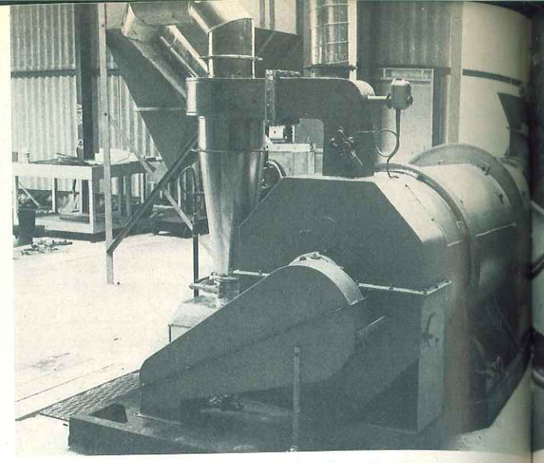
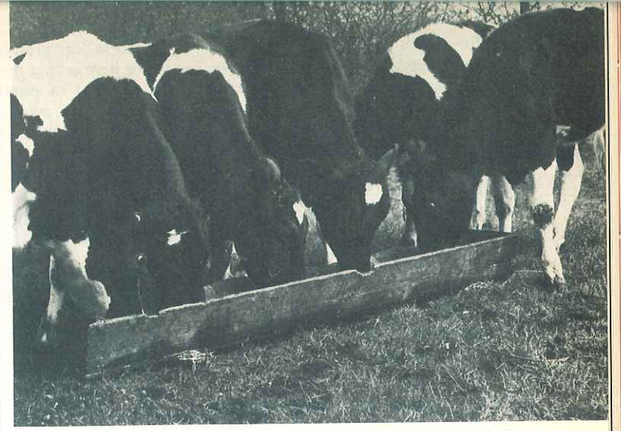
A huge amount of waste is produced by every poultry set-up and it must be disposed of without polluting the neighbourhood with malodours.



A profitable way to dispose of poultry droppings is to dry them in a machine like this. (Photo by courtesy of Colman)

A modern plant which hydrolises chicken feathers for a processing plant. The cooked feathers have a high protein value for inclusion in animal feed. (Photo by courtesy of Baker-Perkins)



Ruminant animals like cattle can make the best use of dried poultry manure because it is rich in urea which they can convert into protein. (Photo by courtesy of Thornbers)

Processed Animal Waste Problems And Opportunities

● In the last 20 years, the poultry industries of the developed nations have achieved the highest level of production efficiency in history. However, the industry's volume and efficiency must be expanded further if we are to feed future growth.

Today, it is not uncommon for poultry units to house as many as 2 000 000 laying hens or 100 000 broilers per production unit. This type of concentrated production has seriously increased the problem of pollution control. Current ingredient prices and increased interest in environmental pollution have created demands for more careful handling of animal wastes.

Reducing the quantity of waste produced is not possible. The great necessity is in utilising the nutrients contained in this waste by properly processing and using them in the production of food.

From a production standpoint, the primary benefactors of waste recycling will be large producers who will benefit immediately by processing and efficient utilisation of animal waste. Therefore, any procedure or any processing technique such as ensiling or drying must generally be considered of great economic and social benefit to all mankind.

Safety Factors

Aside from the asthetic considerations, which often are most repulsive to the average person, there are certain factors which must be controlled to safely feed animal waste. There is limited evidence that meat, milk and eggs produced for human consumption can be contaminated by feeding processed animal waste.

Data resulting from recent studies indicate that the levels of arsenic, mercury, copper and zinc were not appreciably altered in the tissues, faeces or eggs by recycling dried poultry waste in the diet of laying hens. Milk from dairy cows fed relatively large quantities of dried poultry waste contaminated with polychlorinated biphenyls was uncontaminated with the PCB's. Residues of the mono to pentachlorabiphenyls were not detected while residues of the hexa to decachlor-biphenyls occurred in milk.

In another study, four lactating Holstein cows were fed dried manure from broilers consuming 3-nitro 3-hydroxy phenyl arsenic acid as a feed additive. Arsenic consumption averaged 40 ml/cow/day. Arsenic did not appear in milk from cows as a result of this intake. It has been reported that feeding broiler litter containing a substantial level of arsenic resulted in only a moderate accumulation of arsenic in the liver. Similar results were obtained for copper.

In recent years, accidental chlorinated hydrocarbon contamination of edible milk, meat and egg tissues has increased the concern of the animal industry.

Practically all countries and most reputable livestock and poultry producers have some form of monitoring programme to insure that contamination of feed ingredients does not occur. Increased surveillance by government inspection services has necessitated very careful evaluation of feed ingredients especially in the poultry and dairy industries.

That coupled with a tremendous monetary loss when accidents have occurred has been an added incentive to maintain and expand all surveillance programmes. Therefore, it is highly unlikely that heavy metal or pesticide residues will be a problem in waste products. If the material is adequately processed there is little chance of passing pathogens into the system.

Regarding pesticides, droppings do not normally contain them because the animal body tends to absorb these materials rather than pass them through the waste. Carbanates and organo phosphates are rapidly hydrolised and are not stored as such in the body.

If processed animal waste is to be used as a feed, the question arises as to its actual feeding value. If it is of sufficient feeding value to replace substantial portions of nitrogen and phosphorus, then it can be evaluated in terms of the amount of materials which will be saved. That in turn can be related to the amount of soya bean meal and phosphate which would be free for domestic

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Poultry manure which has been dried and processed to produce a fine mash for use in chicken feed or cubes for larger animals. (Photo by courtesy of Thorners)

use or for export.

Poultry waste is even more attractive than cattle manure as a source of protein and energy when fed to ruminating animals. These materials usually are high in nitrogen as well as energy. It has been suggested that the protein content of broiler litter was 30%.

It was indicated that 45% or more of the total nitrogen in broiler litter was in the form of protein. The interesting factor here is that the non-protein nitrogen content of poultry waste is in the form of uric acid. Other non-protein nitrogen fractions include ammonia, urea and creatine.

Interestingly enough, the main nitrogenous compound excreted by poultry (uric acid) can be utilised by rumen micro-organisms. It has been suggested that uric acid is broken down in the ruminant at a slower rate than urea. This may mean a more efficient non-protein nitrogen utilisation compared with urea.

It also has been suggested that the apparent digestibility of nitrogen from poultry litter varied from 65% to 82%. It appears that the average digestibility of energy of poultry litter fed to cattle is

Probleme und Möglichkeiten mit weiterverarbeiteten tierischen Abfallprodukten

Zusammenfassung—Je Produktions—einheit sind in der Geflügelhaltung heute bis zu 2 Mill. Legehennen oder 100 000 Broiler nichts Ungewöhnliches. Durch diese Konzentration in der Geflügelproduktion ist das Problem der Umweltverschmutzung ungemein erschwert worden. Die jeweils erzeugte Menge an Abfallprodukten kann nicht reduziert werden. Und wir stehen vor der grossen Forderung, die in diesen Abfallprodukten enthaltenen Nährstoffe durch sachgemässe Verarbeitung in den Nahrungsmittelproduktionspronzess einzuspannen.

Bestimmte Faktoren müssen allerdings der Kontrolle unterliegen, wenn tierische Abfallprodukte risikolos verfüttert werden sollen. Rezente Studienergebnisse deuten daraufhin, dass durch Wiederverfütterung getrockneten Geflügelkotes an Legehennen die Gehaltsmengen an Arsen, Quecksilber, Kupfer und Zink weder im Gewebe noch in den Fäkalien oder Eiern messbar geändert wurden. Weiter wurde berichtet, dass die Verfütterung von Broilerdung mit erheblichen Arsengehaltsmengen nur zu einer mässigen Arsenanhäufung in der Leber führte. Ahnliche Resultate liegen für Kupfer vor.

In praktisch allen Ländern und in den meisten renommierten Tier- und Geflügelproduktionsbetrieben gibt es irgend ein Uberwachungsprogramm gegen die Verunreinigung bzw. Verseuchung von Futteringredienzien. Es ist höchst unwahrscheinlich, dass Schwermetall oder Pestizidienrückstände in Abfallprodukten zu einem Problem werden. Sofern das Material sachgemass verarbeitet wird, ist das Risiko einer Pathogenübertragung kaum gegeben.

Als Wiederverfütterung an Wiederkäuer sind Geflügelabfälle als Protein- und Energiequelle noch attraktiver als Rinderkot. Diese Produkte weisen im allgemeinen sowohl hohen Stickstoff—wie auch Energiegehalt auf. So wurde angedeutet, dass der Proteingehalt im Broilerdung bei 30% liegt, während die durchschnittliche Energieverdaulichkeit des an Rinder verfütterten Geflügeldungs bei ca. 64% liegt.

Harnsäure, die wichtigste vom Geflügel ausgeschiedene Stickstoffverbindung, kann von den Mikroorganismen des Pansen verwertet werden. Berichten zufolge wird Harnsäure im Verdauungssystem des Wiederkäuers langsamer abgebaut als Harnstoff. Im Vergleich zum Harnstoff könnte darin eine effizientere NPN—Verwertung liegen.

Problemi e vantaggi delle deiezioni animali riciclate.

Riassunto—Oggi non e un'eccezione trovare complessi avicoli che alloggiano fino a 2.000.000 di ovaiole o 100.000 broilers per unità di produzione. Questo tipo di produzione concentrata ha aggravato seriamente il problema del controllo sull'inquinamento. Ridurre la quantità di deiezioni prodotte non é possibile. La grande necessità consiste nell'utilizzare i nutritivi presenti in queste deiezioni, riciandole e utilizzandole nella produzione del mangime.

Vi sono certi fattori che devono essere controllati per l'utilizzazione di deiezioni animali nel mangime. Da recenti studi risulta che i livelli di arsenico, mercurio, rame e zinco nei tessuti, nelle deiezioni o nelle uova, non erano molto alterati con l'aggiunta nel mangime delle ovaiole, di deiezioni reclicate di polli. E' stato notato inoltre, che il mangime, composto di lettiera di broilers, con un livello importante di arsenico, dava soltanto un modesto aumento di arsenico nel fegato. Gli stessi risultati sono stati ottenuti per quel che riguarda il rame.

Praticamente tutti i paesi e tutti i produttori avicoli rinomati possiedono un certo programma, per evitare la contaminazione degli ingredienti alimentari. E' altamente improbabile che resti di metalli pesanti o pesticidi siano un problema nei prodotti a base di lettame. Se il materiale viene recuperato adequatamente, esiste una probabilità minima che i patogeni passino nel corpo.

Le deiezioni di polli sono, come fonte di proteine e energia, ancora migliori del letame bovino, dato come mangime ai ruminanti. Questo materiale contiene normalmente molto nitrogeno ed energia. Pare che il contenuto proteico di lettiera di polli sia del 30%, mentre la digestibilità media di energia é circa del 64%, se dato a bovini.

La maggior consistenza nitrogena escrementata da polli (acido-urico) puo' essere utilizzato dai microorganismi dei bovini. Pare che l'acido-urico venga decomposto più lentamente che l'urea. Questo puo' significare un'utlizzazione più efficace del nitrogeno che l'urea.

Problèmes Et Possibilités Des Résidus Animaux Transformés.

Sommaire—Aujourd'hui, il n'est pas extraordinaire de trouver dans certaines unités de production jusqu'à 2.000.000 de pondeuses ou 100.000 poulets de chair. Ce type de production concentrée a sérieusement augmenté le problème du contrôle de la pollution. Il n'est pas possible de réduire la quantité de résidus produits. Il faut donc utiliser les éléments nutritifs de ces résidus en les transformant correctement et en s'en servant pour produire de la nourriture.

Il y a certains facteurs à contrôler pour faire de ces résidus une nourriture saine. Des résultats d'études reçues montrent que les taux d'arsenic, de mercure, de cuivre et de zinc ne changeaient pas vraiment dans les tissus, les déjections ou les oeufs de pondeuses dont l'alimentation contenait des résidus de volailles séchés ou recyclés. On a trouvé qu'en donnant à manger de la litière de volailles contenant un taux important d'arsenic, on n'obtenait qu'une faible augmentation de l'arsenic du foie. Des résultats identiques ont été obtenus avec le cuivre.

Pratiquement tous les pays et les plus connus des éleveurs de volailles s'assurent d'une façon ou d'une autre qu'il n'y a pas de contamination des ingrédients alimentaires. Il est peu vraisemblable qu'il y ait un problème dans les produits obtenus avec les résidus de métaux lourds ou de pesticides. Si le traitement est correct il y a peu de chances de voir passer des germes pathogènes dans le nouveau produit.

Les déjections de volailles sont même plus intéressantes que celles du gros bétail comme source de protéines et d'énergie dans la nourriture des ruminants. En général, elles ont une teneur élevée en azote aussi bien qu'en énergie. Il a été suggéré que le contenu en protéines de la litière de poulet de chair était de 30% alors que le bétail était capable de digérer approximativement 64% d'énergie provenant de la litière de poulets de chair.

Les principaux composés azotés fournis par les volailles (acide urique) peuvent être assimilés par les microorganismes de la panse. On a suggéré que l'acide urique était décomposé moins vite par le ruminant que l'urée. Ceci peut signifier en comparaison avec 1'urée une utilisation plus efficace de l'azote non-protéinée.

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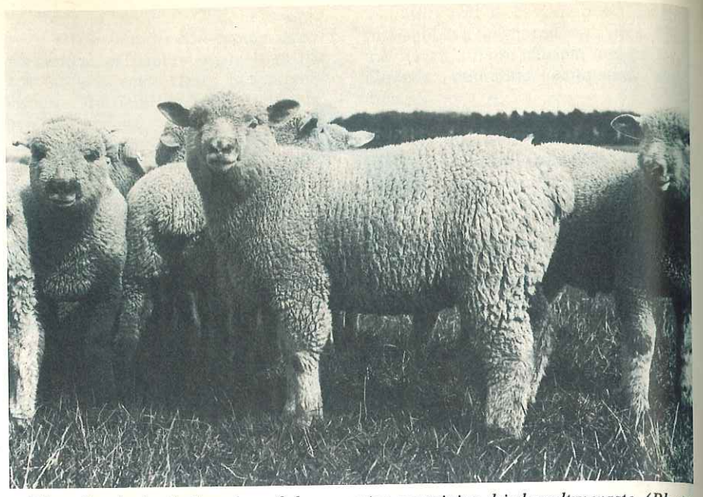

These fine fat lambs have been fed on a ration containing dried poultry waste. (Photo by courtesy of Thornbers)

approximately 64%. It has been estimated that as much as half the poultry waste produced could be processed into usable animal feed. This would mean millions of tons of a feed material with an average value of 30% protein and an average digestibility of 60% or better when fed to cattle. The benefit to the poultry industry and the savings to the consumer are easily calculated from these figures.

—Dr. M. G. McCartney

(The author is head of the department of poultry science at the University of Georgia, USA – *Editor*)