

An Investigation on the Cause of Donkey Population Decline and its Impact on Smallholder Resilience Farming System: A Case of Zimuto Communal Area, Masvingo District of Masvingo Province

Silvester Machenesa¹; Maphios Mpofu²;
Lawrence Masaka³; Braine Madzinga⁴

¹ Makoholi Research Institute, P.O. Box 9182, Masvingo, Department of Livestock Research and Specialist Services

² Matopos Research Institute P. Bag K5137, Bulawayo, Department of Livestock Research and Specialist Services

³ Midlands State University P. Bag 9055, Gweru, Department of Animal and Wildlife Sciences

⁴ Makoholi Research Institute, P. Bag 9192, Masvingo, Department of Livestock Research and Specialist Services

Publication Date: 2026/07/15

Abstract: Donkeys play a crucial role in the livelihoods of low- to middle-income farmers, particularly to smallholder farmers where resources are limited. They provide essential income and serve as a crucial means of transporting food, water, goods, and tillage to resource-limited communities. Despite their significance, concerns regarding the decline in donkey populations have been overlooked. The aim of this investigation was to explore the causes of donkey population decline and its impact on smallholder farmers. A case study of Zimuto Communal Area, Masvingo District in Masvingo Province. The research was carried out using RAO software to select sample size. Data was analyzed using Statistical Package for Social Sciences version 20 (SPSS). Four hundred and four (n= 404) were randomly interviewed using semi- structured questionnaire on a face-to-face basis. Analysis of individual responses focused on key indicator questions related to demographic information was used to investigate the cause of donkey population decline and its impact on smallholder farmers. The results showed that, lack of training in donkey farming was the most significant factor contributing to population decline. As a result, small holder farmers are forced to resort to manual farming methods, leading to reduced farming area result in low yield, increased labor burdens on women and children, and the erosion of wealth, particularly among disadvantaged families. Work should be focus on collaborating with donkey owners, Agritex, Researchers, Private Partners, Veterinary Service, Institute of Higher learning and Scholars in order to improve on donkey welfare.

Keywords: Donkeys; Population Decline; Impact; Economic Significance; Technical Advice.

How to Cite: Silvester Machenesa; Maphios Mpofu; Lawrence Masaka; Braine Madzinga (2026) An Investigation on the Cause of Donkey Population Decline and its Impact on Smallholder Resilience Farming System: A Case of Zimuto Communal Area, Masvingo District of Masvingo Province. *International Journal of Innovative Science and Research Technology*, 11(7), 162-168. <https://doi.org/10.38124/ijisrt/26jul043>

I. INTRODUCTION

Donkeys have been a game-changer for human livelihoods and economic growth, especially in the agricultural sector of developing countries (Ravichandran et al., 2023). Donkeys are drawing global attention, triggering policy and research discussions because of their significant

influence on human civilization and development (Geiger and Hovorka, 2015; Johnston, 2023; McLean and Gonzalez, 2018). They are helping humans, especially vulnerable groups like women and children, cope with threats to their livelihoods (Geiger and Hovorka, 2015; Johnston, 2023; McLean and Gonzalez, 2018). Donkeys played a significant role in enhancing Africa's trade, early access to offshore

markets, and social and economic mobility by providing transportation and other forms of labor (Geiger and Hovorka, 2015; Johnston, 2023). In developing countries, donkeys are valued for multiple products such as meat, milk, and hides, in addition to the labor they provide (Ali et al., 2024; Gifford-Gonzalez and Hanotte; Johnston, 2023). They are called “beasts of burden” due to their ability to withstand harsh conditions and perform hard labor (Ali et al., 2014; Braimah et al., 2013; The Donkey Sanctuary, 2020). Sadly, despite their importance, donkeys often don’t receive the kindness they deserve from humans. Donkeys have faced mistreatment, abuse, neglect, and welfare violations, negatively impacting their health and well-being (Ravichandran et al., 2023; Ahmed et al., 2023; Bazzono et al., 2022; Mwasame et al., 2019). They are often viewed as low-status and backward compared to other livestock like cattle, sheep, and goats, contributing to their mistreatment (Braimah et al., 2013; Fernando and Starrkey, 2004). Despite their importance, donkey populations globally are facing threats, according to research (Gifford-Gonzalez and Hanotte, 2011; Maggs et al., 2021). Donkeys have been subjected to a life of distress, pain, torture, and fear, largely due to human actions (Ahmed et al., 2023; Geiger et al., 2012; Hovorka, 2015). They have had to endure, and coping with those harsh conditions can’t be easy for them (Ahmed et al., 2023). The negative perception humans have about donkeys has made things worse, despite their contributions to social and economic activities (Fernando and Starrkey, 2004; Mwasame et al., 2019).

Despite this significance, there have been consideration concerns regarding the population decline of donkeys which has been systematically ignored among owners and users including policymakers in some regions of the world since time immemorial (Ravichandran *et al* ; 2023). This paper builds its narrative from this context informed by observations that the donkeys decline in the Zimuto Communal Area of Masvingo District in Masvingo Province, Zimbabwe requires attention by redressing it as it is prevalent. The main aim of this paper was to investigate the cause of donkey population decline and its impact in the study area.

II. MATERIAL AND METHODS

➤ Study Site Description

The study was conducted in Zimuto Communal Area Masvingo district, Masvingo Province, Zimbabwe. Zimuto communal area is located to the north of Masvingo town. The area is predominantly rural with a population of approximately 27 000 people. The area falls within Natural Region 4 of the Zimbabwean ecological classification system.

Natural region 4 is considered highly suitable for extensive farming and receives an annual rainfall of 450- 650mm per annum. The mean temperature is 25°C, significant frost occurring in June up to early August. The area has got a semi extensive farming system with low and periodic drought and severe dry spells during rainy season. Zimuto Communal area is characterized by sandy soils with low organic matter and humus content, and consequently low soil fertility. Farming dominates economic activities for the arid and drier area of the community. Farming activities in the area are considered risky because of highly variable rainfall that affects biomass production fluctuating nitrogen fertilizer and farm output marketing prices and unreliable yields. Most households in the Zimuto Communal Area depend on informal livestock and dryland crop farming for livelihood. Poverty is alarming in the area. This is exacerbated by the lack of formal employment opportunities.

➤ Data Collection

Rao software was used to calculate sample size. Face to face interviews which used semi- structured questionnaire were used for four hundred and four (n= 404) farmers randomly selected. The interviews were administered on both farmers who have donkeys and those who do not have donkeys. Focus Group Discussion were also used to collect data. Data was collected through transect walk. The research team assisted by Extension Officers who were working in the Communal area. The assist ensured that all areas of community are covered. The informants were interviewed using a Shona language translate as it was anticipated that there could be language barriers should the interviews be conducted in English. Braimah et al., (2013) who adopted a similar approach with study guided the design of the questionnaire. The quantitative data were analyzed using SPSS version 20. The excel spreadsheet has used to determine frequencies. Simple figures and table were used to capture the quantitative outcome while the outcome from the qualitative data was captured in reader friendly narratives.

III. RESULTS AND DISCUSSION

The results covered the social- demographic characteristics of the respondents, how the respondents’ outline the cause of donkey decline, outline if the respondents received technical advise on donkey management, number of respondents own donkey before, number of respondents who have donkeys, number of respondents want donkeys and the impact caused by donkey decline.

➤ Social- Demographic Characteristics of the Respondent

Table 1 Household Head Distribution

	Frequency	Percent	Valid Percent	Cumulative Percent
Female	200	49.5	49.5	49.5
Males	204	50.5	50.5	100.0
Total	404	100.0	100.0	

Age distribution	Frequency	Percent	Valid Percent	Cumulative Percent
20 – 30	32	7.9	7.9	7.9
31 – 40	48	11.9	11.9	19.8
41 – 50	82	20.3	20.3	40.1
51-60	55	13.6	13.6	53.7
61-70	85	21.0	21.0	74.8
71-80	83	20.5	20.5	95.3
81 and above	19	4.7	4.7	100.0
Total	404	100.0	100.0	

Mode of Communication	Frequency	Percent	Valid Percent	Cumulative Percent
no smart phone	221	54.7	54.7	54.7
smart phone	155	38.4	38.4	93.1
Nil	28	6.9	6.9	100.0
Total	404	100.0	100.0	

Table 1 Summaries the social – demographic characteristics of the respondents. The table revealed that 50.5 of the households among the participants were male headed followed by those headed by females 49.5. Most of the respondents 21.0 where aged 61-70 years of age. This age bracket was followed by those at 71- 80 years (20.5), 41-50 years (20.0) , 51- 60 years (13.6), 31- 40 years (11.9) ,20-30 years (7.9) and finally 81 years and above (2.7). The results furthermore revealed that 2.7 had never been to school. On the other hand, 38.1, 54.2 and a further 5.0 respectively had attained primary, secondary and tertiary level education. The results revealed that 54.7 of the participants use non-smart phones, 38.4 of the participants use smart phones and 6.9 had no cell phones.

Table 2 Income Generation

Variable	Frequency	Percentages	Valid Percentage	Cumulative Percent
livestock and crops	267	66.1	66.1	66.1
Crops	128	31.7	31.7	97.8
Livestock	1	.2	.2	98.0
Salary	3	.7	.7	98.8
home industry	5	1.2	1.2	100.0
Total	404	100.0	100.0	

The results revealed that livestock and crop farming was the highest source of income generation among the participants (66.1), followed by crop farming (31.7) home industry (1.2), salary (0.7) and livestock.

Table 3 Households with Donkeys

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	18	4.5	4.5	4.5
No	386	95.5	95.5	100.0
Total	404	100.0	100.0	

According to the results, 4.5 of the participants own donkeys and 95.5 they do not have donkeys at all.

Table 4 Households Owned Donkeys Before

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	36	8.9	8.9	8.9
No	368	91.1	91.1	100.0
Total	404	100.0	100.0	

The results revealed that 8.9% of the respondents used to owned donkeys and 91.1 % of the respondents used not have donkeys. The results revealed that number of respondents used own donkey were decline from 36 (8.9 %) to 18 (4.4%) farmers. The number of farmers used to own donkeys were decline by 50% for the past ten years.

Table 5 Farmers want Donkeys

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	283	70.0	70.0	70.0
No	121	30.0	30.0	100.0
Total	404	100.0	100.0	

The results revealed that 70% of the respondents want to keep donkeys whilst 30% of the respondents they were not interested in donkey farming.

Number of Respondents Received Technical Advise

	Frequency	Percent	Valid Percent	Cumulative Percent
Yes	18	4.5	4.5	4.5
No	386	95.5	95.5	100.0
Total	404	100.0	100.0	

The results revealed that only 4.5% of the respondents received technical advise whilst 95.5 % of the respondents they never received technical advise on donkey management.

Source of Information

	Frequency	Percentages	Valid Percentage	Cumulative Percentage
Vet office	1	.2	.2	.2
Other farmers	21	5.2	5.2	5.4
Nil	382	94.6	94.6	100.0
Total	404	100.0	100.0	

The results revealed that only 0.2% of the respondents received technical advise from Vet Office, 5.2% received technical advise from fellow farmers and 94.6% of the respondents never received technical advise on donkey management.

Reasons for not Restocking

	Frequency	Percent	Valid Percentage	Cumulative Percent
Expensive	19	4.7	4.7	4.7
Not available at the market	265	65.6	65.6	70.3
Not interested	120	29.7	29.7	100.0
Total	404	100.0	100.0	

The findings showed that 65.6% of respondents did not acquire donkeys because they were not available in the market, 4.7% did not buy donkeys because they were too costly, and 29.7% said they had no interest in donkey farming.

Source of Draft Power

	Frequency	Percent	Valid Percent	Cumulative Percent
Cattle	223	55.2	55.2	55.2
Donkeys	11	2.7	2.7	57.9
Tractor	1	.2	.2	58.2
Manual	165	40.8	40.8	99.0
Cattle and Donkeys	4	1.0	1.0	100.0
Total	404	100.0	100.0	

The results revealed that 55.2 of the respondents used cattle for draft power, 40.8% of the respondents used manual for ploughing, 2.7% of the respondents used donkeys for draft power, 1.0% of the respondents used both cattle and donkeys for ploughing and 0.2% of the respondents used tractor for ploughing.

IV. DISCUSSION

The majority of respondents reported not receiving technical advice on donkey management, resulting in a lack of essential information about management practices such as dipping, deworming, treatment, and proper feeding. This gap in knowledge has contributed to a decline in the donkey

population, primarily due to increased mortality rates stemming from poor management practices. The findings were supported by Ravichandran et al., (2023) who have highlighted that donkeys are mistreated, abused, neglected and their welfare compromised with impunity. Maggs et al., (2021) support these findings by highlighting that donkey populations worldwide face numerous threats.

The percentage of respondents who owned donkeys in previous years has decreased from 36% to 18%. This is in contrast to Mafukuta (2012), who observed a growth in donkey keeping, evidenced by a rising population. Only a minority of respondents received technical advice from fellow farmers, and this guidance was often inadequate, given that many respondents lacked familiarity with proper donkey management practices. For instance, a farmer who attempted to supplement their donkeys' diets provided feed intended for ruminant animals, despite donkeys being monogastric.

The lack of technical advice among farmers is further supported by Donkeys for Africa (2018), which indicates that poor treatment of donkeys arises from a lack of education among farmers. Ahmed et al., (2013), who found that training positively influences stakeholders' responses to donkey welfare issues, emphasize the significance of training for donkey farmers. Similarly, Donkeys for Africa (2018) argues that education is crucial for promoting more ethical treatment of donkeys.

Despite the decline in population, there is a growing demand for donkeys, as many farmers are increasingly interested in owning them for economic reasons, particularly following significant cattle losses due to Janja disease. Respondents motivated by economic factors reflect this trend, as donkeys have become valuable assets in their livelihoods. Mafukuta (2012) corroborates this, noting the rising interest in donkey ownership for economic purposes.

Janja disease, which has a fatality rate of up to 90% (Lawrence, Sibeko-Matjila, and Mano, 2000), had a devastating impact, particularly in rural areas of Zimbabwe (Herald, January 6, 2021). Cattle were traditionally the primary source of draft power before the outbreak of Janja disease, which has been reported consistently throughout 2020 and into the first quarter of 2021 (Ruzvidzo, 2021).

The sale of donkeys within the community is uncommon due to a severe shortage of these animals. For those selling donkeys, prices range from \$150 to \$200. This increase in price has made donkeys unaffordable for many low-income farmers. Supporting this observation, Mafukuta et al. (2024) noted that the cost of purchasing a donkey has skyrocketed to between R2000 and R5000.

Despite these high prices, many respondents expressed a desire to keep donkeys due to their multiple benefits, including providing essential labor and serving as a means of transport for both human and goods. Respondents also indicated that they use donkeys for traction purposes in dryland farming. These findings align with previous studies (Braimah et al., 2013; Avornyo et al., 2015; Maggs et al.,

2021) who highlighted that donkeys have been vital livelihood assets for many households, particularly for women and children, in developing regions. In the study area, numerous women-headed households are interested in owning donkeys for farming activities. This trend is consistent with the findings of Avornyo et al. (2015) in Bawku, Nigeria, and Braimah et al. (2013) in Kassena-Nankana, Ghana. Increasingly, women are entering the donkey ownership economy, motivated by the benefits and rewards observed among their peers.

The demand for donkeys is notably skewed towards women-headed households, which contrasts with findings by Braimah et al. (2013), who reported a male-dominated donkey economy in Kassena-Nankana, Ghana. In the study area, donkeys provide significant support to women by performing essential tasks, such as carrying water, firewood and goods. This aligns with the observations of Ali et al. (2014), who highlighted the utility of donkeys worldwide.

Respondents expressed interest in donkey ownership primarily due to their hardiness, resilience, and low maintenance costs. These attributes make donkeys reliable working animals, capable of undertaking physically demanding tasks that may be challenging for humans or other livestock. Additionally, donkeys are well adapted to thrive in harsh environments, including arid regions with limited resources, making them particularly suitable for agricultural practices.

Their low maintenance requirements allow donkeys to survive on sparse vegetation and limited water, enabling them to work effectively in conditions where other animals may struggle. Furthermore, donkeys are generally calm and docile, making them easier to handle and train compared to other livestock. This temperament facilitates effective collaboration between farmers and their animals.

The donkey population decline has resulted in financial burden to the disadvantages families, forced labour, loss of main livelihood source and related benefits, loss of wealth and income and loss of future social economic wellbeing.

➤ *Loss of a Primary Livelihood Source and Related Benefits*

The reduction of donkeys has both direct and indirect effects on rural livelihoods. The Zimbabwe Ministry of Lands, Agriculture, Fisheries, Water, and Rural Resettlement (2020) reports that agriculture is a critical source of rural livelihoods and plays a vital role in the national economy. Additionally, the Zimbabwe Democracy Institute (2020) emphasizes agriculture's importance for livelihood and development in the country.

Donkeys, along with other livestock, are essential for income generation and food security. In communal areas, crop production heavily relies on draft power. Consequently, the decline in the donkey population significantly compromises the livelihoods of many households, as their agricultural activities depend on this crucial resource.

➤ *Erosion of Wealth and Income*

Donkeys, along with other livestock, play a crucial role in sustainable rural livelihoods. The decline in donkey populations threatens this livelihood base, adversely affecting the wealth of communal farmers. For many disadvantaged families, donkeys are a vital source of wealth, food, and income.

➤ *Study limits*

During the study, the Researcher encountered some challenges in conducting the survey, which are as follows:

Limited access to respondents due to power road network, this has led to increase travel time and costs for enumerators.

Language barrier was a major challenge, which led to misinterpretations of survey questions, sometimes the respondents was feeling uncomfortable or hesitate to answer questions.

Natural events such as funeral, which is a part of Zimbabwean culture, especially in rural areas whereby the community's focus shifts to mourning and support. Another limitation was power dynamic with local leaders, which were influence in respondent's participation.

V. CONCLUSION

This paper highlights the cause of the declining donkey population and the impact on rural livelihoods, particularly for women and children. While recognizing that the decline has multiple effects on disadvantaged families, the focus of this paper was restricted to the Zimuto Communal Area in the Masvingo District of Masvingo Province. The challenges stemming from the decline include the erosion of livelihoods, reduction in wealth and income, and insecurity regarding future well-being.

Despite this restricted focus and use of a single case study, it is evident that the decline in donkey populations has devastated rural livelihoods that depend on draft power for agriculture. Mitigating the impact of this decline is an urgent priority.

To address these issues, various interventions are necessary. Donkey farming should be included in extension training manuals like any other domesticated animals. Collaboration among Research Institutions, Agritex, veterinary services, Universities, Colleges, and Private players is essential to develop comprehensive training manuals for farmers. Given the significance of donkeys and other farm animals in rural livelihoods, such training initiatives should be prioritized in policy discussions.

REFERENCES

- [1]. Alis, M., Baber, M., Hussain, T., Awan, F. and Nadeem, A.(2014) "The contribution of donkeys to human health", *Equine Veterinary Journal* Vol. 46, pp. 766- 767.
- [2]. Avornyo, F.K., Gabriel, T. and Salifu, S. (2015), "Contribution of donkeys to household food security: a case study in the Bawku Municipality of the Upper East Region of Ghana", *Ghana Journal of Science, Technology and Development*, Vol.3 No. 1, pp . 15-24.
- [3]. Braimah, M. M., Abdul- Rahamah, I. and Oppong-Sekyere, D.(2013), " Donkey- Cart Transport, a Source of Livelihood for Farmers in the Kassena Nankana Municipality in Upper East Region of Ghana" , *Journal of Biology, Agriculture and Healthcare*, Vol.3 No. 17, pp. 127- 136.
- [4]. Donkeys for Africa , (2018), " How ethically are donkeys treated?" , *Africa Network for Animal Welfare*, Vol. 10, pp. 1-4.
- [5]. Donkeys for Africa, (2020), " A road towards sustainable change", *Donkeys for Africa*, 23, December 2020. Retrieved from: DfA- 2020. Pdf(donkeysforafrica.org) (Accessed 02 April 2014).
- [6]. Fraser, D. (2008), "Understanding animal welfare. " From the role of the veterinarian in animal welfare: too much or too little?" , *Acta Veterinaria Scandinavica*, Vol. 50 (Suppl 1) S1.
- [7]. Geige, M. and Hovorka , A. (2015), " Donkeys in development: Welfare assessments and knowledge mobilization" , *Development Practice*, Vol.25 No. 8, pp. 1091-1104.
- [8]. Hassan, M. R., Steenstra, F.A. and Udo, H.M.J .(2013), " Benefits of Donkeys in rural and urban areas in northwest Nigeria", *African Journal of Agricultural Research* , Vol. 8 No.48, pp. 6212.
- [9]. Lima, Y. F., Tatremoto, P., Reeves, E., Burden; F.A and Santurtun, E. (2022). " Donkey skin trade and its non- compliance with legislative frame.
- [10]. Maggs, H. C., Ainslie A. and Bennett, R.M. (2021), " Donkey Ownership Provides a Range of Income Benefits to Livelihoods of Rural Households in Northern Ghana", *Animals*, Vol. 11, P. 3154.
- [11]. Mtembo, S. , 2021. Hundreds of cattle die under new wave of January disease. [https:// masvingomirror-com/ hundreds-of -cattle- die- under-new-wave-of - january-disease/Musisi](https://masvingomirror.com/hundreds-of-cattle-die-under-new-wave-of-january-disease/Musisi), F.L & in cattle by immunization in Eastern , Central, and Southern Africa- *Agriculture and Human Values* 12: 95- 106.
- [12]. Oxfarm; 2018. The sustainable livelihoods approach: a toolkit for Wales. London : Oxfarm Ruzvidzo, W., 2021. January disease claims 1000 cattle in Mash West. [https:// www.sundaymail.co.zw/ January – disease- claim- 1000- cattle -in mash- west](https://www.sundaymail.co.zw/January-disease-claim-1000-cattle-in-mash-west).

- [13]. Mwasame, D.B., Otieno, D.J. and Nyang'anga', H. (2019), "Quantifying the contribution of donkeys to households livelihoods; Evidence from Kiambu Country, Kenya", Invited paper presented at the 6th African Conference of Agricultural Economists, September 23- 26, 2019, Abuja, Nigeria.
- [14]. Norris, S.L., Little, H.A., Ryding, J and Raw, Z. (2021) "Global donkey and mule populations: Figures and trends", Plos one , Vol .16 No.2 :e 0247830.
- [15]. Nthakheni, N.D. (2006) "A livestock production systems study among resource-poor livestock owners in the Vhembe district of Limpopo province", Doctorial Thesis. University of the Free State, Bloemfontein.
- [16]. Ravichandran, T., Perumal, R.K., Vijayalakshmy, K., Raw, Z., Cooke, F., Baltenweak, I. and Rahman , H. (2023), " Means of Livelihood, Clean Environment to Women Empowerment: The Multi- Faceted Role of Donkeys", Animals (Basel), Vol.13 No .12, p. 1927.
- [17]. Smith, D.G. and Pearson, R. A. (2005), " A review of the factors affecting the survival of donkeys in semi-arid regions of Sub- Saharan Africa", Tropical Animal Health and Production, Vol.37 (Supplementary 1) pp. 1- 19).
- [18]. Starkey, P. (1995), " The donkey in South Africa: myths and misconceptions", in : Starkey, P. (E.d), Animal Traction in South Africa : Empowering rural communities. Overseas Development Institute, London.
- [19]. The Donkey Sanctuary (2020), "Ethiopia's donkeys need urgent re-evaluation", The Donkey Sanctuary , UK. Retrieved from [https:// www. The donkeysanctuary.or.uk\ about us/ media – centre/ press- release/ Ethiopia as- donkeys- need – urgent- re- evaluation](https://www.thedonkeysanctuary.or.uk/about-us/media-centre/press-release/Ethiopia-as-donkeys-need-urgent-re-evaluation)(Accessed 09 December 2023).
- [20]. The Donkey Sanctuary (2024) , "African Union Leaders Agree to ban on donkey slaughter", Retrieved from: [https: // www. The donkeysanctuary .org. uk/ news/ african -union -leaders- agree- to ban -on – donkey – slaughter](https://www.thedonkeysanctuary.org.uk/news/african-union-leaders-agree-to-ban-on-donkey-slaughter). (Accessed 01 March 2024).
- [21]. Valette, D. (2005) , " Invisible workers: The Economic Contributions of working Donkeys , Horse and Mules to livelihoods. Brooke: Action for working horse and donkeys", Retrieved from : [https:// www. The brooke.org / site/ default/ tiles/ advocacy-and - policy/ Invisible workers- report. Pdf.](https://www.thebrooke.org/site/default/tiles/advocacy-and-policy/Invisible-workers-report.Pdf)(Accessed 27 August 2023).
- [22]. Vetter, S. (1996), " Investigating the impacts of donkeys on a communal range in Namaqualand: How much does a donkey" "cost" in goat units?", Unpublished BSc (Hons), University of Cape Town.