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Organic ruminant production in Nigeria: Research questions.

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ABSTRACT

Organic livestock production is not an entirely new concept in Nigeria, as it has only been practiced and researched into in the breach for several decades. The major shortcoming has been the non-observance of international standards as set and specified for the production of organic foods, particularly with regards to feeds and feedstuffs, housing requirements and animal welfare issues among others. The significance of ruminants within the overall concept of organic agriculture concept has been acknowledged. This paper considers the current status of organic ruminant production and research in Nigeria, and proposes a number of research questions that are pertinent for successful national organic ruminant production strategies in relation to the international standards and settings. It is concluded that addressing the identified research questions amongst others, coupled with an enabling policy framework, can be expected to result in a satisfactory organic ruminant production efficiency and productivity within the overall framework of organic agriculture practice in Nigeria.

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INTRODUCTION

Human population growth, increasing urbanization and rising incomes are predicted to double the demand for, and production of, livestock and livestock products in the developing countries by 2019 (Delgado *et al*., 1999). Livestock production is growing faster than any other agricultural subsector, and it is predicted that by 2020, livestock will produce more than one-half of the total global agricultural output in value terms. This process has been referred to as the "livestock revolution" (Delgado *et al*., 1999). New innovations leading to this revolution have often been a result of access to new and more powerful inputs, like coal or mineral oil and electricity. Those inputs are so powerful and cheap that they could be overused to overcome many difficulties in a fairly easy way and separate farming systems into independent parts (Gustafson, 2005). The author observed that it has taken some time to realize the environmental drawbacks of this heavily supported agriculture, but noted that a lot of efforts are now on in finding more sustainable solutions, including the development of guiding principles for food production based on systems ecology embracing natural and social systems, termed organic farming. The European Union, which was the first to certify organic food in 1991, has been identified as one of the major forces in these efforts.

It has been observed that the development of organic farming is a parallel in perspectives among farmers and consumers. In organic farming, agriculture is often referred to as an agro-ecosystem, defined by Sukhonthanit (2008) as a community of plants and animal interaction with their physical and chemical environments that have been modified by people to produce feed, fibers and other products for human consumption and processing. In organic farming there is a pronounced goal to decrease the dependence on non-renewable resources due both to their effects on our climate and to declining supplies (Gustafson, 2005). As formulated by KRAV´s Board of Directors (KRAV, 2001), the basic features of organic agriculture are two: care for nature's fundamental functions and the idea of global solidarity. The aim is to produce high-quality products in a sustainable manner and to do so in a credible and reliable way. The striving should be to respect natural processes and behaviour through the entire chain from farm to the final consumer. With particular reference to organic livestock production, this should be done primarily to keep farm animals in a manner which promotes good health and dignity, give animals opportunity to express their natural behaviour, and their products should be available to the consumers at reasonable prices (KRAV, 2001). Additionally, it was stated that the farmer should enjoy a reasonable income, a safe working

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environment and the opportunity to experience joy and satisfaction in his or her work.

The current status of organic livestock production in Nigeria

After a long period of discussing the need for innovations in organic and biodynamic farming by various interest groups, the National Research Council of the National Academy of Sciences in 1989 issued a highly significant report on "Alternative Agriculture" which was defined as a system of food and fiber production that applies management skills and information to reduce costs, improve efficiency, and maintain production levels through such practices as crop rotations, proper integration of crops and livestock, nitrogen fixing legumes, integrated pest management, conservation tillage, and recycling of on-farm wastes as soil conditioner and bio-fertilizers. In 1993, the National Research Council released a report on "Pesticides in the Diets of Infants and Children" which concluded that people in this age group could be at considerable health risk from consumption of foods containing pesticide residues. Higa and Parr (1994) observed that both of these reports raised considerable speculation about the future of chemical-based agricultural production systems, and that these systems of agricultural production have created many sources of pollution that, either directly or indirectly, can contribute to degradation of the environment and destruction of the natural resource base. Agricultural systems which conform to the principles of natural ecosystems have since been receiving a great deal of attention in both developed and developing countries. The ultimate goal of sustainable agriculture according to the National Research Council, and other sources as well, is to develop farming systems that are productive, profitable, energy conserving, environmentally sound, conserving of natural resources, and that ensure food safety and quality (Higa and Parr, 1994).

The development of organic animal husbandry has been observed to be slower than that of organic plant production. The reasons that have been adduced for the situation include historical and philosophical, as well as the fact that research on animal production often is more expensive and difficult to carry out compared to crop research (Sukhonthanit, 2008). Of recent however, the importance of livestock to the success of organic farming has often been a source of major discourse (Younie, 2000). According to the author, this revolves essentially around whether grass/clover leys are seen as critical for generating nitrogen in the farm system or whether a truly stockless system based on green manures and

grain legumes is possible. Younie (2000) opined that truly stockless systems are only likely to be agronomically reliable where soil type is very favourable, and that in most situations a system involving grassland and livestock is likely to be the most sustainable system of organic production. The ruminant livestock, in particular, are certainly necessary for their role in utilizing the leys, and are also important as a source of manure for transferring fertility to priority crops around the farm. Livestock also fulfill an additional role through their utilization of arable crop residues. Viewed in this context, organic livestock production is not an entirely new concept in Nigeria, as it has only been practiced and researched into in the breach for several decades, as evident in several scientific publications on integrated approaches to livestock production. The major shortcoming has been the non-observance of international standards as set and specified for the production of organic foods, particularly with regards to feeds and feedstuffs, housing requirements, and animal welfare issues among others. The International Federation of Organic Agriculture Movements (IFOAM), an umbrella organization for all other organizations of organic farmers, scientists, educationalists and certifiers from almost every country in the world, has developed basic standards for organic farming and production (KRAV, 2001). The European Union (EU) has also published extensive standards for organic production in "Council Regulation EEC 2092/91 on organic production of agricultural products and indications referring thereto on agricultural products and foodstuffs" (KRAV, 2001). The EU Regulation (EEC-No. 1804/1999 amending 2092/91) was introduced to harmonize the rules of organic livestock production across member states and to set minimum standards (Sundrum *et al*., 2005).

The future of organic ruminant production in Nigeria

It is evident from the preceding session that a baseline for a transition from the conventional livestock production to organic livestock production could be said to already exist in the country and the complementarities between crop and livestock productions are well known. Crops and crop residues provide feed, whereas livestock provide animal traction, manure, food, a form of savings or collateral, income diversification and risk reduction (Akinlade *et al.*, 2010). Although short-cycle species, such as chickens and pigs, are often very important for household food security and immediate cash needs, only ruminants can convert highly fibrous material and forages into valuable products that have little or no alternative use. Organic farming systems with ruminants are generally more productive than those without

them. Their ability to utilize leguminous forage plants, which fix atmospheric nitrogen, is widely acknowledged as critical to organic crop production. In order to obtain sufficient nitrogen in an organic crop rotation, Sukhonthanit (2008) recommended that about one-third of the crops should be legumes. The animals can fill trophic niches that otherwise would not be utilized, for example marginal lands otherwise unsuitable for agriculture (Sukhonthanit, 2008). The focus of this paper, therefore, is to provide a possible guide to the future of organic ruminant production within sustainable agro-ecosystems in Nigeria, hence, the following discussion/research considerations on the requirements for the ruminant component.

Collection of baseline data on existing agricultural production systems in Nigeria

This should be an all-encompassing study, which will be conducted using a multi-disciplinary approach, involving the collection of primary quantitative and qualitative data on agricultural production systems, livestock numbers and available resources. The results and outcomes of this study should reveal the existing and potential synergies among all the various arms of agricultural practice in the country, as it is established (Sukhonthanit, 2008) that the number of animals must be balanced in relation to the possible crop production and available resources for a successful organic livestock farming. Organic farming relies largely on locally available resources and is dependent upon maintaining ecological balance and developing biological processes to their optimum, and it is also committed to conservation of biodiversity within agricultural systems (Mader *et al.*, 2005). It is also very much about trying to implement an ecological centrism in a monetary-centric society (Salomonsson, 2005). The proposed study is expected to reveal the challenges, threats and the opportunities inherent in organic agriculture as a whole and the various integral parts, including organic ruminant production. Local standards and guidelines for organic animal farming will eventually be based on the collected baseline data. It is recommended (Sokhonthanit, 2008) that further development of such standards should be a continuous process based on practical experiences gained from production, processing, and marketing of the resulted organic animal products.

Setting and specifying standards for organic ruminant production in Nigeria

Standards were an integral part of the development of organic agriculture from the very beginning, hence its importance. The first

guidelines were developed by private associations to formalize an alternative production system to conventional production. The basic standards of the International Federation of Organic Agriculture Movements (IFOAM) are applied worldwide, with modifications to accommodate some standards peculiar to individual nations and their endemic ruminant breeds. The variety of production sites and the resultant product properties have not allowed for the identification of certain product quality that could be described exactly and confirmed analytically, hence, the production method itself has become the criterion for standard identification (Sundrum *et al*., 2005). From the foregoing, it is obvious that a twin-approach is needed for the task of setting and specifying standards for organic ruminant production in the country.

The first of this twin-approach involves a review of the existing literature on the subject matter alongside the national baseline data collection, coupled with collaborative/working visits to IFOAM, and some organic agriculture national regulatory agencies such as KRAV and the EU. The other side of the proposed twin approach is multi-faceted, but focused on researchable topics on the production and productivity indices of our endemic ruminant breeds viz-viz their roles and integration into organic farming, which should be science-based and practice-linked as it was in the early stages of organic farming development in some countries like Switzerland (Niggli, 2005). Following the basic scientific notion that the phenotype is a product of the genotype and the environment, it becomes imperative that the research topics on organic ruminant production in Nigeria should be considered from the viewpoints of the genetic make-up of our endemic ruminant livestock species as to the suitability of each species for organic production, as well as of the development of appropriate herd environments, acknowledged to comprise of the management, hygiene, feeding and husbandry practices for those species considered suitable for organic production. These two perspectives can hardly be divorced from one another, and thus, have to be considered in concert, with some of the internationally-set standards used as the baselines for research hypotheses.

Nigeria is endowed with a wide variety of endemic ruminant breeds that have evolved to adapt to the prevailing environmental conditions and traditional husbandry systems. Collaborative research efforts on the desirability or otherwise of the different breeds for organic production appears to be the area of research of utmost importance and urgency, with the existing data on their productivity indices under the conventional production systems serving as the baseline. Research teams Should thereafter be constituted to conduct specialized, but coordinated research activities along the various disciplines of animal production within the

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Overall concept of organic agriculture practice. The following areas of research are proposed in order to optimize the use of the identified ruminant breeds for organic production

Improvement of the breeding values of identified breeds

Low genetic potential is often assumed among our endemic ruminant breeds, often leading to plans to replace these breeds by exotic breeds, or to cross them with exotic germplasm, which are often done unsystematically (Kiwuwa, 1992; Baker and Gray, 2003). These attempts are known to constraint farmers in the sense that they are pushed by economic forces to adopt exotic germplasm for short-term benefits without accounting for long-term sustainability (Kiwuwa, 1992). Research efforts should therefore be made to take advantage of the opportunities that exist to improve productivity, adaptation (disease parasite resistance) and welfare of our suitable indigenous breeds through within-breed selection (Woolaston and Baker, 1996; Njoro, 2001; Ayalew *et al*., 2003; Baker and Gray, 2003) within the organic production concept. The selection of breeds must be adapted to crop production suitable for each ecological zone, to available resources, and to local agro-climatic conditions.

Animal health and welfare status

The maintenance of a high animal welfare status is enshrined as one of the principles of organic farming and good health is obviously a major element in the overall welfare status of the animal (IFOAM, 1998). Sukhonthanit (2008) identified the strong economic bond between humans and animals in organic farming as well as moral (and sometimes emotional) bond to animals as sentient and fellow beings on this planet, thus imposing a responsibility on humans for the welfare of farm animals. Good livestock health is seen not simply as the absence of disease, but also as a high level of vigour and vitality, thus enhancing the animal's ability to resist infection, parasitic attack, metabolic disorder, and recovery from injury (Younie, 2000). The maintenance of health and welfare status in organic livestock, whilst minimizing veterinary treatments, requires a positive approach to livestock husbandry (Boehncke, 1997). In any decision the farmer makes, e.g. on grassland management, on housing, on reproductive pattern, he should place the highest priority on the likely impact on livestock health (Younie, 2000). All the elements which have been suggested for inclusion in preventive health strategies could be regarded as pre-requisites for a

successful organic production system, revolving around health/parasite control, feeds and feeding management, feed processing and preservation, housing conditions and space requirements, waste management and routine management practices, amongst others.

The main health concerns of organic ruminant farmers in the United Kingdom tend to be endo-parasites and ecto-parasites in young stock, and fertility and mastitis in dairy stock (Halliday *et al*, 1991; Roderick *et al*, 1996), and the situation is not likely to be different worldwide. The most important nematode parasites of ruminants implicated in production losses are principally found in the gastro-intestinal tract. These include species of *Haemonchus, Cooperia, Bunostomum, Gaigeria, Oesophagostonum, Trichuris* and *Trichostrongylus* (Fajimi *et al*., 2004). Signs of parasitism include loss of condition, rough hair coat, scours, diarrhoea, bottle jaw, pale mucous membranes (eyelids, gums) indicating anaemia, and eventual death. Effective and sustainable control methods of nematode parasites of grazing livestock are generally acknowledged as becoming evermore challenging and difficult. This is largely due to two contrasting issues. One is the rapid escalation of resistance to anthelmintic drugs. The development of anthelmintic resistance in worm populations is now a worldwide phenomenon, in constant expansion, and is particularly prevalent in goats (Zajac and Gipson, 2000; Jackson and Coop, 2000; Kaplan, 2004), although the phenomenon has also been reported in cattle and sheep (Prichard, 1994; Waller, 1994; Pomroy *et al*, 2002). Secondly, there is the increasing trend towards organic farming, in which there is prohibition of the prophylactic use of all chemical compounds. Livestock producers urgently need non-chemotherapeutic alternatives in parasite control. Researchers have responded to this challenge and a variety of quite different approaches have been the subject of intense investigation in many countries for some time now. Among these alternative methods are control measures that are nutritionally-based and ecologically sustainable (Barry and McNabb, 1999). An increasing number of recent studies indicate that nutrition could affect parasitism not only through quantitative variations of different diet components, but also by the presence of some qualitative compounds in plants, notably leguminous and non-leguminous browses, consumed by herbivores, and particularly secondary metabolites (Athanasiadou *et al,* 2003). Hence, in the development and promotion of organic ruminant production in Nigeria and in setting the standards, there is the need to screen the browses in all the country's ecological zones for the presence of such secondary metabolites, and open an inventory for such plants. The levels of presence of the secondary metabolites considered beneficial in the context of health/parasite control in organic ruminant production should be

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determined while appropriate feeding strategies/packages for their effective utilization and integration should be developed. Other options that could be explored, singly or in combinations, include appropriate pasture management practices (Chafton, 2006), the use of ethnoveterinary medicine (Chafton, 2006), the use of the different species of the nematode-trapping fungi, such as *Duddingronia flagrans*, which feed on nematodes (Faedo and Krecek, 2002; Chafton, 2006), and the breeding of genetically resistant animals against gastrointestinal nematodes (Dominik, 2005).

A remarkable shift in agricultural practices occurred over the past century in response to new technologies. In particular, the Haber-Bosch method for synthesizing ammonium nitrate made the traditional practice of recycling nutrients with crop rotation and animal manure less necessary. Synthetic nitrogen, along with mined rock phosphate, pesticides and mechanization, greatly increased crop yields in the early 20th century (Agriculture - Wikipedia). All the technologies were adapted and adopted for grain and pasture production over the years, leading to the production of cheaper livestock. The resultant challenges for organic ruminant production from these technologies demand for research activities into the more effective use of crop rotation and animal manure for grain and pasture production. Applied in appropriate quantities, organic residues have an ameliorating effect on soil organic matter (Kapkiyal *et al*., 1999; Mac Hitech, 2006). The manures from sheep and goat are particularly helpful in the quick decomposition of organic matter because of their small size and large surface area (Mac Hitech, 2006). Although organic matter is not a requirement for growth per se, it contributes to soil fertility through its effects on soil biota and properties (Sikora and Stott, 1994). Additionally, sheep and goat manures are estimated to have almost 2.75%N (Mac Hitech, 2006), one of the three minerals considered most important for plant growth. However, it will be important to standardize manure handling and processing techniques as well as application rates and times relative the nutrient requirements of different grain and pasture species for optimum production levels. The effects of animal factors such as species, age, diet, the purpose for which the animal is being used and the state of general health or well- being must also be considered. Organic wastes from animal production have generally been associated with environmental pollution, and have also been linked to global warming in the generation of greenhouse gases (Parr and Hornick, 1992). Indeed, organic farming has the potential to reduce GHG emissions and sequester carbon (IFOAM, 2004). A productive use of these so-called wastes as

described above, and their utilization in agricultural production as sources of energy will go a long way in further integrating livestock and crop production within the concept of organic agriculture. The potentials of pasture fertilization options through various grass/legume mixtures relative to mineral fertilization also need to be further assessed.

Closely related to the above is the need to develop ruminant feeding options that depend solely on forage resources, with a minimum dependence on grains and other concentrate feeds. A review of the feeding systems used in warm climates (Roggero *et al*, 1996) suggested that sustainability depends on making use of diverse local biological resources. This concept, which has also been advocated by some other researchers (Onwuka, 1985; Onwuka *et al*, 1989; Abubakar and Mohammed, 1992; Osagie, 1998; Tian *et al*, 1998, Okoli *et al*, 2003), calls for a wider use of the diversity of fodder tree species as providers of animal forage (Asaolu *et al*., 2009) within the concept of organic agriculture. It has been reported (Cederberg and Stadig 2003; Fanelli, 2007; Ogino et al. 2007) that raising cattle for beef organically on grass, in contrast to fattening confined cattle on concentrated feed, may emit 40% less GHGs and consume 85% less energy than conventionally produced beef. There is also the need to move away from the use of traditionally-used salt-mineral licks to feed supplements that are organic in nature. In the light of this, research activities into the feasibility of multi-nutrient blocks based on forage, and with a minimum of inorganic materials, such as "moringa multi-nutrient blocks" that were developed and promoted among urban and peri-urban farmers in The Gambia by the International Trypanotolerance Centre (Asaolu *et al.,* 2010), should be given a strong consideration. Production of hays and silages of high nutritive value from our indigenous pasture species but with a minimum of mineral additives should also be given a high priority.

While information may be available on space requirements by our endemic ruminant breeds, their adaptability to the recommended housing conditions for organic livestock farming needs to be investigated. For instance, KRAV (2001) recommended specifications for building and rebuilding cowsheds and tethering of animals. The desirability or otherwise of adopting such standards within our local production environments needs to be established. The effects of the adopted housing prototypes on the animals' production and well-being, routine management practices, as well as manure handling also need to be established. As the final target of organic farming is the consumer, it is desirable that the internationally recommended processing and packaging practices (IFOAM, 1998) be assessed relative to the available local resources, national and regional taste and consumer preferences. Standards for transport, live inspection,

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slaughter abattoirs and procedures as well as retail handling of meat and milk products resulting from organic ruminant production need to be set, based on empirical data in synergy with traditional/indigenous knowledge.

CONCLUSION

A number of research questions that are pertinent for successful organic ruminant production in Nigeria have been raised in this paper. Addressing the research questions, which though are not exhaustive, appears to be the key to kick-start organic ruminant production in the country. Sustained efforts in this regard and an enabling policy framework can be expected to result in a satisfactory organic ruminant production efficiency and productivity within the overall framework of organic agriculture practice in Nigeria.

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