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Body and Limb Conformational Deformities in Sheep in the Sahel: A Review

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Abstract: Ideal conformation is a blend of balance, structural correctness, tracking, musculature/muscling and character. These determinants impact the sheep's health, adaptability, gait, longevity and productivity. A good conformation is vital for the sheep to attain maximum production efficiency. Existing patchy data show that frequency of body and limb conformational defects in the sheep in the Sahel zone is high with a prevalence range of 11.9-27.19%. The conformation defects ranges from the most obvious to the most obscure. Amongst these are malformations of the face, jaw and dentition, wavy or curvilinear spine, angular limb deformities, sloppy or straight pastern as well as varus or valgus deformities. Faults of conformation have been and continue to be a significant issue affecting the overall development of sheep production system and profitability. Certain conformational disorders reduce mobility and prevent normal productive performance. In the Sahel region schemes used for conformation referencing do not exist. Hence, the need for comprehensive databank and a reporting system for the preponderant body and limb conformational disorders that predispose ruminant livestock to injuries, lameness and eventually loss of productivity. Moreover, livestock population is growing and so is the frequency of conformational anomalies. Using the abundantly available detection and corrective tools it is possible to mitigate the deleterious effects of conformational defects in the sheep. It is therefore pertinent that thorough and effective management practices, early detection and adequate treatment of disorders be performed adequately to mitigate these conditions and allow increased productivity of the sheep.

Key words: Conformational deformities, preponderance, sahel region, sheep, mitigate

INTRODUCTION

Good conformation is vital to achieve maximum production efficiency in the sheep. A sheep with good conformation has a wide, straight back, strong head and muzzle, smooth shoulders, fullness through the heart area, a good spring of ribs, even flowing sheen coat, wide leg spacing and a long, well balanced body with adequate skeletal size (Mitchell, 2007). This translates to optimal balance, structural correctness, way of going (tracking), muscling/musculature and breed/sex character (also known as type) (Henderson, 1990; Ensminger and Parker, 1986). An important component of optimal conformation is absence of unsoundness where a sheep moves painlessly, efficiently and productively throughout its life. This may be attained through good body condition, sound feet and standing squarely with body parts in correct position, number and condition (Henderson, 1990). The ideal conformation through the process of ram selection and ewe classing is often employed to seek out the sheep with optimal body and limb conformations (Ensminger and Parker, 1986). This has evolved over the years to be a highly effective protocol amongst breeders to select and obtain sheep with the right genetics that offer ideal body and limb conformations including overall make and shape, size and constitution (ability to do well). Previous studies mainly centered on limb conditions and predisposition of the sheep to lameness, hoof conditions or acquired disease states. Any mention or data on conformational anomalies is usually lumped with other conditions (Egwu *et al*., 1994; Mohammed *et al*., 1996; Paul-Bokko and Chaudhari, 2001). To date there is no standalone data or work outlining the components of the conformational problems in the sheep in Nigeria. This review is foremost in the explication of the body and limb conformational anomalies in the sheep.

DETERMINANT COMPONENTS OF BODY AND LIMB CONFORMATIONS IN THE SHEEP

Sound conformation is determined by balance, structural correctness, tracking, musculature/muscling and character (Fig. 1). These determinants impact the sheep's health, adaptability, longevity and productivity (Itty *et al*., 1973).

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Fig. 1: Normal conformation of the; A, C) head; B) body; A) forelimbs and D) hindlimbs in the Sahelian sheep

Balance refers to the amalgamation of body parts and arguably the most critical component (Ensminger and Parker, 1986). It is essential for both quality of movement and performance in any event and a function of the sheep skeletal framework. It indicates equal distribution of muscling and weight. Moreover, balance is determined by the animal's proper angles and proportions of different parts of the body (Henderson, 1990). In other words, a sheep can be light bodied or heavy bodied and still be balanced if its bone structure allows for equal distribution of that weight. Proper balance enables the carriage in a manner to allow for easy manoeuvrability, greater power and smoother movement. Structural correctness, determined by the skeletal structure allowing for correct proportion of the body parts, is critical for soundness as well as correct and clean movement (Hassani *et al.*, 2014). The way a sheep's body parts are put together are arranged to form the whole animal. Animals should be longer than they are tall and with adequate muscling and body capacity (Mitchell, 2007). This is determined by proper structure and alignment of bone, particularly the limbs. Structural correctness is tied very closely to balance and influences locomotion (Hassani *et al.*, 2014). The animal carries equal weight on his front end and back end and on its topline and underline and sideways. A structurally correct sheep will maintain balance on the move, uphold a level top and keep a head held high (Hassani *et al.*, 2014).

Leg conformation significantly impacts on locomotion or tracking for cleanness in quality of movement (Faria *et al.*, 2014). The front and rear view determine footfall, whereas side view determine stride length quality of the sheep (Anous, 1991). The volume, quality and distribution of the musculature on all sides demonstrate the degree of muscling and largely determined by breed (Kempster *et al.*, 1981; Laville *et al.*, 2004). Some breeds like Balami are naturally more heavily muscled. An important consideration is defined, smooth and adequate muscling in the loin and rump areas and over the entire topline flowing together seamlessly (Fig. 1). It is desirable that the back should tie smoothly into the hip without severe angles or bumps (Laville *et al.*, 2004).

Character is emphasised by a saying that a ram is "half the flock". This implies that a ram is the primary means by which genetic improvement are made in a flock and spread over many more offspring than the ewe. Thus ram masculinity adjudged by its alertness, eyes and general attitude can be indicators of rugged and stout appearance and fecundity (Fig. 1). These traits coupled with firm, evenly sized and well descended testicles that move freely within the scrotum and testicles and epididymis free from abnormalities mark the desirable sex character (Yakubu and Akinyemi, 2010). Though scrotal size varies by breed, body condition and season, 6 months old ram lamb should have a scrotal circumference of at least 30 and 35 cm by 18 months or older (Agaviezor *et al.*, 2012). There are also correlations between a ram's scrotal size and the reproductive performance of its progeny (Laville *et al.*, 2004). Correspondingly, ewe signifies femininity, intelligence and female character found in outstanding sheep. A suitable ewe is endowed with bright eyes, a good sized normal sound udder with the two teats normally sized, healthy, functional, free from defects, injury and not blind (Kempster *et al.*, 1981).

The ultimate goal is that an animal is classified as "sound", from the inside out" (Kaler *et al.*, 2009). As this is rarely attained, animal may be categorized as "serviceably sound" if it has some structural flaws but is able to perform its intended purpose (Kempster *et al.*, 1981). Presence of obvious anomalies will deem an animal unfit for its intended use and considered "unsound" (Kaler *et al.*, 2009). Unsoundness usually refers to any condition which will severely inhibit the sheep from performing. There seem to be a connection between body conformation, fleshing quality, ability to fatten and milking ability (Kempster *et al.*, 1981; Anous, 1991).

Body and limb conformations

Head, neck and body: An "ideal" head will vary somewhat among breeds. The distance from the poll to the midpoint between the eyes should be half the distance from the midpoint of the eyes to the midpoint of the nostrils (Jackson and Mansour, 1974). In other words, the eye will be positioned at about one-third of the distance from the poll to the nostrils. Eye socket-should be prominent giving the animal all around vision. Nose and ears vary significantly amongst breeds. The Sahelian sheep nose range from banana face as in balami breed to slightly roman in udda and yankassa and straight in West African Dwarf (WAD) breeds (Adu and Ngere, 1979). The ears are long and droopy in balami, medium size and droopy in udda and yankassa, erect and short in WAD (Adu and Ngere, 1979). High withers and the setting of the shoulders, enables the sheep freedom of movement a most important feature (Laville *et al*., 2004). Deep square or broad lower jaw allow for sufficient spacing and proper development of the incisor teeth (Kempster *et al*., 1981; Laville *et al*., 2004). The latter should meet the dental pad at right angles. In the mouth, both the top and bottom jaws are correctly aligned so the incisor teeth are flush with the pad on the upper jaw (Kempster *et al*., 1981; Laville *et al*., 2004). Horns should be growing away from the head (Fig. 1).

Broad and strong neck holds the head well up and fit smoothly into the shoulder with no drop in front of or behind the shoulders (Anous, 1991). Neck underside is preferably free from folds or wrinkles, although this defect may be acceptable if not to a major degree. Long enough neck contributes to an overall balanced appearance (Kempster *et al*., 1981). Withers higher than shoulder blades fit smoothly against the vertebrae. Well laid back shoulders produce correct angle in the pasterns (Anous, 1991). Top view is wedge shaped, narrower in the shoulders with a wide back end. Since, the withers are higher than in lowland breeds and as there is usually a slight slope at the tailhead; the topline will not be so level from withers to tailhead (Kempster *et al*., 1981).

Chest, heart-girth and spring of ribs: Wide and deep chest is essential for the constitutional vigor of the sheep and meat (Laville *et al*., 2004). It is in a depth and width of the chest and particularly in the depth that the vital organs are housed. It is desirable that the underline is level and as parallel to the back or top line of the body as possible with deep and full flank (Kempster *et al*., 1981). The ribs are deep and well-sprung, arching out and slights upwards from the spine and carry deeply down to the low brisket (Kempster *et al*., 1981). The spring or arch of the ribs is essential for constitutional vigor and fattening qualities. The back is level, straight and reasonably long with the loin as long, wide and deep as possible (Laville *et al*., 2004).

Front legs, hind legs and feet: Limbs of sheep with good conformation are straight and set squarely under the corners of the body, slender and slight from absence of muscles below knee and end in strong pasterns for fleetness and agility (Fig. 1). Strong feet and pasterns guarantee a sheep to remain in the flock enabling it to have a long productive life. The more structurally correct the legs are the more evenly distributed (Anous, 1991).

An ideal forelimb of a sheep is straight when viewed from the front, set perpendicularly and directly under the shoulder blades and of similar width to the shoulders (Faria *et al*., 2014). A vertical line drawn from the point of the shoulder to the middle of the hoof bisects the knee (Kempster *et al*., 1981). Sideways, a straight line drawn from the center of the scapula through the front edge of the knee bisects the hoof. The width of the hooves at the sole roughly approximates the width of the legs as they originate from the chest (Mitchell, 2007). Variations of the lines and angles are considered structural blotch and ranks a sheep lower (Jackson and Mansour, 1974).

The limb of lamb or mutton is wide and full when viewed from the rear (Fig. 1). A correct hindlimb placement is dependent on the gaskin and cannon bone location. The sound hindlimb has well defined angles in the joints, at the hip, stifle, hock and pastern joints (Anous, 1991). The angles are critical, particularly during mating when large amounts of stress are placed on these joints in rams (Jackson and Mansour, 1974). When viewing the hindquarters, a straight line from the buttock bisects both its hock and fetlock and middle of the hooves (Kempster *et al*., 1981). Sideways, a sheep standing squarely allows a line perpendicular to the ground that touches the point of the rump cheek, the back of the hock and the back of the fetlock (Jackson and Mansour, 1974). This conformation of the hind limb allows the sheep to carry weight well over its hindquarters and reach under itself as it moves to allow for maximum power. Length of rump is an important aspect of total thigh evaluation whereas width denotes a wide pelvis for ease of lambing (Anous, 1991). The rump top line continues out level and straight to above the dock (Jackson and Mansour, 1974).

A final important consideration when examining the fore and hind limbs is the angle and length of the pastern (Anous, 1991). The pastern supplies the spring and cushions acting as shock absorber during impact from hoof landing and can affect the soundness of the entire limb (Jackson and Mansour, 1974). The pastern angle typically matches the shoulder angle of approximately 45°C to the horizontal line (Jackson and Mansour, 1974). The feet is firm, oval in shape and neither completely round nor long and narrow, large enough to bear the animal’s weight in soft ground without splaying (Kempster *et al*., 1981).

FAULTS IN CONFORMATION OF THE BODY AND LIMBS

Ideal body and limb conformation and conformation faults are identified in accordance with livestock type and use. Faults affect sheep performance, productivity and husbandry. Deviations from normal body and limb conformations itself cause or predisposes ruminants to lameness and other complications.

Any conformational flaw causes deviations in the structure and functions of the body and/or limbs. It would actually be unusual for a sheep to live-out its entire life-span without experiencing defect of one degree or another. The degree of conformational anomalies tolerated by sheep would be unacceptable in other species (Anous, 1991). Many of these are minor and constitute no problems and can resolve on their own with rest and time are self-limiting or sheep adapts effortlessly. Moreover, the sheep has enormous capacity to accommodate anomalies during development and growth; accounting for disappearance of the mild abnormalities and the less prominence of the moderate to severe ones to exhibit deformities (Paul-Bokko and Chaudhari, 2001). Acquired problems like minor sprains, twists or muscle bruises account for a large percentage of these common problems (Kempster *et al*., 1981). Genetic/hereditary or congenital ones can pass as blemishes and without detriment to conformation (Greber *et al*., 2013). More serious defects can lead to future lameness and pain due to excessive stress placed on certain areas of the body during movements (Fisher, 2011).

Faults of the head, neck and body: Minor variations in jaw alignment are permissible and are not inheriited defect. Sheep with severe “undershot/monkey mouth” or “overshot/parrot mouth” jaws arise and are heritable defects (Loon *et al*., 2000; Ma *et al*., 2002). These sheep may in addition have dental or dentition problems (Loon *et al*., 2000). These defects may present difficulty grazing short pastures. Skeletal malformations of the face include wry nose (twisted nose), concave face or roman face (convex face) (Ma *et al*., 2002). Malformations in the spinal column include torticollis (twisted neck), kyphosis (dorsal arching of the back), swayback or lordosis (down-ward curving of the spine in the lower back) (Fig. 2), scoliosis (lateral deviation of the back) and synostosis (fusion of vertebrae) (Panther *et al*., 1990; Gangwar *et al*., 2014). These defects may occur alone, in combination with or associated with defects of other body systems, particularly of the Central Nervous System

Fig. 2: Conformational defects in the Sahelian sheep. A) swayback: down-ward curving of the spine in the lower back (arrow) in an ewe; B) Hoof overgrowth in a ram (arrow) and C) Re right carpal joint varus angulation in a lamb (arrow)

(CNS) (Kempster *et al*., 1981). These conditions contribute to back weakness or damage to the delicate spinal cord and can result in permanent paralysis of portions of the body. Any tendency to a short dumpy back between shoulder and hip or between hip and tail head, is a serious conformation fault (Jackson and Mansour, 1974). Excessive width of the withers as favoured by some breeds may predispose ewes to dystocia (Laville *et al*., 2004). Badly set, prominent shoulder blades, causing a depression behind the shoulder is undesirable (Jackson and Mansour, 1974). A shallow, narrow chest indicates small lung capacity, cramped heart room and in general a weak, delicate constitution (Kempster *et al*., 1981). The tendency of the underline to slope upwards from the stomach to the chin of the sheep is a constitutional fault (Jackson and Mansour, 1974). Rams with pendulous or below average scrotal circumference as well as ewes with pendulous udders and bulbous or oversized teats are also undesirable (Jackson and Mansour, 1974; Agaviezor *et al*., 2012).

Faults of the forelimb and the hindlimb: The sheep’s forelimb propels the progression of the body and the first contact with trauma sources. Conformational deviations amplify strain disproportionately to different regions of the limbs. For instance, valgus deformities tend to be associated with outward rotation of the cannon bone, fetlock or pastern (Meynaud-Collard *et al*., 2009). Sheep with varus deformities are often narrow in their stance and knock the medial hooves during walking (Fig. 2). Conformational defects of the forelimb such as bandy legs cause increased strain on the joint and the ligaments and tendons attached to it (Kaler and Green, 2008b). This places extreme pressure on the points of rotation. All of these deviations cause an unequal line of concussion (Kaler and Green, 2008a). The concussion from every stride the sheep takes causes an impact to travels up the limb unequally. The area that absorbs more of the concussion is more likely to be damaged more severely. Excessively heavy bones and very short cannon bones and unnaturally short limbs will handicap the sheep. All of these conformational defects can lead to lameness and blemishes since they exert excessive pressure to be centered on a particular area of the limb. Increased pressure on the outside of the hoof wall can lead to conditions like heel bruising (Kempster *et al*., 1981). Severe deformities of the carpus sequel to poorly conformed carpal joint or excessively loose joint often become lame as the deformity worsen (Kaler and Green, 2008a). In general a sheep will come down more heavily onto the unaffected limb and its head will appear to nod onto this limb. Carrying too much weight on the forelimbs can also lead to future lameness of the front legs (Kaler and Green, 2008a).

Hind limbs are also prone to structural deviations. Cow hock, bowlegs or sickle hocks places additional strain on the limb, joints and interferes with locomotion. A cow hocked sheep has hocks bent inward with the hooves turned outward while bowleg has the feet turned by Anous (1991). Either way extra strain is placed on the hock joints and lameness can ensue. Bowlegged and cow hocked sheep often have difficulty in proper usage of their hindlimbs as such lack the athletic ability of proper conformation (Anous, 1991). Straight or post legged sheep rear leg has hardly any angle to the hip and hocks (Yoganandan *et al*., 2008). This abnormality causes the stifle muscle making the sheep to take a shorter choppier stride when in motion (Yoganandan *et al*., 2008).

Faults of the feet: The way the hooves grow often indicates structural problems further up the limbs (Anous, 1991). Some sheep have abnormal or excessive hoof growth, cracked hooves or extremely splayed hooves (Fig. 2). Long or excessively short even claws may indicate too much or not enough pastern angle, causing both claws of the hoof to grow or wear excessively (Jackson and Mansour, 1974). Overgrown claws affect the mobility and performance of the sheep (Fig. 2). Too straight pastern angle (often resulting from pasterns being too short) causes increased jarring of the leg/joints, joint pain and stilted walk (Anous, 1991). Pasterns that are too straight may also affect the navicular bone, causing it to come in contact with the short pastern bone and leading to erosion of the bone or the formation of bony spurs (Turner, 1986). On the other hand, too long and sloping a pastern places too great a strain on the tendons and joints (Yoganandan *et al*., 2008). In spite of the problems associated with pasterns that are too short and straight, it is also possible for the pastern to be too long or too sloped (Kempster *et al*., 1981). These problems have an increased risk that the fetlock will hit the ground upon severe impact. Additionally, conformational anomalies may result from thin heel and sole; contributing to occurrence of unsoundness and predisposition of the sheep to injuries and lameness (Sanders *et al*., 2009).

Faults in the joint: The joints are quite stable, relatively unprotected and can be easily damaged in a dislocation, arthritis and developmental insufficiencies (Young *et al*., 2006). Joints can be freely mobile, partially mobile or immobile (Young *et al*., 2006). Angular limb deformities involve deviations when viewed from the front or back such that the deviation is excessive from side to side (Peltonen *et al*., 1984). Intervertebral disk disease where the cushion-like disc between the bones of the spine become deformed and cause pain and even paralysis is common (Fisher, 2011). For instance, degenerative joint disease is extremely common degenerative type of arthritis (Angus, 1991). Many angular limb deformities cause no problems and resolve themselves. In these skeletal defects, a portion of a limb is bent or twisted crossways or towards the midline of the body (Peltonen *et al*., 1984). The positioning of the limb in the womb, hypothyroidism, a poorly formed or loosely jointed limb or underdevelopment of the carpal or tarsal and long bones can manifest as varus or valgus deformities among other anomalies (Pape and Madry, 2013).

PREVALENCE AND AETIOLOGY OF CONFORMATIONAL ANOMALIES

Conformational anomalies are amongst the prevalent problems in sheep. An experiential study in sheep between January 2011 and December 2013 in Maiduguri area of the Sahel region yielded an annual prevalence of 11.32±0.58% conformational anomalies with or without attendant deformities (personal communication). Of the 197 sheep, the balami accounted for 31%, yankassa 27% and udda 19%, WAD 13% and others 10% of conformational anomalies affecting sheep. The body conformational defects observed include skeletal malformations of the face including concave face in WAD and of the spinal column such as lordosis (down-ward curving of the spine in the lower back) and synostosis of the lumbosacral joint in the balami and yankassa sheep.

In another earlier study, Paul-Bokko and Chaudhari (2001) reported 13.8% limb conformational deformities in Maiduguri. Deformities that were observed included genu valgum, genu varum, offset knees in the forelimbs; excessive angulations of the hock in the hindlimbs and thin wall and sole, steep hoof and sloping pastern of the foot; with more anomalies (61.8%) in the forelimbs. Since, the forelimb leads the stride during locomotion, it can be more prone to effects of conformational anomalies, trauma and concussions (Paul-Bokko and Chaudhari, 2001). The actual prevalence may be higher as a significant number may not be reported or recorded. No other report(s) exist on the conformational deformities in sheep prevalent in the Sahel region of Nigeria. Earlier works reported on lameness in relation to limb and hoof conditions (Egwu *et al*., 1994; Mohammed *et al*., 1996; Bokko *et al*., 2003). The frequencies of conformational anomalies were higher in ewes (59.6%) than rams as well as higher in sheep aged 3 years or less (65.2%). This arises because many sheep keepers prefer ewes for the purpose of multiplication.

The aetiologies of most of these defects are yet to be understood fully. Conformational deformities are theorized to mainly arise following disrupted genetic, congenital or hereditary developmental processes or even acquired (Greber *et al*., 2013). As such the aetiology may be multifactorial. Additionally, defects may be induced by more than one agent. Disruption or errors in the sequential steps of development may be followed by defects in the musculoskeletal development manifesting as body and limb conformational deformity. Such developmental defects may not become apparent until later in life. It is often difficult to determine what event(s) may have resulted in an anomaly (Murray *et al*., 1996). Sub-clinical laminitis, digital and inflammation and/or infection of the anatomical structures and glands such as interdigital pouch have been reported to cause conformational deficiency (Jensen 1974; Murray *et al*., 1996; Shearer and Van Amstel, 2011). Other predisposing factors culminating in poor conformation include deviation of hoof from normal shapes. This exposes them to different kinds of hazards.

CONSEQUENCE OF POOR CONFORMATION IN SHEEP

The success and profitability of the sheep stock depends on the productivity of the entire flock products (Cupps, 1991). Faults of conformation have been and continue to be a significant issue affecting the overall productivity and profitability of today's commercial ruminant livestock operations and the overall development of sheep production system. Most sheep breeders favour pedigree data, production and reproduction data, breeding data and financial data over conformation. Moreover some of the conformational anomalies are subtle or self limiting. However, in long term the effects are deleterious to sheep productivity hence profitability (Itty *et al*., 1973). Ideally, soundness examination to determine conformation is desirable for any sheep intended for breeding or other purposes. Conformation can be improved by selection genetically; essentially deciding which sheep will be parents; the phenotypic manifestation that sheep breeders opt to harness and propagate (Ensminger and Parker 1986; Hassani *et al*., 2014). Conformation scale runs from 1-5; with 1 as the best and 5 the worst (Kaler *et al*., 2009). Quickest genetic gain is realized when high lambing percentages allow for a heavy culling rate (Booth *et al*., 2004).

Conformational disorders that predispose sheep to lameness are of great concern due to the frequency of occurrence (Bokko *et al*., 2003). Certain conformational disorders reduce mobility and prevent normal productive behaviour (Singh *et al*., 1993). The principal manifest of poor conformation is unsoundness that is accompanied by or leads to pain and/or lameness. Defective conformations become more apparent albeit with less severity with age. In severe cases of lameness, animal may remain recumbent for long periods and may carry the affected limb. This affects optimal grazing and/or reduces mobility and reproductive performance (Sprecher *et al*., 1997; Garbarino *et al*., 2004). Moreover, most sheep in the Sahel travel long distances either for grazing or watering. Economic losses arise from reduced market value and decline in overall productivity of the sheep (Bokko *et al*., 2003), increased culling rate (Booth *et al*., 2004; Juarez *et al*., 2003; Hernandez *et al*., 2005), decreased reproductive efficiency (Sprecher *et al*., 1997; Hernandez *et al*., 2001; Garbarino *et al*., 2004) reduced growth feat and increased production costs (Cha *et al*., 2010). Furthermore, poor conformations cause huge welfare problems (Bruijnis *et al*., 2012). Conformational anomalies can negatively affect both animal welfare and performance because animals may be reluctant to eat or drink if standing or walking is laborious (Lindqvist, 2001). As the incidence and awareness increase, it is probably equal in importance to reproductive inefficiency to which it is now known to be closely related.

The conformational assessment in sheep can be performed on flock-basis instead of individual sheep. Sheep owners can have and own conformation assessment outlet or several breeders work together to hold a routine conformation assessment of the flock, rather than until disorders arise. In the last decade, there have been significant advances in understanding body and limb conformation. Diagnostic procedures today are sophisticated practices such as digital imaging, molecular testing kits, etc. These tools show increased fluid within the joint, soft-tissue swelling around the joint, formation of bony outgrowths, hardening and thickening of bone beneath the cartilage and sometimes a narrowed joint space or pseudocrepitus that occurs in some cases of arthritis. Depending on the nature, location and type of the anomalies effective treatments options are devised around the anomaly. Sheep are often not treated for conformational anomalies or lameness on herd basis until they are gathered for another purpose. The key to successful treatment is integrative care. These along with detection techniques had been earlier outlined by Bokko and Adamu. By providing more than one treatment modality there is a greater benefit to the sheep. Effective treatment of conformational deformities should cause both resolution of the defect and a return to normal conformation.

CONCLUSION

The frequency of body and limb conformational deformities in the sheep in the Sahel region is high yet schemes used for conformation referencing do not exist. Faults of conformation have been and continue to be a significant issue affecting the overall development of sheep production system and profitability. It is therefore pertinent for a comprehensive databank and a reporting system for the preponderant body and limb conformational disorders in the sheep. This along with thorough and efficient management practices; early detection and adequate treatment of disorders can satisfactorily alleviate these conditions and allow optimum productivity of the sheep.

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