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Livestock Data Management Practice on Research Station of Gandaki Province of Nepal

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ABSTRACT

Data management is the systematic collection, storage, cleaning, editing, transcribing, and disposal of waste data. The Nepal Agricultural Research Council (NARC) is the country's primary custodian and leading agricultural research organization. NARC has generated a wealth of primary data through design and experimentation, including sample survey research in animal science and Crop science. Livestock knowledge management is critical for efficient and effective livestock production because it allows farmers to make informed decisions while also ensuring that the productivity. The current study attempts to investigate the past and current scenario of livestock data management on a small scale, identifying possible ways of efficient scientific data management tools and techniques within a country's agricultural research the system. NARC can play an important role in data management by providing access to agricultural research and development data and information, providing technical assistance to farmers and other agricultural stakeholders, and developing and implementing policies and procedures. The questionnaire was filled out by 36 respondents from three research stations in the Gandaki province via Google form, which revealed that 44.40% of the researchers used statistical software for sample size calculation, 52.50% of the researchers consult statisticians for framing experimental design, sample size calculation, research questionnaire construction, data management, and report writing. For livestock and fisheries data management and analysis procedures, 66.70% used Microsoft Excel, 75% used SPSS, and 33.30% used R studio. Researchers involved in livestock and fisheries research in the study area used both open source and proprietary statistical software for data management and analysis. Livestock data management not only improves the researcher's statistical capacity, but also raises farmer, stakeholder, and researcher awareness of production and productivity. PSPP, Jamovi, Blue-sky Statistics, R studio, and Python were all highly recommended for livestock data storage, management, analysis, and interpretation. As a result, GIS and qualitative data analysis are critical for improving livestock data. Evidence-based decision-making is now axiomatic in many sectors and has become increasingly important in prioritizing development in low- and middle-income countries.

Keywords: **Agriculture Research, Livestock, Data Management, Design, NARC**

INTRODUCTION

Data are valuable gold for all research organizations because they allow them to measure the productivity, effectiveness, efficacy, and goals of their research. Data, according to Resnik (2008), is "recorded information used to develop or test human knowledge(*1. Understanding Data and Research | The Ethics of Data Management*, n.d.)." Data management is the systematic collection, storage, cleaning, editing, transcribing, and disposal of waste data. Data management is the practice of managing data as a valuable resource in order to maximize its value to organizations. Effective data management necessitates the use of a data strategy as well as dependable methods for accessing, integrating, cleansing, governing, storing, and preparing data for analytics. There were numerous problems and challenges for the analysis and data management of research work prior to the advancement of statistically based computer software technology. Nepal Agricultural Research Council (NARC) is the country's primary custodian and leading agency for agricultural research for agricultural grafters and development. Since the establishment of NARC, numerous livestock and crop sector research projects have been carried out in order to advance agricultural research. As one of the world's leading agricultural research institutions, NARC has generated a wealth of primary data through design and experimentation, including sample survey research in animal science and plant science. Primary data are more reliable and valid tools for agricultural technology verification, which is advantageous to agricultural researchers, academicians, and professionals. Agricultural data are vital tools for nations in developing plans, programs, and policies.

The process of gathering, organizing, and analyzing data linked to livestock production is known as livestock data management. This information may include animal health, nutrition, reproduction, genetics, and production performance. It may also contain information about environmental aspects such as weather, soil, and water quality. For efficient and effective livestock production, data management is critical. It assists farmers in making educated decisions regarding their operations and ensuring the health and productivity of their animals. Data management also assists producers in identifying areas for improvement and developing strategies to boost efficiency and profitability.

Farmers and ranchers need livestock data management to track the health and performance of their animals. It assists them in making informed decisions regarding their cattle, such as when to vaccinate, breed, and sell. It also aids them in monitoring their animals' health, identifying any problems, and taking appropriate action. Data management can also assist farmers and ranchers increase the efficiency and profitability of their operations.

Livestock data management benefits research groups by offering a comprehensive view of their livestock operations. This includes checking animal health and performance, monitoring feed and nutrition, and regulating breeding and genetics. It also aids in the identification of areas for improvement and potential study fields. With access to reliable and up-to-date data, research organizations may make informed judgments about their livestock operations and establish strategies to enhance them. Furthermore, data management can assist in identifying trends and patterns in livestock production, which can then be utilized to inform research and development.

In research organizations, a livestock database is often built utilizing a combination of software and hardware. A database management system (DBMS) such as Oracle, Microsoft SQL Server, or MySQL is commonly used to build the database. This program is used to store and manage the data in the database. The hardware used to build the database typically includes servers, storage devices, and networking equipment. The servers are used to host the database and offer access to it. The storage devices are used to store the data in the database. The networking equipment is used to connect the servers and storage devices to the rest of the organization's network.

In recent years, livestock databases have grown in popularity as a means of tracking and managing cattle. Animal's databases are used to record and manage information about animals, such as breed, age, health, and productivity statistics. They can also be used to track and monitor animal movements, as well as animal health and welfare.

A literature study of livestock databases was done to examine the current state of the art in this subject. The analysis discovered that there are numerous types of livestock databases accessible, including commercial, open source, and custom-built databases. The review also discovered that the databases differ in terms of aspects such as data storage capacity, data security, and user-friendliness.

1. FAOSTAT: The Food and Agriculture Organization of the United Nations (FAO) maintains a comprehensive database of livestock statistics known as FAOSTAT. It includes data on cattle production, consumption, trade, and pricing, as well as other pertinent information.

2. Livestock statistics Network: The Livestock Data Network (LDN) is a global database of livestock production and trade statistics. It is managed by the International Livestock Research Institute (ILRI) and provides thorough information on livestock production, consumption, and trade.

3. Global animal Production and Health Atlas: The Global Livestock Production and Health Atlas is a comprehensive database of animal production and health data. It is administered by the World Organization for Animal Health (OIE) and provides thorough statistics on livestock production, health, and commerce.

4. Global Livestock Information Network (GLIN): The Global Livestock Information Network (GLIN) is a global database of livestock production and trade statistics. It is maintained by the Food and Agriculture Organization of the United Nations (FAO) and includes precise information on livestock production, consumption, and trade.

5. Global Livestock Monitoring System (GLMS): The Global Livestock Monitoring System (GLMS) is a global database of livestock production and trade statistics. It is managed by the World Bank and includes thorough information on livestock production, consumption, and trade.

The practice of managing livestock data in Nepal is still in its infancy. The Nepalese government has taken certain steps to strengthen the livestock sector's data management system. The Department of Livestock Services (DLS) created the Livestock Information System (LIS) to gather, preserve, and analyze data on livestock production, health, and marketing. The system is used to track livestock farm performance, identify areas for development, and devise plans for better livestock management.

A Livestock Data Management Unit (LDMU) has also been established by the government to coordinate the collecting, storage, and analysis of livestock data. The LDMU is in charge of creating and updating the LIS, as well as providing technical assistance to livestock farmers and other stakeholders. https://nepal.gov.np:8443/NationalPortal/view-page?id=62

Manage the collection, the government has also formed a Livestock Data Management Unit (LDMU).

Furthermore, the government has launched a Livestock Data Portal (LDP) to give all stakeholders with access to livestock data. Data on livestock production, health, and marketing, as well as other related information, are available through the portal. The portal is also used to share information about cattle rules and activities.

The government is also attempting to improve livestock data quality by implementing new technologies such as Geographic Information Systems (GIS) and Remote Sensing. (RS). Data on cattle productivity, health, and marketing is collected and analyzed using these technologies. Overall, the Nepalese government is working to strengthen the livestock data management system.

The Nepal Agricultural Research Council (NARC) can play an important role in data management by giving access to data and information related to agricultural research and development. NARC can also provide technical assistance to farmers and other agricultural stakeholders to guarantee the effective use of data and information. Furthermore, NARC can create and execute policies and procedures for data management and data sharing in the agriculture sector. Finally, NARC may give training and capacity building to agricultural stakeholders to enable optimal data and information utilization.

For livestock and fisheries research, a number of databases can be built, including databases for tracking animal health, genetic information, production data, and environmental data. Databases can also be utilized to store feed and nutrition information, animal behavior, and market trends

MATERIAL AND METHODS

The station-specific literature review was conducted using primary and secondary sources. Data were gathered from previous annual reports, publications of scientists and technical officers of research stations. Primary data were gathered from an authentic source of livestock unit. A sample survey was conducted within the NARC research stations. A self-administrative Google questionnaire form was created and distributed to NARC researchers, who completed the form electronically. The collected data on the research station were entered into Microsoft Excel 2013 version. These data were edited at the field and central levels for further data validation. These data were analyzed using open source and proprietary statistical software.

Survey Site

The survey site was NARC research Station of Nepal. There were 66 research station of Nepal Agriculture Research Council of Nepal including the commodity research program office. Nearly 70 researchers were asked questionnaire through google form questionnaire through via mail during period 2023 January to April 4. The pretesting of the questionnaire was carried out on 15 sample form .The reliability of the questionnaire was tested by calculating the Cronbach's alpha to examine the internal consistency of the questionnaire which was 0.69. Later on, questionnaire was modified according as the result of the pretesting.

Data Processing

The collected data were entered in to Microsoft Excel Version 2013 in which data validation and editing were done properly. Finally, edited raw data were transferred in to SPSS, PSPP and R studio for further data management and analysis

Data Analysis

All the required assumption for statistical analysis for various parametric and nonparametric statistical test were examined so that analysis and interpretation were more accurate. However, outlier detection and their remedial solution was properly done through user-friendly statistical software. The experimental design adopted in experimental field trial were, basically

Completely Randomized Design (CRD), Randomized Block Design (RCBD), Latin Square Design (LSD) and Split Plot Design and So on following the essential principle of randomization, replication and local control. The fixed effect model and mixed effect model of analysis of variance are used in the majority of animal and plant science research. Before applying the Global test of significance, the basic assumptions of ANOVA are I normality, (ii) variance homogeneity, and (iii) error independence, all of which must be tested.

The completely randomized design model (Gomez & Wiley, n.d.)is given by

The completely randomized design model

$\boldsymbol{Y_{ij}} = \mu + \boldsymbol{\alpha_i} + \boldsymbol{e_{ij}}$ (Fisher, 1925) .... (1)

$$\boldsymbol{TSS = SST + SSE}$$

Total Sum Square = Sum of Square due to Treatment+ Sum of Square due to Error …… (2)

$\boldsymbol{Y_{ij}} = \mu + \boldsymbol{\alpha_i} + \boldsymbol{b_j} + \boldsymbol{e_{ij}}$ (Montgomery, 2020)...................... (3)

$$\boldsymbol{for\ all\ i = 1, 2, 3, \ldots\ldots\ldots, a}$$

j=1,2,3,……………,b

$$\boldsymbol{TSS = SST + SSB + SSE}$$

Total Sum Square = Sum of Square due to Treatment+ Sum of Square due to block Sum of Square due to Error

$\boldsymbol{Y_{ijk}} = \mu + \boldsymbol{\alpha_i} + \boldsymbol{b_j} + \boldsymbol{\gamma_k} + \boldsymbol{e_{ijk}}$ (Montgomery, 2020)...................... (3)

$$\boldsymbol{for\ all\ i = 1, 2, 3, \ldots\ldots\ldots, n}$$

j=1,2,3,……………,n

k=1,2,3,…………..,n

$$TSS = SSR + SSC + SST + SSE$$

Questionnaire during pretesting. Total Sum of Square =Sum Square due to Row +Sum Square due to Column+ Sum Square due to Treatment+ Sum Square due to Error

The blocking model in a factorial design with interaction effect is given by

Y_{ijk} =μ $+\alpha_i + b_j + (\alpha_i b_j) + e_{ij}$ …………………. (4)

for all, i=1,2,3………….a

j=1,2,3……………b

k=1,2,3,…………..n

The general linear model for the Split Plot design is given by

Y_{ijk}=μ+α_i+b_j +$(\alpha b)_{ij}$+v_k+$(\alpha v)_{ik}$+$(bv)_{jk}$+$(\alpha bv)_{ijk}$+e_{ijk} **…………..(5)**

For all, i=1,2,,…….,r

j=1,2,3…….a

k=1,2,3………b

Where α_i, b_j and $(\alpha b)_{ij}$ represents the whole plot and correspond to respectively to blocks (or replicates), main treatments (factor A), and whole plot error (replicates or blocks) X A); and v_k, $(\alpha v)_{ik}$, $(bv)_{jk}$; and $(\alpha bv)_{ijk}$ represents the subplot and correspond respectively to the subplot treatment (factor B),the replicates or blocks X B and AB interactions, and the subplot error (block X AB).

Most of the statistical design in animal science research based on the fixed effect model and mixed effect model of analysis of variance. The basic assumption of ANOVA before applying Global test of significance is (i) Normality (ii) Homogeneity of variance and (iii) Independence of error which is essential to be tested.

Data Management

The data management practice was primarily carried out in Microsoft Excel due to its multifaceted structure in data entry, editing, and analysis. However, user-friendly and open-source statistical software like Genetat, SPSS, Minitab, R Studio, and Stata were frequently used. PSPP kept and accomplished data protection for the gathering and storage of data.

RESULTS

Table 1 shows that distribution of herd strength of goat in National Goat Research Program (Bandipur) where majority of lat. Capra aegagrus hircus goat was found in breed development.This table presents a comprehensive figure of the goat population within the National Goat Research Program in Bandipur, classified by breed/species, gender, and age groups, presumably shown by columns for males and females across three subcategories during the data collection over a cross-sectional period. The overall population is aggregated for each breed. There was a wide variety of goat breeds, such as Khari, Boer (purebred and crossbred), Jamunapari, Barbari, and Saanen.

The predominant population, including 170 individuals, succeeded by Boer 87.5% (112) and Boer 75% (94).

No goats have been documented for the Jamunapari and Sinhal breeds, suggesting either a lack of current inventory or non-involvement in the program.

Crossbreeds, including Saanen 93.75%, Saanen 87.5%, and Boer 98.44%, have reduced numbers. In the first subcategory, males comprise 30 individuals, while females predominate with 188.Within the overall population, several breeds exhibit a nearly equal distribution; yet, females typically exceed males considerably.

Aggregate Population: The herd has a total of 706 goats, exhibiting significant variation in both purebred and crossbred varieties.The Boer breed is well represented, especially in the high crossbreed percentages (87.5% and 75%), which shows that breeding methods for this variety are being focused on.

The Saanen breed is prevalent, albeit in lesser quantities, especially in its pure and hybrid varieties. Specific breeds, including Nubian, Jamunapari, and Sinhal, lack documented populations, possibly because of their poor significance to the program's objectives. This data illustrates the program's commitment to preserving a varied genetic pool, with a particular emphasis on Boer and Saanen breeds for effective crossbreeding. The prevalence of females in the population is characteristic of breeding operations designed to enhance herd productivity. The exclusion of certain breeds may indicate prioritizing or resource allocation tactics within the study program.

Table 1 Herd strength of goat in National Goat Research Program, Bandipur

Goat Breed/Species	Male	Female	Male	Female	Male	Female	total

Khari	2	38	7	27	10	16	100
Sinhal	NA	NA	NA	NA	NA	NA	0
Jamunapaari	NA	NA	NA	NA	NA	NA	0
Jamunapaari 50%	NA	7	NA	NA	NA	NA	7
Boer Pure	21	53	2	37	31	26	170
Boer 99.61%	NA	NA	NA	NA	NA	NA	0
Boer 99.22%	NA	NA	NA	NA	NA	NA	0
Boer 98.44%	NA	NA	NA	1	1	NA	2
Boer 93.75%	NA	2	NA	9	5	NA	16
Boer 87.5%	NA	9	10	10	27	56	112
Boer75%	1	20	NA	32	16	25	94
Boer 50%	1	23	1	20	23	20	88
Boer 25%	NA	NA	NA	NA	NA	NA	0
Barbari Pure	1	6	NA	4	5	6	22
Saanan Pure	4	21	NA	10	9	8	52
Saanan 75%	NA	3	2	4	1	NA	10
Saanen 50%	NA	3	NA	3	2	3	11
Saanen93.75%	NA	NA	2	2	1	5	10
Saanen 87.5%	NA	3	2	3	3	1	12
Nubian 50%	NA	NA	NA	NA	NA	NA	NA
Total	30	188	26	162	134	166	706

Source: National Goat Research Station; Bandipur

Table 2 reveals that testing the assumption of normality Paudel et al. collected weight data that demonstrated normality. Both the K-S and S-W tests show that the weight data adhere to a normal distribution throughout all time intervals. The results corroborate the assumption of normality, which is essential for subsequent parametric statistical analyses such as ANOVA or regression.

Table 2: Testing the assumption of Normality in weight data

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
Weight(kg.)	Statistic	df	Sig.	Statistic	df	Sig.
Initial A	0.131	16	0.200*	0.981	16	0.968

After 7 days	0.156	16	0.200*	0.979	16	0.959
After 14 Days	0.133	16	0.200*	0.979	16	0.951
After 21 Days	0.111	16	0.200*	0.981	16	0.968
After 28 Days	0.108	16	0.200*	0.985	16	0.992
After 35 Days	0.106	16	0.200*	0.985	16	0.992
After 42 days	0.124	16	0.200*	0.983	16	0.983
After 49 days	0.148	16	0.200*	0.980	16	0.960
After 56 days	0.133	16	0.200*	0.984	16	0.986
After 63 days	0.130	16	0.200*	0.969	16	0.819
After 73 days	0.127	16	.0200*	0.960	16	0.654

* This is a lower bound of the true significance.

a Lilliefors Significance Correction

Source : Paudel etal.Unpublished data ,Bandipur

Table 3 displays an ANOVA (Analysis of Variance) test that compares the mean weights of goats across different treatments at multiple time intervals. This is a guide to understanding the essential components of the table. The sum of squares of the variance among groups is the variance attributable to disparities among treatment group means. Also, the sum of variance within the group and the variance among the treatment groups is known as the error variance.

The likelihood of obtaining the data assuming the null hypothesis (no difference between means) is valid. Generally, we regard a p-value under 0.05 as statistically significant. Throughout all time points, the F-values are minimal, and the p-values (Sig.) are elevated, signifying no significant changes in goat weights across the different treatments at any interval. This outcome indicates that the treatments did not produce statistically significant differences in average goat weights over time.

Table 3: ANOVA table for variation in mean comparison of Goat Weight among various Treatments

		Sum of Squares	df	Mean Square	F	Sig.
Initial	Between Groups	17.674	3	5.891	0.299	0.825
	Within Groups	236.055	12	19.671		
	Total	253.729	15			
After 7 days	Between Groups	6.407	3	2.136	0.117	0.948
	Within Groups	218.237	12	18.186		
	Total	224.644	15			
After 14 Days	Between Groups	6.134	3	2.045	0.117	0.948
	Within Groups	209.765	12	17.480		
	Total	215.899	15			

After 21 Days	Between Groups	3.747	3	1.249	0.067	0.977
	Within Groups	225.090	12	18.757		
	Total	228.837	15			
After 28 Days	Between Groups	4.237	3	1.412	0.073	0.974
	Within Groups	233.362	12	19.447		
	Total	237.599	15			
After 35 Days	Between Groups	8.079	3	2.693	0.124	0.944
	Within Groups	261.411	12	21.784		
	Total	269.491	15			
After 42 days	Between Groups	8.806	3	2.935	0.149	0.928
	Within Groups	236.309	12	19.692		
	Total	245.114	15			
After 49 days	Between Groups	6.752	3	2.251	0.114	0.950
	Within Groups	237.827	12	19.819		
	Total	244.579	15			
After 56 days	Between Groups	6.879	3	2.293	0.117	0.948
	Within Groups	234.419	12	19.535		
	Total	241.298	15			
After 63 days	Between Groups	13.056	3	4.352	0.230	0.874
	Within Groups	226.777	12	18.898		
	Total	239.833	15			
After 73 days	Between Groups	15.852	3	5.284	0.257	0.855
	Within Groups	247.160	12	20.597		
	Total	263.012	15			

Source : Paudel et al., Unpublished data ,Bandipur

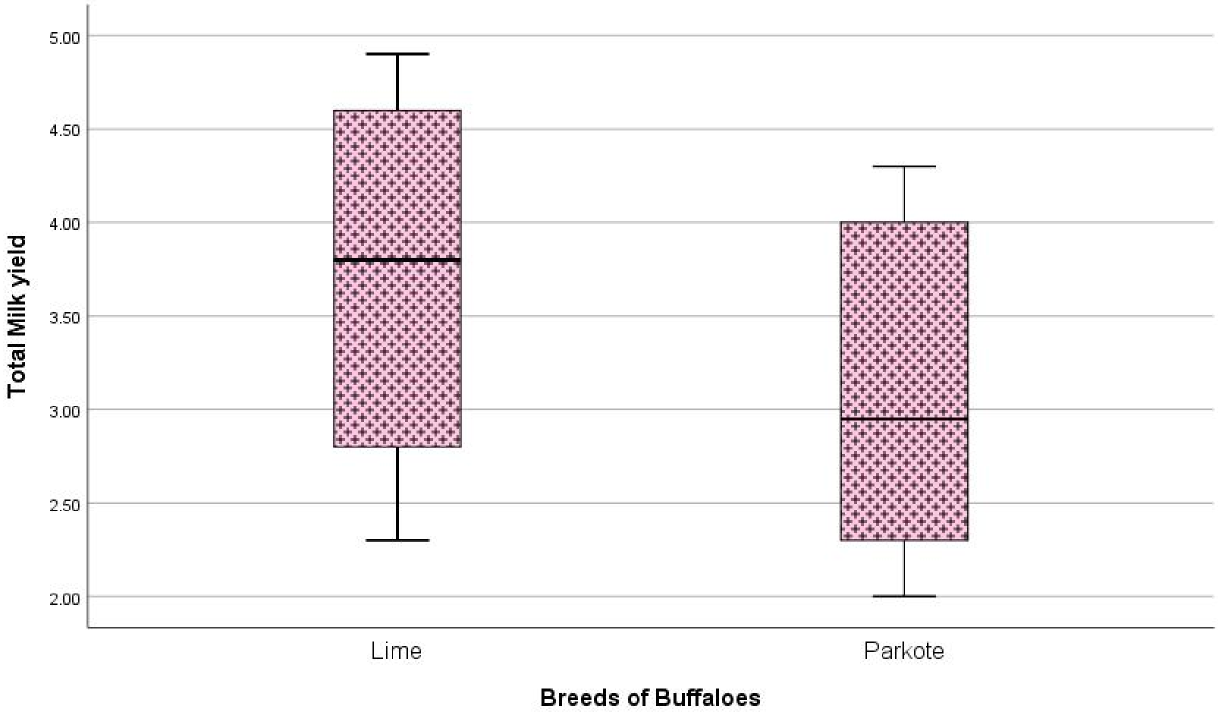

Figure: Milk production of Buffaloes according to breeds

The Whisker box plot shows the distribution of total milk yield of buffaloes according as breeds .

Parkote Breed:

The median milk yield was approximately 3.75 liters.The interquartile range (IQR) spanned from about 3.00 to 4.50 liters. Whiskers plot extended from approximately 2.50 to 5.00 liters, indicating no extreme outliers.

Parkote Breed:

The median milk yield was lower, at around 3.00 liters. The IQR spanned from about 2.50 to 4.00 liters. The whiskers plot extended from approximately 2.00 to 4.50 liters, also showing no extreme outliers.

In overview, the Lime breed had a slightly higher median milk yield compared to the Parkote breed. The range of yields was wider for the Lime breed, as indicated by the higher maximum whisker value. Both breeds had similar overall distributions, with slight differences in central tendency and dispersion value.

Handling of the research work by the researcher (Finding from short communication)

Livestock data management in systematic design is essential part for the research organization, especially National Animal Science Research Institutes, Khumaltar. The up-to-date data recording and management is essential part of research activities. Major findings of the first-year works are as follows.

Most of the researchers working in the animal Science basically follow the experimental design and sample survey approach in conducting research. While following experimental design, the thumb rule of experimental design for the selection of number of replication and number of treatments had been chosen such that error degree of freedom at least 11 or more. Most of the researcher followed balanced complete design such as CRD, RCBD in goat, poultry and fishery research in station of this project. Most of the software used for the experimental design and analysis of the data are SPSS and Excel.

Most of the data of the milk recording data in RARS, Lumle were in handwritten form from a decade. There are so many piles of milk data recording file but data recording form is incomplete. The data recording form is therefore further modified according to well standard norms from concerned organization.

The main objection of CRD design is that the principle of local control has not been adopted so that experimental error is more inflated by the entire variation in the experimental units.

Table 4: Distribution of yearly Milk Yield of Buffaloes in RARS, Lumle (N=25)

Month	Mean	Minimum	Maximum	Total milk yield
Asaar	14.94±1.69	9.6	17.2	463.20
Jestha	15.72±0.77	13	16.8	503.00
Baisakh	16.54±1.26	14	19.2	512.90
Chaitra	18.56±1.59	16	25.3	519.80
Fagun	21.23±1.61	18.5	25.3	615.80
Magh	23.12±1.40	20.3	26	670.40
Pausha	22.9±2.58	17.6	26.5	641.20
Shrawan	12.52±5.04	4	24.4	375.60
Bhadra	25.08±2.54	19	29.2	802.60
Asauja	22.61±2.64	17.3	26.9	723.60
Kartik	21.53±2.03	17	25.4	667.60
Mangsir	22.59±2.50	17.6	26.5	723.10
Total	19.77±4.50	4	29.2	7218.80

* Source, Annual Milk yield recording data. Regional Agriculture Research Directorate

N= Number of lactating buffaloes

(Field Work, 2076)

This table summarizes the monthly distribution of milk yield in buffaloes at RARS, Lumle, derived from data collected from 25 buffaloes over the course of a year. It encompassed the average milk yield, the minimum and greatest yields, and the total quantity of milk produced for each month.

The mean milk yield fluctuated annually, spanning from 12.52±5.04 liters in Shrawan (minimum) to 25.08±2.54 liters in Bhadra (maximum).
The standard deviations (±) represented fluctuations in milk yield. Shrawan exhibited the greatest variation (5.04), indicating heightened variability, whilst Jestha demonstrated the least (0.77), implying more uniform results.

The minimum documented production was 4 liters in Shrawan, and the maximum was 29.2 liters in Bhadra.Months like Baisakh, Chaitra, and Fagun exhibited consistent increases in both minimum and maximum yields, indicating seasonal patterns.

The monthly milk yield was greatest in Bhadra (802.60 liters), followed by Asauja (723.60 liters) and Mangsir (723.10 liters).In Shrawan, the month with the lowest average yield, we observed the minimum total milk yield (375.60 liters).

The yearly average milk production was 19.77±4.50 liters.

The annual milk yield totaled 7218.80 liters.Milk production reached its zenith in the months of Bhadra, Asauja, and Mangsir, indicating that these periods provided optimal environmental circumstances or feeding techniques.The minimal milk production occurred in Shrawan, probably due to unfavorable weather circumstances, restricted feed availability, or physiological stress in buffaloes.

The findings indicated substantial monthly fluctuations in milk production, affected by seasonal influences. The peak output in Bhadra and the low production in Shrawan underscore the necessity of using customized feeding, management, and health techniques to enhance milk production year-round.

The mini scale sample survey regarding the knowledge, attitude and practice of statistical methods and data analysis among the livestock r and fisheries researcher of Nepal revealed that about 86.70% of the researcher find the reliability coefficient while pretesting questionnaire. Nearly 43.30 % of the researcher involved in agriculture used Statistical software to calculate sample size. About 50% agricultural researcher consult statistician while designing and framing questionnaire. Nearly 76.70 % of the researcher of Livestock and fisheries research had been taken data analysis training.

DISCUSSIONS

The bio statistical database management system of a Nepal Agriculture Research Council is in developmental stage. It should be strengthened through correct and up to date database management system, good statistical design and research methodology. The research process and finding are questionable until and unless good statistical design, sample size calculation and proper analysis with reliable and valid techniques. The database management system integrates not only research-based data; it also incorporates information system for formation of plan, policies and programs. It reduces the duplication of data by fulfilling the gap between demand and supply. With regard to livelihood-related variables, socioeconomic data plays an important role in the livestock sector's production and productivity dimension. Data on socioeconomic variables. A sample survey is useful. Statistical tools used in quantitative research methods. Sample survey methods are an excellent and cost-effective method for conducting socioeconomic research on the effects of livestock on poor farmers' livelihoods. Open-ended and closed-ended survey questionnaires were developed.(Ouafiq et al., 2022) The main challenges are data integration complexities, a lack of skilled personnel and adequate resources, insufficient infrastructure, and a data warehouse architecture that is insignificant.(Ouafiq et al., 2022)

NARC had two major institution such as National Animal Science Research Institute and National Agricultural Research Institute for the capacity development of the researcher working within organizations. These two institutions have been given a mandate for capacity development of the researcher. Both intuition of the NARC had been launched a capacity development training such as proposal design workshop, experimental design and data recording, data recording and statistical analysis and Geographical Information System training in timely basis. These training were quite helpful for data management. There are number of statistical tolls for data analysis and interpretation(Joshi et al., 2019)

Strength:

Improved data accuracy and quality: Implementing a livestock database management system can help to guarantee that data is entered and handled accurately and consistently, thus enhancing data quality.

Enhanced efficiency: A database management system can streamline data entry, storage, and retrieval, improving efficiency and reducing errors in cattle data administration.

Better decision-making: Access to reliable and up-to-date data can assist decision-makers in making informed decisions about livestock management, which can lead to increased production and profitability.

Improved animal health: A livestock database management system can help track animal health and monitor disease outbreaks, allowing for quick action to be done to avoid disease spread.

Weakness:

Lack of resources: Establishing and maintaining a livestock database management system involves significant financial and human resources, which can be difficult for underdeveloped nations like Nepal.

Limited infrastructure: A lack of appropriate infrastructure, such as internet connectivity and energy, might make implementing and maintaining a livestock database management system problematic.

Limited technical expertise: The technical expertise of individuals maintaining and using a livestock database management system is critical to its performance.

Opportunities: Improved data-driven decision making: A livestock database management system can give stakeholders with the information they need to make informed decisions about livestock management, resulting in increased productivity and profitability(University of Copenhagen, 2022).

Increased market access: A livestock database management system can give data on livestock productivity and health, allowing farmers and other stakeholders to access new markets.

Improved animal health: Better data on livestock health and disease can aid in the prevention and control of disease outbreaks, resulting in improved animal health and lower economic losses.

Improved policy formulation: Data from a livestock database management system can be used to support policy decisions on livestock management, resulting in better regulation and governance of the industry.

Threats: Risks to data quality and confidentiality: A livestock database management system may be exposed to cyber-attacks and data breaches.

Dependence on technology: A cattle database management system necessitates technological infrastructure and skill, both of which might be affected by power outages, equipment breakdowns, or other technical concerns.

Cost: The initial and ongoing costs of building and maintaining a livestock database management system might be high, limiting its adoption and efficacy.

Data quality: The accuracy and completeness of data in a livestock database management system are dependent on data input and management quality, which can be damaged by human error or other factors.

The Nepalese livestock and fisheries database management system could benefit from the following enhancements:

Data Collection: Ensure that data is collected regularly and accurately. This could include educating data collectors and managers, as well as adopting data quality control systems to detect errors and inconsistencies.

Integration: Connect the database management system to other systems, such as those for animal health or market access. This ensures that all necessary data is collected and that the system can serve a wide range of livestock and fisheries-related operations.

Improve the database management system's user interface to make it more user-friendly and accessible to a larger variety of users. This could entail creating mobile applications.

CONCLUSIONS

The collection, analysis, and interpretation of data related to livestock production on a research farm or station is referred to as livestock data management. The goal of livestock data management is to increase the livestock enterprise's productivity and profitability.

The conclusion of livestock data management on a research station is determined by the research objectives. However, some broad conclusions can be drawn from livestock data analysis.

For starters, good data management allows researchers to make informed decisions about livestock management practices. Researchers, for example, can determine the optimal feed ration for different classes of animals by analyzing data on feed consumption, which can help to reduce feed costs and improve animal performance.

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