The Preservation of Straw for Fedder.

Straw was formerly regarded merely as a subsidiary article of food for animals and was administered to them only in admixture with fodder of high nutritive value. Horses in Europe, for example, were not given pure oats but a mixture of oats and finely cut-up straw. During the war, however, it was found necessary to make exact researches as to the nutritive value of straw, and it was found that it contained very considerable quantities of albumen etc., but that these food substances are assimilated by the animal stomach only to a very small extent, because they lie deeply embedded within the straw cellulose. The greater portion of the nutritive substances, therefore leave the body of the animal in an undigested condition.

It was accordingly proposed to facilitate the work of digestion for the animal stomach by subjecting the straw to a preparatory chemical treatment. The straw was, for example, cooked with soda, caustic soda or other similar chemical substances, then washed and dried. On feeding animals with the straw thus treated it was found that whereas they had formerly assimilated 20 per cent of the nutritive substances in ordinary straw, they now assimilated nearly 80 per cent, that is, more than twice as much. Straw has, therefore, now acquired as important character as fodder, especially as it has the further advantage of being stored for almost indefinite periods of time.

Such methods of chemical treatment as those just referred to are however of hardly any value to India, as they entail extensive apparatus, especially for the process of washing and filtration. The necessary chemicals too would be far too expensive. But there are other methods of dealing with the straw, that are better adapted to the conditions of the country. The raw materials necessary for the purpose are present in the shape of the sugarcontaining fruit juices obtainable from the vast quantities of sweet fruit that would otherwise be wasted.

If such fruit be treated in vats or water-tight pits with a layer of slaked lime, the calcium oxide of the latter enters into chemical combination with the sugar of the fruit. The clear solution containing this chemical compound is then allowed to be absorbed by the straw and to evaporate slowly. The sugar-lime opens up the straw cellulose in the same manner as soda and has the additional advantage of not requiring any cooking process. What is even more important is that the straw does not need to be washed. Its nutritive value is now very considerably enhanced by the sugar contents and it is readily

eaten and easily digested by animals. The straw can, of course be often dried in a solution of sugar-lime, until it is practically saturated with the latter. If it is treated in long, uncut stalks, it is easier to dry and make up into bundles, in which form it is also easier to transport. Such bundles can be stacked in places sheltered from the rain and be stored for years as reserve fodder. In Germany the chemically treated straw is finely cut-up and pressed together into dry cakes. Fodder can be prepared for export in this manner, but machinery is necessary for the purpose.

The utility of the above simple method of procedure consists in the fact that the peasants of even the remotest villages can turn the fruit juices and the straw to good account for the creation of new values, no machinery or apparatus being needed. In the neighbourhood of the cities, where it is essential to maintain considerable stocks of cattle owing to the large consumption of milk and meat the economic importance of the prepared straw is obvious, especially owing to the distance of grazing grounds. As, too, there is a very large consumption of fruit, there is also aconsiderable amount of waste which can be profitably employed for preparing straw for fodder. The enormous value of the reserves of such fooder in flooded areas will also be readily appreciated.

(The Industrial and Trade Review for India. Berlin Feb. 1925).

Cotton.

HERBERT J. SPINDEN.

When a famous English novelist wrote a history of the world in two heavy but refreshing tomes, he devoted about 8 pages to the contributions which America before Columbus made to the world after Columbus. In this cramped space he could not explain how modern industrial England owes more to American Indian Cotton than to any other material factor. Nor did he explain that the white harvest of poor London scattered values and utilities among all the nations of the earth,

It is not part of our emotional complex to feel a twinge of gratitude for the plants that feed and clothe us. In keeping with artistic rather than practical judgments on civilization, we find sentiments enough about the climbing rose, which embodies the philosophy of ideal beauty, but where is our poet who can muster the drumming thunder of a thousand mills and sing the song of Cotton?

Cotton as a wild plant was blown round the world, and species are found on desert islands like the Galapagos. Two kinds were domesticated in India, one a tree cotton and one a small herb, alternating with wheat to complete the agricultural year of the Hindus. Both of these cottons had very short fibres, which could not be spun by hand. Mention of cotton in the old world is found as early as 7th century B.C. but the first archaeological examples are from well within Christian times.

In America two, or perhaps three, basic species of cotton were developed into a great many varieties, and were bred to yield fibre three or four times as long as the cotton plants in British India. Cotton fabrics are found in the south-west among remains of the pre-cliff dwellers. Columbus was the son of a weaver and was familiar with the scraggy cotton that the Arabs brought to Spain. His first day ashore in the Bahamas was spent in trading red caps and glass beads for cotton thread in balls.

Thus was begun the commerce of cotton between Europe and America, which reached its peak in 1911 when about 11,000,000 bales of 500 lbs. each crossed the Atlantic from the United States, and half as much stayed at home. Now it is true that the sentimental associations of the Europeans are with Asiaic cotton. Calico is from Calicut, where Vasco de Gama landed in india ; muslin is from Mosul, across the river from the place where Sennacherib cultivated tree wool in his hanging gardens. Neverthless, it is the cotton of the Mexicans. the Peruvians. and the Arawaks that rules the world today.

From the tribute roll of Montezuma, it appears that 234.800 porters" loads of woven cotton and 4,400 bales of raw cotton were delivered yearly by conquered Indians as tribute to the Aztees. This amounts to about 35-000.000 dollars in present values. The first Spanish Governor of Yucatan writes, in 1561, that the Mayas of the northern parts of the Peninsula were then paying in tribute 1,280,000 yards of woven cotton. Indeed, cotton was an imported item of Spanish commerce till disease and slavery had tremendously reduced population in Mexico and Peru.

Cotton weaving in England had small beginnings, the raw material being secured in the eastern Mediterranean islands and in Asia Minor. Then the British East India Company brought in Hindu textiles and created a London vogue. In 1692 John Barkstead called attention to the extraordinarily fine fibre to be secured at the British plantations in the West Indies. When by a series of fine inventions, beginning with John Kaye's thrown shuttle, looms, and spinning

frames were improved and put under mechanical power, it was the longer staple of America that made the venture a success. In 1794 to 1798, when the industrial development in spinning and weaving was in its infancy, England's cotton imports show 45,000 bales from America and 11,000 bales from the old world.

Then followed the introduction of American cottons into India and finally into Egypt. It is very clear that the industrialization of cotton in English factories was the first move in our present mechanical age, and as seen above, it was the old civilisations of America that furnished the necessary product. But it is perhaps worthy of note that the art of weaving had been carried very far in America, the fibres being cotton, henequen, the wool of the ilama, alpaca, vicuna, and other allied animals.

Ancient Peru shows more varieties of weaving than any other place in the world, and they are of a degree of fineness untouched on the more celebrated looms of Asia or Europe. Wool weft on cotton warp, in tapestry technique, has been found with 320 or more picks to a square inch. Various finishing processes were developed, such as the dyeing and hand painting, but for the most part designs were mechanically involved in the weaving itself. Among the beautiful colors of the new world were cochineal, anil, or indigo, fustic, and various other logwood stains.

(The Queensland Agricultural Journal, April, 1926.)

Caponizing.

P. RUMBALL, POULTRY INSTRUCTOR,

The question whether caponizing is profitable or otherwise is best left to the individual producer to decide, as the features governing the commercial side of the proposition, that is the cost of feeding and ultimate sale, are of a varying nature.

The capon, however, has advantage over the uncaponized bird in weight, quality of flesh, cost of maintenance, etc. The opinion frequently expressed that capons grow to a greater size than cockerels is wrong. When the reproductive organs are removed cockerels lose any fighting instinct and lead a lazy inactive life, thereby putting on more weight or flesh but not size. It is possible also to retain capons until they are fully developed and to market them as desired. This

is not so with cockerels, as they become troublesome and lose the quality of flesh. The inactive life a capon leads, naturally reduces food consumption, and so they are kept at greatly reduced costs, which materially assist a producer catering for a regular supply of poultry. To the mixed farmer, however capons should appeal most, inasmuch as they can be allowed to range with the farm flock. There is no necessity of segregating sex, and by being sterile the egg product is in no way injured.

Appearance of a Capon. The comb and wattles of a capon do not develop and the head remains small and colorless having the appearance of unhealthiness. The pointed feathers of the neck and those in front of the tail and large sickle tail feathers grow profusely, and in countries where capons are recognised in their true value as table-birds these feathers are left on the bird in dressing and serve as a trade-mark.

Marketing. At present the caponiser should cater for regular customers but if his supply is greater than demand, the marketing of the surplus should take place when young birds of quality are scarce, which happens annually from March until early cockerels are on the market—say September. Cockerels of any breed may be caponized, but breeds of the light or small varieties, such as Leghorns, are not so suitable as the larger varieties, such as Orpingtons, etc., although in this article, Leghorns have been used for illustration purposes.

The age at which the operation is to be performed naturally varies with development of various breeds but generally speaking the correct period is between 8 and 12 weeks when the chickens are about 2 lbs. in weight. The next point which the caponiser must keep in mind is light. A good light is essential, especially to the inexperienced operator. With practice he can operate under indifferent conditions, but for start the positions of various organs must be thoroughly understood. The third requirement is to refrain from feeding and watering the bird for at least 24 hours—36 would be better. Under such circumstances the intestines become empty and will of their own account fall away from the side where the incision is made and as well as lessening the chance of injury, permit of the reproductive organs being seen much easier.

The Operation. In addition to knife, spreader, probe and forceps, a table and two pieces of soft cord with a running nose at one end and two half bricks attached to the other, with a basin containing a weak antiseptic solution are necessary. The table may be an old packing case or barrel or the operator may prefer to make a more

elaborate and possibly convenient bench. The bird is fastened down by means of the cord and bricks, one noose being placed around its legs, and the other around its wings, close to the body, and the bricks allowed to hang down on either side.

The next move is to pluck a few feathers off the seat of operation which is just in front of the hip joint. In a bird of the correct age very few feathers will need removing and those that are lying in the way can easily be held aside by damping them with the antiseptic solution which should always be used to cleanse the position to be operated on. The clear space obtained by doing this is shown in Fig. Having done this the correct position to make the incision must be ascertained. This is best done by placing the thumb on the hip-joint gradually moving the forefinger along the body until the last rib is felt. It is between the two last ribs that the incision has to be made but before doing that draw the skin as far back as possible with the forefinger so that when the operation is completed and the skin goes back to its natural position the wound in the skin and the abdominal cavity are not directly opposite. Having made the cut insert the spreaders, enlarge opening to about 1½ inches and gently spread the ribs. When this is completed a thin membrane will be noticed covering the intestines. This has to be removed which is done by means of the probe, before the testicle can be seen. The testicle is easily noticed if the bird had been properly starved. It is yellowish-white in color, runs parallel with the backbone and in birds of correct age three quarters of an inch long and little thicker than a plump grain of wheat. With the forceps take hold of the testicle, being careful not to grasp the large artery which runs parallel with and close to it. Withdraw the instrument with testicle attached with a twisting motion and after appendages have been twisted up and pulled out, cut them about one and a half to two inches from testicle to make certain that no portion of the organ remains. When the operation is completed on one side turn the bird and repeat the process. Some operate from the one side only but this method carries more risk and saving in time is doubtful. The operation does not appear to cause the bird much distress. In about a week it is a very difficult matter to find where the incision was made—a few wind puffs are occasionally met with, but they merely need to be pricked.

After the operation of caponizing turn the bird loose. If the operation had been correctly performed the skin covers the wound and no dressing of any description is required. It is as well, however, to keep the capons in clean quarters and away from untreated birds for a few days, but beyond this other treatment is unnecessary.

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Recognised "Vitamines."

"Vitamines" are now recognised : (1) Fat soluble A vitamine, which is present in animal and fish oils and green feeding stuffs. It is essential to growth, is heat stable, and appears to be necessary for the growth of all animals, although evidence shows that fowls require a very small amount of this vitamine for normal growth. (2) Water Soluble B vitamine (antineuritic), the absence of which causes a form of neuritis with paralysis. It is present in cereal grains, and birds are particularly sensitive to its absence from a diet. (3) Water soluble C vitamine (antiscorbutic) is easily dsstroyed by heat, and its absence from a diet gives rise to scurvy. Man and the guinea pig are peculiarly susceptible to the absence of this vitamine. whereas birds appear to be able to dispense with vitamine C altogether. (4) Fat Foluble D vitamine (antirachitic) was formerly grouped with Fat soluble A. Its absence from a diet gives rise to rachitic symptoms. By suitable exposure to ultra-violet light, the onset of rickets in an animal fed on a diet deficient in fat soluble D vitamine may be delayed or even prevented. (5) Vitamine E has been described by Evans and Bishop, who showed that absence of this vitamine from a diet led to sterility. This vitamine is heat resistant, and is present in wheat germ oil. It is present in oats, maize. lettuce, lucerne, and in small amounts in animal tissues. In the male, absence of this vitamine from a diet gives rise to degeneration of the testes, and in the female temporary sterility occurs which lasts as long as the diet remains deficient in this vitamine.

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Rural Developments.

SIR REGINALD H. CRADDOCK, G.C.I.E., K.C.S.I.

In some quarters it is the fashion to write as if the Indian Government had up to the present been entirely oblivious of its responsibilites to the rural population, and that it lay upon Indian Ministers to repair past neglects, and to devise and carry out policies to transform the Indian plains into great granaries, and to convert poverty-stricken and ignorant cultivators, with only a rudimentary knowledge of agriculture into prosperous and scientific farmers. Such a view ignores entirely the labours of several generations of revenue and settlement officers, the remarkable results already achieved by the agricultural departments, the entire machinery of co-operative credit, the activities of the veterinary officers, and the wonderful effects upon India's prosperity of the great irrigation works and railways. There

is indeed little that a Royal Commission can find out that the Government does not know already, or cannot collate from the abundant material available in the settlement and revenue reports and the recommendations of numerous committees and conferences held annually or from time to time. In fact, for years past the Government has been much more active and much better equipped with reference to rural economy than to urban and industrial problems, witness the remarkable success of its efforts in coping with successive famines.

The ryot is no fool. Anyone who has been in close contact with Indian agricultural problems for a great many years knows that the progress made has been on sound lines and that if these lines are steadfastly pursued this progress will be accelerated and greatly extended. The Indian ryot is no fool, he has long-inherited experience, and though if left alone he is very conservative yet once let him be convinced that a particular crop or a particular method is within his means, and is going to pay him, he will adopt it. But he has no use for an itinerant lecturer with a science degree who merely lectures and passes on. Long before scientific agriculture was heard of in India particular improvements and more advanced practices came into use. The ryot must know that you know all that he can teach you before he will begin to learn from you. The way to convince the Indian ryot is not by publishing the results obtained on some distant farm, but by demonstration *in situ.*

Practical Domonstration Essential. The scientific agriculturist must first experiment on a central experimental farm, which is typical of a tract ; he must not be in any hurry to demonstrate until he has satisfied himself over a series of years that the seed and the method tested is really a success. The premature demonstration on the village lands that fails puts back the improvement many years. But if the scientific agriculturist is patient and the demonstration *in situ* succeeds he may be perfectly assured that one after another the neighbours of a demonstration plot will imitate and adopt his methods. It is thus by the establishment of central farms on which experiments can first be proved, and by the subsequent multiplication of demonstration plots, that knowledge can be diffused. But success is only obtained if there are in the agricultural department earnest practical men, who add to their theoretical knowledge experience of the locality and of the mentality of the cultivators. When a man like this wins the confidence of the cultivator he will be looked up to, consulted and his advice followed. It is by these methods that the agricultural department has won success in provinces where they have been adopted.

Tillers of Soil Must Prosper. But this is still only half the battle and if it is to be won, there are other obstacles to be overcome before success can be widely diffused. The great desideratum is to keep the actual tiller of the soil prosperous and contented. This is a more baffling problem than the mere instruction to him of more profitable agricultural methods. A man must not only be taught, but he must have the incentive and the means to apply what he learns. To have the incentive, he must enjoy security of tenure, and to have the means he must command cheap credit. The first of these essentials is dependent upon the enactment and enforcement of tenancy laws ; the second upon the organization of co-operative credits. But the first also reacts on the second ; for a man with security of tenure can command better credit than the man who has no security to offer, except that one of uncertain harvest.

No use helping the Wrong Man. The Government has done a great deal to protect the cultivator much more in some parts of India than in others, but its intention and its laws are constantly frustrated because the protection reaches the wrong person. In the Zemindari provinces it has secured the landlords, but in many of them the tenant has not got adequate protection, while in the ryotwari provinces the protected ryot has often become a landlord and a middleman and the tenant beneath him—the actual cultivator—is impoverished and rack-rented. In the Punjab cultivated by large bodies of small landowners and in the Central Provinces, Bengal, and Bihar the protection is very partial while in Madras, Bombay and Burma, whereever the ryot has taken to letting his land, instead of cultivating it himself, the protection has shifted from the actual cultivator to the middleman. This is the great problem, and it is the one on which it is probable that the verdict of a Royal Commission might carry weight. On the other problem-that of cheap credit-usury laws can seldom escape successful evasion, and co-operative credit is the one remedy that promises most success. It seems unlikely that a Royal Commission, could suggest a better, but there can, in view of the magnitude of the problem be no objective to their trying to find one.

Advantage of small holdings. Great stress is sometimes laid upon the ill effects of minute sub-division of holdings, but this is an evil for which a violent remedy would probably be worse than the disease. The most productive and intensively cultivated areas are those in which population presses on the land ; give a man a large area and a low rental and he becomes prone to sub-letting. or else he cultivates in slovenly fashion. Any interference with the age-long joint family system in favour of primogeniture would arouse the most violent opposition. The sub-division of lands corrects itself for the superfluous

members drop out and seek their livelihood elsewhere, or the land passes again, owing to debt into the hands of a single holder. No legislation and no Royal Commission can keep the thriftless, shiftless, unwilling or unindustrious cultivator upon the land, and in spite of trials and vicissitudes, a substantial proportion of Indian cultivators are hard-working, contented and reasonably prosperous. But that fact need not, and should not cause us to relax our efforts to make the proportion larger and the degree of prosperity greater. There is enormous scope for improvement.

Not many over Assessments. There are two matters, on which it is only possible to touch briefly : (1) the effect of land-revenue, (2) agricultural educatton.

Time was, no doubt, when whole tracts of country were over assessed. This with successive settlements and accumulated experience has passed away. The only places which might be over-assessed now are stray villages in which deterioration due to special local causes has escaped notice and relief. Otherwise, over the country at large, the revenue is so light that the revenue payer can always obtain rents so high in proportion to the Government assessments that middlemen are created and rack-rented subtenants come into existence. No commission will now-a-days be able to impeach either the moderation of the land-revenue demand or the consideration with which it is collected.

Adult Education wanted. As to agricultural education it is useless to multiply science students with an urban up-bringing. Nor is it within practical politics to make millions of ryots scientific farmers with English education. A nucleus of well-equipped colleges to provide teachers and demonstrators is of course necessary but 90 per cent of the students in agricultural colleges and demonstrators are not prone to practise the profession of farming. Moreover agriculture is a department in which it pays better to instruct adults than children or adolescents ; for whereas the youth will not be able to teach the elders, and will not be an elder himself until he has forgotten his school and college course, any practical instruction that the adult absorbs he will most certainly impart to his children. A shrewd cultivator will learn much more from demonstration plots and farms than his son will acquire if he is taken to agricultural college where he learns to prefer urban life to rural, and salaries to farming profits. The training of farm labourers at the farms is also very valuable.

Co-operation Essential. The greatest results can only be achieved by the co-oporation and co-ordination of the efforts of the Revenue