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The drying of hides and skins

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COLONIAL PRODUCTS ADVISORY BUREAU
(PLANT AND ANIMAL)

THE DRYING OF HIDES AND SKINS

By

J. R. FURLONG, Ph.D., A.R.I.C.

*Principal of the Colonial Products Advisory Bureau, and Secretary of the Consultative
Committees on Hides and Skins, and Tanning Materials*

LONDON: HER MAJESTY'S STATIONERY OFFICE

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INTRODUCTION

IT IS TWENTY YEARS SINCE EXPERIMENTS CARRIED OUT IN KENYA YIELDED results which established the principles for the correct drying of hides, and it is now appropriate to take stock of the experience gained in applying those principles under various conditions, in order to arrive at a true understanding of what has been learnt in practice during that period.

It is recognised that to obtain the best possible leather from a hide, it is desirable to proceed to the tanning operations without reducing the hide to a dry state. In other words, the best leather is made from hides that have not been dried. Many countries, however, have insufficient native hides for their needs, and it is necessary to bring supplies from overseas or long distances to the tanneries. The distance which green or lightly-salted hides can safely travel without putrefactive damage occurring is very limited, and it is therefore essential to submit the hides to some process of curing, in order that they may be transported and stored without deterioration. The curing may consist of salting the hide and transporting it in a wet-salted condition, an expensive method applicable to the best qualities of hides, or the material, after salting, may be dried out and sent to the market in dry-salted condition. In many countries, however, salt is scarce, and the use of the imported material would be too costly. Recourse is therefore made to the procedure of air-drying as a method of preservation. This is practised in many hot countries, particularly in the African continent. Dry hides represent a large proportion of the production of the entire output of such countries as Nigeria, East Africa, South Africa, Sudan and Abyssinia, while India and South America are large producers of dry hides.

Dry hides represent a very important class of raw material for the tanneries of the world to-day. In the decade before the war many tanners had developed a technique for producing leather of the highest quality from this class of hides, and during the war a still larger number of tanners in the United Kingdom were forced to use Colonial dry hides for the first time. Whilst Continental tanneries had always handled Colonial hides, it is the great advance which has been made in this connection in the United Kingdom, as a result of war-time experience, that is of significance. Tanners have learnt how to obtain good results and it is to Colonial sources that English tanneries now look for increasing supplies of their raw materials.

CATTLE HIDES

This article deals only with dry hides produced by straight, air-drying methods, and is not concerned with processes of curing involving the use

of salt. The easiest plan for producing an air-dried hide is that adopted in the past by natives in Africa and elsewhere. It consists in pegging the hide, stretched out flat, on the ground. The method, however, may give disastrous results, as experience has shown only too well. It was quite common to find that this type of curing gave tannery losses amounting to as much as 30 per cent. of the consignment. The fault consisted in putrefactive damage, which took the form of "taint" and "hair slip" on the grain side and, in a more advanced state, of "blister." The latter term was applied when putrefaction was so severe that large patches or areas of the hide appeared as blisters when the goods were submitted to the soaking operation in the tannery. Very often holes developed right through the hide. The attack, confined to the surface region and causing taint or hair slip, gave rise to loss of grain or loosening of the hair. The latter damage could be detected in the dry hide by rubbing with the finger, but the more serious evil of blister was generally not discernible in the dry hide, and hence the great drawback attaching to it, as buyers were unable to detect it until the hide was put in work. The putrefaction or degradation which had taken place had converted the hide substance to a soluble form, without a visible change, but this became dramatically apparent when the hide was put in soak at the tannery, when the putrefied part was dissolved out.

It was found that by hanging up the hide in a shed and allowing it to dry in the shade, good results were obtained in overcoming this fault. It therefore became the fashion to regard the sun as the cause of the trouble, and the use of shade in drying as necessary for producing material free from this blemish.

The above represented the state of our knowledge some twenty years ago, when the Advisory Committee on Hides and Skins of the Imperial Institute, now the Consultative Committee on Hides and Skins of the Colonial Products Advisory Bureau, recommended that an investigation should be undertaken to determine the cause of blister, and to examine methods of drying with a view to devising a process which would avoid the development of such damage.

A scheme of experiments was drawn up by Mr. Eustace Montgomery, Adviser on Animal Health to the Secretary of State for the Colonies and a member of the Committee. The collaboration of the authorities in Kenya was secured, and the trials were carried out in 1932. A great loss was suffered in the death of Mr. Montgomery before the trials were completed, and the writer was left to carry the investigation to a conclusion, and to interpret the mass of detailed results which were obtained.

The drying trials were conducted by the Division of Animal Husbandry in the grounds adjoining the Nairobi Abattoir. They were carried out in both wet and dry seasons of the year, in order to ascertain the influence of weather on the incidence of blister, and to ascertain suitable drying procedure for all conditions. Other factors which were varied were the period elapsing between flaying and stretching the hide to dry, and the freedom of the hide from fat and meat, which might be left on at the time of flaying. In all 1,000 hides were employed, 500 were prepared in the wet season between May 2nd and June 29th, 1932, and 500 in the dry

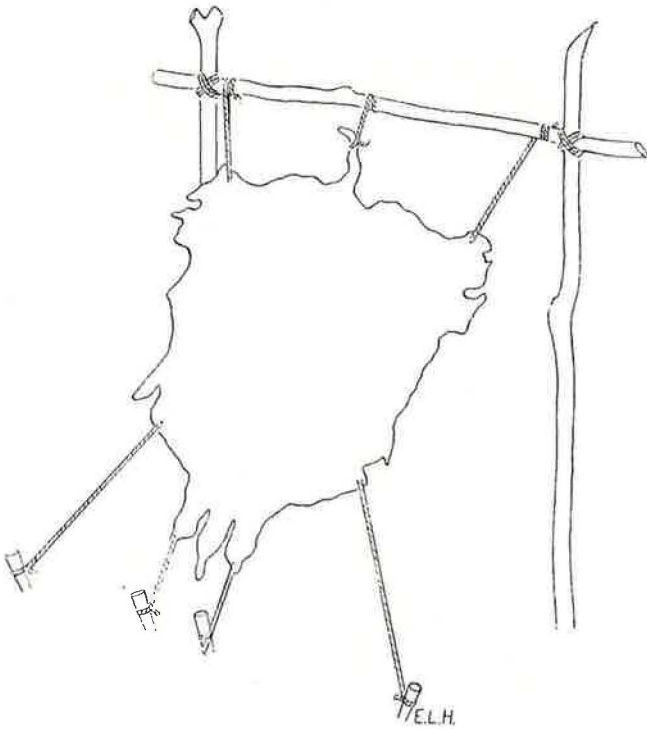
PLATE I.



[By Courtesy of "The Leather Trades' Review"]

PEGGING A HIDE ON THE GROUND IN THE OPEN FOR DRYING IN THE TRADITIONAL NATIVE MANNER

PLATE II.



THE METHOD FOR DRYING HIDES RECOMMENDED IN 1932, IN WHICH THE HIDE IS SUSPENDED FROM A POLE AND ATTACHED TO PEGS IN THE GROUND PLACED ON THE SHADOW-LINE OF THE POLE. THE FORCE OF THE SUN IS THEREBY TEMPERED.

season between October 7th and December 29th, 1932. In each season the 500 hides were divided into two lots, one lot of 250 hides being left for 1 hour after flaying and before stretching them out to dry. The other lot of 250 hides was left for a period of 6 hours. Each lot was divided further into two equal series, one series of 125 hides being cleaned by the removal of obvious pieces of fat and flesh, while the other series was not cleaned. Each series of 125 hides was divided into five batches of 25 hides and dried by five different methods as follows:

- (i) *Shade. Air Cushion.*—Dried in the shade, in banda or shed with grass roof; stretched on pegs so as to allow a space of not less than 3 inches between ground and sides of hide, the ridge of the hide, head to tail, being supported on a pole, erected about 9 inches high, the hump being raised and loosely stretched by insertion of pieces of light wood.
- (ii) *Sun. Air Cushion.*—Dried in sun, stretched on pegs off the ground in the same manner as that described in (i).
- (iii) *Sun. Grass Cushion.*—Dried in sun, stretched on a bed of dry grass about 2 inches thick.
- (iv) *Sun. Ground.*—Dried in sun, stretched directly on the ground by pegging, as usually practised.
- (v) *Sun. Grass Cover.*—Dried in sun, stretched directly on the ground, but flesh side loosely covered with grass, either green or dry, between 7 a.m. and 5 p.m.; the covering being removed during the night and when cloudy.

In all experiments the hides were stretched with flesh side uppermost.

At the end of each season's operation the hides were brought to the United Kingdom and tanned by The Penketh Tanning Co., and by Messrs. W. L. Ingle, Ltd. The hides in the dried raw condition, and at various stages during the working in the tannery, were examined by the late Dr. Dorothy Jordan Lloyd, Chairman of the Advisory Committee, and by the writer. The experiments, and the results, are fully recorded in a report entitled "*The Drying of East African Hides*", published by the Imperial Institute in 1934.

The outstanding feature of these experiments was that the hides dried in the full force of the sun but suspended on pegs at a short distance from the ground, were practically free from blister and taint, and were almost equal in quality, if not quite, to the hides dried in the shade. Hides dried on a grass cushion, or on the ground with a grass covering, or on the ground without any additional material, all proved subject to putrefactive damage.

The results clearly showed that the essential condition for the correct drying of hides was the free circulation of air on both sides of the hide, and this principle has become established as the guiding factor in all operations of drying hides and skins. It is known to-day as Suspension-drying.

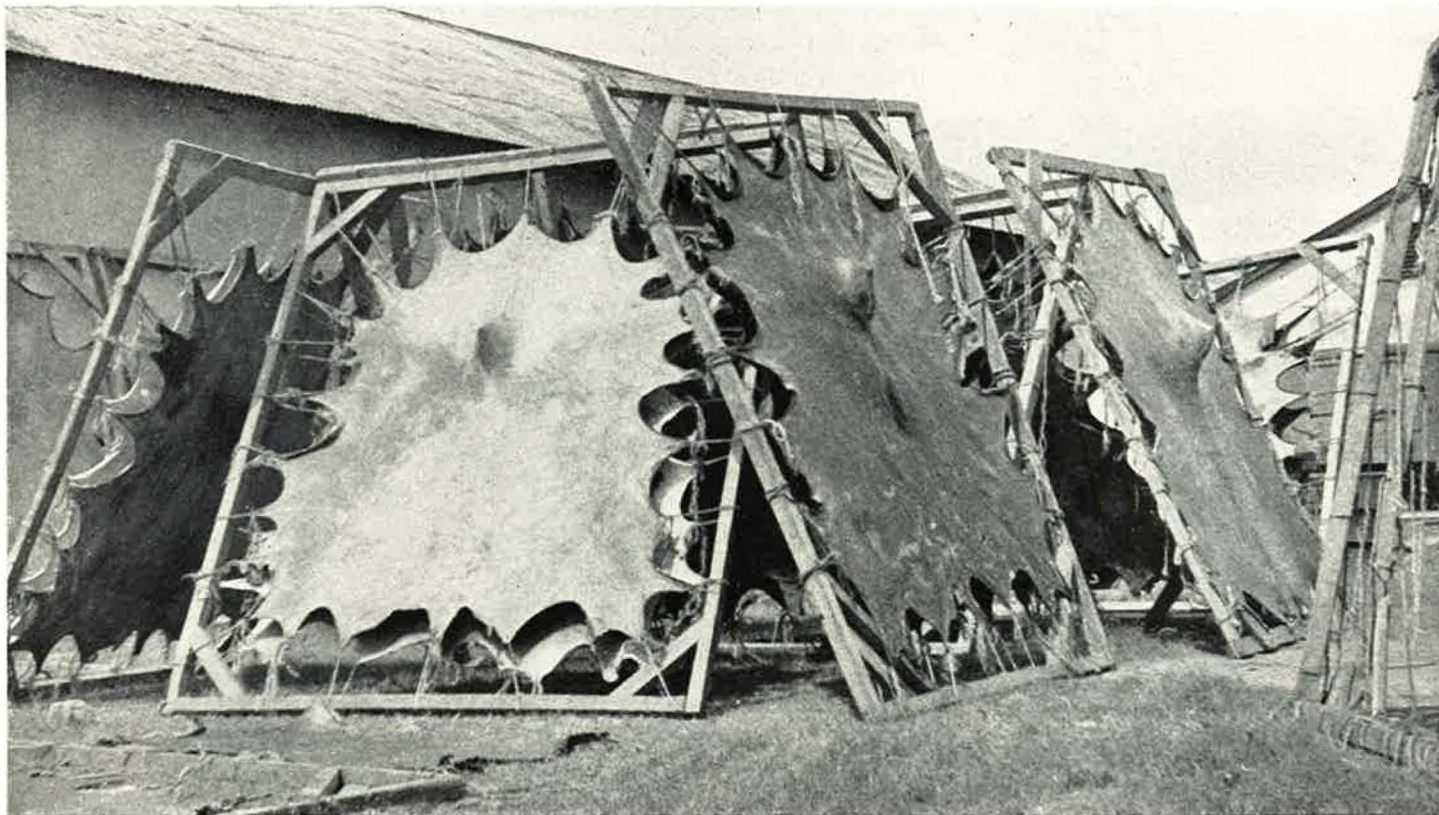
With regard to sun and shade, there was only one conclusion that could be drawn from these experiments, and that was, that the sun was in no way detrimental to the drying of hides, and shade was not essential to the production of good quality.

It had not been realised previously that the merit of drying in sheds was not due to the shade, but to the fact that the hides were suspended and exposed to air on both sides. This view was of a revolutionary nature as, at that time, the opinion was strongly held that the sun was harmful. Although the results clearly showed that hides could be dried horizontally at a short distance from the ground, but in the full force of the sun, without harm, provided there was free circulation of air on both sides, it was felt that to recommend such a process was too bold a step until further experience had shown that it was a perfectly safe procedure. Consequently, it was decided that some measure of tempering the sun's rays should be advocated and, to this end, the suggestion of Major Alan Guthrie, Leather Trades Institute, Madras, to suspend the hides on a "shadow-line" was adopted. In this method the hide is stretched from a horizontal pole, at 5 or more feet from the ground, running in a line east and west. The hide is suspended clear of the ground by tying the tail butt and hind shanks to the pole, and then tying the head and fore shanks to pegs in the ground, the pegs being placed on the line of the shadow thrown by the horizontal pole at midday. The hide is thus stretched at an angle with the ground, flesh side uppermost. In this manner the hide will be freely exposed on both sides for drying and, as the sun's rays strike it very obliquely, their effect will be less than if the hide were stretched out flat on the ground. It was believed that this method would yield dried hides of practically equal quality to shade-dried hides, without the trouble and expense involved in erecting bandas for shade-drying, an undertaking which presented serious difficulties in many parts of Africa. An alternative method of suspension, in which the hide was laced to a frame, was also recommended. It was, however, suggested that the frames might be placed in the shade of trees or shed walls if available, as an alternative to arranging them on the shadow-line.

The Kenya trials also demonstrated that it was dangerous for a hide to lie over a pole, since in the experiment where poles were employed for raising the middle of the back, putrefaction occurred along the line of contact. The reason is clear, since here again was a confined area of hide, lacking free circulation of air, which was subject to restricted drying. It had become a practice in some parts of Africa to hang hides loosely over poles in the sheds to dry. The examination of material from these origins on several occasions subsequently showed the method to be subject to this serious fault of putrefactive damage, and the pole-drying of hides should, therefore, never be employed, either in the shade or in the sun.

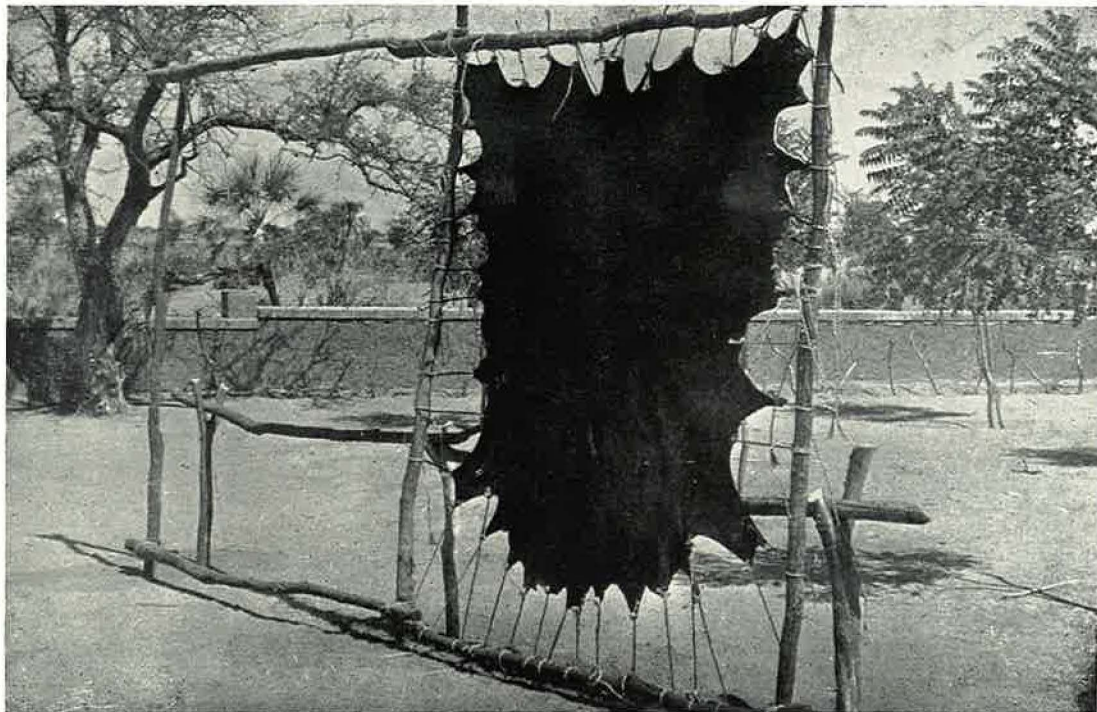
A further lesson taught by the trials was that excessive lumps of fat or flesh left on the hide at the time of flaying are liable to restrict drying and to give rise to putrefaction. It is therefore desirable that large portions of such material should not be left on the hide in the flaying operation. If they do occur, they should be removed with great care to avoid cutting the hide. The after-cleaning of hides for any other purpose than removing gross lumps of fat and flesh is not to be recommended, because of the risk of gouging, should the operation be carelessly performed.

PLATE III.



DRYING HIDES ON FRAMES IN THE OPEN.
Some frames carry two hides kept apart by a prop

PLATE IV.



[By Courtesy of the Inspector of Hides, Sudan Veterinary Service

DRYING A HIDE ON ERECTED FRAMEWORK.

Note the crude platform to enable the operator to reach the top pole

The variation in the season was clearly seen in the results. The hides prepared in the dry season were much superior as regards freedom from putrefactive damage and deterioration to those of the wet season. The slower drying was conducive to the development of damage. The other factor which was varied, viz., delay between flaying and drying, provided no evidence that a delay of 6 hours produced bad effects. This result applied specifically to these trials and the conditions under which they were carried out. More comprehensive trials carried out subsequently on the question of delay have conclusively shown that, while some latitude may be permissible in districts of exceptionally low humidity, in general it is necessary to suspend hides and skins for drying without delay in order to avoid putrefactive damage.

The Committee's report was widely distributed to all Empire countries where hides are prepared by sun-drying, and created considerable interest. The Government of Southern Rhodesia, in 1934, decided to carry out a further series of trials on similar lines, and the resulting hides were sent to the Imperial Institute and examined in the same way as the hides from the Kenya experiments. The full report on the Rhodesian experiments is published in the *Bulletin of the Imperial Institute* 1936, **xxxiv**, 15.

In these trials hides were prepared by six different methods, viz., (1) Pitting, i.e. immersion in brine, in pits, followed by drying when convenient to do so; liquors generally old, (2) Dry-salting, (3) Shade-drying, (4) Sun-drying on the ground, (5) Sun-drying by suspension, and (6) Sun-drying over poles.

The methods which yielded the best results were dry-salting, shade-drying and sun-drying by suspension. There was no material difference in the quality of the leather from these three groups. The hides dried by the Committee's suspension method were considered to be of equal value to the shade-dried hides, and were described as follows by the tanner who handled them: "A perfect cure, not a sign of putrefaction anywhere. Beautiful pelt equal to the dry-salted. A marvellous lot of hides."

The experience in subsequent years of applying the principles of drying established by the above research has clearly shown that there is no need for shade-drying and no necessity to temper the effect of the sun by placing the hide in a shadow-line position as originally advocated. It must, however, be recognised that drying in the full force of the sun does not cause any harmful effects provided that, in addition to ensuring the necessary free circulation of air, the hides are removed when they are just dry, and not left to bake in the sun. There is evidence that sun-baking gives rise to a condition of altered fibre structure, which prevents the efficient soaking-back of the material in the tannery. By the expression "just dry," used above, is meant a condition that permits the hide to be doubled without application of undue pressure.

There have been several attempts to explain the meaning of the results obtained in the original Kenya trials. It has been thought by some that when the hide is pegged close to the ground and in contact with it, that the uppermost surface, the flesh side, dries out quickly and becomes sealed off. The hair and grain side in contact with the ground dries out much

more slowly but, nevertheless, becomes sufficiently dry and sealed. It is concluded from this, that the inner part of the hide between the two surfaces has not dried out properly, but still retains a certain, and undesirably high, amount of moisture. Those holding this view state that subsequent to drying, during transport and storage, decomposition of the hide substance continues. This explanation, however, is not sound since the hides, when removed from the ground at the end of the drying operation, are in fully-dry condition and difficult to bend. In fact, at one time it was usual to describe these hides as "flint-dry." It is, therefore, difficult to conceive that sufficient moisture has been left inside the hide for further putrefactive action to take place.

The writer holds the opinion that the explanation of the damage caused in ground-drying consists of the action of a high temperature in conjunction with moisture. The uppermost surface of the hide in that position dries out quickly, while below that surface, and up to the surface which is in contact with the ground, the rate of drying-out is increasingly slower. The hide, however, does dry out completely, but in the position nearest to the confined under-side, the rate of loss of moisture has been sufficiently slow for decomposition of the hide substance to take place. The decomposition which has occurred consists of that due to the agency of putrefying organisms, as well as purely chemical action. With the full force of the sun, it must be recognised that the gelatinisation temperature may be approached or even reached, and with the retained moisture the break-down of the hide substance takes place. It is evident from observations that the hide is completely dried before it is removed from the ground, and it must, therefore, be concluded that the action of degradation terminates with the operation of drying, and that no further decomposition takes place during transport or storage, unless moisture is added to the hide during unsuitable conditions at those stages.

In recording the Kenya experiments, and in subsequent writings on the subject, the term "putrefactive damage" has been used to describe the fault arising from improper drying. It has been employed in a wide sense, and in fact the action which has taken place is referable to chemical as well as bacterial agency.

The question of the rate of drying must be reconsidered in the light of the experience of recent years. At one time it was thought that the slow drying of hides in the shade was a good feature, and that the rapid drying which the sun brought about was detrimental. In the Kenya trials it was shown that the slower drying in the wet season was conducive to the development of putrefaction, and subsequently evidence has come to hand that in several cases of drying hides by suspension in shade bandas, the rate of drying in the wet season has been sufficiently slow to cause trouble. Bearing this in mind, it is far more reasonable to regard the fault of ground-drying as referable to slowness, and that the desirable feature in drying is quickness. Examination of all the evidence shows that we have no reason to hold that rapid drying has ever caused any harm to hides, within the limits of the sun-drying operation, and with due avoidance of over-drying. We come, therefore, to the conclusion that in the drying of hides the moisture should be removed as quickly as

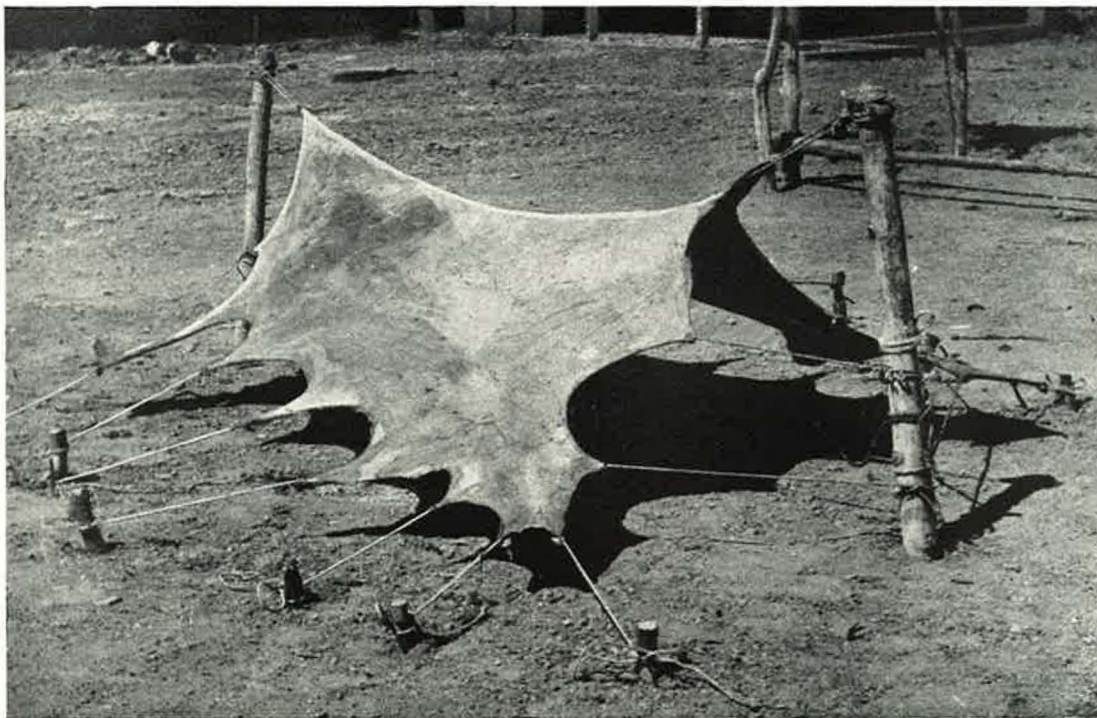
PLATE V.



[By Courtesy of the Inspector of Hides, Sudan Veterinary Service

A GENERAL VIEW OF HIDES DRYING ON FRAMES ERECTED IN THE OPEN

PLATE VI.



[By Courtesy of the Inspector of Hides, Sudan Veterinary Service

THE TENT METHOD OF DRYING, SUGGESTED FOR USE IN AREAS WHERE POLES AND FRAMES ARE UNAVAILABLE

possible, otherwise putrefaction takes place, and if the temperature is sufficiently high, degradation of the hide proteins may be effected.

Suspension-drying in the open was at first adopted slowly in East Africa, as it meant reversing the teaching which had been previously given on the necessity for shade, but it has now been actively encouraged for many years, as the provision of drying bandas proved expensive and uneconomic. There is no reason why the drying sheds should not be used, where they exist, in suitable climatic conditions, as they have the advantage of providing a locked-up enclosure, which affords protection against theft and predatory animals. There is, however, the inevitable trend away from the erection of new drying bandas.

The provision of frames or a timber structure in the open to carry hides for the drying operation may also be a difficult matter in certain circumstances. It will be easily understood that the method cannot be applied in areas devoid of trees or materials for making poles.

Some of the well-known nomadic tribes in Africa possessing large herds of cattle are amongst the principal producers of hides. These people generally wander across country possessing very little grass, let alone major vegetation that would provide timber. The question of suitable apparatus for suspension-drying in these circumstances presents a serious problem.

In East Africa it has been suggested that hides might be dried in umbrella fashion stretched to pegs at a distance of from 6 to 9 inches off the ground, while a centre peg at greater height joins two corner pegs by long thongs and provides for the middle of the hide to be elevated. This method would appear to have considerable promise, and the amount of equipment concerned is small and not beyond the ability of a nomadic tribe to transport from place to place. The procedure has not been put into sufficient operation yet for an opinion to be expressed about its general efficiency, but it would appear to conform to the requirements of free circulation of air on both sides of the hide.

In the Sudan, where a great advance has been made in the preparation of hides and skins in recent years, under the instruction of Mr. E. Knew, the Inspector of Hides, an arrangement somewhat similar to the above umbrella process has been introduced. In this case, the method, known as tent-drying, requires two poles fixed in the ground between which a taut rope or wire is fixed. This line should be about 3 feet or more from the ground. The hide is stretched over this line and tied to pegs in the ground. Precautions should be taken to ensure that the hide remains uncrumpled, by stretching the ends on the line to the upright.

Whereas, in the case of goat skins, as described later, drying over a line is a simple matter and easy to arrange because of the light weight of the skins, a similar arrangement for hides is not possible. The wet weight of a hide may be 60 lb. or more, and to provide a single line capable of taking this weight without sagging needs very substantial uprights and guy ropes. At the same time, in view of the size of the hide, the bellies would fall together and prevent the circulation of air. It would be necessary to keep the bellies apart by tying them to pegs at some distance from the line of suspension. It is therefore seen that such a structure

represents about as much labour and material as providing a frame. A modification of this method, which has been tried in Kenya, employs three horizontal wires, so placed as to run through the corners of a triangle having 6 inch sides. This structure again needs to be very firmly erected.

The value of the original drying trials in 1932 has been proved over and over again in recent years. They established the correct methods of drying hides and skins, and the methods being put into operation have resulted in the raising of the quality of material from many Colonial origins. As an instance, it might be mentioned that East African hides previous to those experiments had a poor reputation, as they were liable to suffer from blister. Enormous strides have been made in raising the quality of the hides from East Africa; at first progress was slow and gradual but, in the last few years, the advance has been very rapid and, to-day, it is true to say that hides from East Africa are of a high standard of preparation, and at the time of writing, they are fetching top prices in the dried hide market.

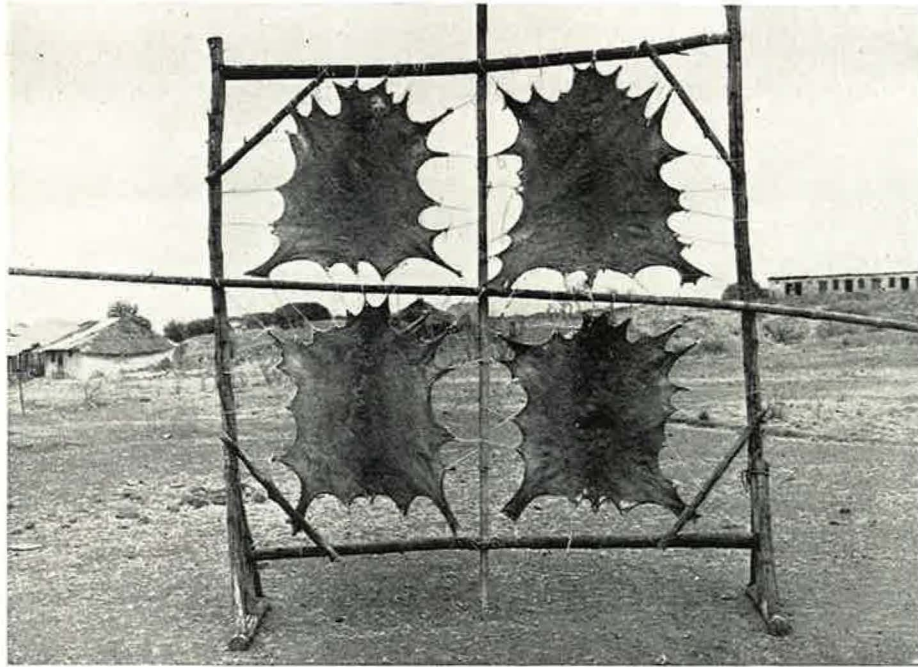
GOAT SKINS

In the early days the method used for goat skins was ground-drying, which caused similar trouble to that which arose in using the method for hides. The principle of suspension-drying established for hides was obviously applicable to skins, and its acceptance was forthwith encouraged, but with the reservation that as goat skins were possibly more sensitive to the sun's heat than hides, it was advisable to suspend them in the shade, until more was known on this point. Suspension-drying is much easier to carry out in the case of goat skins than in respect to hides. On account of their smaller size and much lighter weight, smaller and less substantial frames or structures are required. It became the practice, however, in many places to use the large hide frames sub-divided into four squares by introducing two crossed poles, and to place the frame in the shade of a tree or wall.

In Nigeria, another form of suspension-drying has been developed for goat skins. The method consists in hanging the skins over wires in sheds with open sides or enclosed with wire-netting. This exposes them to free air circulation, but protects them from direct sunning. Simple precautions are taken to prevent edges from curling, by the insertion of straws. Drying sheds of this pattern are provided by Government in markets and villages, and their use is compulsory. More elaborate structures are often used in the exporters' establishments, where frame-work and wires permit skins to be stretched out flat in the vertical plane, attached around their periphery by clips to the vertical and horizontal wires, the whole installation being under cover of a roof and enclosed with wire netting.

The line-drying of goat skins has given excellent results in Nigeria, the product being free from putrefactive damage or degradation attributable to the process of drying, except for a very occasional fault. The anxiety as regards line-drying is obviously the fear that the inner hanging surfaces will be close together and retard the circulation of air. The rolling up of edges, which if allowed to occur would spell trouble, is avoided, as men-

PLATE VII.



[By Courtesy of "The Leather Trades' Review"]

SKINS DRYING ON FRAMES.

The large frame for drying a hide has been readily converted by two poles to take four skins

PLATE VIII.



[By Courtesy of "The Leather Trades' Review"]

SKINS DRYING OVER A TAUT ROPE, WITH STRAWS INSERTED TO PREVENT FOLDING AND CURLING

tioned, by the insertion of straws. It must, however, be borne in mind that the Northern Provinces of Nigeria, where the bulk of the goat skins originates, have an exceptionally dry atmosphere for most of the year, and that the dry air has a very rapid drying effect.

In introducing the method into East Africa, Dr. French, the Adviser on Hides and Skins to the East Africa High Commission, was aware of the need to ascertain whether the procedure was suitable for local climatic conditions which, on the whole, are more humid than those of Northern Nigeria, before recommending the general adoption of line-drying. Experiments which were conducted under cover gave satisfactory results, and it was apparent that the new procedure was a valuable method with which to replace the old destructive one of ground-drying, since it would be easy to hang the skin immediately after flaying over a line between the veranda uprights of a hut, instead of dropping the skin in a corner till time was found to lace it to a frame. Further, it was sought to establish that goat skins could be successfully dried in the open, in full sun, on lines between permanent posts. Trials were therefore carried out under varying climatic conditions in Nairobi, in dry hot, dry cool and warm wet weather, with both goat and sheep skins. The skins were suspended over wires and also in wooden frames, running in an east-west direction, in the open. Control tests were also made in the shade in open-sided sheds. The results obtained on tanning the skins, indicated that drying in the open and in the sun gives tannery out-turns equal to those obtained with the shade-dried skins, provided that, as in these trials, the skins are removed to store when dry, but not over-dry. Goat skins allowed to remain in the sun for 5 days after becoming dry developed cracks on handling, but the resulting leather did not appear to be otherwise faulty.

In Nigeria, experiments were carried out by the Department of Veterinary Services at the suggestion of the Imperial Institute in 1948, with reference to drying conditions.

The results showed that goat skins dried in full sun were equal to those dried in the shade. This result was confirmed by trials carried out in the Sudan by the Veterinary Service in conjunction with the Bureau, in 1949. The latter trials took place in the so-called cool season, and goat skins were dried both on frames and over lines in the sun, as well as in the shade. The sun-dried skins in each case were equal to the shade-dried ones. The experiments are recorded in detail in this *QUARTERLY*, 1951, II, 23-25. The maximum shade temperature during the experiments was 97° F. The frame-drying method, employed in full sun, showed that it had the advantage of requiring less time for carrying out than the corresponding line-procedure, but this factor may have little significance under local conditions. In the hot season, drying trials were carried out in this series with sheep skins, but not with goat skins. The shade temperature rose at times to 109° F. There is evidence that the high temperature was responsible for some damage observed on the sheep skins, but no conclusions will be drawn until the experiments have been repeated. It is, therefore, advisable to bear in mind that there may be a temperature limit for the exposure to the sun of sheep skins and also goat skins beyond which degradation may take place. It may differ for

the two types of skins, as one would expect the goat skin to be the more hardy and resistant of the two.

There is, however, no instance of the sun injuring goat skins up to date, and they are now being dried in the open on a fairly wide scale in Uganda and Kenya. These skins have been coming forward in commercial consignments for some two years now and have met with approval. It may safely be accepted that the line-drying of goat skins in the sun is a safe method, provided an eye is kept open for discovering any temperature ceiling which may show itself.

In order to make sure of adequate air circulation under less favourable conditions of atmosphere, the method now advocated in East Africa requires the operator to insert straws or twigs to keep the bellies apart. Although this may not yield so flat-sided a skin as when freely suspended, the skins when soaked back have been found to be quite satisfactory in shape.

The importance of avoiding creases, folds and curled-up edges during line-drying has been strongly demonstrated by some consignments of goat skins from Africa recently examined by the writer. These skins, which in the raw showed pronounced creases, indicative of hanging in a crumpled-up form during drying, when put in work yielded pelts showing narrow belts of putrefied material running from the edges of the skin across the belly. The pelts were useless for making leather.

Although line-dried goat skins do not possess the smooth bright appearance on the flesh side of skins dried on frames, their value for leather production is equal to that of the latter. This point was submitted to The British Glacé Kid Tanners' Association for consideration, and they expressed the opinion that the drying of skins over lines was in no way detrimental, and that the clean, shining appearance of frame-dried skins was of no advantage, except that of making defects more obvious.

SHEEP SKINS

The drying of sheep skins of the hair type, the only kind to be dealt with in this article, has in the past been carried out in various ways depending upon local conditions, but often with little care. In the Somaliland Protectorate, however, there is a well-defined method which has been long established. It consists in stretching the skins, which are taken off in cased form, i.e. pulled off without ripping down the belly but with some slight initial cuts, between sticks at a distance of 6 to 8 inches from the ground, in the open. The skins are turned inside out in casing, and consequently the skins have the flesh side out while drying. In this method of suspension, one side is fully exposed to the sun, while the other is towards the ground, and consequently in the shade. No ill effects due to exposure to the sun have been observed in this method, but an important qualification must be stated. The skins are usually suspended for drying in the public market place in the early morning, and taken down in the afternoon before they are fully dry and transferred to a lock-up store, for the sake of safety. The last stages of drying take place in the dealer's store, where the skins are hung up in bunches. Under these conditions of drying in Somaliland, full exposure to the

sun causes no harmful effects to sheep skins, but they are removed to the shade before the drying process has been carried to the flint-dry stage.

This method has the fault that only four pegs are employed for suspension, and this necessitates the belly being tied to the back peg, giving a belly fold which is liable to become putrid through restricted drying. To overcome this failing, the Tanners Mission which visited Somaliland in 1949 recommended the use of a fifth peg, and the stretching of the belly outwards to this peg, thus avoiding a tucked-in fold. Skins dried to this pattern have subsequently been examined by the Bureau and submitted to tanning trials. The results were entirely satisfactory. A further modification which was also recommended was the removal of the scrotal portion, a part that is of no use to the tanner, at the time of drying, since it is liable to crease, remain damp and develop worm attack.

Although drying sheep skins in the full sun under Somaliland conditions has proved satisfactory, and Dr. French's experiments with the skins at Nairobi, referred to in the section on goat skins, gave similar results, the trials conducted in the Sudan in 1949, also referred to in that section, provided evidence that there may be a limit to the temperature which sheep skins can endure when exposed to the sun, beyond which degradation of the skin-substance takes place in the presence of moisture. The drying of hair-sheep skins in the open, either on frames, over lines or stretched on pegs, can be regarded as satisfactory, but exposure to extreme sun-heat should be regarded as doubtful until more is known on this point.

RECOMMENDED METHODS

Cattle Hides. There are various modifications of suspension-drying which give satisfactory results. If stout poles or squared timber are available, the hides should be stretched in portable frames which take one or more hides, or attached to permanent structures. The frame should be of sufficient size to carry the hide so that it does not touch the frame. The method originally recommended, in which the hide is stretched from a horizontal pole to pegs in the ground, does not represent much saving of timber. It gives satisfactory drying, but the flatter hide obtained by uniform stretching to four sides of a frame has a slight advantage.

Where there is a serious shortage of materials for making frames the "umbrella" and "tent" methods mentioned on page 239 may be tried out. These methods, which appear promising, have not been employed yet to a sufficient extent for a final judgement to be passed on them.

The hide should be prepared for drying by subjecting it to thorough washing, and to cleaning for the removal of gross pieces of flesh and fat, if these are excessive. The lacing holes around the edge of the hide should be made with a half-inch or three-quarter inch chisel. It is advisable to place a piece of wood under the hide, and tap the chisel smartly with a mallet or lump of wood. The use of a special chisel-edged implement which makes a round hole of $\frac{1}{2}$ inch diameter is to be recommended. The holes should not be more than 8 inches apart. If cut with a straight

chisel they should be parallel to the edge of the hide at a distance of $\frac{1}{2}$ inch from it. There are various methods of lacing, but perhaps the best is to use a short length of rope for each hole, knotting it at one end, and passing it through from the hair side so that the knot holds the hide. The direction of the strain of each lace should be arranged to spread the hide out evenly and without crumpling. The hide should be stretched to its natural size, but not over-stretched. As it dries out, contraction takes place, and the tension on the laces increases, necessitating some slackening if too much initial stretching has taken place.

The hump which is present in hides from Zebu cattle should be distended during the drying operation by means of a thin stick, but not by bunches of grass or other material that hinder drying. The flesh side of the hide should be exposed to the sun.

The time required for drying will vary in accordance with the climatic conditions. In hot, dry periods, 3 days may be sufficient, but in dull or rainy weather, up to 8 days or longer may be required. Only in areas where rain is liable to be continuous for more than a day is the provision of cover necessary. Protection from the sun is unnecessary, but if drying sheds are in existence, there is no reason why they should not be used, provided that the drying is not retarded in unfavourable weather.

The hide is ready for removal from the frame or drying structure when it is just short of being quite dry, so that it can be doubled along the line of the backbone, hair side inwards, without requiring undue force. In this once-folded, book form, it should be further sunned to just complete the drying, and then removed to store.

It is advisable to treat all hides and skins, which are not put into work immediately, with an insecticide to prevent attack by the grub of the Hide Beetle, *Dermestes vulpinus*, during storage and transport. If arsenication is employed for this purpose, it is desirable that it should be carried out as early as possible. For preference the hides should be dipped in the arsenical liquor before the initial drying. It is often the practice to delay arsenication until the dry hide reaches the port of shipment, when wetting and re-drying are necessary, carrying with them a renewed risk of putrefactive damage.

Goat Skins. If drying sheds with wires or frames are available, they should be used, but if new equipment has to be provided, frames or lines in the open will give equally good results. The skins should be stretched in the frames in a manner similar to that described above for hides, the holes being near to the edge of the skin, parallel to it, and about 4 inches apart. The lacing in the case of skins may be made with a continuous length of twine, instead of short pieces.

For line-drying, the skins are hung over a taut line consisting of wire or thin rope that is not more than $\frac{1}{4}$ inch in diameter: cotton-covered electric wire is suitable. The skin should be spread out evenly, the line of the backbone along the wire, so that no crumpling takes place, the hair side touching the line, the flesh side out. To prevent crumpling, further measures are taken in the form of inserting straws to keep the shanks, dewlap, belly and thighs from curling. Further, the shanks should be pushed apart by fixing a thin stick, 9 to 12 inches long, through the

two front shanks and another through the two hind ones. This method of suspension has an advantage over the frame method, in so far that it takes less time to set up the skin for drying than that required by the frame method. The wire can be fixed between veranda posts, or between special posts erected for the purpose, if a fair number of skins have to be handled.

If excessive sun-heat is encountered, it may be advisable to provide some protection from it, but this will only be necessary in exceptional circumstances. Nevertheless, the possibility should be kept in mind.

Sheep Skins. Hair-type sheepskins should be dried by the methods given above for goat skins, but with due respect to the caution given concerning high sun-temperatures.

At the expense of repetition, it is emphasised again that the old method of drying hides and skins on the ground is liable to cause serious damage, and should never be employed. It is desirable that the use of the method should be prohibited in areas where the improved processes are practicable. Drying over poles is also a bad method, and should not be employed.

