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REVIEWER'S REPORT

Manuscript No.: IJAR-58675

Title: “Enquête socio-sanitaire sur les sites de production de la moutarde africaine (soumbara) à FERKE en Côte d’Ivoire.”

Recommendation:

Accept with Minor Revisions.....

Rating	Excel .	Good	Fair	Poor
Originality	✓			
Techn. Quality		✓		
Clarity		✓		
Significance		✓		

Reviewer Name: Faheem Abdul Muneeb

Reviewer Report

Overall Assessment

The manuscript entitled “Enquête socio-sanitaire sur les sites de production de la moutarde africaine (soumbara) à FERKE en Côte d’Ivoire” addresses an important and practically relevant public-health issue: the hygienic and sanitary conditions under which soumbara is produced in the Ferké area of northern Côte d’Ivoire. The study examines 150 production sites distributed across Ferké-ville, Diologokaha, Fangakaha, Koussorokaha, and Lassologo and assesses environmental hygiene, sanitation facilities, handwashing practices, personal hygiene, utensils, packaging and storage, and water supply. The topic is relevant because soumbara is an important traditional food product and source of livelihood, while inadequate hygiene during production may create risks for food contamination.

The manuscript has a clear practical orientation and provides substantial descriptive field data. The reported observations are potentially valuable, particularly the very high prevalence of flies, inadequate

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wastewater disposal, limited sanitation facilities, poor handwashing practices, extensive use of non-potable water sources, inappropriate storage conditions, and frequent direct contact between producers' hands and the product. For example, all 150 sites reportedly had flies, 93% disposed of wastewater directly into the environment, 80% of sites lacked toilets, and 80% of producers did not wash their hands during manipulation of intermediate and final products.

The manuscript is therefore potentially useful for researchers and practitioners concerned with food safety, informal food production, traditional fermented foods, and public-health conditions in West African communities. The use of direct site inspection rather than relying entirely on self-reported responses is also a positive feature, and the authors attempt to structure the assessment according to the "5M" approach and Codex-related food hygiene principles.

However, the manuscript in its present form requires substantial clarification before publication. The central problem is not the relevance of the topic or the quantity of data collected, but the alignment between the stated objectives, the methodology, the statistical treatment, the results, and the conclusions. The study states that it evaluates the "knowledge and practices" of producers, but the methods and results predominantly report observations of hygienic conditions and practices rather than an actual measurement of knowledge. Similarly, the statistical methodology refers to ANOVA, Duncan's post-hoc test, means, standard deviations, and microbiological parameters, although the presented study is largely based on categorical frequency data and no microbiological results are reported.

There are also several numerical and terminological inconsistencies that need to be carefully corrected. Some percentages in the abstract and discussion do not correspond to the tables, and the denominators used for certain sanitation variables are unclear. The use of statistical superscripts for categorical frequencies is not adequately explained and appears methodologically inappropriate in several tables. In addition, the conclusion that the producers have a "crucial lack of knowledge" and that the sites are characterized by "total insalubrity" goes beyond what the presented data can establish.

These issues are important but largely correctable through careful revision of the methodology, statistical analysis, presentation of results, and interpretation. The underlying field study appears worthwhile and contains sufficient empirical material to support a useful paper. I therefore consider the manuscript suitable for publication after **minor revisions**, provided that the authors carefully address the methodological and reporting issues identified below.

Strengths of the Paper

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The most important strength of the manuscript is its practical relevance and field-based character. The study examines an actual food-production activity in a specific geographical setting rather than discussing food hygiene only theoretically. The selection of five locations within the Ferké area provides useful information concerning production conditions in a region where soumbara is culturally and economically significant. The manuscript explains that the sites were selected because they contain numerous soumbara production sites and because producers were available and willing to participate.

The sample size is also a positive feature. The inspection of 150 production sites provides a substantial descriptive dataset for an exploratory assessment of hygienic conditions. The distribution of 30 producers/sites per locality provides a relatively straightforward structure for presenting the observations and potentially permits comparisons between localities, although such comparisons are not actually developed in the present manuscript.

The manuscript covers a broad range of food-safety dimensions. Rather than concentrating only on personal hygiene, it considers the location of production sites, environmental conditions, wastewater disposal, sanitation facilities, handwashing, personal hygiene, utensils, packaging, storage, and water supply. This multidimensional approach is appropriate for assessing food hygiene because contamination can occur at multiple points throughout the production environment.

The environmental observations are particularly striking and provide a strong empirical basis for the paper. Table II reports flies at all 150 sites, cockroaches at 60%, mice at 33%, and domestic animals at 80%. Wastewater was reported at 33% of sites in the table, while the separate wastewater-disposal analysis indicates that 93% of sites discharged wastewater directly into the environment. These findings indicate that the environmental hygiene of the production sites deserves serious attention.

The findings concerning personal hygiene are similarly useful. The study reports that only 4% of producers wore clean clothing, only 3% had short nails, 80% had direct contact with products without washing their hands, and 93% wore jewellery during production. The handwashing table also reports particularly low compliance during manipulation of intermediate and final products, with only 4% classified as always washing their hands at this stage.

The assessment of water supply is another important contribution. Only 13% of sites reportedly used water from the SODECI distribution network, while 40% relied on wells and 47% on marigot water. Eighty percent of the sites stored water in basins. These findings are potentially important from a food-safety perspective and deserve greater emphasis in the discussion.

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The study also provides useful information about utensils and storage. Forty-six percent of sites reportedly used ageing plastic utensils, 7% used broken utensils, and another 7% used cracked utensils. Fifty-three percent of storage areas were classified as inappropriate, while all sites reportedly stored soumbara at ambient temperature. These observations provide useful targets for future hygiene interventions.

The discussion attempts to relate the findings to previous work from Côte d'Ivoire and other African settings, rather than treating the observations as isolated. The references to previous research on informal food production, food handlers, sanitation, and soumbara production provide a reasonable starting point for contextualizing the findings.

Areas to be Improved

The first and most important revision concerns the study objective and what was actually measured. The abstract states that the objective was to evaluate the “connaissances et les pratiques” of soumbara producers, and the introduction repeats this formulation. However, the methodology describes an inspection questionnaire based on food hygiene principles, and the results overwhelmingly concern observed conditions and practices. There is no clearly presented section measuring what producers actually know about hygiene, no knowledge score, and no questions or results showing whether producers understand the reasons behind recommended practices.

This distinction is important. Poor practice does not necessarily demonstrate poor knowledge. A producer may know that hands should be washed but lack water, soap, time, or appropriate facilities. Conversely, poor practices can sometimes reflect insufficient knowledge. The authors should therefore either add the actual knowledge assessment if such data were collected, or revise the objective, abstract, results, discussion, and conclusion so that the paper is explicitly presented as an assessment of hygienic conditions and practices rather than knowledge. The current conclusion that there is a “manque de connaissances” is not sufficiently supported by the reported evidence.

The sampling procedure also requires clarification. The manuscript states that 150 sites were visited, “à raison de 30 productrices par village,” which creates some ambiguity about the unit of analysis. Is the study based on 150 production sites, 150 individual producers, or 150 producer-site observations? The wording alternates between “sites,” “productrices,” and “personnel.” This should be made consistent throughout the manuscript. If each producer operated one site, this should be explicitly stated. If several producers worked at the same site, the sampling design is different and should be explained.

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The basis for selecting the five localities also needs clarification. The manuscript says that they were selected because of the number of production sites, availability, willingness to participate, and high production levels. This constitutes essentially a purposive/convenience selection rather than a random sample. The authors should acknowledge this and avoid implying that the results necessarily represent all soumbara production sites in Ferké or northern Côte d'Ivoire. A short statement concerning the generalizability of the findings would improve the methodological credibility of the paper.

The statistical methodology is the most problematic technical issue. The methods state that R 3.01 was used with ANOVA and Duncan's post-hoc test, that means and standard deviations of “paramètres microbiologiques” were calculated, and that differences between means were tested at the 5% level. Yet the manuscript does not report microbiological measurements anywhere in the results. The results consist primarily of counts and percentages for categorical variables. ANOVA and Duncan's test are generally not the appropriate primary tools for comparing such categorical frequency data.

The authors should revisit the entire statistical analysis and describe only the procedures actually used. If the study is purely descriptive, frequencies and percentages may be sufficient. If comparisons among the five localities were performed, appropriate categorical-data procedures such as chi-square or Fisher's exact tests could be considered, depending on cell sizes. If the authors genuinely collected continuous microbiological measurements, those data need to be reported and the corresponding methodology and results added. At present, the reference to microbiological parameters appears disconnected from the actual study presented.

Relatedly, the statistical superscripts in the tables require reconsideration. Tables I–VIII attach letters such as “a,” “b,” and “c” to counts or percentages and state that values followed by different letters are statistically different. For example, Table III gives different superscripts to the numbers of sites discharging wastewater into nature and into a canal. However, comparing the two categories of a single categorical variable and describing them as statistically different using ANOVA/Duncan does not provide meaningful scientific information. If the purpose of the table is simply to describe the distribution of categories, the letters should be removed. If statistical comparisons are intended, the authors need to explain precisely what hypothesis is being tested and use an appropriate test.

There are also important inconsistencies in the numerical reporting that should be corrected throughout. The abstract states that 93% of production sites had no place for wastewater disposal, whereas the results state that 93% of sites discharged wastewater “dans la nature.” These are not necessarily the same

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statement. The former concerns the absence of a disposal facility; the latter concerns the destination of wastewater. The manuscript should distinguish between them.

A particularly important issue concerns **Table IV and its denominators**. The table reports toilets for $n=150$, but covered toilets, clean and attractive latrines, and faecal waste are presented with a total of only 30. The narrative subsequently says that 80% of sites lacked toilets, 80% lacked covered toilets, and 90% lacked clean and attractive latrines. The reader needs to understand whether the latter variables were assessed only among the 30 sites that actually possessed toilets. If so, this must be stated explicitly. The current presentation can easily lead readers to interpret the 30-site denominator as applying to all 150 sites.

The same attention should be given to **Table V and the accompanying narrative**. Some statements in the prose do not correspond neatly to the table categories. For example, the narrative mentions handwashing after touching “une partie du corps,” whereas the table uses “après avoir touché son corps sales,” and the prose and table should employ identical wording. The authors should systematically check every number and category between the narrative and corresponding tables.

The interpretation of the water results also deserves more careful treatment. The finding that 47% of sites use marigot water and 40% use well water is potentially very important, but the study does not test the microbiological quality of these sources. Therefore, the authors should not automatically characterize these sources as unsafe without supporting water-quality measurements. The paper can state that these sources raise potential food-safety concerns and warrant further assessment, but actual contamination should not be inferred solely from the source type.

The same principle applies to the claim that the observed conditions could cause serious food poisoning. The environmental conditions documented in the study clearly suggest potential contamination risks, but no microbiological analysis of the soumbara, water, utensils, or production environment is presented. Therefore, the manuscript should distinguish between observed hygienic risk factors and demonstrated microbiological contamination. A future study could strengthen this work substantially by combining observational hygiene assessment with microbiological testing of the product and relevant environmental samples.

The discussion is currently too limited relative to the amount of empirical material presented. The results contain information on eight major dimensions of hygiene, but the discussion primarily emphasizes sanitation facilities, personal hygiene, and pests. The findings on water sources, utensil conditions, storage, packaging, and wastewater disposal should receive more systematic interpretation. For instance,

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the fact that all sites reportedly store soumbara at ambient temperature deserves discussion in relation to the characteristics of the product, its fermentation process, duration of storage, packaging, and whether ambient storage is necessarily problematic under all circumstances.

The paper would also benefit from a stronger distinction between structural constraints and individual behaviour. The results show very poor handwashing practices, but they also show that sanitation infrastructure is severely limited. Eighty percent of sites reportedly have no toilet, only 13% obtain water from the formal distribution network, and 80% store water in basins. It would therefore be too simplistic to attribute poor hygiene entirely to the producers' lack of knowledge or willingness. The discussion should consider whether inadequate infrastructure, access to water, informality of the production sector, economic constraints, and lack of regulatory support help explain the observed practices.

The manuscript should also avoid the expression “insalubrité totale” in the conclusion. Although the findings demonstrate serious deficiencies, “total insalubrity” is an absolute formulation and is not an analytical measure used in the study. The same applies to the statement that the hypothesis has been “verified.” Since the hypothesis simply predicted that producers would not adopt good hygiene practices, the authors can state that the findings are consistent with the hypothesis, but they should avoid presenting a broad descriptive hypothesis as though it had been formally validated through an inferential statistical test.

The introduction should also be updated and focused more tightly. The opening reliance on FAO material from 1990–1997 is historically understandable but somewhat dated for a contemporary food-safety article. More recent literature on food safety in informal food systems, traditional fermented foods, street foods, and artisanal food processing in West Africa should be incorporated. The manuscript should also avoid making therapeutic claims about soumbara—such as effects on hypertension, jaundice, anaemia, or sexual weakness—unless these claims are directly relevant to the study and supported by appropriate scientific evidence.

The manuscript's title describes the work as a “socio-sanitary” survey, but the actual study is overwhelmingly sanitary. There is little or no systematic socioeconomic analysis of the producers. If socioeconomic variables such as education, income, age, experience, household characteristics, or access to infrastructure were collected, they should be presented and related to hygiene practices. If they were not collected, the title should be reconsidered and a more precise title focused on hygienic and sanitary conditions of soumbara production would be preferable.

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Finally, the manuscript requires substantial language and presentation editing, particularly because it is written in French but contains numerous grammatical, spelling, spacing, and agreement errors. Examples include inconsistent spacing around percentages, “peux” instead of “peut,” “les pratiques”/“la pratiques,” repeated words such as “trois types trois types,” and several awkward formulations. The tables also require uniform formatting, and the use of superscripts and statistical notes should be standardized. The scientific content is sufficiently interesting that these editorial problems should not be allowed to obscure the findings.

Recommendation

This is a relevant field-based study that provides useful descriptive evidence concerning the sanitary conditions and hygiene practices associated with traditional soumbara production in Ferké. The large number of inspected sites, the breadth of hygiene indicators examined, and the direct observation of production environments are important strengths. The findings concerning environmental contamination risks, inadequate sanitation, hand hygiene, water supply, utensils, and storage provide a meaningful basis for recommendations concerning training, infrastructure, and regulation of the sector.

The manuscript nevertheless requires careful revision before publication. The authors should particularly reconcile the stated objective with the variables actually measured, clarify the sampling unit and sampling procedure, correct the statistical methodology, remove or justify inappropriate significance testing of categorical frequencies, resolve the inconsistencies in percentages and denominators, clarify the sanitation table, and avoid interpreting observed poor practices as evidence of lack of knowledge unless knowledge was directly assessed. The discussion should also distinguish potential food-safety risks from demonstrated contamination and should give greater attention to structural constraints such as access to water and sanitation infrastructure.

These revisions would substantially improve the methodological credibility and scientific precision of the paper without requiring a fundamental change in its subject or empirical basis. The study contains worthwhile field evidence and has clear practical relevance for food safety and public health in the Ferké region. **I therefore recommend: Accept with Minor Revisions.**