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An Extension Teaching Demonstration Using Broiler Chicks as a Model

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AN EXTENSION TEACHING DEMONSTRATION USING

BROILER CHICKS AS A MODEL

by

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Joseph B. Ishaya

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ABSTRACT

An Extension Teaching Demonstration Using
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by

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This test demonstration was intended to develop a modern management program to improve broiler production in Nigeria through extension teaching methodology. The management programs included animal health, nutrition, and general care.

Some of the factors that limit broiler production in Nigeria are associated with the management strategy presently adopted by Nigerian subsistence farmers.

This report considers the effect of different protein sources on broiler nutrition and the techniques necessary to get the farmers to practice the result of up-to-date research findings.

The extension teaching demonstration reported here is based on 60 day-old chicks. Chicks were randomly assigned to two pens, Pen A and Pen B at the Utah State University poultry farm. Pen A had 40 chicks and Pen B had 20 chicks. Chicks in Pen A received Diet #1 (corn-soybean meal). Chicks in Pen B received Diet #2 (corn-cottonseed meal).

Chicks were weighed weekly starting on July 2, 1983 which was the third week of the demonstration. The difference between the weekly weight gain was obvious. Birds fed corn-soybean diet were superior to those fed corn-cottonseed meal diet. The birds in Pen A were marketable at eight weeks whereas those in Pen B were not marketable at the same chronological age.

A field day was conducted at the poultry farm to report the results of the demonstration.

(33 pages)

CHAPTER I

INTRODUCTION

Many new and different social, economic, and environmental problems have come sharply into focus in recent years. This phenomenon is expected to continue in the future. The causes and the solutions of such problems appear to rest with continuing growth of human technology and information. Expansion of knowledge continues to change our environment and lives by creating new complex problems (Boyle, 1981). Today in Nigeria some farmers take correspondence courses from European universities that may not be relevant to their tropical situations. Morgan, Holmes and Bundy (1976) reported a nationwide survey conducted by the American Institute of Public Opinion on adults to learn their interest and participation in adult education programs. Twenty percent of the people interviewed by the institute had taken (or were taking work in adult education) or would take such courses.

Boyle (1981, p. 3) said "There is a crucial need for lifelong learning." Farmers are all longing for knowledge to improve their lives and defeat ignorance. Apps (1973) said that life is full of the unexpected and the insensitive and we must learn how to bend so we will not break. Continuous learning will give the farmers confidence to develop and maintain their abilities to solve their problems and also know their rights.

Research (Bailey, 1948; Communications Handbook, 1976; Brams, 1980; Obibuaka, 1981) shows that agricultural producers (farmers) can more readily accept new technology when they can see its benefits and even participate in the demonstration of new technology.

The responsibility of the Extension Service is to take research findings to consumers, farmers, and others so that they can generally improve the quality of their lives (Bailey, 1948; Boyle, 1981). Morgan et al. (1976) state that effective Agricultural Extension Service team work with local farmers through field demonstrations convince those who may otherwise doubt that things could be done, permit teaching of theory along with practice and present subject matter in the way that can be understood easily to screen out irrelevant practices and to utilize that which is beneficial for increase in food production.

A lack of protein is frequently a limiting factor in animal or chick diets. This is because grains and their by-products are deficient in both quantity and quality of protein for farm animals. And since protein sources are expensive feeds, most farmers in Nigeria do not feed protein feeds. If they do, it will not be in the right proportion. Dobson, Anderson and Warnick (1964) reported higher growth rate and more feed efficiency on chicks fed rations with balanced proportions of essential amino acids.

This study is an attempt to communicate modern management and improved broiler nutrition to Nigerian farmers through demonstration program.

Statement of the Problem

Broilers have become a significant source of animal protein in the diet of many people of the world. This is because chicken meat is one of the cheapest sources of protein in many parts of the world, especially in the United States. In the U.S., 20 grams of protein from chicken meat cost 21 cents in 1976. In comparison, 20 grams of protein from white bread cost 18 cents; from hamburger, 21 cents; turkey, 26 cents; ham, 43 cents; beef ribs, 59 cents, and from pork chops, 65 cents. Okarie (1978) reported the superiority of chicken meat to all domestic animals in respect of protein due to the very low fat content of the muscle. Fast growing chickens require less time to reach market weight. This reduces cost of keeping the flock. Broilers are the quickest source of income among all farm animals. Despite this impressive advantage, the broiler production in Nigeria is to a great extent still dependent on the traditional management and nutrition program. As a result, broiler producers in Nigeria do not produce enough chicken for the consumers with a consequence of low consumption of "noble protein." Therefore, there is a great need to increase and improve broiler production in my native Nigeria.

However, if modern management programs and improved animal nutrition are identified and communicated to the Nigerian producers in the way that can be understood easily, then they may be willing to adopt new practices. The net result may be an increase in the level of animal production. The practicality of such programs depends on the role of such liaison personnel as the extension agent and extension subject matter specialists in communicating research findings to the farmers. Modern broiler management programs and improved broiler diets or rations are effective production methods. For these modern methods to be feasible in Nigeria, the transition from the traditional methods to modern methods must be done gradually by the farmer at his will.

Moreover, in Nigeria, linkage systems between the Research Service, the Extension Service, the farmer, service institutions, and government policies are limited and often totally lacking. The Extension Service addresses people through the radio and TV in a country where farmers cannot afford to buy their essential goods. All of this slows down the technology transfer process. Transition is likely to be successful only if and when demonstrations are actually carried out in such a way as to yield results.

Objectives

1) To teach improved management and production program for broiler chickens to farmers through Extension demonstration method.
2) To demonstrate the effects of different protein sources on broiler growth rate.

CHAPTER II

LITERATURE REVIEW

Demonstration as a Method of Adult Education

The effect of different protein sources in broiler nutrition is quite obvious; but, the most important step which is quite often ignored is how to get the farmers to practice the modern management and improved broiler nutrition. Farmers acceptance of new information developed by researchers is frequently rejected or ignored because of a lack of confidence in developments they have not been associated with. Therefore, the methodology of disseminating new technology becomes very important.

People usually resist change when they perceive such change to threaten their security, or when the benefits from such change are not clear, or when such change does not involve the inputs of the people (Holmberg, 1978; Lippit, Watson & Bruce, 1958; Moczarski, 1979; Obibuaka, 1981; Spicer, 1952). According to Harris (1898, p. 35), "Education should excite in the most ready way the powers of the pupil to self-activity. Not what the teacher does for him, but what he is made to do for himself, is of value." Involving people in early planning processes of educational programming enhances their participation. They view the program as their own and usually are more receptive to the information taught.

Initial demonstrations must be focused on the improvement of traditional poultry husbandry which requires more work but small money and brings sure results. As the farmers confidence in the system grows, he is likely to try using more advance methods and more money inputs to improve productivity further. Hopper (1968) pointed out that demonstrations must produce quick results for the people to see, then they will willingly adopt.

Result demonstrations as a method of technology transfer brought about the formation of the Extension Service (Bailey, 1964). Result demonstrations increase in the adoption of new technology by farmers (Hinton, 1969; Vitzthurn & Florell, 1976).

The Extension agent should recommend that farmers adopt these better practices at first on only a small part of their land. This reduces the farmer's risks and hesitation and especially allows the results of the improved practices to be compared with traditional practices in the farmers own field (Kelsey & Hearnes, 1955).

Success in extension work is, to a great extent, dependent on motivation. All extension efforts are of no avail unless farmers are willing to accept and adopt new techniques of farming. The issuance of direction, however well conceived and phrased, does not mean that they will be followed. Individuals have zones of acceptance (Newman, 1963). Instructions falling outside the zone will be disregarded; those that fall within this zone or that bear relevance to their needs will be carried out. Appropriate use of motivation will enlarge this zone. Extension field workers are responsible for creating the teaching or demonstration environment that allows motivation to occur.

The goal of the extension work is to transfer technology to farmers so that they will be able to help themselves. Extension work involves human beings--creatures whose behavior is difficult to predict. Each individual has a very unique character; therefore, a strategy that may motivate one group toward acceptance may not work for another. Human beings are impervious to new ideas that they envision may not bring rewards to them. This is especially true with farmers in less developed nations. A crop failure for them frequently means starvation for the farm family. They are, therefore, unwilling to risk their business for new innovations that lack guarantees of success. Farmers are motivated to adopt new technology if the benefits outweigh its costs and risks (Gibson, 1978).

Trocke (1972) has pointed out that a manager should address himself to the problem of "how can I get people to do what they can do?" According to Seaman Knapp's philosophy on extension "What a man hears, he may doubt; what he sees, he may possibly doubt; but what he does he cannot possibly doubt" (Bailey, 1948, p. 155).

An Extension agent should possess both "technical" and "people" know-how. The latter includes, among other things, motivation and according to Davis (1972) motivation deals with satisfaction of a person's needs. Needs satisfaction requires a humanistic approach (Watson, 1978). Incentives, that is, external conditions placed in work environment by management are often likely to encourage individuals to accept new innovations. An individual lacking in motivation may be compared to a wheel-barrow--he goes no further than he is pushed.

Every Extension worker ought to keep in view the primary and secondary needs while dealing with human beings. Similarly, every extension worker charged with the responsibility of transferring technology to farmers should be aware of the needs of the farmers since they are likely to be motivated by those ideas that will reward them or are related to their needs. Maslow (1943) has proposed a hierarchy of needs, namely:

1) Basic physiological needs such as food, shelter, clothing.
2) Safety and security.
3) Belonging and social needs.
4) Esteem and status, that is, desire for recognition, prestige, and self respect.
5) Self actualization and need fulfillment.

Each individual has a limitless need for personal satisfaction. The implication of this hierarchy of needs supports the notion and extension philosophy that technology transfer is more apt to occur if (a) the potential program participants are involved in the full programming process (planning, implementation, evaluation, and reporting of teaching or demonstration actions); and (b) if the teaching efforts (demonstrations) are conducted with the learners (farmers) involvement in the full conduct of the demonstration on his farm land.

Protein and Protein Quality

The quality of protein has been intensely studied due to its marked effect on growth. The protein quality is no better than the most limiting essential amino acids. An experiment conducted over a period of 12-14 years by Magendie (1783-1855; as cited by Maynard, Loosli, Hintz, & Warner, 1979, p. 146) produced the first evidence that all proteins were not of equal value. He showed that meats are of better quality than gelatins.

Feeds which supply the proper proportion and amount of the various essential amino acids supply good quality protein. Thus, feeds which furnish an inadequate amount of any of the essential amino acids have poor quality protein. If any one amino acid is lacking in proper amount, it will limit the utilization of the other amino acids in the diet (Geiger, 1947; Yeo and Chamberlain, 1966). That is, one amino acid deficiency will cause the entire diet to be inadequate. For this reason, it is important that feeds low in one or more of the essential amino acids not be fed alone; otherwise, chicks will not make proper use of the protein supplied by the feed in performing the body functions which requires protein.

Protein supplements are usually slightly low in one or more of the essential amino acids. Consequently, other feeds should make up the deficiency. In most cases, proper selection of feeds accomplishes this. There may be occasions, however, where supplementation of certain diets with synthetic amino acids may be desired.

Nesheim, Austic and Card (1979) reported in their writings that all grain and their by-products are deficient in both quantity and quality of protein. It is necessary to supply protein to poultry rations from other sources. Soybean and cottonseed meal have been investigated by many researchers in the feeding of poultry.

Soybean meal is palatable, highly digestible, of high energy value, and results in excellent performance when used for different animal species (Church & Pond, 1982). Maynard et al. (1979); Nesheim et al. (1979); and Scott, Nesheim and Young (1976) pointed out that soybean meal is unique among major plant protein sources because it has a higher level of lysine which is the most limiting amino acid in plant protein; and that most plant proteins have multiple deficiencies, but all the amino acids are supplied by soybean meal in excess of the NRC pattern, but sulfur amino acids. Scott et al. (1976) and Baker (1974) documented improvement in feed intake, gain, and protein efficiency ratio in chicks fed high quality protein.

Church and Pond (1982) found that soybean meal has trypsin inhibitor material which inhibits digestibility of protein. This inhibitor and other factors can be inactivated by proper heat treatment during processing. Soybean also contains genistein, a plant estrogen which may account, in some cases, for part of its high growth inducing properties.

Contrary to soybean meal, cottonseed meal is deficient in lysine, methionine, and leucine (Scott et al., 1976; Phelps, 1966). Attempts to feed cottonseed meal as the sole protein supplement in chick diets usually results in poor growth, poor efficiency of utilization, and high mortality (Phelps, 1966). Kuiken (1951), Rojas and Scott (1969), and Nesheim et al. (1979) found that cottonseed meal contains gossypol which can depress rate of chick growth. Withers and Carruth (1918); Lyman, Holland and Hale (1944) found that when cottonseed meals are heated in the manner which raptures the pigment glands, the gossypol is rendered non-toxic. Anderson and Warnick (1964, 1966) determined the sequence in which the essential amino acids become limiting for growth of chicks based on five different cottonseed meals. They reported lysine to be the most limiting amino acid. Methionine, threonine, and leucine were also found to be limiting in the order named.

The major ingredients of poultry rations, at the present time in the USA, are corn, as the primary energy source, and soybean meal, as the major protein source. These ingredients are usually available in plentiful supply which allows rapid growth with very efficient feed conversion.

A number of satisfactory substitutes may be used where soybeans are not produced with improved knowledge of poultry nutrition. Improved knowledge of nutrition has allowed more complete utilization of many products that were unmarketable at one time (Church and Pond, 1982).

Based on extensive research, the amino acid requirements for chicks have been identified and quantified. Table 1 provides that information.

Table 1

Amino Acid Requirements of Chicks*

	Starting Broilers		Finishing Broilers
Amino Acids	% of Protein	% of Diet	% of Diet
Arginine	5.0	1.16	1.02
Histidine	2.0	0.47	0.41
Isoleucine	4.0	0.87	0.82
Leucine	7.0	1.63	1.43
Lysine	5.0	1.16	1.02
Methionine	2.0	0.47	0.41
Cystine	1.6	0.37	0.33
Phenylalanine	3.5	0.82	0.72
Tryosine	3.5	0.70	0.62
Threonine	3.5	0.82	0.72
Tryptophan	1.0	0.23	0.21
Valine	4.3	1.00	0.88
Applicable Protein Level		23.3	20.5

*These recommendations for amino acid requirements are from the National Research Council and from Scott et al. (1976).

CHAPTER III

MATERIAL AND METHODS

The demonstration site was at the Utah State University Poultry Farm, Logan, Utah.

The materials used in the demonstration were:

1. Heat lamp
2. Wood shavings
3. Disinfectants
4. Sixty day-old chicks
5. Waterer
6. Feeder
7. Cardboards
8. Iodine

Procedures

This project was conducted in close cooperation with Dr. Anderson who assisted me in developing the test diets and Dr. Dobson who instructed me on the management of the birds. Group A was fed diet with soybean meal as the major protein source and Group B was fed a diet with cottonseed meal as the major protein source. The performance of the two groups of broiler chickens fed the two diets was compared.

Sequence of Events

1. On June 7, 1983, two pens were designated for the project.

2. On June 10, 1983, poultry manure was shoveled from the pens. The pens were then swept, washed, disinfected, and allowed to dry.

3. On June 11, 1983, wood shavings were spread on the floor of the pens about an inch thick.

4. Dr. Anderson and I mixed the two diets and started feeding on June 17, 1983. The feeding and water troughs were filled and placed under heat lamps surrounded by cardboard. See Table 2 for composition of Diet #1 and Table 3 for Diet #2. Table 4 shows the chemical analysis of both diets in terms of percent of nitrogen, calcium, and phosphorus.

5. On June 17, 1983, Dr. Anderson and I sexed the chicks. The chicks were randomly assigned to two pens, Pen A and Pen B.

a. Pen A had 40 chicks.
b. Pen B had 20 chicks.
c. Chicks in Pen A were to receive Diet #1 (corn and soybean oil meal).
d. Chicks in Pen B were to receive Diet #2 (corn and cottonseed meal).

6. The heat lamps were placed and turned on. The chicks were kept under heat lamps surrounded by cardboards to keep them warm.

7. Chicks were fed every day and waterers were washed daily. This provided opportunity to observe the chicks every day.

8. The chicks were weighed weekly, starting on July 2, 1983.

9. The chicks were wing banded for identification purposes. Iodine was applied as they were tagged to avoid further infection.

10. Periodically, as the chicks grew, the feeders and waterers were raised to avoid waste of feed and to keep the water clean.

Data Collection

Chicks were weighed weekly, starting July 2, 1983, which was the third week of the experiment. On that day chicks were starved for eight hours to clear their gastro-intestinal tracts for the initial weight. Chicks were wing banded so individual weights were recorded (Table 4).

Table 2

Test Diet #1 Showing Ingredients and Cost

Ingredients	(gm)	Protein (gm)	Lysine (gm)	SAA[a] (gm)	Calcium (gm)	Phosphorus (gm)	ME Mcal	Cost $
Vitamin Mix[b]	150	12	--	--	--	--	.300	0.120
Trace Mineral Mix[c]	21	--	--	--	--	--	--	0.010
Sodium Chloride (salt)	114	--	--	--	--	--	--	0.004
Fat: Vegetable Oil	600	--	--	--	--	--	5.28	0.180
Limestone Flour	295	--	--	--	112.0	--	--	0.019
Dicalcium Phosphate[d]	150	--	--	--	34.5	27.70	--	0.053
Meat and Bone Meal	1500	688.	34.0	13.5	171.0	80.00	3.000	0.400
Soybean Meal	9000	4050.	271.0	130.0	18.0	54.00	21.600	2.520
Corn #2 Yellow	18140	1596.	39.9	63.5	1.8	45.35	61.060	2.800
DL-Methionine	30	17.	--	30.0	--	--	.090	.110
TOTAL	30000	6363.	372.9	237.93	337.0	207.00	91.330	6.200

[a]Methionine and cystine.

[b]The vitamin mixture provided the following per kilogram of diet: 10,000 IU vitamin A, 1200 ICU vitamin D_3, 2.5 mg menadione sodium bisulfite complex, 15 mg alpha-tocopheryl acetate, 3 mg riboflavin, 6 mg D-pantothenic acid, 2 mg thiamin hydrochloride, 25 mg niacin, 0.02 mg vitamin B_{12}, 300 mg choline chloride, and contained approximately 8% protein and 2 kcal/gm.

[c]The trace mineral mixture provided the following per kilogram of diet: 80 mg Mn, 1.1 mg I, 120 mg Zn, 3 mg Cu, 30 mg Fe, 2 mg Mo, 0.7 mg Cr, and 0.075 mg Se.

[d]Dicalcium phosphate is approximately 23% of Ca and 18.5% of P.

Table 3

Test Diet #2 Showing Ingredients and Cost

Ingredients	(gm)	Protein (gm)	Lysine (gm)	SAA[a] (gm)	Calcium (gm)	Phosphorus (gm)	ME Mcal	Cost $
Vitamin Mix[b]	150	12	--	--	--	--	.300	0.120
Trace Mineral Mix[c]	21	--	--	--	--	--	--	0.010
Sodium Chloride (salt)	129	--	--	--	--	--	--	0.004
Fat: Vegetable Oil	600	--	--	--	--	--	5.200	0.180
Meat and Bone Meal	3000	1377.	69.0	27.00	342.0	160.	6.000	0.810
Cottonseed Meal	8100	3191.	138.0	93.96	13.0	81.	18.400	1.970
Corn #2 Yellow	18000	1584.	39.6	179.20	1.8	45.	60.590	2.770
TOTAL	30000	6164.	246.6	200.16	356.8	286.	90.490	5.860

[a,b,c]See Table 2.

Feed samples from the two kinds of diets were sent to the laboratory for chemical analysis. The results are shown in Table 4. Diet #1 had a higher percent of nitrogen, calcium, and phosphorus which rules out the experimental assumption that the two diets were identical.

Table 4

Results of Chemical Analysis of Diets #1 and #2 for Nitrogen, Calcium, and Phosphorus

Diet Number	Percent Nitrogen	Percent Calcium	Percent Phosphorus
1	3.46	.73	.73
2	3.16	.64	.38

Field Day

On August 7, 1983, a field day was conducted at the USU Poultry Farm, Logan, Utah. The results of the demonstration were shown and explained to international students of extension education.

CHAPTER IV

RESULTS AND DISCUSSIONS

Results

At the end of the project (August 6, 1983), the birds in Group A had consumed 132.4 kg of Diet #1 (with soybean meal as the protein source) at a cost of $.74/bird while the birds in Group B consumed 44.5 kg of Diet #2 (with cottonseed meal as the protein source) at a cost of $.48/bird. Diet #1 cost $.21/kg and Diet #2 cost $.20/kg (see Table 5).

Tables 6 and 7 show the weekly body weight of both groups. The birds in Group A were almost double the size of birds in Group B at the end of the project. Group B were not marketable at the 8th week. Table 8 also shows the net return per bird for the Groups A and B. Group A was more profitable. The net return in Group A was $6.62 compared to $0.59 in Group B.

Finally, I believe the visual difference in size between the two groups would be enough to convince farmers in my native country, Nigeria, to practice improved broiler nutrition.

Discussion

There were 40 birds in Group A at the beginning of the project. Three out of 40 birds died during the brooding period because the cardboards surrounding the chicks were not properly fixed and the birds were able to get out. They were trapped and died. The lives of these birds would have been saved if more frequent visits to watch the birds

Table 5

1983 Feed Prices

Feed	Prices
Vitamin Mix	83.60¢/kg
Dicalcium Phosphate	35.20¢/kg
Corn	15.40¢/kg
Soybean Meal	28.05¢/kg
Cottonseed Meal	24.42¢/kg
Salt	3.30¢/kg
Trace Mineral Mix	44.00¢/kg
Limestone	3.30¢/kg
Vegetable Oil	30.80¢/kg
Methionine	385.00¢/kg
Meat & Bone Meal	26.95¢/kg

Table 6

Group A - Live Body Weight of Birds on Diet #1

Band No.	3rd Week wt. (gm) July 2	4th Week wt. (gm) July 7	5th Week wt. (gm) July 16	6th Week wt. (gm) July 23	7th Week wt. (gm) July 30
1	286	559	543	378	389
2	274	581	1079	1388	1927
3	287	562	984	1282	1797
4	295	607	1104	1311	1775
5	270	562	984	1221	1670
6	269	575	920	1261	1704
7	255	542	918	1159	1582
8	304	601	1100	1460	1993
9	265	522	955	1068	1376
10	265	513	881	1070	1450
11	237	423	775	1026	1377
12	260	540	928	1239	1642
13	273	536	875	1048	1415
14	218	445	824	1038	1448
15	288	563	884	1033	1629
16	316	654	1030	1394	1955
17	242	509	915	1302	1837
18	273	578	1072	1370	1869
19	237	475	846	1108	1494
20	280	622	1109	1400	1906
21	209	603	1056	1394	1925
22	300	634	1101	1438	1966
23	286	567	1005	1261	1762
24	201	425	788	987	1365
25	247	488	859	1127	1399
26	223	474	846	1069	1446
27	209	387	438	555	627
28	258	456	826	998	1398
29	201	443	847	1070	1629
30	258	534	964	1291	1760
31	253	506	860	1109	1412
32	184	426	843	1095	1556
33	225	460	792	1009	1427
34	171	379	735	958	1360
35	223	430	768	985	1382
36	242	512	946	1242	1752
37	220	453	802	1030	1368
Average Weight	251	533	923	1241	1765

Table 7

Group B - Live Body Weight of Birds on Diet #2

Band No.	3rd Week wt. (gm) July 2	4th Week wt. (gm) July 7	5th Week wt. (gm) July 16	6th Week wt. (gm) July 23	7th Week wt. (gm) July 30
38	169	297	533	788	1077
39	203	227	Died	Died	Died
40	142	232	386	554	718
41	164	308	497	698	924
42	175	311	488	692	908
43	147	249	440	568	783
44	157	241	366	489	612
45	168	354	610	591	1160
46	146	247	416	563	692
47	159	321	552	822	1090
48	155	280	425	598	739
49	147	254	452	617	788
50	162	360	642	867	1133
51	137	255	442	619	764
52	122	192	316	394	508
53	108	161	253	325	408
54	143	299	534	791	1116
55	147	265	416	614	770
56	127	238	406	542	712
57	118	192	332	518	752
Average Weight	149	270	447	628	872

Table 8

Net Return in Relation to Feed Cost

	Group A	Group B
Total Feed Consumed	132.4 kgs	44.5 kgs
Average Feed Consumed per Bird	3.58 kgs	2.34 kgs
Total Cost of Feed Consumed	$27.36	$8.69
Cost of Feed per kg	$.2066	$.1952
Total Final Weight of All Birds (August 6)	61.78 kgs	16.87 kgs
Total Value of Birds @ .25 1/2 Cents per Pound or .55 Cents per kg	$33.98	$9.28
Net Gain (total value of birds @ .55/kg live weight less total cost of feed)	$6.62 (37 birds)	$.59 (19 birds)
Net Return per Birds Started	$.178	$.031

had corrected the problem prior to their death. I was only able to watch them once or twice each day and I think this is not enough. Frequent watching during the brooding period is a good management practice. On August 1, 1983, two of the birds in Group A were not growing as well as the others. Both birds sat on their hocks and were reluctant to move. They were taken to the University Veterinary Laboratory for necropsy. The diagnostic laboratory reported no gross lesions in the soft tissues, but bones had extremely thin cortex and fractured and crushed easily. The bones of the torso were soft and pliable. The results revealed osteomalacia.

There were 20 birds in Group B at the beginning of the project. One of them died during the project. Cause of death was not determined.

The mortality rates were 12.5% and 5% in Groups A and B, respectively. The higher mortality in Group A was partially due to management problems and while the one in Group B was not known.

CHAPTER V

CONCLUSION AND RECOMMENDATION

Conclusion

The data shows that it is more economical and profitable when diet #1 (Table 8) was used. There is no doubt that soybean meal is a good protein supplement for broiler chickens. The largest bird in Group B which weighed 1160 gm was smaller than any one of the normal birds in Group A.

Recommendation

The demonstrator must always be in control of his teaching to command the respect of the people and to assure correct application of all pertinent elements.

The only problem I had with this project was the management aspect. If I were to start this project all over again, management would be my number one consideration.

The described benefits of diet #1 have universal application. However, the economic results may vary dramatically in Nigeria as compared to Utah conditions since availability and cost of soybean meal is different. I, therefore, recommend consideration of local conditions be given in terms of cost and availability of soybean meal and other protein sources before recommending a ration in my native Nigeria.

It is not enough to solve an agricultural problem, but more important is how to get the people to practice the result. The message of the Extension Service should be focused mainly on selected demonstrator farmers who will assist in spreading the improved practices to other farmers. It is wise to select these farmers in consultation with village leaders or elders.

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