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Little Known Small Animals of Economic Value: Why Calling Them Mini-livestock Matters

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***Target Audience**: Animal Scientists, Zoologists, Wildlife Scientists and Taxonomists*

Abstract

This paper assessed the meaning of several names attributed to "little known small animals with promising economic future", for a name that is reasonable, properly depict the nature of these animals, convey stakeholders' intent and enhance shared understanding. The study was a review of journal articles, books, reports and institutional websites. Literature search utilized Google Search and Google Scholar using key words. The study confirmed that this group of animals is known by several names– non-timber forest products (NTFPs), bushmeat, neglected and underutilized species, unconventional livestock, microlivestock and minilivestock. The variety of names instigate misunderstanding of the concept among stakeholders. Calling this group of animals bushmeat seems inappropriate as some of them are currently being domesticated and conventionally farmed. Identifying them as NTFPs is improper because the term includes plants and their products. Naming neglected and underutilized species seems tentative because sooner than later, their utilization, research and development will plateau, transforming them to conventional livestock. Calling them unconventional livestock is not apt as the name cannot be generalized to places where they are conventionally farmed and utilized. The term microlivestock misrepresents their true size and nature. For Animal Science research and practice in Nigeria, the term "minilivestock" seems the closest in meaning to what they are, hence, should be used to identify small animals used for food, feed and income. It should replace other names presently in use. Nevertheless, the list of animals that are minilivestock is extensive, fluid and will continue to change as the rate of usage of the species increases.

Description of Problem

More than sixty animal species provide man with food, shelter and energy, but, only domestic cattle, sheep, goat, pig, and poultry play key roles in modern livestock production (1). This select group of animals is called "conventional livestock". They constitute sixteen mammalian species–buffalo, cattle, yak, goat, sheep, pig, ass, horse, bactrian camel, dromedary, alpaca, llama, guanaco, vicuna, deer, rabbit and fourteen avian species–chicken, duck, turkey, goose, muscovy duck, guinea fowl, partridge, quail, pigeon, cassowary, emu, nandu and, ostrich. These species contribute thirty-percent of livestock products for agricultural production and human food needs satisfaction (2, 3). Conventional livestock are well known in the northern hemisphere and international research and development circles. Their popularity enables them attract most money for research and

development from government and donor agencies (1). Their fame is due to their well-defined production systems, advanced breeds and breeding programmes, well-developed food cultures across the world and, high acceptability as food (4).

However, it soon became obvious that many people, especially in the developing world, consume and utilize a wider variety of animal species, than is contained in the standard list of livestock, in western literature. These other animals, which were not domesticated according to principles enunciated by developed countries' stakeholders, were ignored (1). This group includes a wide scope of small indigenous and, mostly terrestrial animal species that have been used over time in the tropics, through collection, hunting and poaching (5). In addition, during this time of epiphany, regarding these unknown animals that play key roles in animal protein provision, governments and donor agencies sponsoring large-scale and intensive livestock projects in developing countries, noticed that the sustainability of their conventional livestock projects was in doubt, irrespective of many attempts to improve productivity. These traditional livestock species continued to face mounting pressure to meet increasing need for animal protein, by the ever increasing human population. The pressure was exacerbated by climate change effects and, land constraint for livestock production. Around 1985, an alternative strategy that promoted the development of "little-known small animals" in livestock production was proposed as the solution to the challenge of unsustainability in conventional animal production, thus, making these little-known small animals a serious issue for discussion (6).

These poorly known animals perform several functions that conventional livestock cannot fulfil or if they do, less efficiently (1). In developing countries, conflict areas and under urban agriculture where land is scarce, small livestock species occupy niches unavailable to conventional and larger animal species (4). The small size of these animals reduces financial risks associated with their rearing. This is because it is easier to buy, sell or slaughter one animal of the herd than large animals, thus, more efficiently adapted to one family's needs for cash or food. They are also easier to maintain in terms of their need for feed. Also, they have higher reproductive rates than larger animals. Furthermore, since they can be maintained on small farms, they have the potential to increase the productivity of the crops by recycling nutrients from crop residues and kitchen wastes into manure. Another interesting feature of these small animals concern conservation strategies. They can be reared using sustainable ways. This helps to reduce pressure on wildlife, enhance recycling of biomass and gives the farmer access to lucrative niche market (7). Due to all these advantages associated with little known small animals, adapting research and development strategies to include them became necessary and began gaining traction.

In 1991, the National Research Council of the United States of America published a book with the title "Microlivestock: Little-known Small Animals with Promising Economic Future" (8). The book tried to focus global attention on some animal species, and their potential to positively change the lives of indigenous peoples of those regions. These small animals have been consumed for ages in mostly the developing world, but scantily reported in mainstream agriculture and food literature, especially in the West.

These "little-known small animals with promising economic future" have undergone a lot of nomenclature metamorphosis over time. The name they are called, depends on the depth of knowledge about them by the name-giver.

The group has been called "neglected and underutilized livestock", "unusual livestock", "bush meat", "non-timber forest product (NTFP)", "unconventional livestock", "non-conventional livestock", "microlivestock" and "minilivestock", by different stakeholders, without agreeing on a single terminology for this concept. Hence, the study of these poorly know animals is full of linguistic conflict (1), thus generating confusion on which of those terms accurately captures the meaning of "little known small animals with promising economic future".

Understanding a concept is important because in teaching, research and development, concepts and names matter. Properly defining names is a prelude to resolving ambiguities around them. Agreeing on a single name enables stakeholders to speak from a common point of understanding. This will enable better delivery of teaching, training, extension and communication of research findings to both experts and non-experts. Poor common understanding of a concept encourages irreconcilable opinion conflict, misrepresentation and misunderstanding of what actually is being talked about, being proposed or being worked on.

This paper discussed the meaning of different names associated with "little known small animals with promising economic future" to recommend an appropriate name for identifying them, and ensure better teaching, research, understanding and communication of research findings involving these animals.

The paper reviewed published literature–journal articles, books, reports and institutional websites. Literature search was done with Google Search and Google Scholar using key words and secondary terms. Materials were sorted and most relevant ones used for this write-up. The paper began with and introduction, followed by in-depth discussion and analysis of each name before outlining their implications. The discussion is divided into the following sub-headings–non-timber forest products (NTFPs), bushmeat, neglected and underutilized livestock, unconventional and non-conventional livestock, microlivestock and minilivestock. It ends with a conclusion and recommendations.

Bushmeat

According to the Bushmeat Liaison Group of the Convention on Biological Diversity (CBD), bushmeat, otherwise called wild meat, is meat obtained from wild animals in the tropics and sub-tropics for food and non-food uses (9). The same report states that bushmeat comes from any non-domesticated terrestrial bushmeat may come from large and small animals including mammals, birds, reptiles and amphibians. Invertebrates such as crustaceans, molluscs, grubs, insects and fish are excluded from this definition, though they are an important source of food for man. Bushmeat production and trade is common and usually associated with West and Central Africa, though it has global reach (10). Bushmeat is used fresh or smoked and some species for trade are more expensive and sought after (9). Calling "little-known small animals with promising economic future" bushmeat would seem inappropriate because some of them are currently being domesticated and conventionally farmed, while others are still wild-hunted. Examples of those that are both farmed and wild-caught include snail and grasscutter. Naming them bushmeat falsifies their true nature, since some of them are under domestication and conventional farming. Also, most members of this group found not only in West and Central Africa but in other parts of Africa, Latin America, Asia and the northern hemisphere. In addition, invertebrates such as mollusks, grubs and insects, key members of little-known small animals, are excluded from

bushmeat definition. Excluding them from the scope of this group, as shown in the definition of bushmeat by CBD (9), an authority in bushmeat research, seems unfitting.

Non-timber forest products (NTFPs)

The term non-timber forest products (NTFPs) is commonly used in forestry and wildlife specialization, where most of "little-known small animals" were first considered for domestication. According to (11), NTFPs are all biological materials except timber, obtained from forests, for use by man while, (12) sees them as goods of biological origin outside timber, from natural, modified or managed forested landscapes, or all resources or products, extracted from forest ecosystem and, utilized in the household, marketed or, that have social, cultural and religious significance. Also, (13) posited that NTFPs are any product other than timber, that is naturally produced in forests and, harvested for human use, without cutting down trees.

According to (14), NTFPs were in times past known by several names–minor forest products, wild products, secondary forest products, or forest by-products. Presently, even FAO refers to NTFPs as non-wood forest products (NWFP). Nevertheless, the terminology used, depends on research and policy objectives (14). Currently, the term NTFP has unified those different names of the concept in to one–NTFP. Unifying the disciplines implies that sometimes, there could be some unavoidable delicate variances in how different scholars and specializations see the concept NTFP and its elements. The several changes made to the term NTFP during its metamorphosis highlights the tendency of scholars to legitimately make a problem out of the concept due its conceptual vagueness. Notwithstanding, the problematization of the NTFP concept has been unable to produce theoretically viable principles that link NTFPs to key issues of development that the research on NTFP was meant to solve.

There are still raging arguments, mix-ups and, contradictions on what is NTFPs are and what they are not (14). Hence, to simply issues, some scholars describe NTFPs by what they are not (15). Most have agreed that the number of species included as NTFP is huge and complex, spanning plant products (fruits leaves, flowers, seeds, roots and bulbs, bark, bamboo, grasses) to animal products (honey, insects, fish, game, resins, horns and skins) used by people for several things (14). In some of those lists of NTFPs fodder for livestock is excluded (16).

Important elements of what NTFP should contain were isolated by (14). These include (i) biological products, not abiotic or services (ii) self-propagating wild species (indigenous, naturalized or alien) that only small number of them were recently locally cultivated or domesticated under human-controlled systems (iii) harvested and used by humans, not wild animals (iv) used for consumption and non-consumption (v) available from human or non-human dominated landscapes and ecosystems (vi) large-scale management objectives set, monitored and regulated by NTFP host communities (vii) most or all of benefits from their use tailored to local livelihoods and wellbeing (ix) accruing benefits incentivize conservation of the species or site supported by enabling environment.

From the discussion, it can be deduced that nomenclature of NTFPs has evolved overtime. Even now, nuanced professional names and perceptions of NTFPs are still motivated by research and policy objectives. NTFPs are wild, natural, indigenous or exotic self-propagating plants and animals originating

from human or non-human dominated forest ecosystems and, used directly e.g. for food or indirectly e.g. for sale and having socio-cultural and religious importance. Benefits derived from them should incentivize their conservation and tailored to local communities. In addition, only a small number of them should have been recently domesticated or cultivated under human control. The list of NTFPs is long, diverse and complex and includes plants, insects, game, fish, their products and by-products.

Identifying "little-known small animals with promising economic future" as NTFPs will be inappropriate. This is because the term includes plants and their products. Also, the list of animal members is too large and complex and includes not just the living animals but their products, by-products and, associated services.

Neglected and underutilized livestock

Usually, neglected and underutilized livestock are species that have been snubbed by Europe and North America-backed research and development organizations as well as world statistics on agriculture and food. The data is usually produced mainly by these Western countries who fail to include the species because their number is "insignificant" relative to well-known conventional livestock (1). The International Livestock Centre for Africa (ILCA), precursor of current International Livestock Research Institute (ILRI), notwithstanding its clear obligation for livestock in Africa, notoriously discouraged research on animals that are not the traditional breeds–cattle sheep, goat, pigs and, poultry. ILCA, by this act, ensured that camels, donkeys, pigs, rodents, and indigenous poultry of great importance to Africa stay neglected and underutilized (1). Their action was further enabled by the difficulty in obtaining and maintaining research funding for these animals, poor access to regions where these species are produced, food and nutritional dogmatism, as well as powerful interest of veterinary and breeding companies that discourage biodiversity maintenance, due to the higher costs associated with catering to a more assorted market.

Presently in Nigeria, the neglect and underutilization of "little-known animals" in animal production is confined to where they are not endemic, well-known or, not popularly eaten. Current literature suggests that there is increasing level of awareness about the nutritional value of these animals, as major sources of meat and poverty alleviation (17, 18). Organizations such as Bureau for Exchange and Distribution of Information on Minilivestock (BEDIM) are currently giving awards of recognition leading researchers in the sector and, providing small grants for research and conference attendance, to interested persons (7). Also, literature on these animals is now generated faster than before. Therefore, continuing to use the name neglected and underutilized livestock is improper. This is because sooner than later, the utilization of these animals and their research and development will plateau, transforming them to conventional livestock, thus meriting a change in name. So, why not seek an enduring name that would be relevant for the long-term?

Unconventional livestock

The terms unconventional, unusual and non-conventional livestock are used interchangeably for the same intended meaning. W. Treitz in 1979 first coined the term unconventional livestock for animal species which are not the focus of mainstream livestock production and research and are not commonly used as food in the place of focus. These little known animals are not unconventional to people who eat and use them over the years (1). Unconventional livestock could be terrestrial or semi-terrestrial species presently exploited and hunted intensively in the wild for human

consumption but also considered as good candidates for commercialization, domestication and captive breeding or for which recent captive breeding programmes have been put in place (19). These animal species are viewed by the industrialized world and some elites of the developing countries as unconventional or non-conventional. It is only recently that their significance for livestock development and role in human nutrition security became extensively recognized. These species are unconventional relative to cattle, small ruminants, pigs or poultry (conventional), thus there is scanty information on their rearing systems. Nutrition, reproduction, behaviour, genetics and health issues, including potential zoonosis of unconventional livestock species are barely studied. This is a major limitation for the development of unconventional livestock and the improvement of the systems efficiency.

An attempt at classification of unconventional livestock in different groups based on ecological affinity, body size or their combination was achieved by (4).

Classification of unconventional livestock based on ecological distribution

Unconventional livestock grouped based on ecological distribution include:

(a) Those with broad ecological range and adapted to several ecological circumstances. They are mainly small-sized, thus ratifying the belief that the smaller the animal, the better they can last where feed supply is inadequate. Examples include rabbit, guinea pig, guinea fowl, duck, pigeon, bee, turkey, and silkworm.

(b) Those adapted to a particular ecological situation or the supposedly "ecological niche" animals which may be large or small-sized. Examples include grasscutter, snail, camel, llama, alpaca, yak, banteng, water buffalo, eland, oryx, deer as well as small animals like capybara, frogs and reptiles.

Classification of unconventional livestock based on body size

Unconventional livestock grouped based on body size include the large animals that eat feed under harsh ecological and climatic settings and the small animals that survive on home scraps, hence, can be raised in smallholder farms and within the household.

Classification of unconventional livestock combining ecological distribution and body size

Combining both ecological distribution and body size, unconventional livestock can also be classed into three:

(a) Those with large body size and high ecological affinity. They are the "true ecological niche" animals. Examples are members of the Artiodactyla.

(b) Those with small body size and high ecological affinity. They are appropriate for specific ecological and economic niches. Examples include capybara, grasscutter, snails, frogs and reptiles.

(c) Those with small body size and low ecological affinity. These are the "true economic niche animals". Examples include rabbit, guinea pig, guinea fowl, turkey, duck, pigeon, bee and silkworm.

Unconventional livestock are used domesticated, tamed or directly from the wild: (i) domesticated unconventional animals have been domesticated for millennia and selectively bred for certain traits under human control, (ii) tamed unconventional livestock have been tamed and used to supply man's basic needs in certain parts of the world. Though not domesticated, their breeding for use by man is controlled but not selectively, (iii) wild unconventional livestock are still in the wild

and, rarely used for food, feed and income by man. Also, man does not control their reproduction or population dynamics (Peters, 1987), (ii) but sometimes can cross to group iii.

In using this term "unconventional livestock", one should be aware that the focus is on the rarity in the use of the species as food and their unpopularity with Western or Western-backed animal production, research and development stakeholders, programmes and projects. Size is not the focus here because both large (e.g. buffalo and yak) and small sizes (e.g. rabbits, grasscutter and snails) are included. Also, wildlife, pets, tamed and domesticated animals made the list. The scope of this name therefore, is extensive and endless.

Another challenge in the use of this concept is that the increasingly vocal and influential animal and pet right activists may stall the development of this sector if defined by this name because the inclusion of pets will be unacceptable to them. In Nigeria, some of the species such as snail and grasscutter are conventionally farmed and used as food in parts of the country but unconventional in others. Thus, the use of unconventional livestock to describe these species is not apt as the name cannot be generalized to where the animals are conventionally farmed and utilized.

The major takeaway from this definition is that whatever animal is rarely used as food, in a particular place, whether large or small, pet or livestock, wild, tamed or domesticated, terrestrial, arboreal (pigeons) or aquatic (duck) is unconventional livestock

Microlivestock

In 1984, Noel Vietmeyer, a member of the Board of Science and Technology for International Development, National Research Council of the United States of America suggested another name, "microlivestock", to replace "unconventional livestock for Little-known Small Animals with Promising Economic Future" (8). By this new name, he intended to attract the attention of the international community to numerous animal species popular in many places in the world and having bright prospects for food, feed and economic use but ignored as protein source by livestock experts, especially in the developed world (5). This awareness, it was hoped could inspire their inclusion in mainstream animal research and economic development programmes using livestock. According to (8), the concept was intended to refer to species which are naturally small-sized, example rabbits, poultry and breeds of cattle, sheep, goats, and pigs that are smaller than half the size of majority their species. These tiny animals are rarely included in conventional livestock development, though they have future prospects. The report emphasized the multipurpose nature of the small species with prospect for smallholders which could be realized immediately realized or in the long-term, with need for more research to generate data for understanding of this promise or its fulfilment. Also, the species could be threatened with extinction, or rare breeds of conventional animals going extinct due to their neglect and underutilization.

The name, "microlivestock", was accepted even as Treitz acknowledged that his own term, "unconventional livestock", was actually more confusing than microlivestock (5).

In addition, Act No. 27 of 2007 of Nigerian National Assembly establishing the Nigerian Institute of Animal Science (NIAS) identifies these little known animals with economic and nutrition prospects as microlivestock and recognized the group as one of the key specializations in Animal Science

(20). Also, the November 24, 2010 communique of Microlivestock Production Committee of NIAS states that "Microlivestock animals include a wide range of animal species including but not limited to rabbit, grasscutter, honey bees, snails, guinea pigs, turtles, crocodiles, giant rats, dogs, cats, monkeys, snakes, insects etc. which contribute immensely to the nutrition of teeming population of the country (Nigeria, sic) but yet are neglected relative to other livestock animals" (21).

It is obvious this name emphasizes the animal size. But, the challenge is that none of the animals listed as microlivestock is microscopic (only viewed with the aid of a microscope) in size. Also, listing cat, dog, monkey, turtle, crocodile and others in the group makes it vague and unending. There is need to be specific when defining a concept so that one would be aware when they have crossed the boundary. Therefore, using the name microlivestock for this group of animals will be incorrect because it will misrepresent their true size and nature.

Minilivestock

Some years after the coining of the term "microlivestock", Jacques Hardouin further refined the term to "minilivestock" (5). He argued that "microlivestock" is fit for organisms of microscopic size (can only be seen with the aid of a microscope) such as fungi and bacteria which are good sources of high quality protein and can be produced under controlled environment. Furthermore, he stated that minilivestock should include animal species that are smaller than conventional livestock such as cattle, sheep, goat, poultry and pig but are used in certain localities for food, animal feed and income generation. Normally, minilivestock breeding and production occurs wherever they are endemic. This means that suitable feed and housing materials are available in the vicinity or can be produced by the breeder, hence, making minilivestock fit for backyard production (22).

A minilivestock seminar was organized in 1992 in the Philippines for young scientists, with interest in minilivestock research and development, to meet and share knowledge and resources. The meeting, according to (5) agreed that:

(i) Minilivestock be adopted to replace microlivestock because microlivestock does not accurately represent this new field of animal production.

(ii) The definition of minilivestock should be using the phrase "species little known in animal production".

(iii) Minilivestock include both vertebrate and invertebrate, terrestrial or aquatic species with live weight of 20 kg or lower.

(iv) The animal must be potentially useful for food, feed and income and, not presently utilized to their full potential.

(v) Species must be poorly studied at the time (23) while (6) included the following characteristics of minilivestock:

(vi) Animal species must be partly or permanently terrestrial

(vii) Species must be popular in their domain of natural dispersion

(vii) They are not normally obtained from organized breeding efforts but, could be possible

Following the resolution of researchers active in the field in1992 to call these animals minilivestock, the Animal Health and Production Division of the Food and Agriculture Organization (FAO) thereafter included minilivestock in the scope of livestock systems under jurisdiction (6). This conferred legitimacy on the use of the term minilivestock for these animals and for their use for food, feed and income.

Those characteristics were further summarized in six principles by the Bureau for Exchange and Diffusion of Information on Mini-livestock (BEDIM) for use in identification of minilivestock species (7):

- Small size
- Popularly used locally
- Directly or indirectly uses by human beings
- Used as food for people, feed for animals and income from sale
- Supports sustainable use of renewable natural resources
- Substitution of gathering, hunting and poaching with controlled production techniques

This definition of minilivestock emphasizes the size of the animal and geographical location of the place of abundance, place of widest diversity and where they are most popularly utilized. Also, availability of local feed and housing materials and the fitness of the animal to smallholder systems is important to defining this concept. Both minilivestock and microlivestock refer to small size but using the prefix mini would not relate to the use of microscope to see the animal but the prefix micro will mean just that. Therefore, minilivestock nomenclature most appropriately describes members of "little known animals" group than microlivestock.

As noted in point number (iv) of the seminar communique, the list of animals that are minilivestock is wide, fluid and will keep changing as the rate of usage of the species increases. If, in the future, the use of any member of this group becomes conventional, its membership of the minilivestock club will cease while, squirrels which are not presently domesticated may become minilivestock sometimes in the future. Of course, the place of usage plays a part in the ascription of minilivestock title. For example, snail may be minilivestock in Niger Delta but not in Sokoto with dominant Muslim population. As societies continue to interrelate and develop, the list of minilivestock will continue to change.

Minilivestock include vertebrates and invertebrates. Vertebrate minilivestock species in Africa include rodents such as the cane rat (*Thryonomys swinderianus*), giant rat (*Cricetomys gambianus*), brush-tailed porcupine (*Artherurus spps*) and guinea pig (*Cavia porcellus*) while the non-rodent vertebrates include edible frogs and birds such as quails and guinea fowl. In some cases, small cold-blooded vertebrates such as frogs, lizards, some snakes and fish are classified as minilivestock, depending on the place of use. However, fish, though an important food source, by convention, is not recognized as minilivestock by the minilivestock scientific community (5). This is probably because it is not partially or permanently land-dwelling.

The invertebrate minilivestock species include giant African land snails such as *Archachatina spps* and *Achatina spps*, earthworms, fly maggots, crickets, grasshoppers, locusts and caterpillars (24, 6). Invertebrates can be accepted as minilivestock if they are useful for food and feed or used to generate income, or reared by man for any of those reasons (5). Therefore, the purpose, condition of use and, the locality where they are used is important in determining whether a species is considered minilivestock. For example, the housefly that transmit disease and termites that destroy houses cannot be minilivestock, but, under controlled environments, where their larvae or maggot are harvested to feed fish and monogastric animals, they are accepted as minilivestock. This also applies to land snails and rabbits viewed as pest when they destroy crops or become nuisance to humans but, when they are deliberately reared or harvested for food, they become minilivestock (25).

Some authors consider small species and breeds of conventional livestock as

minilivestock. But, to maintain a clear boundary, the term minilivestock should rather be viewed as having some form of unconventionality, underutilization and ecological affinity. Hence, the West African Dwarf goats and Bakosi dwarf pigs of Cameroon, and Muturu cattle of East-Central Nigeria, though mini-sized and indigenous, should not be taken as minilivestock but most appropriately tagged "neglected and underutilized livestock".

Based on literature evidence in our discussion so far, minilivestock is the term of choice for this group of animals because its meaning is the closest in meaning "little-known small animals with promising economic future"

Conclusion and Applications

The paper assessed the names of "little known small animals with promising economic future" for a proper and fitting name. We conclude that:

1. The group of animals is known by several names–non-timber forest product, bushmeat, neglected and underutilized livestock, unconventional livestock and microlivestock
2. These commonly used names have severe conceptual shortcomings and could minimize shared understanding of the concept in teaching and research.
3. In the context of Animal Science practice in Nigeria, the name minilivestock is the closest in meaning for small animals used for food, feed and income
4. Minilivestock should therefore replace other names presently in use.
5. The list of animals identified as minilivestock is extensive, fluid and will continue to change as the rate of usage of species increases.

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