Studies in Broiler Production

II. Profit in a broiler enterprise as a function of age of slaughter

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THE efficiency of converting food to flesh in livestock is expressed by the food conversion ratio. The food conversion rate of chickens increases with advancing age and each successive unit increase in weight requires more food for its production as the bird gets older. This is due to the increasing amount of food required for maintenance as birds increase in weight. Since food accounts for approximately 60–65 per cent. of the total cost of broiler production, the return obtained will depend on the age at which birds are marketed. The object of this paper is to determine the optimum age of marketing that will maximise profits.

Broilers may be produced either on a continuous basis where successive batches of chicks are raised in the same buildings or as an occasional single flock raised for a specific market (Dyfri Jones, 1962). The optimum market ages differ in these two cases and will be considered separately.

The costs involved in producing broilers could be classified into fixed and variable costs (Moav and Moav, 1966). Fixed cost does not vary with broiler output and has no influence on the marketing age of the birds. But, it has a considerable effect on the total net revenue per broiler. Variable costs however, vary directly with the killing age o the bird.

The following items enter into the total cost of broiler production:—

(1) Chicks
(2) Brooding
(3) Medication
(4) Food
(5) Dressing and Packing
(6) Labour
(7) Depreciation of buildings and equipment.

The choice of the method of broiler production, *i.e.* occasional or continuous determines whether any of the above items enter into the fixed or variable costs. For example, the cost of chicks and brooding would be classified as fixed costs in the case of an occasional batch whereas these would be included under variable costs in a continuous operation. This is because, the number of chicks that can be raised to broiler age during a fixed period (say 1 year) would depend on the age of marketing. If broilers are marketed at later ages, fewer batches can be reared during the year and therefore the total cost of chicks purchased during the year would be smaller than when they are marketed early. Chick cost would therefore be a variable item in a continuous operation. In the case of an occasional single crop however, this would be classified as fixed cost.

Since profits are determined solely by variable costs, we shall consider only variation in these costs as influenced by marketing broilers at different ages. The calculations are based on weekly weights of a batch of mixed broilers reared at the Poultry Research Station, Kundasale to 14 weeks of age.

OCCASIONAL BATCH OF BROILERS

FOOD is by far the most important if not the only variable cost incurred in producing an occasional batch of broilers. Since food conversion ratio increases with increasing age, the amount of food required to produce an increase of 1 lb live weight will increase with increasing age. The margin of return over food cost will therefore decline with age, but as long as the return however small is higher than the food costs, it would be profitable to keep the broilers. The optimum age of marketing is the point at which weekly return equals the variable cost, *i.e.* when the cost of producing an additional pound in live weight equals the market price of 1 pound live chicken.

The weekly marginal food cost per pound increase in live weight is plotted against age in Fig. 1 for feeds of equal nutritive value at Rs. 600 and 700 per ton. Assuming the cost of 1 pound live weight at Rs. 1.50, the optimum age of killing is vertically below the point of intersection of the horizontal line drawn from this point on the cost scale and the respective cost curve. These are indicated by vertical lines in Fig. 1. Thus, when food costs are Rs. 600 per ton, the optimum age of marketing is a little over 12 weeks, while at Rs. 700 per ton, it is just under 11 weeks. Therefore, at a given price for broiler, the higher the price of food the sooner is the optimum killing age and vice versa.

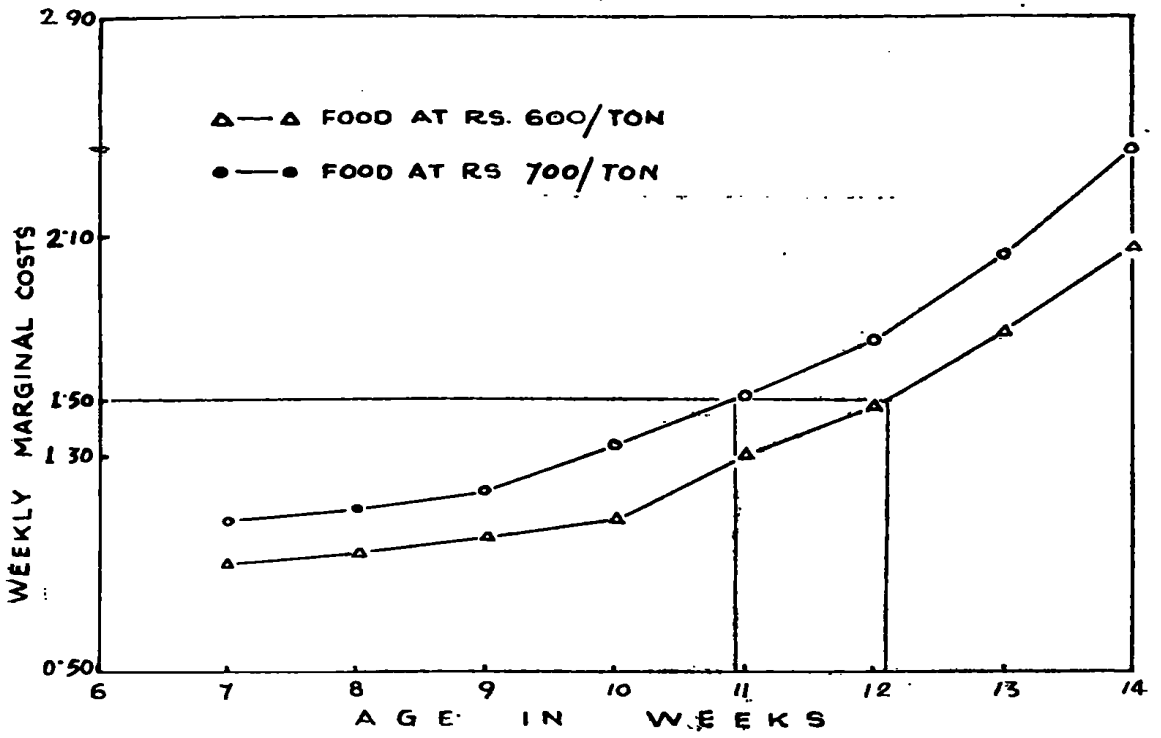

Fig. 1. Weekly marginal costs per lb. live weight gain for an occasional batch of broilers. The arrows indicate the age of marketing for maximum profit.

When food and broiler prices are constant, the optimum market age is determined solely by the weekly food conversion ratios, *i.e.* the amount of food required for a unit increase in weight every week. In order to get an estimate of the nature of dependence of the optimum age of marketing on growth rate and food conversion ratio to 10 weeks, the results of growth studies on male and female stock of broiler parents and their crosses used in another experiment (Buvanendran, 1968) were analysed. The body weights of these stocks at 10 weeks ranged from 2.74 to 3.38 pounds and food conversion ratio from 2.95 to 3.60. Net profits of each stock were calculated for each week from the 7th week, and by curvilinear graphic interpolations, the age of maximum profit was estimated for each flock. The regressions of the age of maximum cumulative profit for the whole crop on body weights and food conversion ratios at 10 weeks are shown in Figs. 2 and 3. There is a positive correlation (0.732) between market age and body weight at 10 weeks indicating that broiler stocks with faster growth rates should be marketed later to obtain maximum profits. The correlation of age at maximum profit with food conversion ratio (Fig. 3)

(is negative) —0.841) again indicating that stocks with low food conversion ratios (or high efficiency of conversion) should be marketed at a later age. This negative relationship is to be expected since birds with faster growth rate are considerably better food converters than slow growing birds.

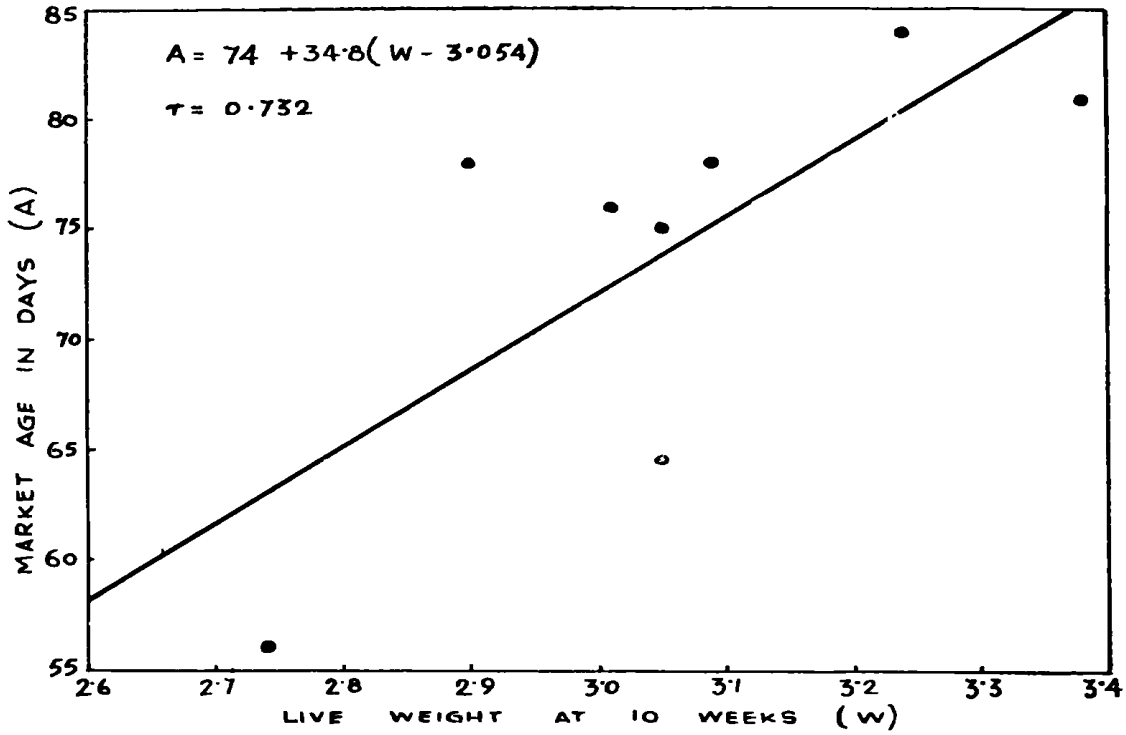

Fig. 2. The regression of " market age at maximum profit for the whole crop "on average body weight at 10 weeks for an occasional batch of broilers.

CONTINUOUS BROILER OPERATION

WHEN broilers are kept continuously on a fixed floor space, the influence of age of marketing on profits can be calculated either on the basis of—

(*a*) the same floor space per bird regardless of the age of marketing, *OR*

(*b*) on a sliding scale of floor space per bird, the amount of space allowed increasing with the increase in the age of marketing.

The number of birds reared and the corresponding costs and returns will be influenced by the space allowance. If calculations are based on the assumption that birds at 10 weeks of age require 1 sq. foot per bird, a 1,000 sq. ft. house will accomodate 1000 broilers per crop at all ages if the same floor space allowance is given regardless of the age of marketing. On the sliding scale however, more birds can be reared per crop if the birds are marketed earlier than 10 weeks and less if sold later.

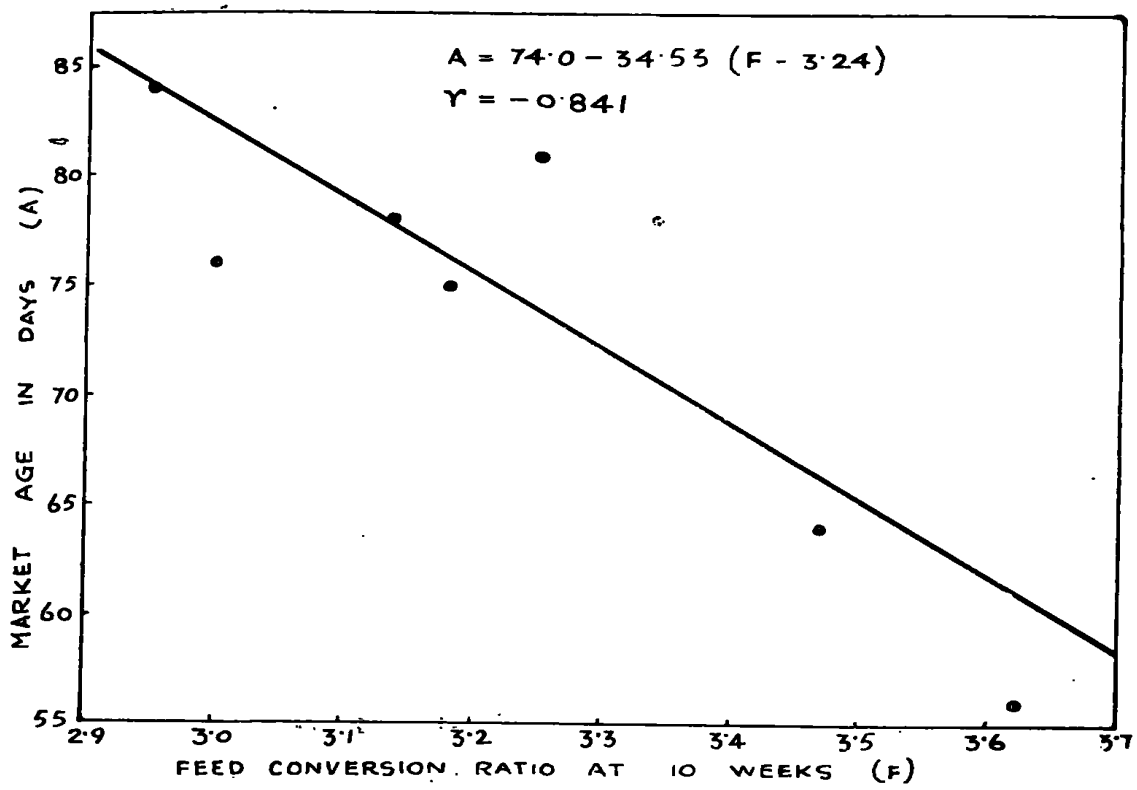

Fig. 3. The regression of " market age at maximum profit for the whole crop " on food conversion ratio at 10 weeks for an occasional batch of broilers.

SLIDING SCALE FLOOR SPACE PER BIRD

THE details of costs and returns from marketing birds at different ages from the 8th to 13th weeks were calculated following the procedure of Dyfri Jones (1962) and are shown in Table 1. It is clear from the table that when broilers are slaughtered at younger ages, more birds can be carried through in the year and the total output in live-weight is greater than when marketed later. But, this increase in live-weight output is more than compensated for after a certain age by the increase in variable expenditure due to costs of chicks, brooding, dressing and feed and the margin of return over variable costs increases from the 8th week to a maximum at 9 weeks and then declines. The optimum age of slaughter is therefore between the 9th and 10th week for this particular strain of broilers.

Table 1

Variable costs and returns when broilers are killed at different ages (Continuous production on 1,000 sq. ft.)

Killing Age (Weeks)	*8*	*9*	*10*	*11*	*12*	*13*
Floor space per bird (Sq. ft)	0·8	0·9	1·0	1·1	1·2	1·3
Number reared per batch	1,250	1,111	1,000	909	833	769
Number reared per annum	6,500	5,252	4,333	3,636	3,094	2,667
Live weight per bird (lbs.)	2·32	2·81	3·24	3·59	4·09	4·41
Total annual output (lbs.)	15,080	14,758	14,039	13,053	12,654	11,757
Cumulative food						
Consumption per bird (lbs.)	7·19	8·88	10·69	12·50	14·68	17·20
Total food consumed per annum (lbs.)	46,767	46,679	46,328	45,464	45,420	45,855
Variable costs per annum						
Day old chicks (Rs. 105/- per 100)	6,825	5,515	4,550	3,818	3,249	2,799
Brooding (Rs. 10/- per 100)	650	525	433	364	309	267
Dressing and packing (Rs. 25/- per 100)	1,625	1,313	1,083	909	773	666
Food at Rs. 600/- per ton	12,527	12,503	12,409	12,178	12,169	12,275
Total variable costs Rs.	21,627	19,856	18,475	17,269	16,500	16,007
Total return (broilers at Rs. 2.25 per pound dressed weight)	25,447	25,904	23,691	22,027	21,354	19,840
Return—Variable costs	3,820	6,048	5,216	4,758	4,854	3,833

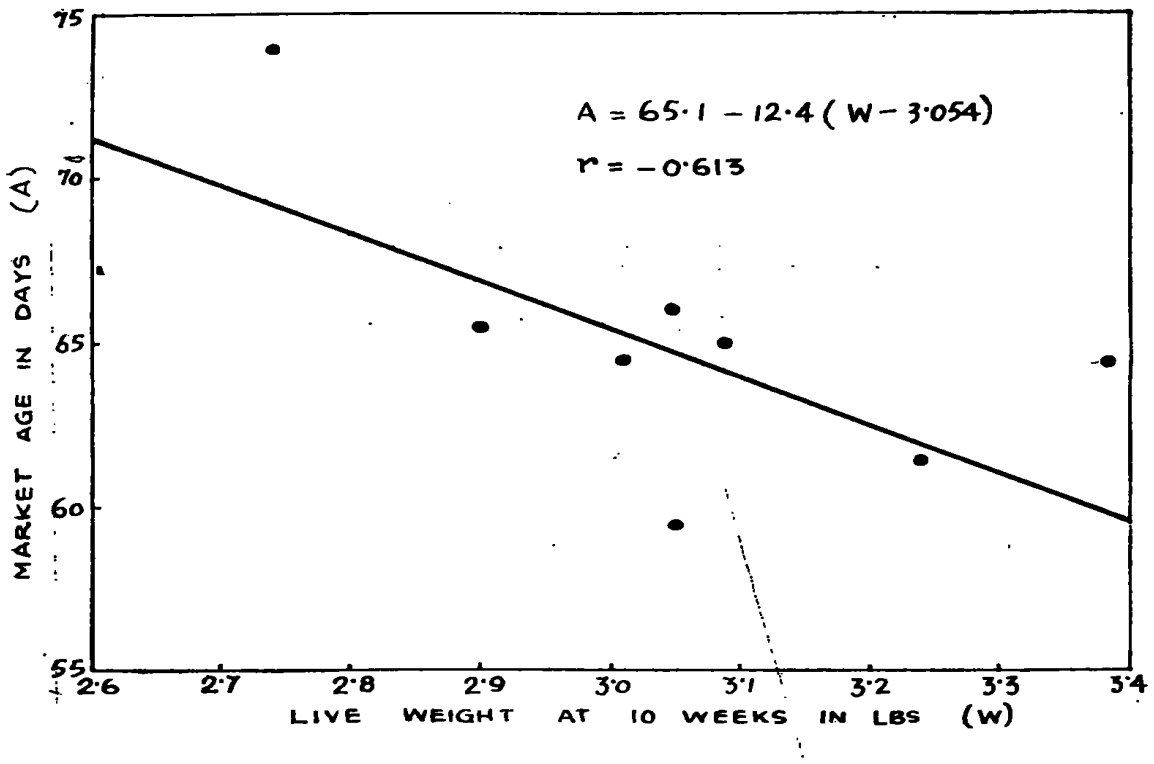

Fig. 4. The regression of " market age at maximum annual profit " on average body weight at 10 weeks for broilers produce continuously.

It was demonstrated earlier that for an occasional batch of broilers, the optimum age of marketing increases with weight at 10 weeks. The influence of weight of broilers on optimum age of marketing for a continuous operation was examined using the same set of data. The optimum ages were obtained by curvilinear graphic interpoliation for the different stocks and the results are shown in Fig. 4. The slope is negative indicating that for continuous production, the higher the growth rate of broilers, the earlier is the optimum killing age and vice versa. This situation is the reverse of what was observed for an occasional single batch of broilers. This is due to the fact that the marginal cost per pound live weight increase at any particular age is smaller for a fast growing broiler stock than a slow growing one.

CONTINUOUS PRODUCTION ON THE SAME FLOOR SPACE REGARDLESS OF AGE OF MARKETING

THE margin over variable costs from broilers slaughtered at different ages is shown graphically in Fig. 5. for continuous productions on the same floor space allowance regardless of age of slaughter of birds. The optimum age of slaughter in this case is later than that on a sliding scale of floor space allowance. The reason for this as pointed out earlier is because lesser number of birds can be carried through when slaughtered at younger ages compared to continuous production with varying floor space allowance. It should however be pointed

out that weight gains have been assumed to be the same under both systems of management. This may not be true under practical conditions, since overcrowding may occur at later ages (on a fixed floor space allowance) resulting in lowered weight gains. If this happens, earlier slaughter would give maximum profits.

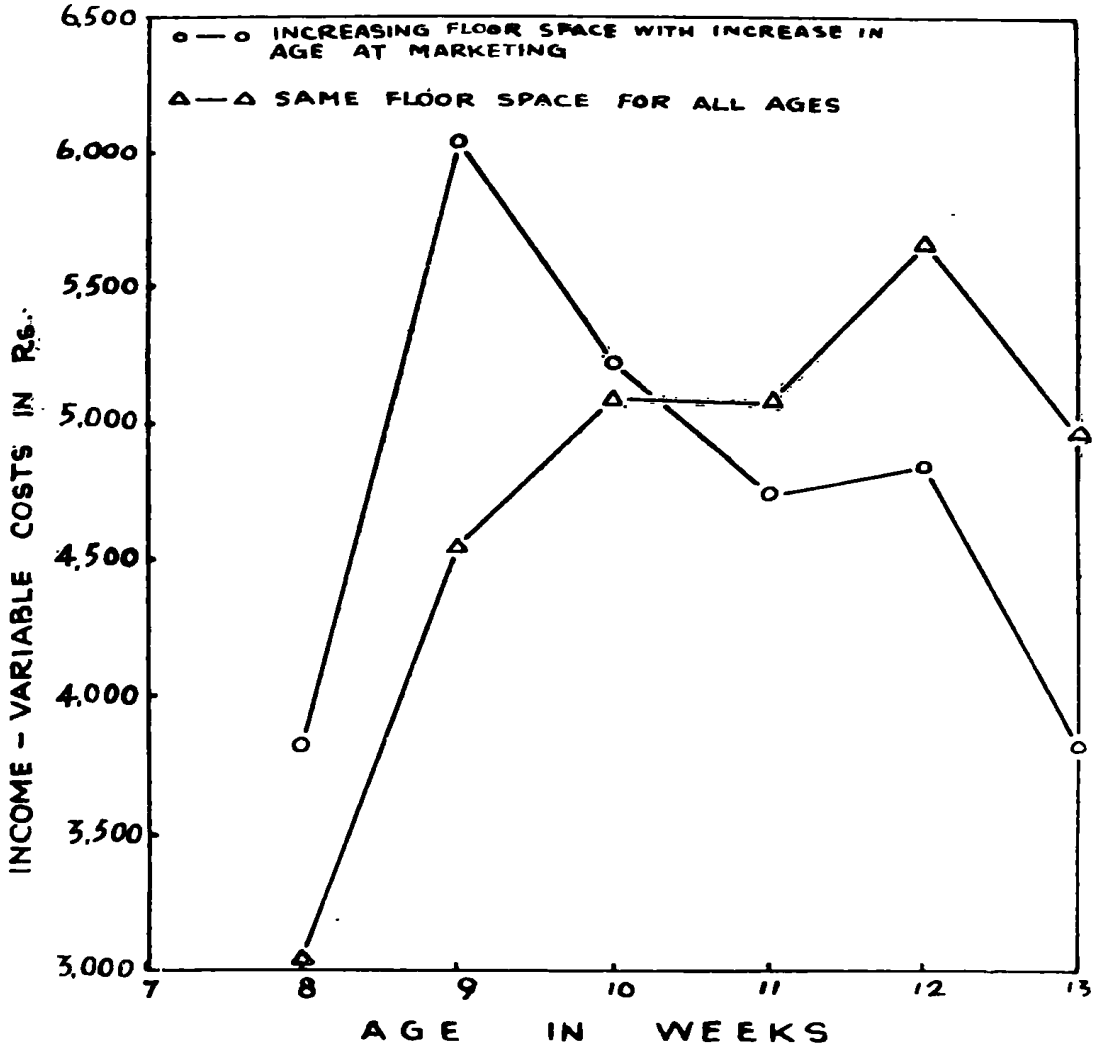

Fig. 5. Annual income over variable costs for broilers produced continously either on sliding scale or a fixed floor space allowance. Ages refer to time of slaughter.

DISCUSSION

THOUGH economic considerations should be the main criteria determining age of slaughter, consumer preference should also be taken into account. For example, lower income groups in this country would probably prefer a dressed broiler weighing under 2 lbs. If farmers are to cater to this group of consumer, it may be necessary to slaughter birds earlier or to sell the birds in cut portions.

The method of calculation shown above also provides a satisfactory means of evaluating the usefulness in terms of profit of feeds differing in cost and efficiency. For example, high efficiency rations would promote faster growth rates and early slaughter would maximise profits (in a continuous operation). More broiler crops can therefore be raised for an year resulting in increased total annual returns. Against this, one has to consider the rise in variable cost due to increase in the price of feed.

Finally, it should be emphasised that the conclusions reached above have been based on the prevailing prices of broiler food and meat and should not be treated as a generalisation for conditions prevailing in this country. Since the prices of these two items vary widely depending on availability, point of sale etc., broiler farmers using these methods should base their calculations on actual prices operating in their enterprise.

SUMMARY

THE object of this paper was to determine the dependence of broiler profits on the age of slaughter and growth rate of broilers. This information is essential to assess the economic merits of rearing broilers either as an occasional crop or on a continuous basis.

It was shown that in the case of an occasional crop, the optimum market age is later for a fast growing broiler stock than for a slow growing strain. The situation in a continuous broiler production system however is the reverse, where fast growing stocks give maximum economic returns when slaughtered at an earlier age than slow growing birds.

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