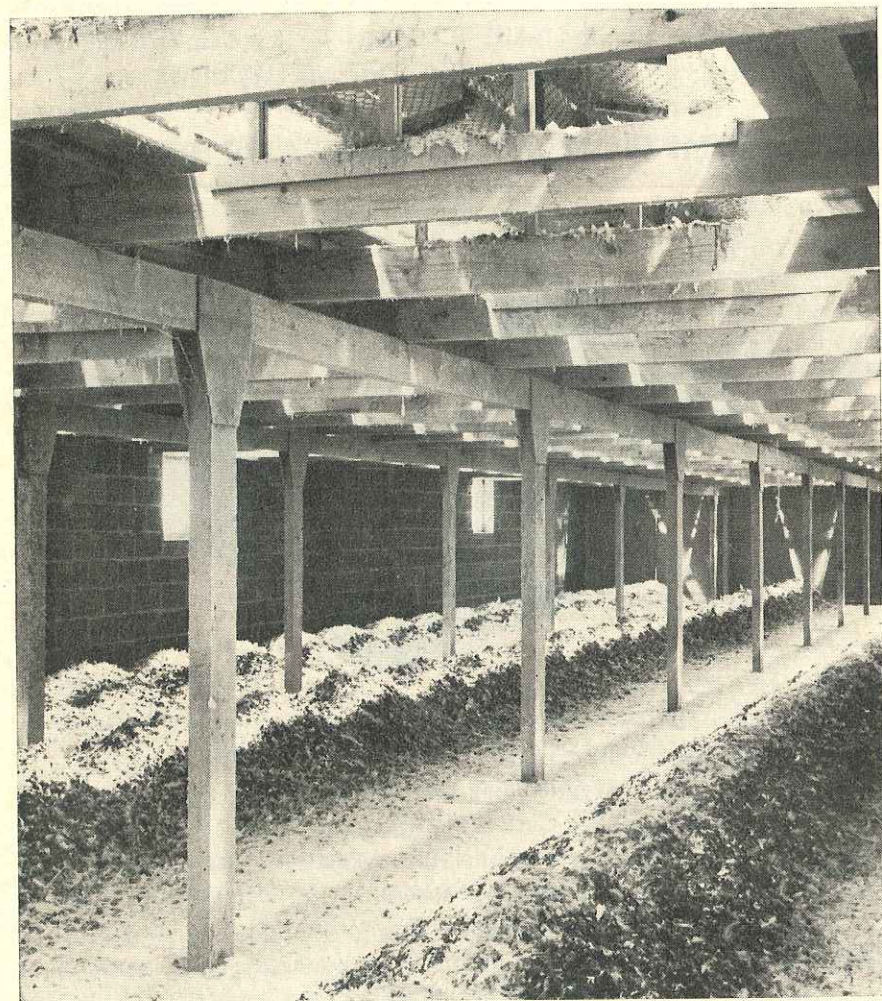


## Deep Pit Cage System Cuts Manure Removal Costs

**SUMMARY:** To reduce manure cleanout costs, many caged layer operators have installed mechanical manure removal devices. But a survey in England reveals that cages without such cleaning devices are less expensive to operate. The deep pit manure removal system, which is not mechanized, was shown to be a low-cost, efficient means of coping with the manure disposal problem.



IN THE DEEP PIT under the cages, the manure is allowed to build up for 4 or 5 years before it is removed by tractor and bucket-loader. The drying action of the reverse ventilation system reduces the volume of manure by nearly half. The floor supporting the cages is high enough to provide the tractor driver with ample working room.

- Cleaning out the manure from a caged layer unit is an expensive operation. The average cost of handling the manure output of 1,000 layers, from cage to disposal point, is around £50 (U.S. \$140) a year in terms of labor and machinery running costs, according to a recent country-wide investigation by Britain's National Agricultural Advisory Service.

The average capital outlay on cleaning equipment in the United Kingdom was found to be about £74 (U.S. \$208) per 1,000 hens. When investment interest and depreciation charges on this amount are added to the running costs, they add up to a total of over 1s-4d (U.S. 19¢) per layer annually.

This may not come as a surprise to laying cage operators who have to live with the sticky problem of droppings removal. But one aspect of the subject which emerged from the NAAS economic investigation is going to come as a shock to a lot of people. It is simply this: Unsophisticated, non-mechanized cages are not as expensive to operate as cages fitted with the very latest thing in push-button cleaning devices (see table 1).

The three mechanical cleaning systems costed in the survey are those most widely used by egg producers in Britain who opt for push-button laying cages. As their names suggest, the systems employ either plastic-coated fabric belting, expendable waterproof paper or travelling scrapers under the cage floors to remove the manure.

But the deep pit system is something relatively new. Developed by Mr. P. F. Parker, a poultry farmer in Nottinghamshire, the idea has sparked a lot of interest during the last year or so. It is estimated that over one



STEPHEN GORDON uses a long-handled T-shaped rubber blade to push 3-4 weeks accumulation of droppings off the trays under the cages. The manure falls down through the gap in the cage stack and drops through the skeleton floor into the pit beneath. Droppings from the lower cages fall directly into the pit.

### Réduction des frais d'évacuation des déjections dans des batteries à fosses profondes

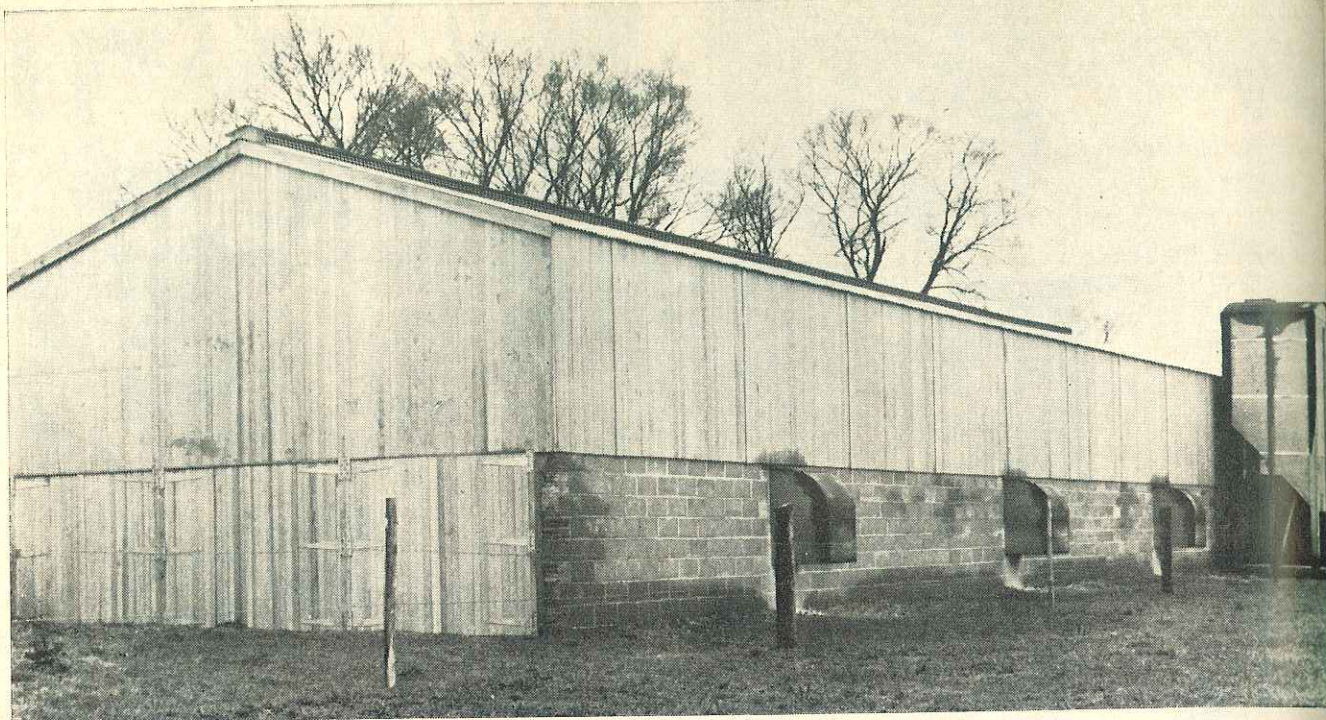
Pour réduire les frais de l'enlèvement des déjections, beaucoup d'éleveurs de poules en cages ont installé des mécaniques pour l'évacuation des fientes. Toutefois, un examen fait en Angleterre révèle que les batteries qui ne sont pas équipées de pareils dispositifs de nettoyage sont moins coûteuses à exploiter. Le système dans lequel les déjections sont évacuées dans des fosses profondes et qui n'est pas mécanisé, s'est avéré un moyen économique et efficace pour faire face au problème de l'enlèvement du fumier.

### Senkung der Entmistungskosten bei Batterien mit dem Tiefjauchegrubensystem

Zwecks Herabsetzung der Kotentfernungskosten, haben viele Geflügelhalter ihre Legehennen-Batterienanlagen mit mechanischen Entmistungsvorrichtungen ausgestattet. Aus einer in England durchgeführten Untersuchung ergibt sich jedoch, dass Batterienanlagen ohne solche Reinigungsvorrichtungen weniger kostspielig in der Ausnutzung sind. Das System, bei dem der Mist in Tiefgruben beseitigt wird und das nicht mechanisiert ist, erwies sich als ein wirtschaftliches und zweckdienliches Mittel, dem Entmistungsproblem die Stirn zu bieten.

### Riduzione dei costi di rimozione delle deiezioni in batterie a fossa profonda

Per diminuire i costi di raccolta della pollina, molti allevatori di ovaiole in gabbie hanno sistemato dei dispositivi automatici per l'asportazione delle feci. Comunque, da una indagine compiuta in Inghilterra risulta che le batterie senza tali dispositivi di pulizia sono meno costose da valorizzare. Il sistema in cui gli escrementi sono evacuati dentro a delle fosse profonde e che non è meccanizzato si risulta essere un mezzo economico ed efficace per far fronte al problema dell'allontanamento della pollina.



THE DEEP PIT laying house at Fifield, England. The pit is walled with concrete blocks to withstand the impact of a tractor cleaning out the manure. The extractor fans are mounted in the side walls of the pit and three sets of double doors at the end of the house provide access for the tractor.

million layers are now housed on the system.

Briefly, the system requires a double-deck laying house. The upper deck is filled with cages, stepped to allow manure to fall straight through to the ground floor. The joists supporting the cages are more than 6 feet (1.8 meters) above ground level so the accumulated manure can be cleared out periodically by a tractor and front-end bucket-loader.

It is considered desirable to have the pit wholly above ground for three reasons: 1. It prevents the manure becoming water-logged; 2. it provides easy access for the tractor; 3. excavating a deep pit in the ground under a single-deck house would necessitate such massive foundations that the cost would be more than for a two-story building.

**Fresh Atmosphere.** For the large-scale intensive egg producer, manure disposal is not only a problem of having too few acres

to spread it on, but also of location and residential objections.

Smell and flies are other difficulties to be considered, and daily manure spreading is not pleasant either for the operator or his neighbors. With the deep pit system, manure can be stored for up to four or five years before it has to be cleared out of the house.

Such long-term storage to avoid offending neighbors does not mean that all the smells and insects are confined inside the laying house. On the contrary, a feature of the deep pit system is the freshness of the atmosphere, especially upstairs where the hens are caged and the operator works.

This is partly because poultry manure does not give off strong odors when it is allowed to remain undisturbed. As anyone who has ever cleaned laying cages by the mechanical scraper method will know, it is only when settled manure is disturbed that it pollutes the atmosphere.

The freshness of the environ-

ment is also partly due to the system of ventilation devised for the deep pit house. The ventilation system is the complete reverse of the natural convection pattern of airflow.

Fresh air is drawn directly into the upper deck through the ridge of the roof, pulled down through the spaces in the floor under the cages, and extracted through the walls of the pit. Result: The faint odor of manure cannot waft up to the level of the cages because it is exhausted directly from the pit.

There are two ways of obtaining this downward airflow. One is to fit fans in the roof which pump air into the house, thus raising the pressure inside the building and forcing the stale air out through vents in the pit walls. The other is to have free inlets along the roof apex and extractor fans in the pit.

With little smell to attract them, flies are rarely any problem. And if they should ever become a nuisance, it is not difficult to control them in an enclosed space

by the modern method of vaporizing insecticide.

**Dries Manure.** An additional advantage of the reverse ventilation system is that the incoming air, which has to pass through the cages upstairs, is warmed by the animal heat output of the layers before it reaches the manure cellar below.

This has a valuable drying effect on the accumulation of droppings on the ground floor. Fresh poultry droppings have an average moisture content around 72%. But owners of deep pit houses in Britain are finding moisture levels as low as 30% in the manure heaps under the cages.

In practical terms, this represents a big reduction in the volume of manure which eventually has to be cleared out of the pit, and explains why experts calculate that a storage period of up to five years is possible. It has prompted an egg producer in Kent who has 30,000 layers kept on the deep pit system, to suggest that this is the ideal type of housing for anyone planning to go into the manure drying business. It would not cost much to extract a further 20% moisture for a saleable product.

**Costs.** A criticism of the deep pit system is that it increases housing costs when used with stepped cages, which require more floor space than the upright, three-tier design which is generally favored in Britain. But in fact, the difference in the floor space requirements of the stepped and upright designs is not as great as is generally believed. And the low-cost simplicity of the stepped cage construction more than offsets the extra housing costs, as figures by NAAS clearly show (see table 2).

Many producers have been able to reduce their combined house-plus-cages cost even further by employing a modified design of cage—a cross between the

Table 1. Costs of various cage cleaning systems

System	Costs per 1,000 layers per year			Total per hen per year
	Labor* Hours	Cost	Maintenance & running costs	
Belt	60	£18	£45	1s-3d
Plough	120	£36	£18	1s-1d
Paper	50	£15	£35	1s-0d
Deep pit	5	£12	nil	3d

\*Labor for mechanical cleaning systems costed at 6s (U.S. 84 cents) per hour for operator only; for deep pit system costed at £2.8s (U.S. \$6.77) per hour for operator plus tractor and front-end loader.

Table 2. Comparative costs of different cage systems

Cage type	House size in feet	No. of birds	Sq. feet per bird	Total cost per bird
Upright 3	18 X 105	2,628	0.72	26s.
Stepped 2	25 X 130	3,456	0.95	25s.
Stepped 3	21 X 100	2,736	0.77	21s.

stepped and upright forms of construction.

One such producer is Mr. Stephen Gordon of Fifield in Berkshire. His cages are upright but with a 9-inch wide (23 centimeter) space down the center of each stack. The upper and middle tiers have droppings trays; the lower tier does not.

This means the droppings from the lower cages can fall directly into the cellar below them. But the trays under the other tiers have to be cleaned manually, the manure being pushed off so it drops through the gap down the center of the stack.

This is neither an arduous nor a time-consuming chore. The trays only need scraping at intervals of 3-4 weeks, and Mr. Gordon cleans a few cages every day in preference to doing the whole houseful at one time. He uses a long-handled T-shaped rubber blade to push the manure off the trays, and it takes him only 40 minutes per 1,000 layers.

**House Construction.** The

deep pit house at Fifield measures 94 ft. long by 27 ft. wide (28.7 m. × 8.2 m.) and holds 5,000 hens in three stacks of cages. The cages are mounted on a skeleton floor; only the working areas around the stacks being boarded with 1/2-in. (1.27 cm.) thick Douglas pine plywood.

"The positioning of the floor joists is critical," Mr. Gordon says. "Their spacing must be tailored exactly to the size of the cages they are to support. In fact, the house virtually has to be built around the cages."

The house, which is 19 ft. 8 in. high (6 m.) at the roof ridge, is built on a concrete base. The walls of the manure pit are of 9-in. (23 cm.) thick hollow concrete blocks, which provide strength to withstand any accidental knocks by the tractor during the cleaning out operation. These walls support the skeleton floor 6 ft. 6 in. (3 m.) above ground level.

The upper walls of Parana pine and the asbestos roof are lined and insulated to allow precise



Photo by courtesy of Messieur D. Backuaert, Agriculteur, Marcelcave, Somme, France

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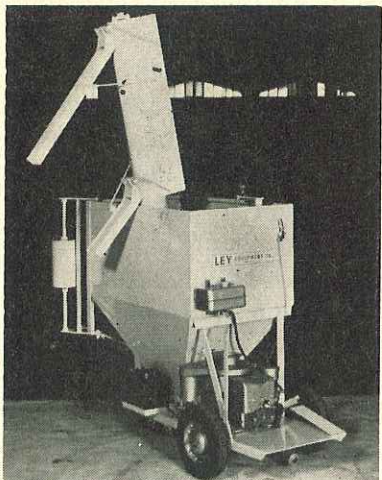
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environmental control on the upper deck. Access to the pit for a tractor is provided by three sets of double doors at one end of the house. The reverse ventilation system is powered by three 24-in (.61 cm.) exhaust fans mounted in protective hoods along each side wall.

Mr. Gordon confirms that the ventilation has a drying effect on the stored manure, and that the atmosphere around the cages is agreeable to work in.

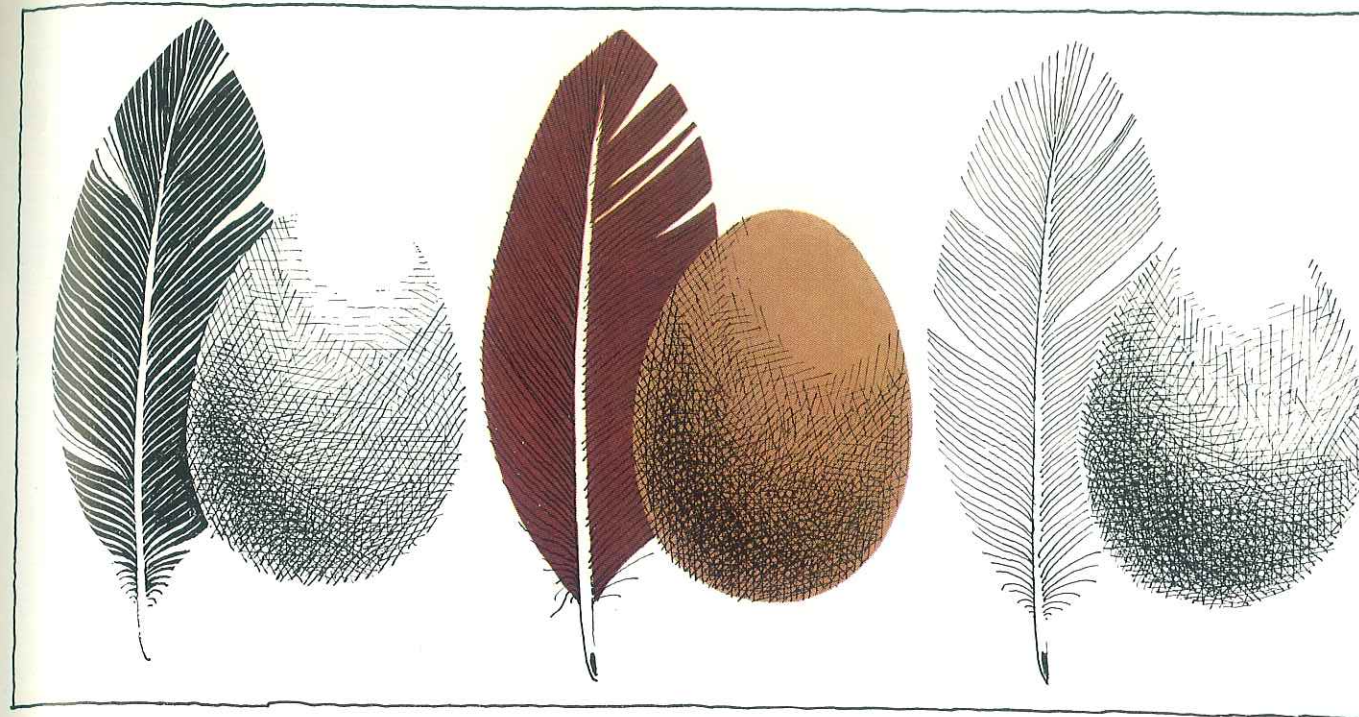
He also finds that the downflow of air provides uniform ventilation in every part of the upper deck, and helps to keep that part of the house clean by drawing any dust down into the cellar. Since heat rises, the warmest part of the house is just under the roof apex. So incoming air has the chill taken out of it in winter.

Saving labor in manure handling was one reason why Mr. Gordon chose the deep pit system. But what also appealed to him was its ultra-low capital cost of only 14s 6d (U.S. \$2.05) per bird, including house, cages, electrical equipment and wiring, plumbing, bulk feed storage, an auger and a powered feeding barrow. —

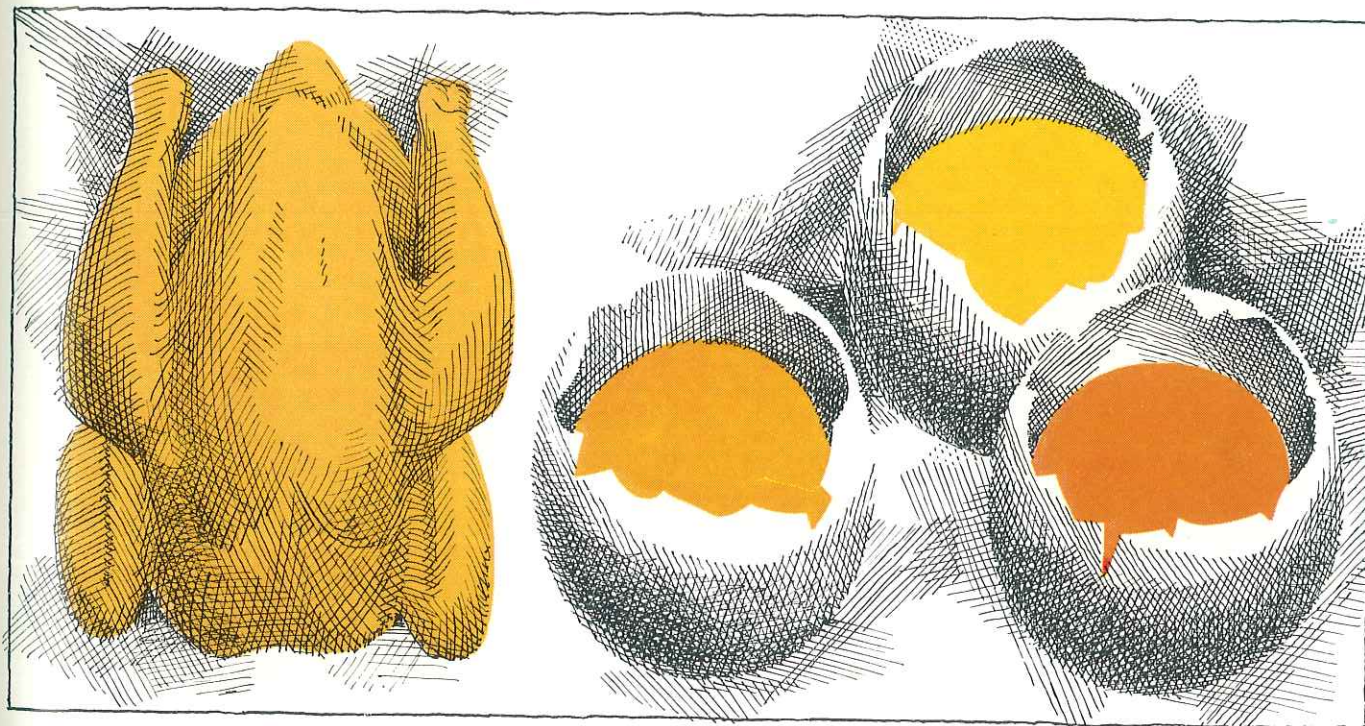
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