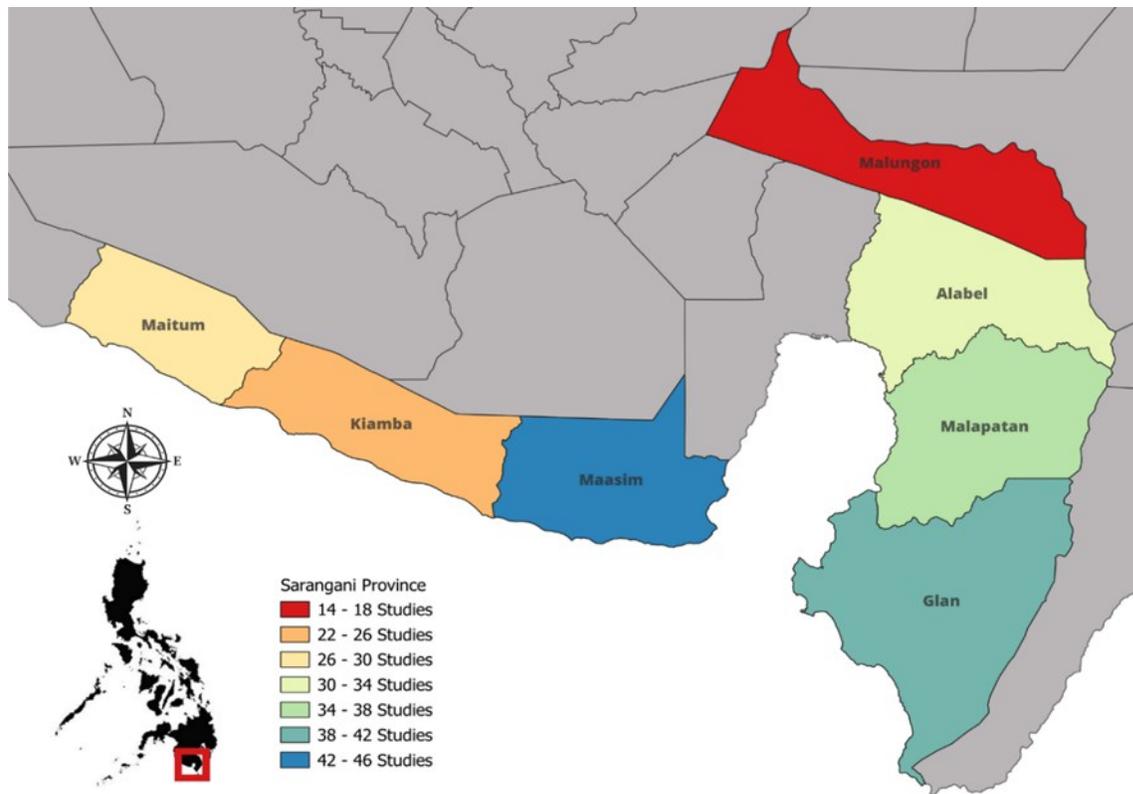


Figure 3. The map of Sarangani Province showing the varying color scheme for the number of conducted studies in different municipalities of the province.

trends have been observed in other coastal regions of the Philippines [12], which substantiate claims that the Philippines is rich in mangrove forests. Comprising 50% of the total mangrove forest species in the world, these species are recognized for their ecological significance and vulnerability to anthropogenic threats [13].

Aside from mangroves, terrestrial and aquatic biodiversity assessments remain underrepresented in the previously conducted studies. Compared to other Philippine provinces, such as Palawan, where floral and faunal assessments have been extensively carried out [14-19], Sarangani remains an underexplored region. Given the province's diverse ecosystems, additional biodiversity assessments are warranted, particularly in remote upland and marine habitats.

As for published scientific articles and conference proceedings, these focused on agroecosystems and agrobiodiversity, with an emphasis on Sarangani upland rice. Biocultural erosion and a very narrow genetic base for traditional rice and other crops, as well as biodiversity losses and extensive ecological devastation in terrestrial and aquatic ecosystems, were highlighted [20, 21]. This is consistent with

global reports on declining crop diversity due to modernization and commercial seed dependence [22].

The observed focus on agroecosystems and agrobiodiversity, particularly upland rice, in published scientific articles and conference proceedings can be attributed to several factors. Primarily, it appears that these studies were conducted by the same or closely affiliated research groups, suggesting a continuity of thematic interest and institutional focus in this domain [21, 23, 3, 20, 24, 25]. This research trajectory aligns with the socio-economic significance of upland agriculture in Sarangani, where traditional farming systems remain a critical component of rural livelihoods and upland rice are seen as the best solution to rice demand [26]. As such, investigations into crop diversity, biocultural erosion, and agrobiodiversity loss are both relevant and necessary to address issues related to food security and cultural heritage conservation.

Moreover, pollution (specifically micro- and macroplastics) in Sarangani Bay is identified as a significant environmental concern, which is consistent with broader findings of marine pollution in the Philippines [27], prompting a call

for research in this area. Similarly, the high number of studies on medicinal plants highlighted their importance, especially in remote villages lacking access to modern medical resources. These findings corroborate conducted studies that documented the reliance on traditional medicine for primary healthcare in geographically isolated areas [28, 29, 15, 30]. However, the lack of phytochemical screening and clinical validation of medicinal plants in Sarangani suggests an opportunity for further research into their pharmacological properties and safety profiles.

This study also identified significant research gaps, particularly in terms of spatial coverage and temporal distribution. While Maasim emerged as the area with the highest number of conducted studies, Malungon had the least research activity. The uneven distribution of studies could be attributed to accessibility challenges, funding limitations, or research priorities of academic institutions. Additionally, the studies included in this review spanned the years 1995 to 2023, with a noticeable absence of undergraduate theses during certain years (years 1997, 2002, 2005, 2007, 2008, 2020, and 2021). This gap reflects potential issues related to inadequate documentation, lack of consistent archiving protocol, or the absence of secure and centralized storage systems, which can lead to the loss, misplacement, or inaccessibility of academic outputs over time. The loss of these academic outputs represents a significant gap in historical research data, emphasizing the need for better archival practices.

Identification of Areas for Future Studies, Policy Recommendations, and Interventions

This study is the first, at least locally and potentially nationwide, to underscore the crucial role of the academe–LGU partnership in harnessing academic research to guide evidence-based policy-making and targeted local interventions. Information generated by this study can be used as a bases for policymakers to craft policies that address the current pressures on Sarangani province and mitigate their effects. From this, recommendations for potential policy formulation can be made as well as a list of literature gaps that can be addressed by commissioning further studies. The prospective research studies, policy recommendations, and interventions listed here are evidence-based and are specifically tailored to meet the province's needs, thereby eliminating the one-size-fits-all approach of local governments especially when no baseline data are available.

Recommendations for the local academic institution (MSU - General Santos) and for the provincial government of Sarangani Province are incorporated in this paper. For the former,

interventions center on better safekeeping of undergraduate theses and other information sources. These are: (1) documentation of all remaining theses with comprehensive metadata (titles, abstracts, authors, etc.) and develop a centralized departmental database; (2) implementation of secure storage strategies, such as digitization and cloud-based solutions (e.g., Google Cloud or CDs). and (3) forging of collaborations/linkages with other colleges, the information and communications technology office (ICTO), and the university library to obtain their records and develop this into a university-wide database of information about Sarangani Province. Furthermore, for future studies, the following are recommended: (1) agrobiodiversity studies involving indigenous, neglected, and underutilized plant genetic resources, (2) value chain analysis for economically important crops, (3) floral/faunal assessment in terrestrial and aquatic habitats, (4), water quality assessment of drinking water in Sarangani Province, (5) inventory and phytochemical screening of medicinal plants, (6) mortality, morbidity, and nutritional status of marginal communities in the province, (7) documentation of indigenous knowledge systems (IKS) about resource use and disaster risk management, and (8) resilience assessment in disaster-prone communities in the province. Finally, on the part of Sarangani Province, the following are recommended: (1) collaboration with MSU – GenSan and other state universities in the area for more exploratory studies and those that need baseline information, (2) upland and lowland ecosystem rehabilitation, (3) community-based resource conservation and (4) intervention targeting health, malnutrition and food insecurity in the more remote areas. Through these collaborations, it is envisaged that evidence-based interventions will be instituted, replacing the inconsistent and inadequately developed approaches of the past. Consequently, this will highlight the relevance of academic research in informing sustainable development strategies, guiding policy decisions, and addressing ecological and socio-economic challenges in Sarangani Province and other areas in the vicinity.

Conclusion

Through the systematic analyses of studies carried by the Science Department of MSU – GenSan, this paper provided valuable information about many aspects of Sarangani Province (i.e. agroecosystem and agrobiodiversity, biodiversity, environment, human health, microbial diversity, and social dynamics) and how these have changed in the face of evolving ecological and

socio-economic scenarios in these areas. Through this study, future researchers can identify new conservation priority areas that need further assessment, thereby providing information required in conservation interventions. This study, is likewise, expected to provide policymakers with valuable insights, including identified research gaps and policy recommendations that can be used to craft policies to address a wide array of problems in the province. Through such engagements, a collaborative and mutually beneficial relationship between Sarangani Province and MSU – GenSan will be fostered, thereby strengthening the university's relevance in the province. Additionally, this study can help close the gap between research generation and research use, while strengthening the awareness among stakeholders about current trends in particular study areas that can be projected into the future. Finally, through the recommendations proposed for policy formulation, data management (at the Science Department) and future research, it is envisioned that information about the province can be collated, synthesized, and distilled into coherent, relevant, and sustainable interventions that will serve end users at the grassroots level best.

Author Contributions

MCAG carried out data collection, collation, analysis and writing of this paper while FLZ conceptualized the study, supervised its conduct and co-wrote the article. CJDV co-wrote this paper and gave valuable inputs for the improvement of the study and helped package it for publication.

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