Hindawi
Advances in Materials Science and Engineering
Volume 2023, Article ID 9803190, 1 page
https://doi.org/10.1155/2023/9803190

Retraction

Retracted: Improved Chicken Reproduction and Yield of Improved Poultry from Titanium Dioxide (TiO_2) Nanoparticles Coated in Jimma Horro Area of Kellem Wollega Zone, Ethiopia

Advances in Materials Science and Engineering

Received 26 December 2023; Accepted 26 December 2023; Published 29 December 2023

This article has been retracted by Hindawi, as publisher, following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of systematic manipulation of the publication and peer-review process. We cannot, therefore, vouch for the reliability or integrity of this article.

Please note that this notice is intended solely to alert readers that the peer-review process of this article has been compromised.

Wiley and Hindawi regret that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

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[1] S. Shuma Abdisa, J. Leta Tesfaye, A. Saka et al., "Improved Chicken Reproduction and Yield of Improved Poultry from Titanium Dioxide (TiO_2) Nanoparticles Coated in Jimma Horro Area of Kellem Wollega Zone, Ethiopia," *Advances in Materials Science and Engineering*, vol. 2022, Article ID 1984178, 7 pages, 2022.

Hindawi
Advances in Materials Science and Engineering
Volume 2022, Article ID 1984178, 7 pages
https://doi.org/10.1155/2022/1984178

Research Article

Improved Chicken Reproduction and Yield of Improved Poultry from Titanium Dioxide (TiO_2) Nanoparticles Coated in Jimma Horro Area of Kellem Wollega Zone, Ethiopia

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Received 12 November 2021; Revised 11 January 2022; Accepted 17 February 2022; Published 18 March 2022

Academic Editor: Palanivel Velmurugan

Current work was accompanied in Kellem Wollega Zones Jima Horro District, Western Ethiopia, to evaluate the reproduction and productive performances of titanium dioxide (TiO_2) nanoparticles' coated poultry. In the existence of sunlight as well as moistness, the titanium dioxide rusts and abolishes microorganisms (bacteria). The covering has been confirmed to decrease bacterial development. Once covered, the superficial remainders self-sanitized as it elongated as there is sufficient sunlight to galvanize the photocatalytic outcome. The middling poultry group scope per family was 12.04 heads. The overall middling time at first of local and improved chicken egg laying was 6.9 and six months, respectively. The overall hatchability and mortality were 82.3 and 41.1, respectively. The lowest chick mortality (39.8) was observed in Tribe Kebele (highland), and the highest clutches per year (2.96) were observed compared to other Kebeles (mid-altitude and low land). Poultry reproductivity is little, so diverse development approaches must be familiarized. The application of TiO_2 nanoparticles in agriculture is a promising method in increasing fine and improved products.

1. Introduction

Agriculture is the backbone of the Ethiopian economy, where the sector contributes about 42.3% to the total gross domestic product (GDP) [1]. The livestock sector as an integral part of agriculture contributes about 40% of agricultural GDP and a quarter (26.4%) of national GDP [2]. In terms of number, Ethiopia has the largest livestock population in Africa, and it is home to 56.71 million cattle, 29.33 million sheep, 29.11 million goats, 2.03 million horses, 7.43 million donkeys, 0.4 million miles, 1.16 million camels, and 56.8 million chicken [3]. Chicken is the largest group of livestock species contributing about 33% of all animal protein consumed in the world [4].

A huge livestock population in general and chicken, in particular, could be expected to increase its contribution to the total agricultural output as well as to improve the living standards of smallholder farmers [5]. This is mainly due to their small size, fast reproduction, low labour, low energy,

and low initial capital requirement and less detrimental impact on the environment compared to other livestock [6].

Of the total chicken reared in Ethiopia, about 99% comprises indigenous, and only about 1% are exotic breeds of chicken. In Ethiopia, about 99% of the total national chicken products (eggs and meat) are contributed by indigenous chickens kept under the village management system, while the remaining 1% is obtained from an exotic breed of chickens kept under intensive management [7]. This might be a function of poor management and lack of awareness.

Nanotechnology is a new, advanced, and interdisciplinary systematic methodology that contains scheming, growth, and solicitation of ingredients and expedients at a molecular plane in nanometre measure at slightest one facet arrays in extent from 1–100 nanometres [8]. It is a wide-ranging continuum developing arena of knowledge that has bright claims which is straightforward and functional disciplines. It will authorize no arena untouched by its appealing systematic claims, and the agronomy segment is no exclusion. The applications of the nanoparticle are explained in Figure 1.

Household people all over the country in broad and emerging states in specific exercise poultry for multiuse practices' counting: as the basis of revenue and capitals to confirm foodstuff safety, traditional and community morals such as ceremonial, expense, and representation, donations to powerful public links, and basis of financial enabling for females [9]. Poultry households in America use bactericidal coverings (coating) to moderate the deliberation of food-borne pathogens in connection with the poultry during fabrication. Green Earth Nano Science Inc., a Canadian company (GENSCC), has established a self-sanitizing photo-catalyst covering (coated) for application in poultry houses [10]. This coating integrates nanoparticle of titanium dioxide (TiO_2). The inimitable photocatalytic characteristics of the nanoparticle of titanium dioxide (TiO_2) are galvanized when the covering is unprotected to likely or ultraviolet (UV) sunlight. In the existence of sunlight as well as moistness, the titanium dioxide rusts and abolishes microorganisms (bacteria). The covering has been confirmed to decrease bacterial development. Once covered, the superficial remainders self-sanitizing as elongated as there is sufficient sunlight to galvanize the photocatalytic outcome. The covering is appropriate by the Canadian-Food-Inspection-Agency (CFIA). In Denmark, the Chicken, as well as Hen Contamination Program, is investigating nano-coatings for self-cleaning and decontamination [11]. The even superficial at the nanoscale makes washing and decontamination more operative. Lastly, Danish researchers are also investigating coatings incorporating nanosilver, which does not need ultraviolet (UV) sunlight for galvanization. The ions from nanosilver preclude the growth of biofilms [12].

In Ethiopia, poultry shows vital parts in the living of supply defied people. Agreeing to poultry manufacture has traditional and financial profits, particularly, in the pastoral societies [13]. The poultry coverage of the country was at an expected 56.87 million, of which 95.86% are indigenous types, 2.79% are cross types, and 1.35% are exotic types (Central Statistical Agency of Ethiopia) [14]. The old-style/community poultry manufacture method is the main method accomplished by nearly all pastoral families [15] and covers more than 90% of the whole poultry meat and egg manufactured in Ethiopia [16]. Investigation rumours from diverse parts of the country showed that the indigenous poultry types have little manufacture [17]. Amid the modern line of scientific novelties in the arena of agronomy, nanotechnology inhabits an illustrious location in remodelling agronomy and nutrition fabrication to fulfil the difficulties in an effective and expensive way.

This investigation was piloted to speak the ensuing aims to assess production yield of local coated with molten titanium dioxide (TiO_2) nanoparticles' poultry and identify major hatchability and mortality of poultry in Jimma Horro District.

2. Materials and Methods

2.1. Description of Study Areas. The survey was shown from November 2018 to December 2019 in three nominated farmer families of Oromia National Regional State. The assessment was conducted at Jimma Horro districts in Kellem Wallega Zone, Oromia National Regional State, Ethiopia. The altitude of the district ranges is between 1400 and 1800 meters above sea level, with average annual minimum and maximum temperature of 18°C and27°C, respectively, while the annual rainfall ranges from 700 to 1000 mm (Ethiopian Digital Elevation Model, 2018). In the study area, livestock and crop farming are the major economic activity of the district. The livestock resource of the study district comprises 66267 cattle, 19421 sheep, 13647 goats, 257 horses, 6809 mules, 9873 donkeys, and 68401 chickens (Jimma Horro Livestock office 2021). Map of the study locations is indicated in Figure 2. The areas were selected because there are many farmers who practice traditional chicken production. Jimma Horro Woreda is one of the 11 woredas of Kellem Wollega zone of Oromia Regional State, located at a distance of about 665 km west of Addis Ababa. The planters in the part exercise diversified husbandry. The total human person of the woreda is around 56403, of which 50% is indicated to be male (Ethiopian Digital Elevation Model 2021).

2.2. Sampling Procedures and Cross-Sectional Survey. The three peasant associations were objectively nominated created on the availability and accessibility of improved titanium dioxide nanoparticle coated poultry ecotypes.

2.3. Data Collection. In this investigation, both secondary and primary data were used to generate qualitative and quantitative information. The questionnaire was translated into Afaan Oromo. It was pre-tested before administration, and some re-arrangement and corrections were made in accordance with respondents' perceptions. Information gathered through questionnaires is socio-economic characteristics of the respondents such as sex, age, education

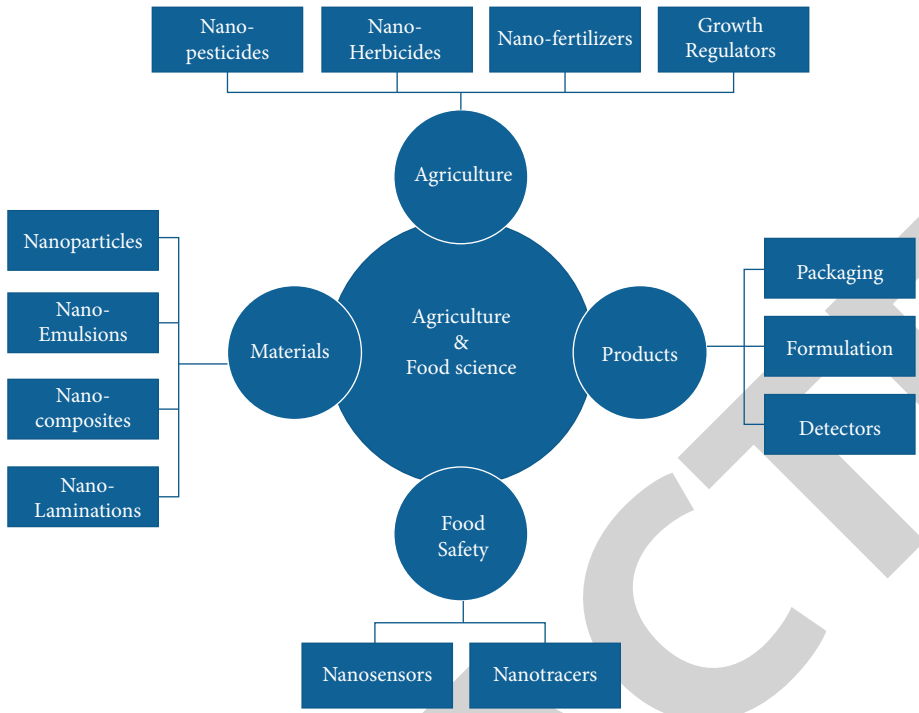

Figure 1: A graphic expression of bids of nanotechnology in agro-food division.

level, household size, livestock possession, the socio-economic benefit of chicken production and major production of egg and meat, and constraints, reproductive performances such as age at first egg, the purpose of keeping chicken, feed, and feeding situations, such as major feed sources, supplementation, and water source, and major diseases of chicken in the areas.

To collect primary information household survey, interviews, with focused groups and key informants, and personal observation were undertaken. The secondary data relevant to this study were collected from published and unpublished sources, Jimma Horro Agriculture and Rural Development Office. Prior to the actual survey, information was gathered through an informal survey based on which the information was obtained from secondary data and informal survey, and a semistructured questionnaire was developed. Both qualitative and quantitative data were interpreted by descriptive statistics. The analyzed data were organized in the form of a table, using percentage, rank, and average.

2.4. Data Analysis. The outcome of calm figures was studied by investigation of alteration (ANOVA) resulting from the SAS 2008. Statistics organized over survey, opinion, and discussion were considered by graphic numbers (SPSS) version 20.

3. Results and Discussion

3.1. Features of Respondents. Family characteristics of respondents around study areas are illustrated in Table 1. Of the interviewed households, about 72.1% and 27.9% were males and females, respectively. About 93.3% were married, and the remaining 2.4%, 2.4%, and 1.8% were single, divorced, and widowed, respectively. Education plays a great role in transferring technology to farmers and initiating their willingness to adopt technologies. Higher percentages of respondents in the study areas were educated (elementary to high school and college) and while only 23.6% were illiterate. The presence of educated farmers in the study district could be an opportunity in the management of chicken and other livestock production.

In relation to their livelihood, popular of the defendants (91.5%) were farmers. The common of the plotted families drop in age below 60% years old; performance that the prolific work essential for care, selling, and organization of poultry manufacture was leading in the household. The average household size was 6.16 ± 0.2, 5.76 ± 0.3, and 5.87 ± 0.2 for Tibe, Ilu Kitaye, and Nunu *kebeles*, respectively, whereas the overall family sizes per household of the study areas were 5.9 ± 0.2 ranging from 1–11persons. Figure 2 illustrates the historical representation of variables and level/types of respondents.

3.2. UV Analysis of Titanium Dioxide (TiO_2) Nanoparticle. UV/visible studies show that the energy band gap decreases with increasing pH values of TiO_2 NPs corresponding to the redshift of the optical absorption edge [18]. This is due to an increase in pH value and lowering of interatomic spacing. It is noteworthy here that values of energy band gap obtained are lower as compared to energy bandgap 3.1 eV for pure anatase, 3 for rutile phase, and the data reported for the mixed-phase TiO_2 nanopowders exhibiting as a capable candidate for self-cleaning application [19]. UV-Vis characterization of TiO_2 coated poultry for improved chicken production is depicted in Figure 3.

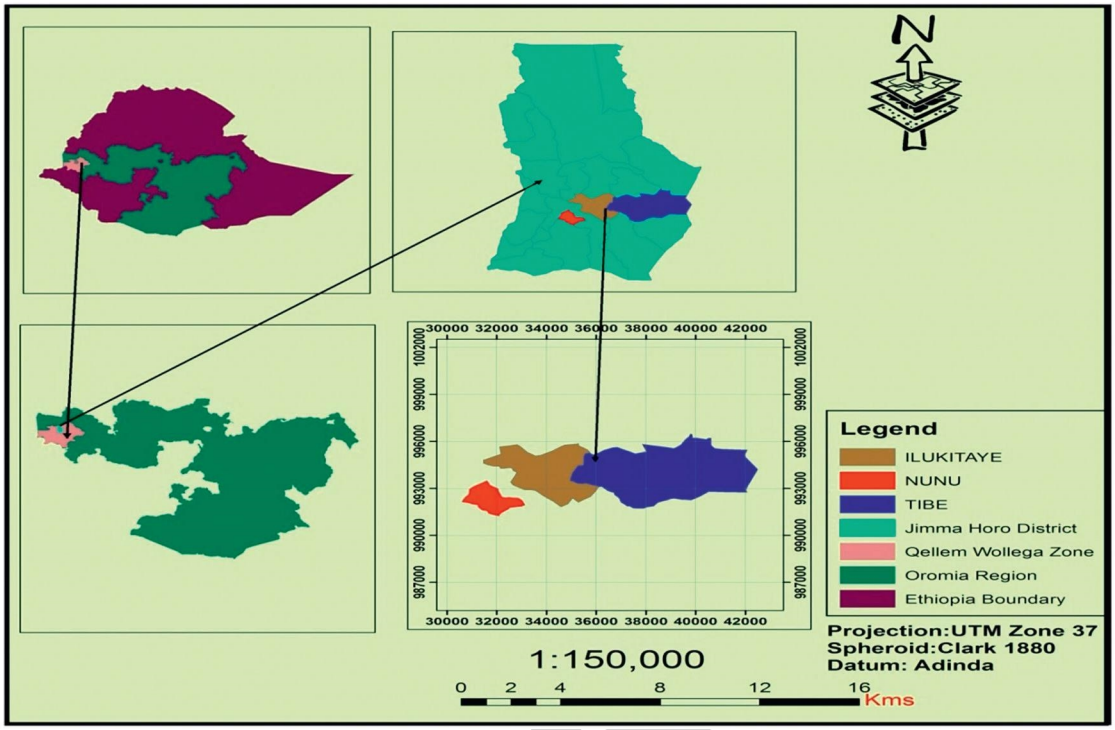

Figure 2: Map of study area (survey parts).

Table 1: Demographic features of defendants in the survey parts.

Variables	Kebeles			
	Tibe ($N = 55$)%	Ilu kitaye ($N = 55$)%	Nunu ($N = 55$)%	Total ($N = 165$)%
Gender of defendant				
Male	67.3	75.5	74.5	72.1
Female	32.7	24.5	25.4	27.9
Marital status				
Single	0	1.8	5.5	2.4
Married	100	96.4	83.6	93.3
Divorced	0	1.8	5.5	2.4
Widowed	0	0	5.5	1.83
Educational level				
Uneducated	18.2	25.5	27.3	23.6
Read and write	45.5	31	23.6	33.3
Elementary	20	30.9	14.5	21.8
High school	12.7	12.7	21.8	15.8
Technical vocation	3.6	0	12.7	5.5
Chief job				
Farmers	90.1	96.4	89.1	91.53
Traders	5.5	2.5	0	2.66
Depend on mining activity	0.8	1.1	0	0.63
Fisher men	0	0	0	0
Government worker	3.6	0	11.9	5.16
Age of households				
> 60 years	7.00	7.00	8	7
Between 35 and 60 years	63.70	58.80	59.64	60.71
Between 19 and 34 years	29	34.00	32.00	32
Average family size/household (mean ± SE)	6.16 ± 0.266	5.76 ± 0.308	5.87 ± 0.229	5.93 ± 0.167
Age of respondents	45 ± 0.984	43.13 ± 0.778	42.64 ± 0.676	43.59 ± 0.479

N, number of respondents; %, percent; SE, standard error.

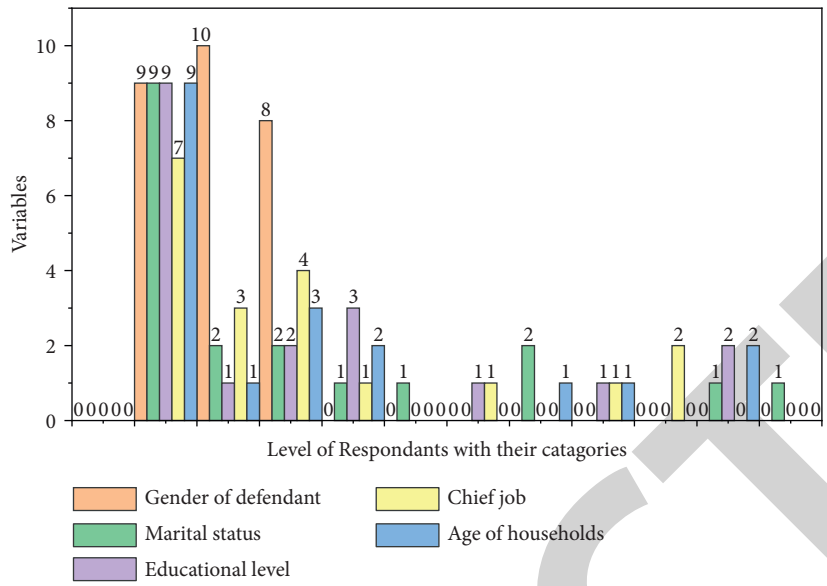

Figure 3: Historical representation of variables and level/types of respondents.

Table 2: Reproduction and manufacturing yields of the titanium dioxide nanoparticle coated improved poultry.

Parameter	Tibe (55) Mean ± SE	Ilu kitaye (55) Mean ± SE	Nunu (55) Mean ± SE	Total Mean	Total Range	P value
Egg produced from exotic per year	232 ± 0.5^{a}	230.1 ± 0.59^{b}	232.3 ± 0.59^{c}	225.2	220–250	0.001
Egg laid per hen per clutch	42.35 ± 0.2^{a}	42.27 ± 0.2^{a}	40.18 ± 0.29^{b}	41.60	37–47	0.001
Age at 1st egg (exotic)	5.94 ± 0.0^{b}	6.4 ± 0.8^{a}	6.21 ± 0.06^{a}	6.00	5–7	0.001
Age at slaughtering (exotic)	4.76 ± 0.1^{b}	5 ± 0.086^{ba}	5.02 ± 0.07^{a}	5.01	4–6	0.003

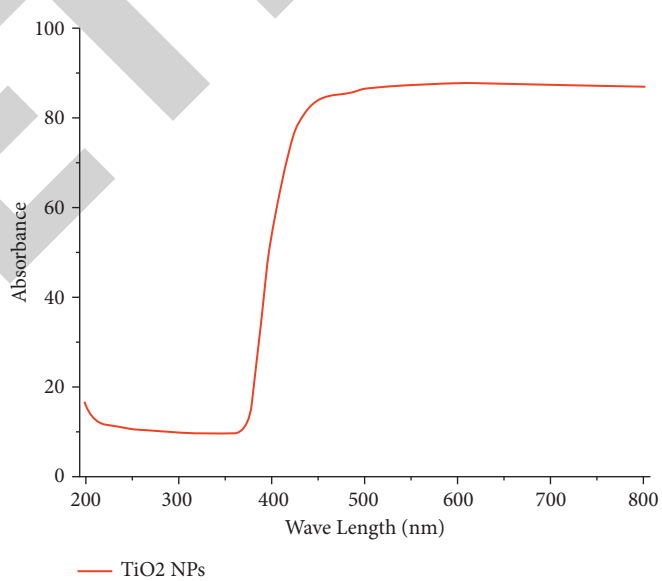

Figure 4: UV-Vis characterization of TiO_2 coated poultry for improved chicken production.

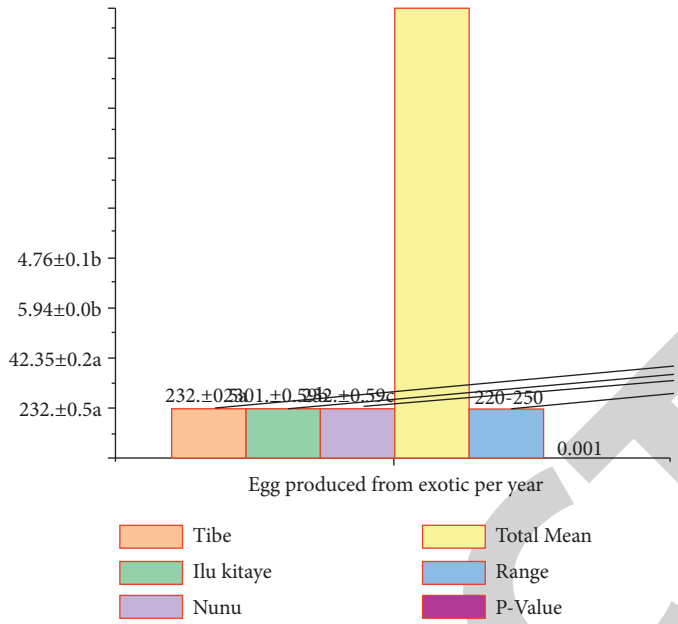

Figure 5: Historical representation of result analyzed for three kebele.

4. Reproduction Performance of Improved Chicken from Coated and Conventional Techniques of Poultry

4.1. Age of First Egg. The current survey shows the total middling period at the first egg of improved chicken was six months, reaching from 5–7 months with significant variance ($P < 0.05$) between peasant associations (Table 2). The average at first egg (183 days) for improved chicken was extended than that described for the saleable chicken ranches. Figure 4 shows the historical representation of the result analyzed for three Kebele. Historical representation of result analyzed for three Kebele is depicted in Figure 5.

The average age at slaughter heaviness of 1.5 kg of the improved broiler chicken of the Jimma Horro District was accomplished at around five months. There were differences among the diverse *Peasant associations* in age at slaughter heaviness of the improved broiler chicken ($P < 0.05$). The age at a slaughter weight of improved poultry in Tibe (highland) *kebele* was originated to be significantly advanced ($P < 0.05$) than Nunu (lowland) *Kebele* and Ilu Kitaye (mid-altitude). Comparing the three *kebeles*, *Tibe kebele* (highland) had the best performance. This might be a function of management in Tibe keble and was good compared to the other two kebeles.

4.2. Egg Manufacture Performance of Improved Chicken. The middling number of improved chicken eggs per clutch survey part is 41.6. There was significant variance ($P < 0.005$) among the three *Kebeles* (agro-ecologies) in the yield of the improved poultry as measured by the middling number of eggs per clutch. Poultry from Tibe (highland) and Ilu kitaye (mid-altitude) *kebeles* had significantly advanced ($P < 0.005$) middling amount of eggs/clutch than chicken of Nunu (low land) kebele.

The general mean yearly egg manufacture of improved chicken was 229.2 ranging from 220–250 seeds. This rate is minor than the rate described for improved breeds of Ethiopia, which harvest around 250 eggs per year per hen under village supervision situations [20]. The major difference in yearly egg manufacture of Tibe *kebele* (highland) is maybe related to the great egg manufacture per clutch noted in the *kebele,* which are the occupation of managing.

5. Conclusions

The results of the present study show that village-improved chicken plays a significant role in the livelihood of the farming community of Jimmo Horro District. It serves as a source of income and as an affordable source of animal protein, and chickens are also used in many social and cultural or religious ceremonies. The majority (51%) of the respondents were keeping chicken for sale, while 20% and 14% were keeping chicken for eggs and meat for household consumption, respectively. The most dominant improved chicken production system in the study area was an extensive subsistence system which is based on scavenging and seasonal supplementary feeding of homegrown grains and household food refusals. In this study, the obtained result is that the average group scope per family of the Jimma Horro District was 12.04 poultry, and the importance is greater than the general middling. The middling titanium dioxide (TiO_2) nanoparticle-coated poultry group scope per family was 12.04 heads. The overall averaging time at first of local and improved chicken egg laying was 6.9 and six months separately. The overall hatchability and mortality were 82.3 and 41.1, respectively. The lowest chick mortality (39.8) was observed in Tibe Kebele (highland), and the highest clutches per year (2.96) were observed compared to other Kebeles (mid-altitude and low land). TiO_2 nanoparticle-coated poultry reproductivity is little, so diverse development

approaches must be familiarized. The application of TiO_2 nanoparticles in agriculture is the promising method in increasing fine and improved products.

Data Availability

The data used to support the findings of this study are included within the article.

Disclosure

This study was performed as a part of the employment of the authors.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

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