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Review article

Relevance and feasibility of mini livestock farming in enhancing food security in Southern Africa

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ABSTRACT

Mini livestock is a sustainable form of animal production that has significant potential for alleviating malnutrition and food insecurity in Southern Africa. It should be considered as a normal component of livestock and rural development which has the capacity to improve nutrition and food security. It is very much associated with increased food security as it lends itself to small scale family production. This discussion looks at the opportunities of utilizing mini livestock species as an alternative source of protein solving the food insecurity challenges in Southern Africa. Mini livestock production has diverse economic and social functions in rural communities. It can be valued as one of the livestock sub sectors having enormous potential for enhancing food security. The conventional livestock production sector has been facing multiple challenges as a result of rise in human population, urbanization and climate change. This trend has lead to a rise in demand for livestock products, which means meat productivity or the number of meat animals will have to increase to meet the animal protein demand. The protein production from conventional livestock has been falling, as a result there is need for alternative sources of animal protein supply. Focusing on mini livestock species as an alternative source of protein may be just as important. Most animals in the mini livestock class are promising in enhancing food security because they require

little capital, equipment, space and labor. The discussion concludes that mini livestock constitute an important reservoir of genetic animal resources which has not been given adequate recognition. However, it is envisaged the utilization of mini livestock will address the animal protein challenges facing Southern Africa, especially in the resource poor rural communities where the problem is most apparent. Given the economic, social and ecological advantages of mini livestock farming it is arguably deserves even greater attention.

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1. Introduction

Between 1995 and 2020 Southern Africa's population is estimated to almost double to 262 million (IFPR, 1997). This current and projected population trend – growing population require in turn appropriate responses to the anticipated pressures on livestock production. Importantly, the unprecedented rate of population growth will have important repercussions on nutrition and food security. This discussion explores the opportunities of utilizing mini livestock species as an alternative source of protein in an attempt to solve the food insecurity challenge in Southern Africa, taking into account their untapped diverse economic, social and ecological functions in most communities. Mini livestock refers to small indigenous vertebrates and invertebrates both domesticated and wild genetic animal resources which can be produced on sustainable basis for food, animal feed and as a source of income. They play an important role in farming systems by offering opportunities for risk coping, farm diversification and intensification, and provide significant livelihood benefits including food security. Sub Saharan Africa has considerable mini livestock species which could complement the increased demand for livestock products. Integrating mini livestock as a major livestock component for the resource poor livestock keepers could provide many direct and indirect benefits to ecosystem function and food sustainability (Bohringer, 2001; Devendran, 2004). Mini livestock farming has potential to meet the criteria of sustainable farming practices, while simultaneously addressing food security (Lenne et al., 2003). The major groups of mini livestock species which have shown promising attributes for food security include chickens (poultry), domesticated rabbits, bee keeping, snail production, rodents , guinea pigs, pigeons and many others found in different parts of the world. The potential for mini livestock to promote food security to help diversify rural livelihoods is believed to be substantial, however very little research has been done to document the benefits that come from mini livestock. The discussion concludes that the biodiversity of mini livestock can act as a valuable source of animal protein and food security in Southern Africa.

2. Potential benefits of mini livestock in meeting food security

Mini livestock many economic, social and environmental advantages over their larger counterparts or classic livestock rearing. There are a number of positive benefits for farmers who engaged in mini livestock farming. Mini livestock keeping should not be seen as a rival to classic livestock rearing, but as a complement to other livestock farming activities. However, mini livestock can be highly productive in areas that are not suitable for large animals, especially where land is limited. In some parts of Southern Africa classic livestock rearing may not be suitable, while mini livestock may thrive. Use of mini livestock reduces the pressure to alter the environment in order to accommodate classic livestock rearing. Farmers engaged in mini livestock farming accrue multiple benefits including provision of owners with a range of products which including the major one enjoying the health benefit of animal products. Suitable for women and children, small-scale farming of certain breeds of rodent is now widely seen as a valuable weapon in the fight against malnutrition and poverty. It provides protein to the poorest families, especially children who would otherwise eat no meat at all in cultures where tradition dictates that the head of the family should take priority. Due to their small size mini livestock may be readily converted into cash and can be well integrated into the crop livestock integrated systems. Backyard mini livestock production can be a major contributor to a more balanced diet for communities. Households that practice mini livestock farming are more likely to have access to a wider variety of nutritious animal products. Mini livestock can provide people with

a primary or supplementary income. They offer prospects of a regular income source once the volume of production exceeds what the resource poor farmer wishes to use for household consumption. Mini livestock keeping is an affordable solution for women, young people and landless farmers, since it generally requires little space - it can even be practiced in the corner of a room - and only needs basic equipment (a few cages) which is cheap and easy to make for resource poor farmers. Classic livestock rearing such as cattle, sheep, goats require a lot of land, which is increasingly becoming scarce in Southern Africa. Breeding mini livestock - smaller animals not traditionally used as livestock - could be the solution to scarce land. Mini livestock have considerable advantage given the current feed resources scarcity due to climatic variability, which is in turn linked to the soaring cost of commercial animal feed. Most of the small livestock can adapt well to less feed , reproduce very quickly, require little in the way of care and have good resistance to disease. Most mini livestock are prolific producers and thrive in feed scarcity farm environments. This means mini livestock can improve total yield and supply diversity of animal products in away which is compatible with limited feed resources. Vulnerable groups, mostly women and children essentially may raise the household incomes, improving access to protein nutrition and enabling local livestock products to compete better with low price livestock imports. The enjoyment of outdoors, exercise, learning about nature, working with friends and neighbors on improving their livelihood are also indirect benefits of mini livestock farming. Many types of mini livestock species remain important for the poor and landless, especially during times of famine and insecurity or conflict, when normal food supply mechanisms are disrupted and local or displaced populations have limited access other forms of nutrition. Even in normal circumstances, these small animals are often important in complementing protein supply to provide a balanced diet, and wild species may often be important in this respect. Limited research conducted on opportunities for mini livestock production have recognized the species' smallness as desirable but not much literature exists acknowledging mini livestock as part of a broader solution to food security. Basic research has explored the potential for mini livestock as major alternative protein source to complement the provision of animal product from conventional livestock. It is argued that the smaller the animal, the more likely it will be kept close to home where it will be used for the benefit of the family (De Wilde, 1991). In this way, it is expected that by encouraging the production of micro-livestock at the household level, deficiencies in protein intake can be managed in poor rural communities. Furthermore, having a diverse range of livestock production activities in which to draw an income is also essential to the vitality of rural households poverty alleviation and food security. Mini livestock often do not have to be fed, do not require substantial labor inputs and do not require access to land beyond the backyard. The sale of individual animals can provide small cash sums without threatening household capital in the way that the sale of larger animals does. Mini-livestock are believed to present an opportunity in which by-products, breeding stock, meat products and other intangibles (e.g. increased knowledge of animal husbandry) can be exchanged for cash or in-kind and are associated with small body size, moderate and management (Akinnus, 1998). Smaller animals tend to breed more quickly and reach sexual maturity at a younger age than large animals. The small size is undoubtedly one of their most significant assets since it makes it possible to produce and manage on small area and in cluster (Thys, 2001). They have shorter gestation interval and are prolific. High numbers of progeny are useful in ensuring both the sustainability of production, and for income generation for the resource poor farmer. Due to shorter generation interval households could sell excess young ones ,breeding stock, or use older animals for home nutrition. Alternatively, due to their small size, the poor resource farmer could increase the number of animals held at a given time without necessarily needing large amounts of extra land, and sell the animals when deemed most beneficial, providing a steadier source of income. Mini-livestock can make an important contribution to increased food security because of its small scale, indigenous and flexible nature and because women are likely to be very much involved in the routine management of the animals (Hardouin et al., 2003).

Mini livestock are well adapted to local conditions are partly resistant to many of the disease and parasites, and have the ability to survive limited feed and water shortage. These characteristics have become genetic for the simple reason that they have been acquired by natural selection over hundreds of generations. In my opinion these characteristics are essential for successful livestock production in the context of climate change. Africa, still has an abundant mini livestock genetic pool, however the large reserve in the smallholder sector face the danger of being wiped out by the frequent droughts as a result of climatic variability. The merit of the mini livestock apart from their ability to adapt to stressful environment are a valuable asset to the smallholder farmers as they could provide their basic needs. The group will survive the increased temperatures, feed resource scarcity. The serves to point to the fact that intensification of mini livestock production would be a viable option in the context of demand for animal protein where conventional livestock species production may be vulnerable to high input.

There is need to set new standards for sustainability of mini livestock. Some of the mini livestock attributes which are not considered in these breeding situation such as smallness and low maintenance cost may be valuable to marginalized rural households. The ability to graze and browse a wide range of forage species which may be unpalatable will be a necessary adaptive characteristic in mini livestock. Mini livestock are smaller animals which have less maintenance requirement which will be paramount in the event of scarce feed resources. Despite the large numbers of mini livestock , information on mini livestock research related to climate change is scarce and often unavailable. Largely as a result of prejudice and ignorance of the importance of mini livestock to farmers in the smallholder farming sector, there had been little research on productivity. On performance alone it is difficult to understand why mini livestock has not reached a position of importance in livestock production. The choice of mini livestock production may increase the adaptive capacity of resource poor livestock farmers because the goat has a greater effect on the ecosystem than other animal species. They are numerous in Africa and could provide substantial quantities of animal protein. However their production is based on age-old husbandry system which need to be gradually modified in order to actual respond to crisis in protein provision. Given the considerable hardy characteristics of mini livestock their promotion will go a long way to facilitate livestock production coping with stressful environment as a result of limited resources. Most mini livestock require little capital or labor, provide an inexpensive, readily palatable meat, some have no odor and are suitable for keeping indoors. Rural poor farmers raise them to supplement diets based on grains and vegetables.

Utilization of mini livestock can be the basis of development programs linked to human nutrition component. The previous developmental programs had no active nutritional component as part of the poverty alleviation and food security. Mini livestock production may focus on hopefully protein consumption by the vulnerable groups and income generation and increasing the intake of meat to improve quality of diet. The widespread use of poultry in Southern Africa villages demonstrates the importance of small, easily managed, household livestock. Small size, the ability to forage for themselves, and a natural desire to stay around the house put chickens, ducks, guinea fowl, and other mini livestock among the most vital resources of rural communities. Scratching a living out of the dirt, dust, ditches, and debris, these often-scrawny creature are a resource to be given greater attention if food insecurity is to be avoided. For the most resource poor farmers, mini livestock may be the only source of meat during much of a lifetime. The climate change influence through gas emissions resulting from use of large animals is well known. Mini livestock, in contrast, have insignificant gas emission which can cause ozone layer depletion.

3. Mini livestock genetic improvement and food security

Genetic improvement research on mini livestock are still lacking in Southern Africa due to a traditional emphasis on large domestic animals and a lack of related training and education. Mini livestock are most relevant to animal genetic biodiversity concerns because they have co-evolved with a particular environment that represent an accumulation of an animal genetic resource through natural selection. These have usually taken a long time unappreciated to evolve and have adaptable characters that cannot easily be developed. Breeding programs should be considered for some mini livestock species, which will at the same start generating data on phenotypic traits, reproductive parameters and carcass characteristics with the final aim of improving overall performance from an economic point of view. The reproductive capacity of these species is the most important factor which will affect their success as an important component of the livestock production system. The breeding criteria of most mini livestock can be more varied than the narrow production criteria of subsistence farming system. Most populations of mini livestock have been subjected to little or no deliberate selection for higher productivity. They have been no benefit of any organized local genetic improvement including established methods of selection for their locally preferred breeding objectives which unknowingly responded to the demands of low input system. This itself may have been an advantage in the sense that the survival traits were not compromised. Through natural selection mini livestock have been selected for genetic adaptation responses in more marginal environments since time immemorial. The selection should be centered on adaptation and productivity which augur well with the uncertainties of climate change. The recent high demand for livestock products need to refocus from conventional livestock to mini livestock to higher production targets to match their counterparts.

Genetic potential of mini livestock is unknown and hardly exploited because the common objective has been to meet the protein requirement from large conventional livestock. The level of appreciation of the role of mini

livestock in most developing countries is low. Previous reports in Nigeria by Vaccaro et al., (1968) and Quijandria et al., (1983) suggested that a genetic basis exists for vital production characters of mini livestock such as guinea pigs for body weight and litter size. The implication is that a general improvement in these traits would occur when selection is practiced. Wright (1960) and Dillard et al., (1972) reported phenotypic and genetic correlations among weights of guinea pigs at different ages, weight gains and litter size. Research is almost negligible and virtually no information on the performance potential of mini livestock in their different native environments is available. Change in population dynamics in relation to demand of protein worldwide has never been looked into. Against this background the development of mini livestock species has not produced any distinct characteristics suited to different conditions. There has been little known about the adaptive value of mini livestock species and their functional role in subsistence production system. This entails that strategy to promote their use should focus on utilization and improvement of individual populations. Individual populations will only survive if superior production traits of economic relevance are identified. Assuming that in any market oriented drive of products derived from mini livestock will follow a trend through different phases which include growth, maturity and decline. Integration of mini livestock in the main livestock system will only take a centre stage through improvement of their overall biological and economic efficiency through provision of an optimized genetic potential meeting the needs of intended market or subsistence farming system. There is generally lack of information on the characterization and extent of genetic diversity in almost al mini livestock animal genetic resources worldwide. This is due to the fact that limited research studies have been conducted to evaluate the production characteristics of these animals. In the absence of research data production characteristics of mini livestock their genetic potential has not been well appreciated. This has led to the assumption that mini livestock are of low genetic potential. Consequently, most animal selection in their population has been left to natural forces or influence. Also, development aid projects for livestock have historically focused on classic livestock rearing, and tend not to focus on mini livestock. The only significant exception to this is the occasional chicken project, and unfortunately these have been dominated by attempts to establish large-scale intensive poultry production, which do not target indigenous chickens. The focus on these programs have been driven by the priorities of developed countries, reflecting both their research structures and their commercial interests. The most notorious example of this is probably the International Livestock Centre for Africa (ILCA), a Consultative Group on International Agricultural Research (CGIAR) centre, which refused to countenance research on animals other than classic livestock rearing, thereby ignoring key African mini livestock domesticates, such as turkeys, goose, guinea fowls, rats, rodents, guinea pigs, insects, mopane worms etc. The time is now ripe for systematic mini livestock improvement on the planned production . Improvement should be organised with integrated rural development context and should avoid purely disciplinary approaches as might be taken by academic zoologists. People in the field are calling for support and assistance in mini-livestock production and are asking for effective extension and training into the rearing of these edible local species, which sadly are frequently ignored and neglected in traditional livestock research, tertiary institute's curricula and rural development programmes.

4. Some challenges associated with mini livestock farming to achieve food security

Almost any household can start up a small household activity based on a few mini livestock species , but scaling up to the next level of a viable and regular output with a view to selling at market is altogether more challenging. Success will largely depend on government support services such as clear technical assistance , based on sound veterinary and animal husbandry research, and the diffusion of affordable production methods that are suited to small-scale producers. Ogunjimi et al., (2012) cited problems confronting mini livestock farmers which included inadequate credit facilities, untimely supply of inputs, inadequate information, improper management skills, low extension contact and inadequate processing technology. However, mentioned community influence, farmland acquisition, characteristics of mini livestock, personality factor, economic status, formal education, household composition, external orientation, farm characteristics, social orientation group and communication tools as factors which influence farmers to participate in mini livestock production. Constraints in snail production included non adoption of recommended practices, poor storage facilities and stagnant production technologies among farming communities (Adinya, 2006). Mini livestock is a minor constituent of livestock population facing challenges which need to be addressed promptly and adequately to bring in rapid improvement in their population. Unlike some bush meat which may not be killed or touched because of religious dictates, taboos or prejudice (Vos, 1978). Small mini livestock population and their productivity per animal demand is critical. Some of

the constraints which may hinder progress in the utilization of mini livestock include little support of relevant research activities to enhance productivity. Livestock production has been given an overriding emphasis as one of the core sectors to solve the current challenges on food shortage and to bring future sustainability to the world over, however the negative impact of climate change on livestock production has been considerable. It is believed that agriculture is the most susceptible sector to climate change and also predicted that climate change will have a graver effect on Africa than on any other continent and that temperatures will rise significantly (Scholtz, 2012). Most sub populations are small in size and mini livestock species are not perceived as a valuable assets. Mini livestock as compared to ruminants tend to have higher feeding requirements per unit of body weight than larger species, which is caused by biological restraints on efficiency of food digestion. As a result, small animals tend to require food that is higher in protein, with less fiber (De Wilde, 1991). In most cases there is insufficient or lack of national mini livestock production policies which result in limited capacity for performance. Animal production and extension services are run through state schemes, breeding policies in livestock production often do not include mini livestock Despite the numerous advantages of mini-livestock, there are disadvantages as well. It is important to be aware of these disadvantages in order to mitigate any constraints small animal rearing may have on the investor. Disadvantages include high energy requirements, increased labor requirements, disease, predation, lack of research, and human resistance to new and small species.

5. Final comment

Unless alternative sources of livestock products are made a priority high prevalence of food insecurity and malnutrition will persist for a long time to come in Southern Africa, taking into account the high demand for livestock products for the ever increasing human population. From the foregoing discussion it is clear that urgent measures need to be adopted which focus on the inclusion of mini livestock species in the main stream livestock agricultural activities. Due to their size mini livestock are user friendly and if properly integrated into main livestock production systems could become a major food source in Southern Africa. These small, hardy animals deserve much more attention. More broadly, the study fulfills the need for research into alleviating food insecurity in Africa, as it is anticipated that animal protein demand will surge due to rapid increase in human population and diets that traditionally did not contain a lot of animal proteins are expected to change. The future implication for food security is that if subsistence rural farmer are engaged in mini livestock production, there will be sustainable increase in production and meet the animal product demand. Micro-livestock tends to be comparatively inexpensive to buy and there is less financial risk in comparison to conventional livestock, making it more realistic that a subsistence farmer would be able to invest in and sustain a group of reproductive micro-livestock as compared to conventional livestock. If food security and nutrition are key agenda in sustainable livelihoods in the majority in Southern Africa the priority is to work with mini livestock species that are important to the majority of rural farmers. There is strong evidence to suggest that the mini livestock can substantially contribute to improved resource farmers basic diet. Most rural households depend on a scatter of small species for protein, with the slaughter of cattle or sheep as a very occasional festival meal. The climate change influence through gas emissions resulting from use of large animals is well known. Mini livestock, in contrast, have insignificant gas emission which can cause ozone layer depletion. Generation of sufficient information on mini-livestock production through research to intensify extension, training and education programs in order to promote it more widely is needed. At the same time there is an urgent need to invest in further technical and systems research on mini-livestock production.

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