Potentials of Poultry Insurance Scheme as a Risk Management Technique for Nigerian Farmers

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Abstract

This paper is an attempt to illustrate how the establishment and operation of a poultry insurance scheme in Nigeria can aid in minimising the incidence of income loss due to high mortality rates in poultry farming. Attention is drawn to the paucity of mortality data as a major bottleneck in instituting the scheme. The study utilises empirical data from the Nigerian experience to show the outlines and logistics of a suggested scheme (type of data, terms. contracts, premium and indemnity calculations).

Introduction

The Nigerian livestock industry consists primarily of five livestock types namely; cattle, sheep, goats, pigs and poultry. According to the FAO (1983) production figures for these groups were 235,000 metric tonnes (MT) of beef, 44,000 MT of mutton and lamb, 137,000 MT of goatmeat, 48,000 MT of pork, and 262,000 MT of poultrymeat. These figures indicate that poultry is one of the most important sources of meat in Nigeria.

In addition to the above, poultry production is widespread all over the country being unrestricted to any part either by disease, religion or aesthetics. In addition, its establishment cost is small compared to other livestock types and its gestation period is also relatively short, thus providing a quick source of income to its owners. Given this background, it is useful to consider poultry insurance as the first example in introducing livestock insurance to the Nigerian agricultural sector.

Poultry Insurance

In its most common meaning, poultry insurance is essentially life insurance applied to birds. Such insurance may cover death from any cause not due to wilful mistreatment or neglect by the owners, or it may cover all such causes of death with stipulated exceptions. The essence of poultry insurance lies in the elimination of the risk of loss for an individual bird through the combination of a large number of similarly exposed birds whose owners each contribute to a common fund by means of premium payment sufficient to make good the losses caused by the risk situation.

Comprehensive (all-risk) poultry insurance programmes have been in operation in countries like Japan, the United States, Canada and the Soviet Union since the turn of the country and is now available in most developed countries (Ray, 1981). However, poultry insurance and indeed, agricultural insurance has been slow to come to developing countries. It started in Jamaica in 1943, Chile 1970, Mexico 1961 and has not been all encompassing in any of these countries since then (Garel, 1980).

Agricultural insurance in general is currently on the top of the programme of agricultural development in Nigeria. As a matter of fact, the Nigerian government has set up a National Agricultural Insurance Scheme based in the Federal Ministry of Agriculture in collaboration with the National Insurance Corporation of Nigeria.

The scheme provides necessary covers to maize, rice, cattle and poultry farmers against natural disaster and other risks. However, the organizational structure and implementation logistics have not been properly worked out. A few studies have highlighted problems in these two areas. (Adegeye et al, 1978; Alli, (1980). Other studies in the area of organization and implementation of such a scheme in Nigeria include those by Adesimi and Alli (1980), Adesimi (1984) and Jafiya (1984). Most of these studies are general with no reference to any particular sector except those of Adesimi and Alli (1980) and Adesimi (1984) which dealt with the issues of arable crop insurance and tree crop insurance respectively.

In the area of livestock production, most researchers have avoided empirical illustration of livestock insurance largely because of the paucity of data with which to establish the actuarial base for its take-off. Jafiya (1984) argued for example, that for a meaningful programme, the statistics should be compiled from the results of a number of years taken consecutively in order to develop a pattern from which to project future possible and probable values in terms of liability and claim costs Even if insurance companies are prepared to take some risks and embark on livestock insurance, mortality data — the most important component of the actuarial base — is virtually not available.

It is in light of this mortality data problems that this paper attempts to shed some light on the issue of instituting a livestock (poultry) insurance scheme for Nigeria. This is borne out of the fact that Nigerian farmers are in even greater need of insurance protection for their livestock against premature death, disuse or disability through disease and accidents, than farmers in more advanced countries where there are social welfare safety nets that take care of basic needs even when yield is almost zero.

The basic advantage of a poultry insurance scheme to the Nigerian economy is that it will stabilise income from poultry production and is the long run raise the return from poultry investment through the resultant improvements in management. This basic advantage is afforded by the fact that (i) poultry insurance will guarantee an automatic protection to the farmer against loss of the percentage of his insured stock from accident disease and high mortality rate; (ii) raise his credit worthiness and thus induce banks to lend to poultry farmers, (iii) increase productivity of poultry birds through the improvement of management practices among farmers, (iv) induce risk-aversed farmers to invest in poultry, (v) relieve the government of the financial burden of providing relief grants to farmers who suffer losses from hazards. Such funds can be transferred to other areas of poultry improvement such as veterinary services, subsidised feeds, etc.

Specifically, the objectives of this paper are:

(a) to examine the prospects of poultry insurance scheme in Nigeria — problems, terms and forms of contracts,

(b) to illustrate the actuarial base of the scheme with empirical time-series data collected from actual farm experience in Nigeria.

(c) to make suggestions that would strengthen its viability.

Risks in Poultry Insurance

Poultry production, like any other livestock operation, is plagued by a host of risks and uncertainties. These include (a) natural risks caused by phenomena such as drought, excess moisture and heat; fire and other vagaries in weather condition (b) poultry diseases such as New Castle, poultry pox, coccidiosis and chronic respiratory diseases (c) pests such as fleas, lice, rats and ticks. All these result in high mortality rates in poultry production.

Apart from these, there are other risks such as social risks (burglary, theft, fire), economic risks (price fluctuations, loss or unexpected depreciation of investment); uncertain or unstable supply of feed as well as variations in the quality of feed. While most of these risks are prevalent everywhere in Nigeria, their seriousness depends on individual management skills as well as locational advantages.

Poultry Insurance Problems in Nigeria

Before discussing the issue of empirical demonstration of the modus operandi of a prospective poultry insurance scheme in Nigeria, it is pertinent to highlight some of the problems that need be tackled to facilitate its effective take off. These problems are discussed under 4 major subheadings namely, (a) problems of insufficient demand, (b) data inavailability (c) organisational problems and (d) moral hazards.

(a) Insufficient Demand. The first basic condition for a workable insurance scheme is the availability of an effective demand, i.e. felt need for insurance, backed by at least a partial ability to pay for it. Adequate effective demand for insurance is expected to be facilitated when there is a considerable number of medium/large scale poultry farmers who appreciate the economic gains from an insurance programme. In Nigeria however, even though there are a sizeable number of medium and large scale producers, the demand for a poultry insurance scheme may be low due to (i) low literacy level among producers resulting in general ignorance of the importance/usefulness of insurance, (ii) low income hence inability to meet insurance costs, (iii) the seemingly poor image of the existing insurance industry in Nigeria and (iv) absence of established culture of insuring farm enterprises.

(b) Data Availability: As noted earlier, lack of data regarding incidence of death, disease and accident among stocks is a major problem in Nigeria. Majority of poultry farmers have not developed a culture of keeping adequate and reliable records on the performance of their stock. Data cannot be collected from insurance companies because most do not have policies on livestock. Any large scale assumption of risks should be based on a fairly accurate estimate of their aggregate probability in other to determine in advance, the precise nature of the insurer's liability and the relative cost and benefit to the insured. It will therefore be difficult to develop any meaningful policy in the absence of such data.

(c) Organizational Problem: From the experience in different countries with respect to the workings of various poultry insurance schemes, it appears that insurance of birds has particularly developed in areas where initiative has been taken

by farmers themselves for their mutual protection either locally by small cooperative societies or on a broader basis by larger provincial or national insurance organizations formed or managed by farmers' unions. In Nigeria, no institution is currently operating a full agricultural or livestock insurance scheme except perhaps the National Cooperative Insurance Society of Nigeria (NCISN) which undertake agricultural insurance on a limited basis.

(d)   Moral hazards: Generally, some losses are incurred in poultry farming which are either due to the disposition of the farmer or deliberate neglect of basic sanitary recommendations. This sort of moral risk is neither covered nor compensated for by the insurance company. In most cases, this moral hazard is difficult to establish and would therefore result in disagreement between the insurer and the insured.

Terms and Conditions of Contract

(i)   Rating Methods

Premium rates for poultry insurance are computed from the probability of loss from death due to disease or accident among specific classes of birds. When or where the scheme has been in operation over a period of time, the probability is calculated on the basis of actual loss experience recorded by many insurance offices over a series of years. In the case of Nigeria where there are virtually no such schemes, it can be determined direct from the mortality data. Whatever the method used, the nature of risk also affects the premiums payable. Due to the epidemic nature of infectious diseases, birds to be insured against such diseases should normally pay more; so also are birds of certain ages since mortality rate increases with age.

(ii)   Basis for Valuation and Indemnity.

In determining the amount of cover, either the market value or the appraised value of the birds could be used. In the U.K. for example, the more general practice is the use of the market value. The difference between the two methods lies in the calculation of indemnities payable upon loss. In the former case, the amount of indemnities payable is based on the market value of birds at loss regardless of, but not exceeding, the insured value. However, under the latter method, the indemnity payable is based on the appraised value of the birds in the insurance office and not the actual value immediately before loss. Such an appraisal value is influenced heavily by the assumed theoretical rate of depreciation. In continental Europe where poultry insurance is common, the total indemnity ranges from as low as 60 per cent in France to as high as 90 percent in Germany.

Poultry insurance policies covering death losses are generally issued for a 12-month period and are subject to renewal. Some Schandinavian countries encourage longer term contracts of up to four years. A long term contract is more economical to both the insurers and the insured in saving costs in time and administration of renewal as well as from the effects of flunctuations in interest rates

and other factors. Other items of information needed in an insurance proposal include breed of stock, sex, age, management programme and class of risk.

Empirical Illustration

Poultry birds generally have been allotted materially shorter spans of life than the biblical three-score-and ten but, the natural laws of survival and death for these birds, except when caused by man, appear to weave a pattern quite similar to that presented by mortality tables for humans. Usually, a progressively rising mortality curve with advancing age appears to be characteristic of any known mortality tables either for man or animals implying that, ceteris, paribus, mortality and age tend to increase or decrease together. Valgren (1945) showed that there is a positive correlation between mortality and advancing age among poultry birds by using mortality data supplied by a Farmer's Mutual Insurance Association in the United States.

The data

The data used for the empirical application to Nigeria were collected from a batch on poultry laying birds in southern Nigeria. Data collected include information on mortality rate, number of birds, age, management practice etc. The data covered the mortality history of a batch of layers from day-old to 35 months old.

Analysis and Interpretation

As table 1 indicates, the farm started operations in the year with 306 layers. The table indicates the age, death rate per 1000 birds, monthly cumulative death and so on for the first 35 months. The highest loss was recorded at the age of 12 months The death rate columns show increasing trend with advancing age. The 3-group moving average was carried out to smoothen out the irregularity in the rise of death resulting from the relative smallness of the numbers of death Losses involved.

Table 2 shows the birds' monthly probability of dying for the entire period of 35 months. Even though there are occasional fluctuations in the figures from the first month till the 35th month when it is expected that all the birds would have been wiped out, the table revealed an underlying trend indicating increasing probability of dying (column 6) and decreasing average future life time (e^x, colum 8) with advancing age.

TABLE 1: MORTALITY TABLE FOR LAYERS (BLACK OLYMPIC) BASED ON 306 BIRDS FROM A POULTRY FARM IN NIGERIA, 1982.

Age (Month) (1)	Number Living (2)	No of Deaths (3)	Cumulative Death (4)	Cumulative Death rate/1000 (5)	3-Group Moving Average (6)
0	306	6	6	19.61	—
1	300	1	7	22.87	27.23
2	299	5	12	39.21	43.57
3	294	0	12	39.21	49.02
4	294	9	21	68.63	65.36
5	285	6	27	88.23	82.79
6	279	1	28	91.50	92.59
7	278	2	30	98.04	107.84
8	276	11	41	133.98	128.54
9	265	6	47	153.59	155.77
10	259	8	55	179.74	185.18
11	251	13	68	222.22	271.24
12	238	58	126	411.76	371.46
13	180	21	147	480.39	473.85
14	159	15	162	529.41	537.04
15	144	22	184	601.31	537.04
16	122	15	199	650.33	638.35
17	107	4	203	663.40	668.85
18	103	9	212	692.81	683.01
19	94	5	217	709.15	706.97
20	89	3	220	718.95	720.04
21	86	4	224	732.03	730.94
22	82	3	227	741.83	740.74
23	79	2	229	748.37	750.55
24	77	4	233	761.44	767.98
25	73	10	243	794.12	796.30
26	63	12	255	833.33	827.89
27	51	7	262	856.21	849.67
28	44	1	263	859.48	860.57
29	43	2	265	866.01	872.55
30	41	8	273	892.16	885.60
31	33	2	275	898.69	907.39
32	31	10	285	931.37	932.44
33	21	11	296	967.32	961.87
34	10	6	302	986.93	984.75
35	4	4	306	1000.00	—

Source: Computed from Data generated on a Poultry Farm in Nigeria.

Premium Calculations

Premium rates for poultry insurance can easily be determined on the basis of mortality data at given ages like the one shown on table 2. The rise in death rate with advancing age suggests a varying premium rate based on the age birds are offered for insurance. This implies that premium payments would be directly proportional to the age of the birds.

Premium calculations can be determined from the Net Premium Calculation which is defined as the amount required from each insured to provide all benefits

promised under the contract excluding expenses. The Net Single Premium (N) is · calculated using equation (1).

(1) .... $N = PIU$

TABLE 2: MONTHLY PROBABILITY OF DYING AND AVERAGE FUTURE LIFETIME

Age Months	Start Survivors (Mx)	Survivors (Sx)	Deaths (Dx)	Probability of dying (QX)	Mx + Sx LX	Tx*	Average Future Lifetime ex
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
0	306	300	6	0.20	303.0	5205	17.01
1	300	299	1	0.003	299.5	4902	16.34
2	299	294	5	0.017	296.5	4602.5	15.39
3	294	294	0	0.000	294.0	4306	14.65
4	294	285	9	0.031	289.5	4012	13.65
5	285	279	6	0.021	282.0	3722.5	13.06
6	279	278	1	0.004	278.5	3440.5	12.33
7	278	276	2	0.007	277.0	3162	11.37
8	276	265	11	0.040	270.5	2885	10.45
9	265	259*	6	0.023	262.0	2614.5	9.87
10	259	251	8	0.031	255.0	2352.5	9.08
11	251	238	13	0.052	244.5	2097.5	8.36
12	238	180	58	0.244	209.0	1853	7.79
13	180	159	21	0.117	169.5	1644	9.13
14	159	144	15	0.094	151.5	1474.5	9.27
15	144	122	22	0.153	133.0	1323	9.19
16	122	107	15	0.123	114.5	1190	9.75
17	107	103	4	0.037	105.0	1075.5	10.05
18	103	94	9	0.087	98.5	970.5	9.42
19	94	89	5	0.053	91.5	872	9.28
20	89	86	3	0.034	87.5	780.5	8.77
21	86	82	4	0.047	84.0	693	8.06
22	82	79	3	0.37	80.5	609	7.43
23	79	77	2	0.25	78.0	528.5	6.69
24	77	73	4	0.052	75.0	450.5	5.85
25	73	63	10	0.137	68.0	375.5	5.14
26	63	51	12	0.191	57.0	307.5	4.88
27	51	44	7	0.137	47.5	250.5	4.91
28	44	43	1	0.023	43.5	203	4.61
29	43	41	2	0.047	42.0	159.5	3.71
30	41	33	8	0.195	37.0	117.5	2.87
31	33	31	2	0.061	32.0	80.5	2.44
32	31	21	10	0.323	26.0	48.5	1.56
33	21	10	11	0.524	15.5	22.5	1.07
34	10	4	6	0.600	7.0	7.0	0.70
35	4	0	4	1.000	—	—	—

*(a) $Lx_n = Tx_n$; (b) $Tx_i = Tx_{i+i} + Lx_i$ (i = 1 .....n)

or example; the value for row 33 col 7 $(Tx_{33}) = Tx_{34} + Lx_{33} = 7 + 15.5 = 22.5$

where

P = the probability of dying

I = the total amount of insurance policy and

U = the discount factor at an assumed rate of interest.

For deaths that occur anytime during the month, the face value of the policy is paid at the end of that month, the discount factor is therefore included so that premium collected at the end of the month can be discounted to the time of loss. The discount factor, based on prevailing interest rates and the period of policy, is read off from a standard present value table. For example, with reference to table 1, suppose the farmer wants to insure his stock. Taking into consideration that the particular farmer's production cost is ₦10, the farmer and the insurance company might decide to enter a policy of ₦2,000 (i.e. at 65 percent of full-risk).

The Net Single Premium for a ₦2,000, 4-month term policy instance is calculated as follows (assuming he starts when the birds are beginning their sixth month and a compound interest rate of 3 percent) using equation (1):

6th Month:	0.004	x	2000	x	0.9709	=	₦7.77
7th Month:	0.007	x	2000	x	0.9426	=	₦13.20
8th Month:	0.040	x	2000	x	0.9151	=	₦73.21
9th Month:	0.023	x	2000	x	0.8885	=	₦40.87
							₦135.05

This amount represents in effect, the amount of money the insurer would have to collect at age 6 months to provide mortality benefits promised under the contract.

Indemnity Calculations

Assessed value basis indemnity calculations is considered appropriate in this paper because there are no records of previous insurance experiences, the animals are new and have to be assessed in advance of acceptance for insurance policies. Indemnity (D) will be calculated using equation (2).

(2) ....D = Original value x Discount factor

x No of deaths

Continuing with the preceeding example, if the original value of each layer at the time of entering the contract is fixed at ₦10, the indemnity payable at the end of the 8th month i.e. 3 months after the contract will equal ₦100.66 = (₦10)(0.9151)(11) while ₦108.87 will be payable to the insured in month 11. However, if under this ₦2000 — 4 months term policy, the entire flock is wiped out, the indemnity payable will not exceed the amount of the policy (i.e. ₦2000.00).

Conclusions

Although there are technical and logistical problems in organizing and operating a livestock insurance policy in Nigeria, experiences with such policies in most of the developed countries would indicate that such difficulties would not necessarily

prevent a beginning albeit experimental.

In starting such policies, Nigeria would be able to draw on these accumulated experiences and hence, choose among systems consistent with her own special circumstances. Because it is a relatively new concept, the government needs getting involved especially with respect to educating and if necessary mandating insurance companies to take a second look at this sector. The farmers also need education with respect to the importance of record keeping which though need not be sophisticated but must meet the needs highlighted by the empirical illustration carried out in the last part of this paper.

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