COMPUTATION OF LIVESTOCK POPULATION

{CASE STUDY: AGRICULTURAL DEVELOPMENT PROJECTS, NIGERIA}

BY

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CERTIFICATION

This project entitled "On Computational Livestock Population Dynamics for Agricultural Development Projects in Nigeria" by ANJORIN, TOBA SAMUEL meets the regulations governing the degree - Post-graduate Diploma in Computer Science, Department of Maths/Computer Science, Federal University of Technology, Minna and is approved for its contribution to scientific knowledge and literary presentations.

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DEDICATION

To the memory of my father, Elder Moses Anjorin, my beloved mother, Deaconess H. I. Anjorin, my wife - Funmi and my daughter - Oyinda, for all their love and support.

Above all, I dedicate it to God Almighty who has opportuned me to have undergone this course of studies.

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ABSTRACT

This study proposed a computerisable Livestock Population Dynamics for the enhancement of managerial and extension services of Livestock production under the Agricultural Development Projects (ADPs) in Nigeria. It specifically examined Pigs and Rabbits' population forecasting, the inefficiency emanated in the manual recording and processing of data related to the animals' population in question.

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CHAPTER ONE

INTRODUCTION TO LIVESTOCK POPULATION

1.1 PREAMBLE

The term Livestock generally refers to all animals kept on a farm for man's use or for pleasure. This includes beef and dairy cattle, pigs, rabbits, sheep, goats and horses etc.

An efficient and prosperous animal agriculture historically has been the mark of a strong, well-developed nation. Such an agriculture permits a nation to store large quantities of grains and other foodstuffs in concentrated form to be utilized to raise animals for human consumption especially during emergencies. Furthermore, meat has long being known for its high nutritive value, producing stronger, healthier people (Encyclopedia Britannica, 1982).

The need for an increased Livestock production in Nigeria like that of the food crops can therefore not be over-emphasised. Thus farm animals should be given more attention as there is prevailing low intake of animal protein by the indigenous people.

Livestock production could be influenced by some of the following factors:

i. The climate, whose main elements are rainfall and temperature: These often influence the distribution and performance of farm animals especially that of pig and cattle production. For instance, temperature alone could directly or indirectly affects the feeding habits,

reproduction and growth of farm animals.

ii. Availability of water and feed.

iii. Proper knowledge about animal production and management.

iv. Economic/marketing condition, governmental policies and programmes, and

v. The prevailing tradition and belief in a locality (Baflour, 1988)

The fact that ADP is a public sector agency that is intimate with the farmers is no more a secret. The potentiality of her Livestock sub-unit in boosting Livestock production nationwide has not been effectively tapped. There is possibility of enhancing the efficiency of the Livestock and Extension units of ADP through the introduction and implementation of the proposed computational Livestock population dynamics.

.2 LIVESTOCK POPULATION

The term Livestock population could mean the total number of each type of farm animal that is being reared by a farmer at a particular point in time. More explicitly speaking, it is the number of farm animals like Pigs, Rabbits, Cattle, Goat etc reared or managed at a point in time. This is determined by "head count" of the animal.

During counting, the Livestock could be classified by their type, breed, age, number of males and females and service age. Other facts that could be noted are the time serviced after parturition, litter size, number of weaners per

a result of a fulfilment of a verse in the Biblical account of creation which stated that "God blessed them - man and animal" and said to them "Be fruitful and increase in number, fill the earth and subdue it" (Holy Bible - RSV, 1971). It is my candid belief that out of quest for a computational LPD that an ancient philosopher and a ruler, Leonardo of Pisa (Fibonacci) asked the question in his manuscripts in 1228 that "How many pairs of Rabbits will be produced in a year beginning with a single pair if in every month each pair bears a new pair which becomes productive from the second month on" A plausible answer was later offered to this problem by the use of recursive algorithm termed Finonacci Rabbit problem to get Fibonacci sequence.

The importance of having a predictable population dynamics of the animals raised by the husbandsman or by the livestock manager over a period of time should not be underrated. It could serve as basis for project analysis and as a reference point to enhance sound decision making regarding livestock production. Also, it can serve as an efficient tool for extension service purposes. This project work thus carried out a detailed study of computational Pigs and Rabbit population dynamics.

1.3.1 PIG PRODUCTION

Pigs which belong to the Kingdom Animalia, order Artiodactyla, Family Sudae and Genus Sus are believed to have been domesticated in E. Asia as early as 2900 B.C. Pigs have

a fast growth rate, if they are well-fed with nourishing feeds under good health conditions. The two main species Sus scroffa and Sus vittatus could reach sexual maturity within 6 - 7 months, but young females (gilt) should be bred at about 9 - 10 months old (Youdeowei et al, 1992). A boar can mate 15 to 45 sows per year. The world average litter consists of seven pigs each in a birth weight of 1.135 kg (Encyclopedia Britannica, 1982).

This prolific animal can produce two litters in one year or five litters in two years. The dam can be separated from her litter i.e. weaned between 6 and 8 weeks after farrowing - Table 1.2 and 2.1.

Though Pigs are kept primarily for production of pork in the tropics, there is rapid rate of return on capital invested on the pig production business. Pig is a good experimental animal for medicinal and nutritional research. Its by-products include pigskin, bristle and manure.

Factors to be considered in selecting Pigs for breeding include litter size (number of young ones at birth), litter size and weight at weaning, efficiency of feed utilization and good carcass quality. Pigs have a simple digestive system like man thus they can consume feedstuffs such as cereal grains like maize; legumes, rice bran, soya cake, groundnut cake, tubers or cassava peelings supplemented with green materials and household kitchen remains.

(a) BREED OF PIGS:

Pigs are sensitive to climatic conditions and so different breeds are found in different areas. In most of the towns in the central states of Nigeria, common popular exotic breeds reared include the large white which is British breed, and Duroc which is that of American breed. Others that are less popular are Hampshire and Large black.

LARGE WHITE BREED

This is a breed often referred to as "the mother breed" because it is one of the most prolific species of Pig known. The body is large, long and heavily built with long and erect ears. The skin is white. Litter size is between 12 and 15 and the female produces large quantities of milk. It is an efficient feed converter with a good growth rate and has a good temperament.

DUROC

This leading breed in America adapts well to the Southern and middle belt zones of Nigeria. However, it is very sensitive to heat. The skin colour is golden to mahogany red with shades varying from light to dark but no black allowed. The large body is noted for good quality of flesh but the female Duroc though prolific have fairly poor mothering ability.

LOCAL BREEDS

This is otherwise known as West African dwarf and it is common in all parts of Nigeria. They are relatively small-bodied animals, poor producers and slow maturing. On

commercial farms, they are often cross-bred with an improved breed especially large black which is a solid black coloured pig with a long body used for production of pork.

(b) SYSTEMS OF KEEPING PIGS

[i] Traditional management of Pigs: Under this system, Pigs kept are few, they are allowed to roam about and scavenge to feed in the neighbourhood.

[ii] The Extensive system: Pigs are kept outdoors on pasture that are fenced.

[iii]The Semi-intensive system: Here the Pigs especially the breeding ones are kept partly outdoors on pastures while the growing fattening pigs and the farrowing sow are raised intensively in doors.

(iv) The intensive system: In this system, all Pigs are raised indoors through out their life span usually on concrete, slatted or mud-floor pens which can be cleaned daily. For an optimal returns on capital invested on Pig production, the fourth or the third system above are preferably recommended.

In the table below are some useful Livestock data for your perusal.

Table 1.2

USEFUL LIVESTOCK DATA

	SWINE	RABBITS	OATS/SHEEP	CATTLE
SERVICE AGE (male or female)	9-10 months	6-8 months	12-18 months	18-24 months
GESTATION PERIOD	114-116 days	30-32 days	148-153 days	80 283 days
1ST HEAT AFTER PARTURITION	1-3 weeks	Induceable as from 2-3 days	4-7 months	6-9 weeks
HEAT DURATION	3-4 days	12-18 hours	1-2 days	10-21 weeks
HEAT REPEAT (Oestrous cycle)	2-4 weeks (Average of 21 days	Not definite Induceable	3 weeks	19-21 days
ADVISED FIRST SERVICE AFTER PARTURITION	8-9 weeks	As from 1 week	4-7 months	12 weeks
AGE WEANED	7-8 weeks	6-8 weeks	4-6 months	6-9 months
AGE CASTRATED	5-6 weeks	1-3 weeks	1-4 weeks	6 weeks to 6 months

1.3.2 RABBITS PRODUCTION

Rabbit belongs to the family Leporidae while the domestic ones Oryctolagus cuniculus is of temperate origin but have since adapted well to tropical conditions, (Youdeowei et al, 1990).

The number of young in a litter mostly ranges between 4 and 11. It varies with breed, level of management and feeding. The management and feeding rabbits can be conveniently categorised into the management of the pregnant doe; the doe and the young, the young and fattening stock and finally the dry does and bucks. For some useful Rabbit data, see Table 1.2 and 2.1.

Rabbits could feed well on concentrates which is rich in

protein, good quality grass like guinea grass or legume hay like Centrosema. Commercial pellet which contains right amount of energy, protein, fibres and minerals is now a common quality rabbit feed.

[a] BREEDS OF RABBITS

Local breeds of rabbits found in Nigeria are rather small in size with little meat. This is mainly due to poor nutrition and breeding. However, common and popular adaptable exotic breeds in Nigeria are New Zealand white, white California, and Chinchilla. They are larger, heavier and meatier than the local ones. Cross-breeds produced by intermating the local and exotic breeds are often vigorous, (Baflour, 1988).

CALIFORNIAN: It has a white body, rose, ears. Their feet and tail may be coloured, mature mass is between 3.5 to 4.5 kg.

CHINCHILLA: This breed is grey in colour, with a mature mass of 4 to 5.5 kg

NEW ZEALAND WHITE: It is white in colour, with a mature mass of 4 to 5.5 kg.

In order to choose a breeding stock, both the buck and the doe should be healthy, vigorous and docile. The animal selected should be highly prolific and possesses good mothering ability and rapid growth rate. Breeding does and buck should be selected preferably at weaning.

[b] **Gains from raising Rabbits**

i] They do not require space as much as cattle, sheep, goats and pigs.

ii] They have high fecundity and prolificacy. A female rabbit can produce 24 - 50 youngs per year and rear 60% of them to weaning. This performance is exceeded only by poultry.

iii] The generation interval is short. A female rabbit (doe) may bear at 6 to 8 months old and the young can be marketed at 8 to 12 weeks at 1.5 - 2 kg each, there is thus a rapid turn over of investment.

iv] Between 25 - 35 % roughages and succulent greens may be included in the diet of rabbits resulting in lower cost of feed unlike in poultry and pigs where the feed is almost entirely concentrate.

v] The dressing percentage of 50 to 75 is realisable. Those of cattle, sheep or goat are just between 40 - 55 per cent. Rabbit carcass is high in protein and low in fat.

vi] There is no storage problem since carcass can be conveniently consumed by a family.

vii] Rabbit skins are in demand for making handbags, slippers and glove linings.

In commercial production, the rabbit is close to modern broiler chicken in terms of growth rate, feed conversion efficiency and meat quality.

1.3.3 BREEDING AND REPRODUCTION IN GOATS/SHEEP AND CATTLE:

Useful information on the above sub-topic could be found on table 1.2. However, it is practicable for a mature he-goat to be kept for servicing up to 100 she-goats. The best time to service is 12 hours after the on set of heat. Tropical goats and sheep sometimes give birth twice a year and usually 3 times in 2 years. The average number of kids born at a birth is generally recorded as 1.3.

For the cows, ovulation usually occur at about 14 hours after the end of heat period, it is thus recommended to breed near the end of heat period. Signs of heat period in cattle and goats includes swelling of the vulva, frequent urination, mucus discharge, restlessness and females attempting to mount other females in the herd. In cows, calving interval is between 12 - 14 months.

1.4 OBJECTIVES OF THE STUDY:

In order to directly or otherwise boost livestock production through ADP activities, there is a need to improve on the present moribund livestock production information and extension methods by introducing and applying a computer - based development strategy with a long-run comparative advantage. Specifically speaking, there is a need to improve on the possible manual computation of data relating to Pig and Rabbit production.

The objectives of this study therefore include;

[i] To provide a source and reference data for the

males, 3 females.

vii] A weaner is valued at ₦150.00 while an adult rabbit is valued at ₦300.00 at 1997 in the middle belt towns of Nigeria.

CHAPTER TWO

AGRICULTURAL DEVELOPMENT PROJECTS (ADP) AND COMPUTERISATION

2.1 INTRODUCTION

The Government of Nigeria fully recognises the importance of livestock production as a vital source of meeting the need of the animal protein intake shortage of her teaming malnourished populace. This awareness might have led to the inclusion of Livestock and Extension service sub-units in each of the ADP and the establishment of few livestock projects in the country with the aid of World Bank assistance since 1971.

Livestock production in Nigeria has been characterised or dominated by several small-scaled livestock raising and semi-nomadic pastoralists (Fulani) with low level of technology. Livestock management systems are generally poor and productivity is low. ADP are therefore required to provide an efficient directions and guidelines such as this understudied computational livestock population dynamics (LPD) for the livestock farmers and ADP livestock superintendents to directly or indirectly enhance their managerial efficiency.

ADP are fundamentally designed to increase small-holder livestock production and income through a core-package of supportive services which among others could include the understudied LPD which can be used for project analysis and budgeting, stock number forecasting, and for an efficient extension services. This project work therefore illustrates the potential for growth of Livestock production by the

introduction of computer technology involving large numbers of small farmers.

The central role of ADPs as the public sector agency closest to the farmers is incontestable. The ability of her Livestock sub-unit to effectively play the roles expected of them in boosting national Livestock production has not been actualised over the years and thus an improvement is necessary.

An officer at Computer Centre, ADP, Abuja once observed and said that since 1994, an unimpressive livestock production activities under the auspices of ADP is not unconnected with weak management resulting from insufficient allocation of fund and high cost of establishment and operation of livestock unit.

2.2 HISTORICAL BACKGROUND OF ADP IN NIGERIA

The first enclave of integrated Agricultural Project in Nigeria was undertaken in 1974 during the tail end of the regime of then Head of State, General Yakubu Gowon. This included those Projects at Gombe, Funtua and Gusau for which World Bank loans totalling US $69 million, were obtained. While these Projects have all experienced cost overruns, arising largely from rapid, internal inflation, their initial performance has been sufficiently promising to enable government to pursue similar Projects. Two such Projects, Ayangba and Lafia received World Bank assistance in 1977, totalling US $131 to Nigeria during the period 1971-7

University of Ibadan linked computer to an instant rule-obeying idiotic electronic machine that performs useful functions through programmed instructions and endowed with the ability to remember things. It is idiotic because it cannot think for itself, it follows rules put into it. Computer has today crept into all human endeavours except making babies. Computer has become a ready and fast problem - solver in space programme, conventional and atomic warfare, in industry, medicine and business accounting to mention but a few.

Computer are categorised into micro computers, mini computer, mainframe and super computers. Minitower, Desktop, fulltower, laptop, notebook are the common types of micro computers available in the market.

The computer is made up of the hardware and software. The hardware includes the systems unit, video display unit, the keyboard and the printers. The software on the other hand is a computer program containing a set of instruction and rules which the computer can read to perform specific functions and assignments. There are the operating system software and application software. The later could help to accomplish certain tasks on the farm.

Computerisation is a short term for processing data to produce information by the use of a computer. Through computerisation, farm arithmetical and financial budgets, cash flow analyses, balance sheet and payrolls could be processed. Computer is thus good in various agricultural researches and

development. It allows researchers to deal with more complex problem of data than he could not have otherwise done. (Bello, 1995).

Computer application could make the keeping of farm records like the names, age, nature of job on the farm, residential address and payroll easy. The performance of the Livestock farm business over a period of time can be known and it ensures that what is being executed or observed is going on according to plan or expectation and if not management takes prompt decision on ways of re-aligning the farm business on a sound footing.

Micro computer has been described as the most useful and ideal type for the computation of general livestock farm records. It is a small computer consisting of a processor on a single silicon chips mounted on a circuit board with memory chips i.e. Read only and random access memories chips (Fapounda, 1995). Livestock population dynamics and valuation projection derived from historical records and current pricing of animals respectively could provide guide for a new entrant into Livestock production and an insight into prospects and problems involved in going into such a business.

Unfortunately, the possession and utilization of computers in most ADP in Nigeria is still limited to their respect planning sub-unit. They are mainly used for administrative tasks such as processing of a report or notification letters. I belief that in order to boost the

efficiency of other sub-units such as that of Livestock or Extension, each of them should possess a functional computers.

2.5 FARROWING AND KINDLING RECORDS FROM SOME ADP AND LIVESTOCK FARMERS:

An act of parturition in pigs is termed farrowing while that of Rabbits is kindling. The time these animals are born after conception depends on their respective gestation period. The number they produce per a litter depends on breeds and quality of management while how often they give birth depends on the level of prolificacy of a particular type of animal. Table 1.3 below shows the date of service and parturition and the litter size of common breeds of Pig and Rabbit raised and recorded by some ADP and farmers in some towns in three central states and Abuja, Nigeria. Apart from the table being a source of useful Pig and Rabbit information, the mean gestation period and litter size of each type and breed of animal in different locality can be easily computed.

Table 2.1

FARROWING AND KINDLING TABLE

SOW					DOE				
PLACE OF REARING	BREEDS	DATE OF SERVICE	DATE OF FARROWING	LIT SIZE	PLACE OF REARING	BREEDS	DATE OF SERVICE	DATE KINDLED	LIT. SIZE
G/lada, Abuja	LW	Jan. 4	April 30	13	G/lada, Abuja	Chin.	Jan. 2	Feb. 2	10
COA, Kabba	LB	Jan. 15	May 11	11	Iffe. Kogi	NZW	Jan. 14	Feb. 15	11
COA, Kabba	LBXLOC	Jan. 29	May 25	10	COA, Kabba	Chinx.	Jan. 27	Feb. 26	9
Kwali	LOC	Feb. 5	June 1	8	Garki Abuja	Cal	Feb. 3	Mar. 4	12
Isanlu	DURxLOC	Feb. 26	June 22	12	G/Lada Abuja	Chinx. NZW	Feb. 22	Mar. 23	10
COA, Kabba	HAMP	Mar. 12	July 6	13	NADP-Minna	NZW	Mar. 11	Apr. 9	11
Kwali	LW	Apr. 2	July 27	11	COA-Kabba	NZW	Apr. 4	May 6	10
ADP. MINNA	LWxLOC	Apr. 16	Aug. 10	10	G/lada Abuja	CAL	Apr. 15	May 13	9
G/lada Abuja	DUR	May 7	Aug. 31	12	COA, Kabba	NZW	May 5	June 39	9
COA, Kabba	HAMP	May 21	Sept. 14	12	Garki, Abuja	CALxChin	May 23	June 22	8
Kwali	LWXLOC	June 4	Sept. 28	11	Semin. G/lada	CAL	Jun. 6	July 6	10
Isanlu	LB	June 18	Oct. 12	9	NADP, Minna	CHIN	Jun. 17	July 17	11
ADP, Minna	LOC	July 2	Oct. 26	10	Kaduna	CALxNZW	Jul. 1	Aug. 2	10
Kwali	LW	July 23	Nov. 16	14	G/lada, Abuja	CAL	Jul. 20	Aug. 17	7
COA, Kabba	LBXLOC	Aug. 13	Dec. 17	12	COA, Kabba	CHIN	Aug. 14	Sept. 14	6
ADP. Minna	LBXLOC	Aug. 27	Dec. 21	10	Kaduna	NZW	Aug. 25	Sept. 24	9
Kwali, Abuja	LWXLOC	Sept. 3	Dec. 28	9	Semin. G/lada	CHINxCAL	Sept. 7	Oct. 8	8
G/Lada, Abuja	DUR	Sept. 24	Jan. 18	10	Iffe, Kogi	CAL	Sept. 27	Sept. 20	6
G/lada, Abuja	HAMP	Oct. 1	Jan. 25	11	COA, Kabba	CHIN	Oct. 8	Nov. 7	7
Kwali, Abuja	LW	Oct. 22	Feb. 15	9	NADP, Minna	NZW	Oct. 20	Nov. 18	7
NADP, Minna	LOC	Nov. 5	Mar. 1	6	G/lada, Abuja	NZW/CHIN	Nov. 9	Dec. 9	10
COA, Kabba	DUR	Nov. 19	Mar. 15	10	NAPD, Minna	CAL	Nov. 19	Dec. 18	11
G/lada, Abuja	DURXLOC	Dec. 10	Apr. 5	8	Kaduna	CHIN	Dec. 12	Jan. 10	8
Isanlu	LOC	Dec. 31	Apr. 26	11	Iffe, Kogi	NZW	Dec. 30	Jan. 18	9

(Data collected as at Aug. 1997)

OTE

W = LARGE WHITE
B = LARGE BLACK
UR = DUROC
AMP = HAMPSHIRE
OC = LOCAL BREED
LD = GWAGWALADA

CHIN = CHINCHILLA
NZW = NEW ZEALAND WHITE
CAL = CALIFORNIA
SEMIN = SEMINARY
COA = COLLEGE OF AGRIC.
NADP = NIGER AGRIC. DEVPT. PROJECT

demonstrated clearly the importance of the role that Agricultural investment projects play in Nigeria's approach to solving its agricultural development problems (McDonald, 1985).

Prior to the creation of six new states in October 1996, the number of ADP has increased to 31 - each per state and also in Federal Capital Territory - Abuja. The new states now have their respective ADP but still at embryonic state. It is also worth noting that these projects have graduated from "short-term project" with specific life span to permanent or more durable establishments that have become the implementation aims of the states Ministries of Agriculture (Annual reports 1990).

A typical ADP is consists of the following core sub-programmes: viz

(i) Crop development

(ii) Livestock development

(iii) Fisheries development

(iv) Agro processing

(v) Rural infrastructure development and

(vi) Development of input supply, distribution credit and marketing.

The inclusion of Livestock services sub-unit has the specific mandate of dissemination of animal health care, advisory role and improved production techniques to the traditional small-holder farmers. Other activities is the

CHAPTER THREE

LIVESTOCK POPULATION DYNAMICS SYSTEM ANALYSIS AND DESIGN

3.1 PROBLEM DEFINITION THROUGH SYSTEM ANALYSIS

Through system analysis, the users of the system are assisted in identifying what information is needed so that a system design can be conceptualised or evolved. System analysis get to the root of the problem and defines users' requirements (Badamosi, 1996).

In most of the ADP in Nigeria, the current approach to Livestock data processing still draw upon the tenets that Project Organisations are small and the environment are simple. With the current global era of computer utilisation cum the rapid demand for a boost in Livestock production through ADP in Nigeria, the prevailing approach is thus moribund, myopic, inadequate and undetailed. It has been generally cumbersome, slow and easily subjected to human error.

Under manual computation, a lot of clerical efforts or inputs are required in carrying out most calculation due to large volume of data for generating an accurate Livestock population projection. Some precious and valuable time are thus lost in storage and retrieval of records. Response to queries and enquiries is generally slow. Manual files are more often bulky and not easily managed. In addition, the particular way files are organised, stored and accessed make

information retrieval difficult and at times impossible. Above all it limits quick flow of information which the management needs for the Project analysis and implementation processes.

The above problems could be attributed to the following reasons:

ii Delay in acquiring information concerning Livestock Population.

ii] Lack of appropriate and adequate tools of computation including stationery.

iii] Improper record facilities and inadequate storage media for facts and data.

iv] Difficulty in copying with increasing computational workload as on commercialised Livestock farming.

v] Unpardonable or costly mistakes arising from wrong computation of bulky or complex data related to the Livestock.

vi] Lack of proper documentation after the use of prepared data for the proposed livestock production thus making future references impossible and

v] Waste of resources and duplicating of efforts based on overstaffing i.e. livestock data recorders and processors.

The obvious need for an alternative approach is timely. In the conventional system of livestock data creation, a great deal of data originates in the form of clerically prepared

source document that was gathered from interviews and farm records from the extension clients, or the livestock officer. Information such as types and breeds of livestock, age at the time introduced into the farm, number of males, females and the weaners could be obtained (Aworuwa, 1981) but a typical computerisable livestock population dynamics is uncommon.

3.2 THE ALTERNATIVE SYSTEM: A COMPUTATIONAL PIGS AND RABBITS POPULATION DYNAMICS

The alternative system is expected to be able to provide a detailed Pig and Rabbit information for the livestock managers, the contact farmers or for a new entrant into Pig or Rabbit production. Such an information could serve as a source or reference document for project analysis and implementation. Through the use of a computer, it could bring about an accurate and speedy processing of animal breeding data hence reliable information or extension services could be given as deemed necessary or when requested.

Livestock management efficiency could generally improve if LPD are appropriately computerised. It is believed that computerisation could provide management with accurate and timely information leading to better planning, decisions and control. LPD package could be backed-up and securely kept to check accidental loss of valuable data.

Database Management System is an appropriate application software that can provide a user-friendly environment for inputing and computing large or varied volume of data and also

allows the user to store, sort, retrieve, delete, search, and update large amount of information more than the manual system.

The Pigs and Rabbits population dynamics (PRPD) Dbase files for Livestock and Extension units of Agricultural Projects require an entry of input data such as types and recommended breeds of livestock, recommended system of management, predicted weaning periods, number of weaners and cumulative numbers of heads of animals and their periodic value under a stipulated number of breeding females - Table 3.1 & 3.2.

The two animals' population dynamics data are technically assumed based on the mean of several previous records. The projection of the population commenced from one servicing male and at least one breeding female as the population increases when their grand dam and or their matured female offsprings breed and reproduce.

3.2.1 PIGS MEAN POPULATION DYNAMICS DATA

The table above contains a typical pig mean population dynamics data inputed in a Database file. Proceeding its output design are included some guiding information and basic assumption (section 1.5). On the data in the record of first serial number, the zero month under the weaning time connotes the first time the pig farmer or manager brings in a male and a female (2 month old) weaners into his pen. Since they have not yet farrowed by then, zero is inputed under the number of

weaners while the cumulative number remains two. A weaner is valued at ₦1,500.00 therefore the 2 amount to ₦3,000.00 as it is shown on the last column of the record.

Table 3.1

PIGS MEAN POPULATION DYNAMICS DATA

SERIAL NUMBER	WEANING TIME (MONTHS)	NO OF BOAR	NO OF SOW	NO OF WAENERS	CUM NO	PERIODIC VALUE OF PIGS IN NAIRA
1.	0	1	1	0	2	3000
2.	13	0	0	8	10	12000
3.	19	0	0	8	18	12000
4.	25	0	0	8	24	12000
5.	26	0	3	24	48	108000
6.	31	0	0	8	56	12000
7.	32	0	3	24	80	108000
8.	37	0	0	8	88	12000
9.	38	0	3	24	112	108000

The second serial number data has the record for the 1st set of weaners produced on the 13th month into the pig production business i.e. 7 months reserved for the initial weaners bought to attain service age, plus an average of 4 months for gestation and 2 months for the piglets farrowed to attain weaning age. Zeros are inputed under the number of boar and sow because it is the same initial male and female breeders that reproduced. Out of an average of 10 piglets farrowed per litter, 8 weaners are expected in ratio of 5 males to 3 females. This has been the prevailing mean sex ratio per litter. Since weaner is valued at ₦1,500.00 a total

of 8 amount to ₦12,000.00. The cumulative pig number on the second serial number is 10 because the 8 weaners was added to the 2 grand pigs.

In the same vein like the second serial number record, the third and the fourth ones coincide with the 19th and 25th months into the pig production business respectively. Also, the grand sow is expected to wean an average of 8 piglets each on the 31st then on the 37th month. A breeding sow is expected to have a weaning interval of 6 months. This is because at a weaning period, i.e. when the piglets are 2 months old the sow are serviced. An average of 4 months is for the gestation period then another 2 months for weaning the piglets farrowed.

On the 26th month when the 5th serial number data were to be taken, 3 females from the 1st set of weaners produced should have produced a weanable 24 piglets which are valued at ₦108,000.00. In the same vein, on the 32nd month, 3 females from the second set of weaners should have produced another weanable 24 piglets. A similar trend is repeated on the 38th month into the Pig production business.

Through the Database files and programs written, it will be possible to automatically compute the number of weaners, cumulative number and periodic value of Pigs if the pig farmer or manager starts his production business with not more than 10 sows and with 1 servicing boar. Investigation reveals that the sexual vigour of a servicing boar starts to dwindle

drastically after spending 3 years in the pen. Thus a replacement of an old or a weak boar may be necessitated when such an observation is made.

Data creation program can be used to enter more Pig population dynamics data in case the pig production business extend beyond 38 months projection stipulated in this project work. Also data modification program allows for modification of already created pig data in case some of the initial assumptions change.

3.2.2 RABBIT MEAN POPULATION DYNAMICS DATA

Table 3.2 shows Rabbit population dynamics data entry inputed in a Database file. Preceding a report from this file are some useful information inform of some assumptions on which the data created are based (4.3.1 & 4.3.2). The record of the first serial number starts with zero month under its weaning period. This represent the time a pig farmer or a manager introduces a 2-month old male and female weaners into his pen. Since they have not yet kindled by then, zero is inputed under the number of weaners while the cumulative number is two. A weaner is valued at ₦150.00 therefore the two Rabbits amount to ₦300.00 as it is inputed and shown on the last column of this record.

Table 3.2

RABBIT MEAN POPULATION DYNAMICS DATA

SERIAL NUMBER	WEANING PERIOD (MONTHS)	NO OF BUCK	NO OF DOE	NO OF WEANERS	CUMULATIVE NUMBER	PERIODIC VALUE OF RABBITS IN NAIRA
1.	0.0	1	1	0	2	300
2.	8.0	0	0	5	7	650
3.	11.5	0	0	5	12	650
4.	15.0	0	0	5	17	650
5.	16.0	0	3	15	32	2700
6.	18.5	0	0	5	37	650
7.	19.5	0	3	15	42	2700
8.	22.0	0	0	5	47	650
9.	23.0	1	3	15	62	2700
10.	24.0	1	9	45	107	8100
11.	25.5	0	0	5	112	650
12.	26.5	0	3	15	127	2700
13.	27.5	2	9	45	172	8100
14.	29.0	0	0	5	177	650
15.	31.0	1	9	45	222	8100

The second serial number record contains the number of 1st set of weaners produced on the 8th month into the rabbit production business, i.e. 5 months reserved for this new and young rabbit to attain service age, plus an average of 1 month for gestation and 2 months for the friers kindled to attain weaning age. Zeros are inputed under the number of buck and sow respectively because it is the same grand buck and doe that reproduced. Out of an average of 8 friers kindled per litter, 5 weaners are expected in ratio of 2 males to 3 females. This higher female ratio per a litter is prevalent based on the rabbit breeding records taken during this course of study. Since each weaner is valued at ₦150.00 a total of 5 weaners amount to ₦650.00. When the five weaners was added to the two grand Rabbits, the cumulative number on the record

in question becomes seven. In the same pattern like second serial number record, the third, and fourth ones coincide with the weaning time on the 11½ and 15 months into the Rabbit production business respectively. (Records 3 and 4 of Table 3.2). Also the grand doe is expected to produce an average of 5 Friers each on the 18.5, 22, 25.5, 29 and 32.5 months respectively into the rabbit production business. A breeding doe is expected to have a weaning interval of 3½ month i.e. an average of 3 weeks to rest after kindling, average of 1 month for gestation plus about another 7 weeks period for the bunnies to attain weaning age.

On the 5th serial number record i.e. 16th month into the business, 3 females from the 1st set of weaners produced is expected to have produced a weanable 15 friers. They were valued at a total of ₦2,700.00. Similarly, on the 19½ months weaning time, 3 females from the 2nd set of weaners produced should have produced another weanable 15 friers. This trend is repeated on 9th and 12 serial number records.

Since the weaning intervals is 8 months, those 15 weaners produced on the 16th month into the business are expected to have 9 females which should have produced 45 weanable friers i.e. five friers per litter in nine places. A similar phenomenon is expected on the 13th and 15th serial number records.

It is made possible through the Database files and programs written to automatically compute the number of

weaners, cumulative number and periodic values of Rabbits if the Rabbit production business will not be more than 8 does and with 1 servicing buck. Omolohunnu, a Director of Extension Services at Abuja ADP revealed from his personal Rabbit records that drastic reduction and great weakness in sexual activity could be witnessed in the male if the number of female per buck exceed eight or if a buck is used for servicing more than 1½ year.

Data entry program can be used to create more Rabbit population dynamics data in case the Rabbit production business go beyond 31 months duration whose data were entered in the Database file of this project report. Data modification program is available for updating already created Rabbit data in case the initial assumptions are altered.

3.3 ALGORITHMS OF LIVESTOCK POPULATION DYNAMICS

By algorithm is meant a step by step procedure which is used to solve a particular type of problem and return an answer. It involves input, processing and output of data like that of livestock population dynamics.

3.3.1 INPUT OF LIVESTOCK DATA

This entails what data we have to supply in order to get an output. In this studies, it includes comments on name of livestock, the breed, management system, service age, time to service after parturition, ratio of servicing male to that of breeding female, gestation period, expected average litter size and assumed value of an adult/a weaner in Naira. The

data entry computational table is consist of serial number which has a record each consisting of the projected weaning time, the number of servicing male, the number of breeding female animal, the average number of weaners produced, cumulative number of the animal and the periodic total value of animals reared.

3.3.2 PROCESSES INVOLVED IN THE LIVESTOCK DATA

This section spells out what processing is necessary in order to achieve a solution. It involves computation of average number of weaners, expected cumulative number of animals and their value in Naira at each weaning time if the number of breeding females is more than one at the inception of the livestock production business.

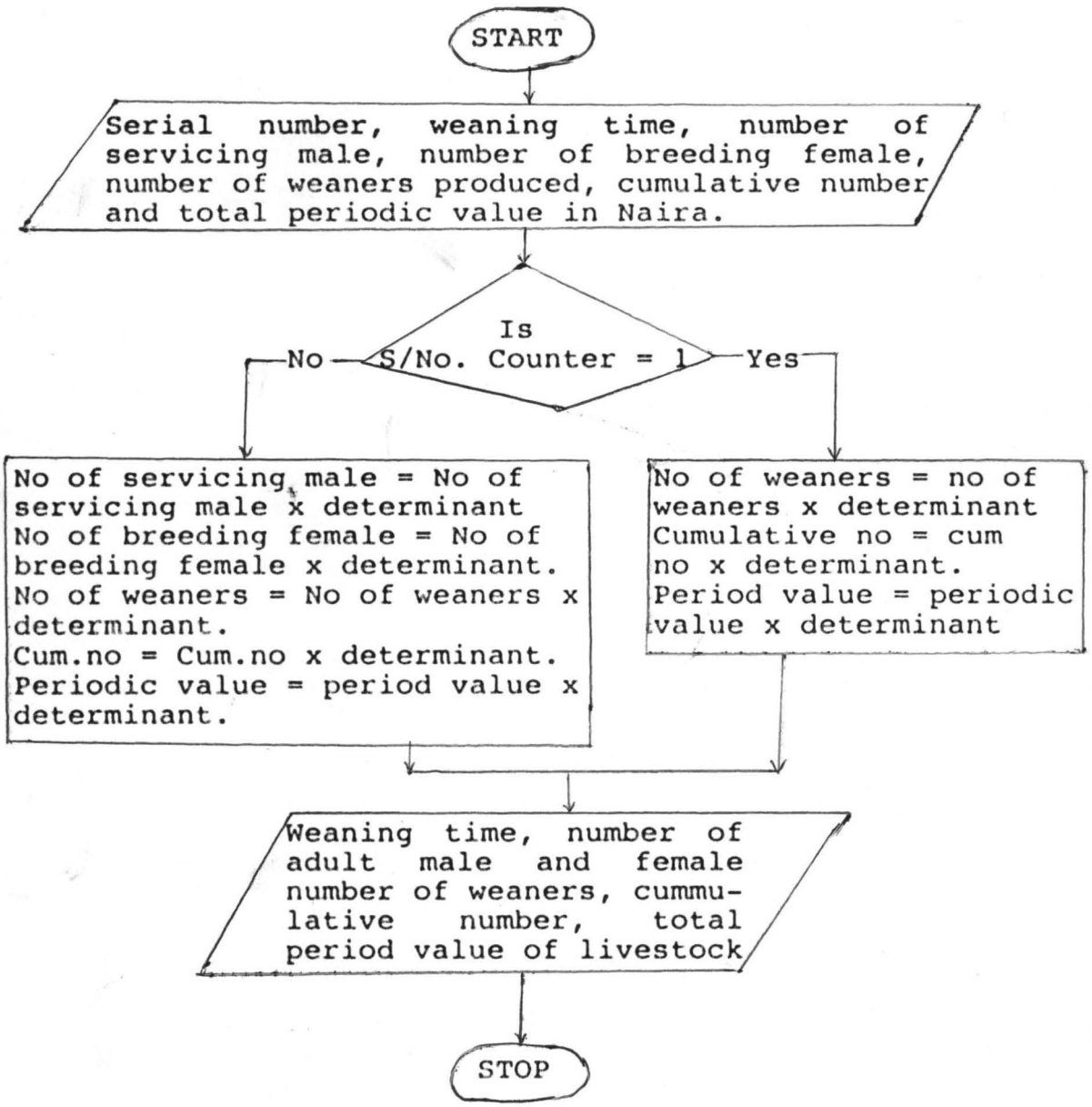
3.3.3 OUTPUT OF LIVESTOCK DATA

The output gives us the information or report we want to get out from the Dbase program. An expected LPD report contains a full comments as it is shown in 3.3.1. In addition, it could give a varied but desired report of the LPD as the number of the breeding female animal changes between 1 and 10 in Pigs and 1 and 8 if it is Rabbit (section 3.2)

3.4 THE LPD SYSTEM FLOWCHART

The system flowchart gives a pictorial representation of the operation involved in the solution of a LPD problem. It makes the job of writing the program in a logical manner, set down the ideas precisely, show the steps in the process of a solution and have a diagrammatic solution to the problem for easy assimilation by someone with no knowledge of program writing.

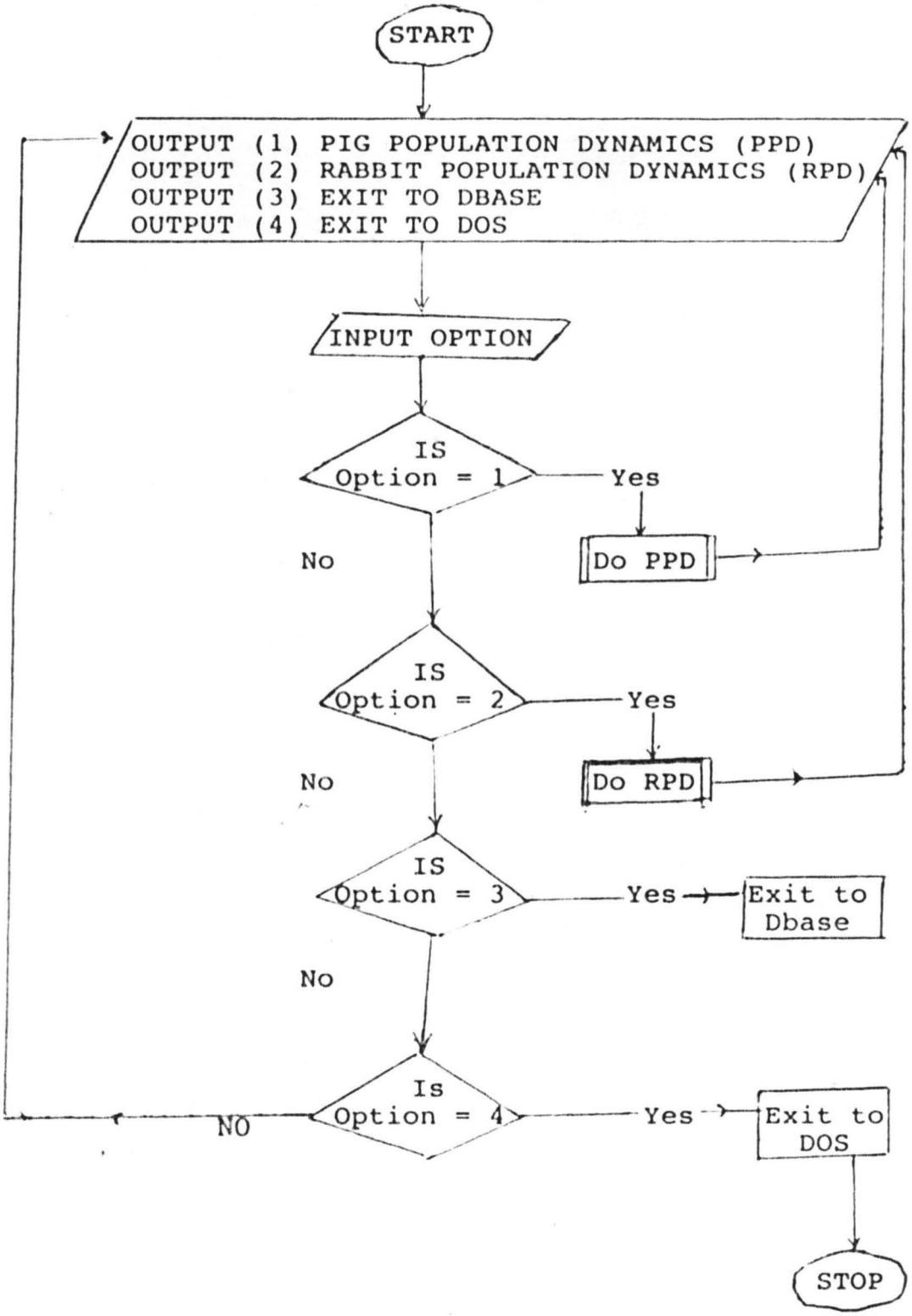
3.4.1 GENERAL FLOWCHART FOR LPD



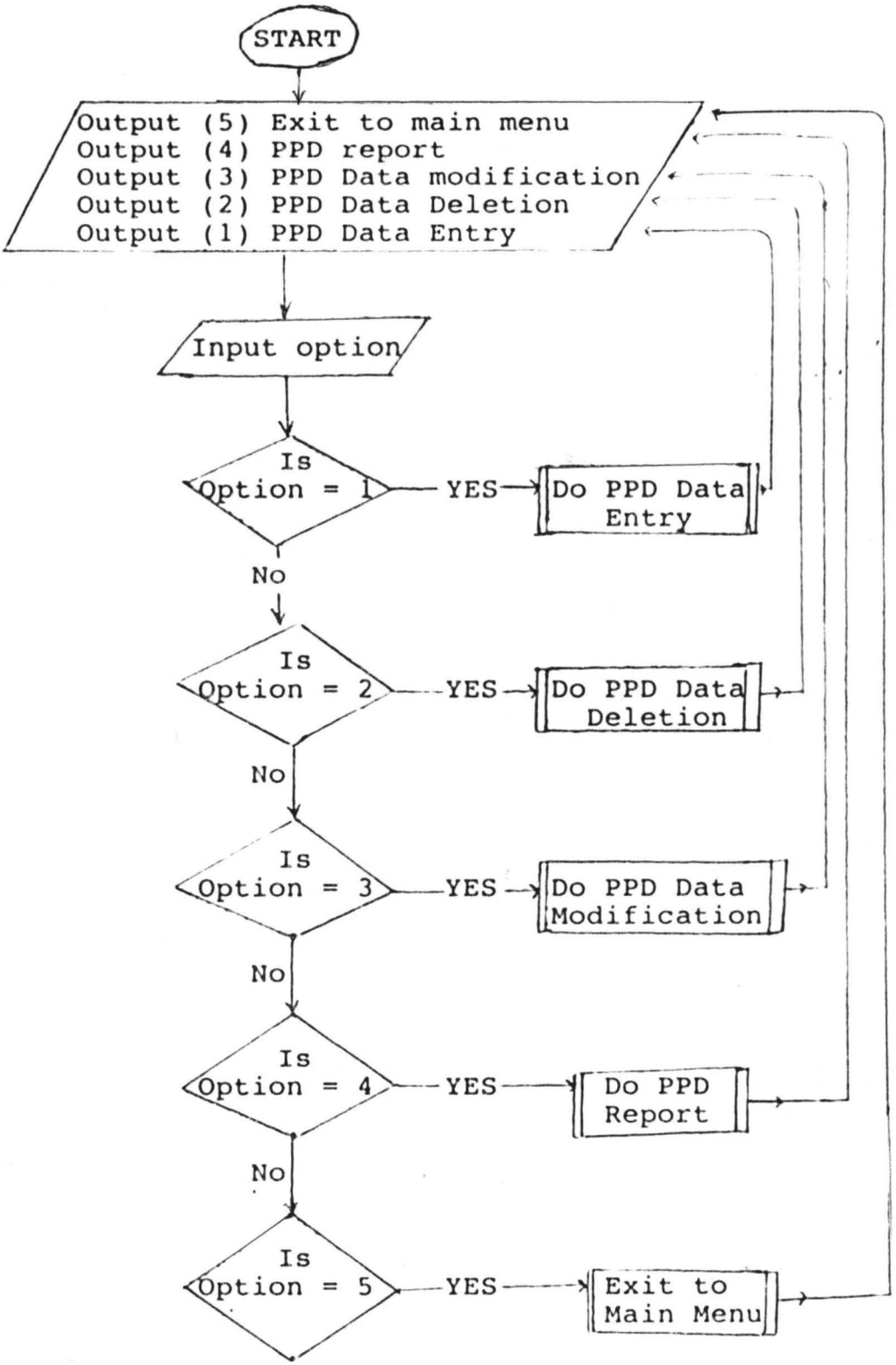
NOTE: Each serial number counter coincides with a record at a particular weaning time. Also the determinant is the number of breeding female that the livestock farmer or manager starts with.

3.4.2 MAIN PROGRAM FLOWCHART

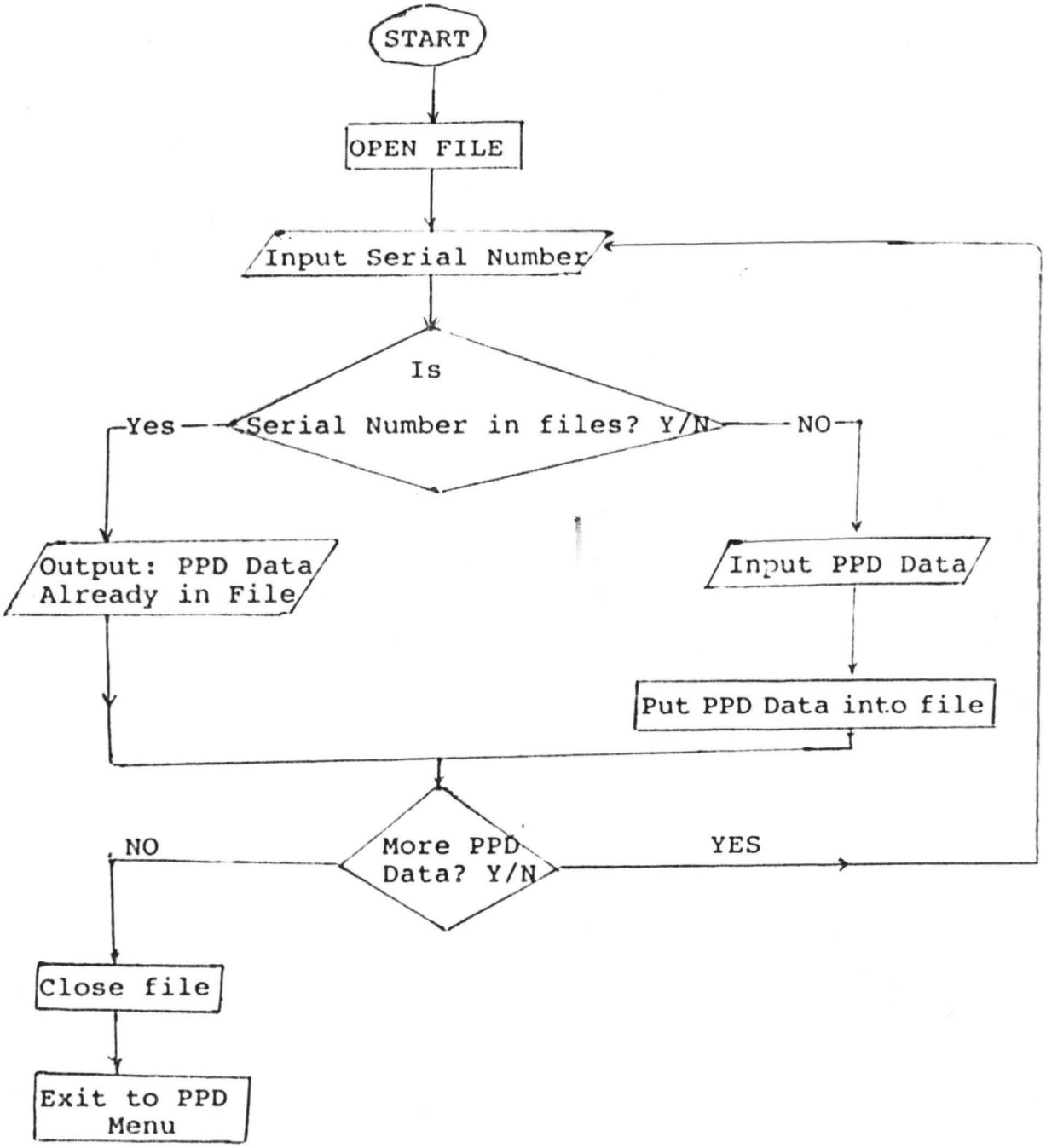
MAIN PROGRAM



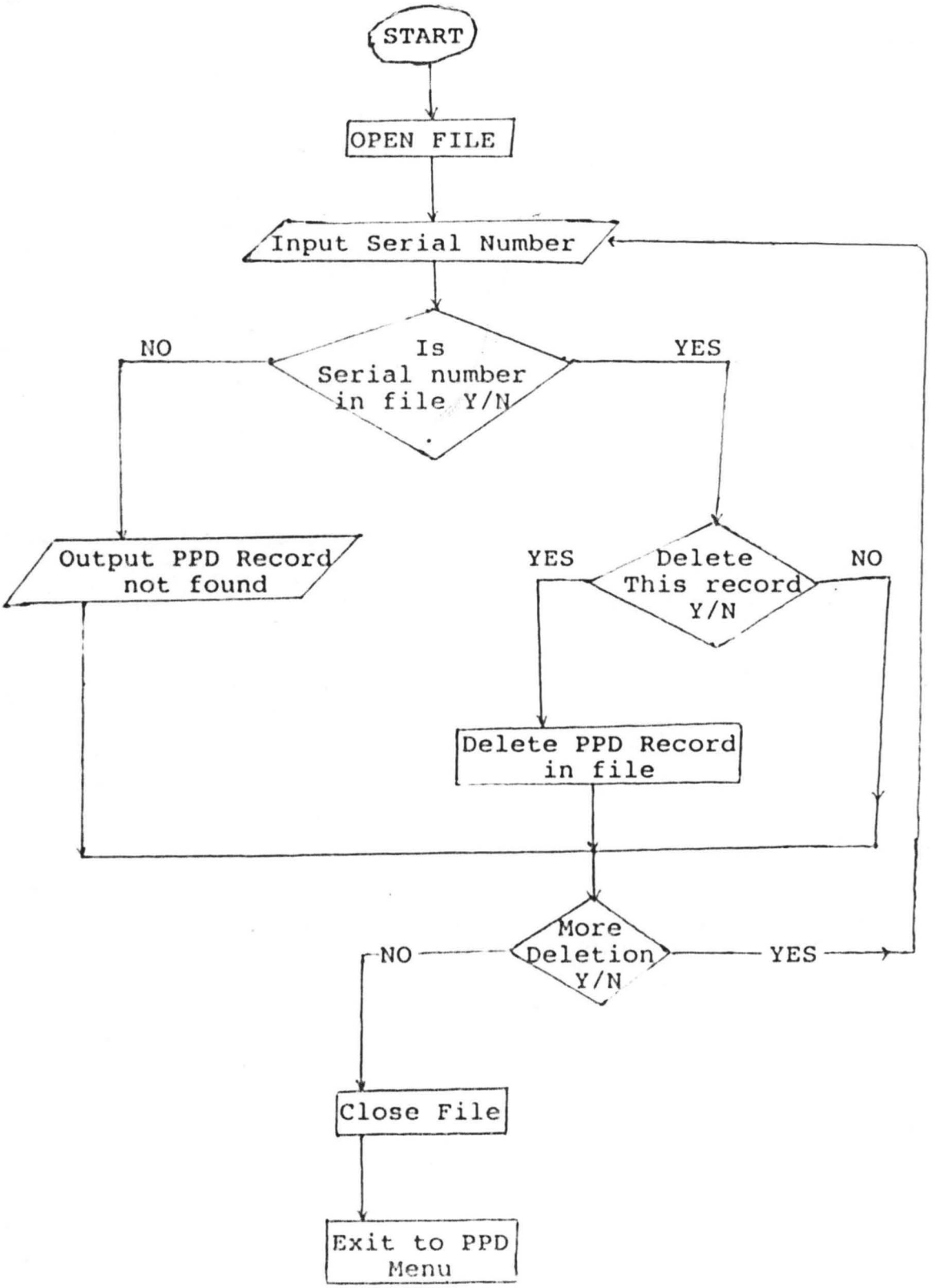
3.4.3 PIGS POPULATION DYNAMICS (PPD) OPERATING SYSTEM FLOWCHART



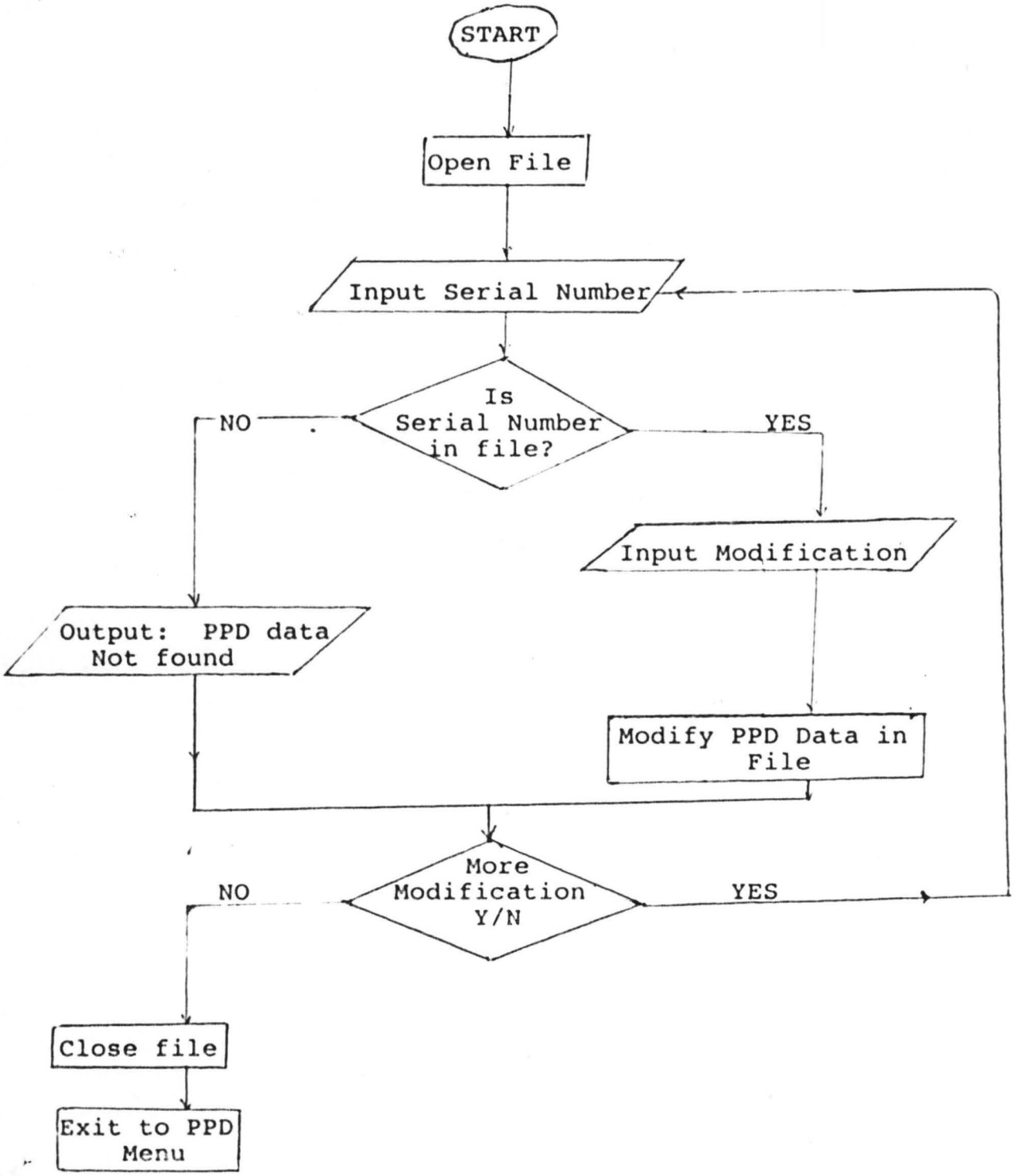
3.4.4 PIGS POPULATION DYNAMICS (PPD) DATA ENTRY PROGRAM FLOWCHART



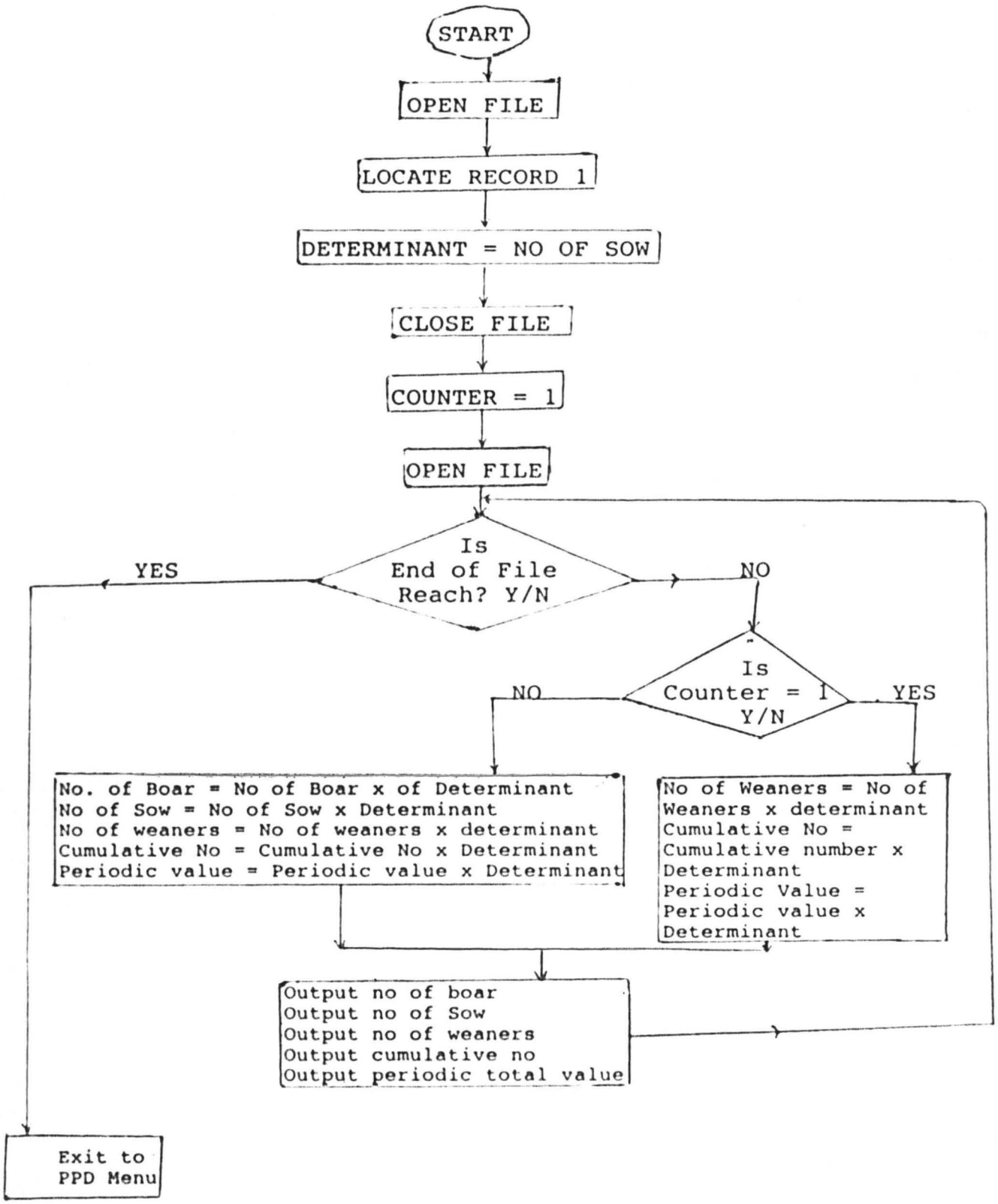
3.4.5 PIG POPULATION DYNAMICS (PPD) DATA DELETION FLOWCHART



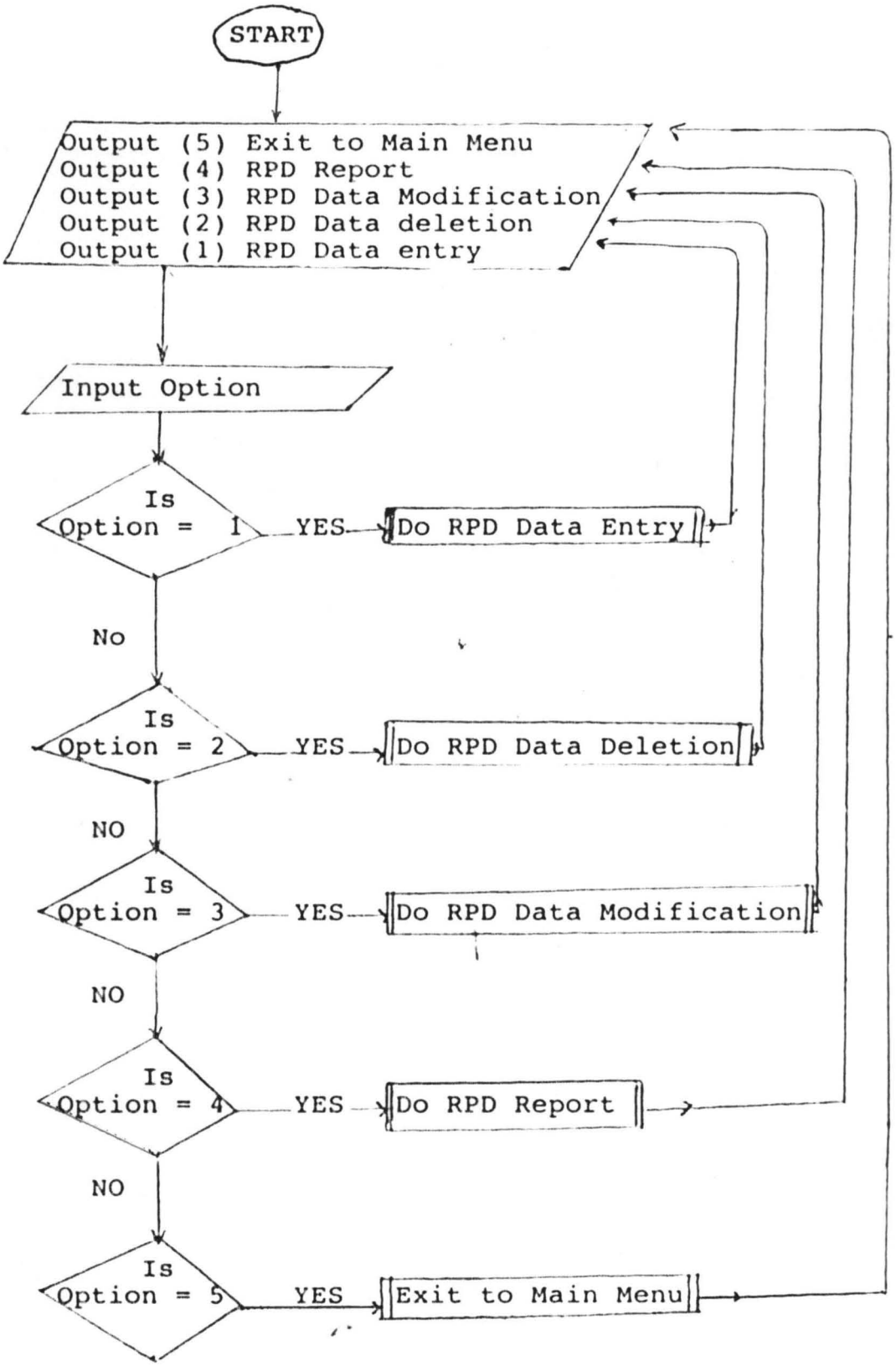
3.4.6 **PIG POPULATION DYNAMICS (PPD DATA MODIFICATION FLOWCHART**



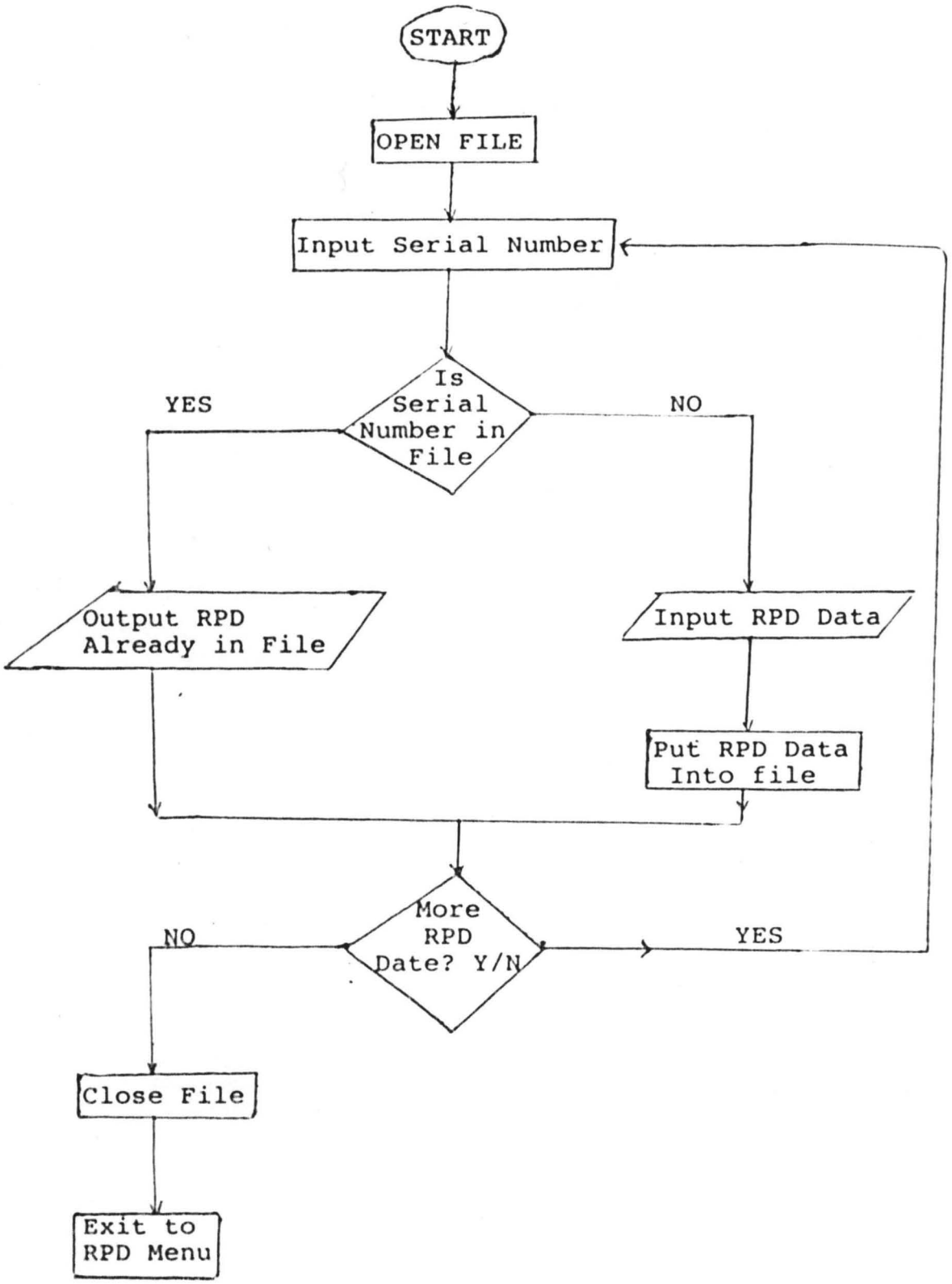
3.4.7 PIG POPULATION DYNAMICS (PPD) REPORT GENERATING FLOWCHART



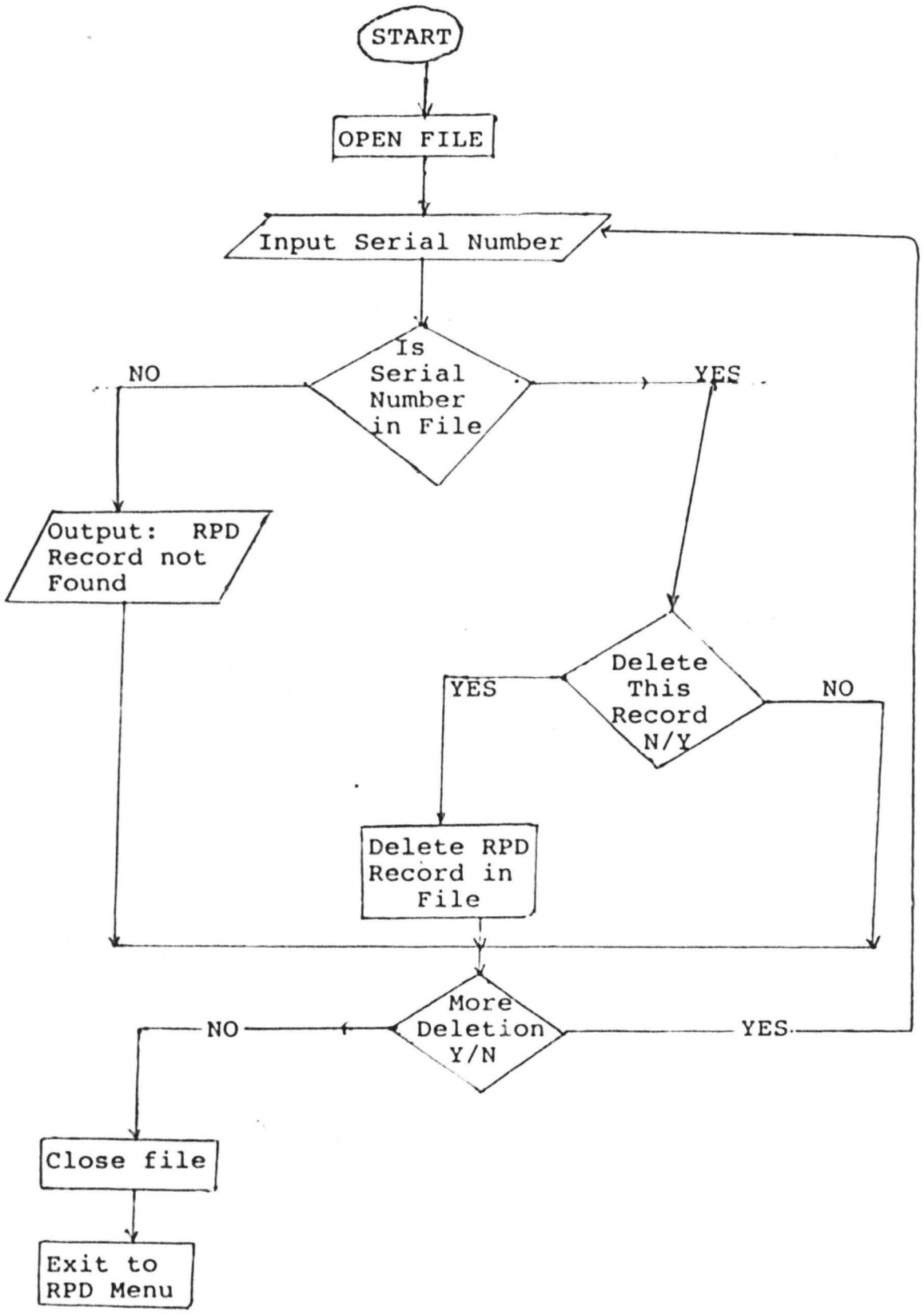
3.4.8 RABBIT POPULATION DYNAMICS (RPAD) OPERATING FLOWCHART



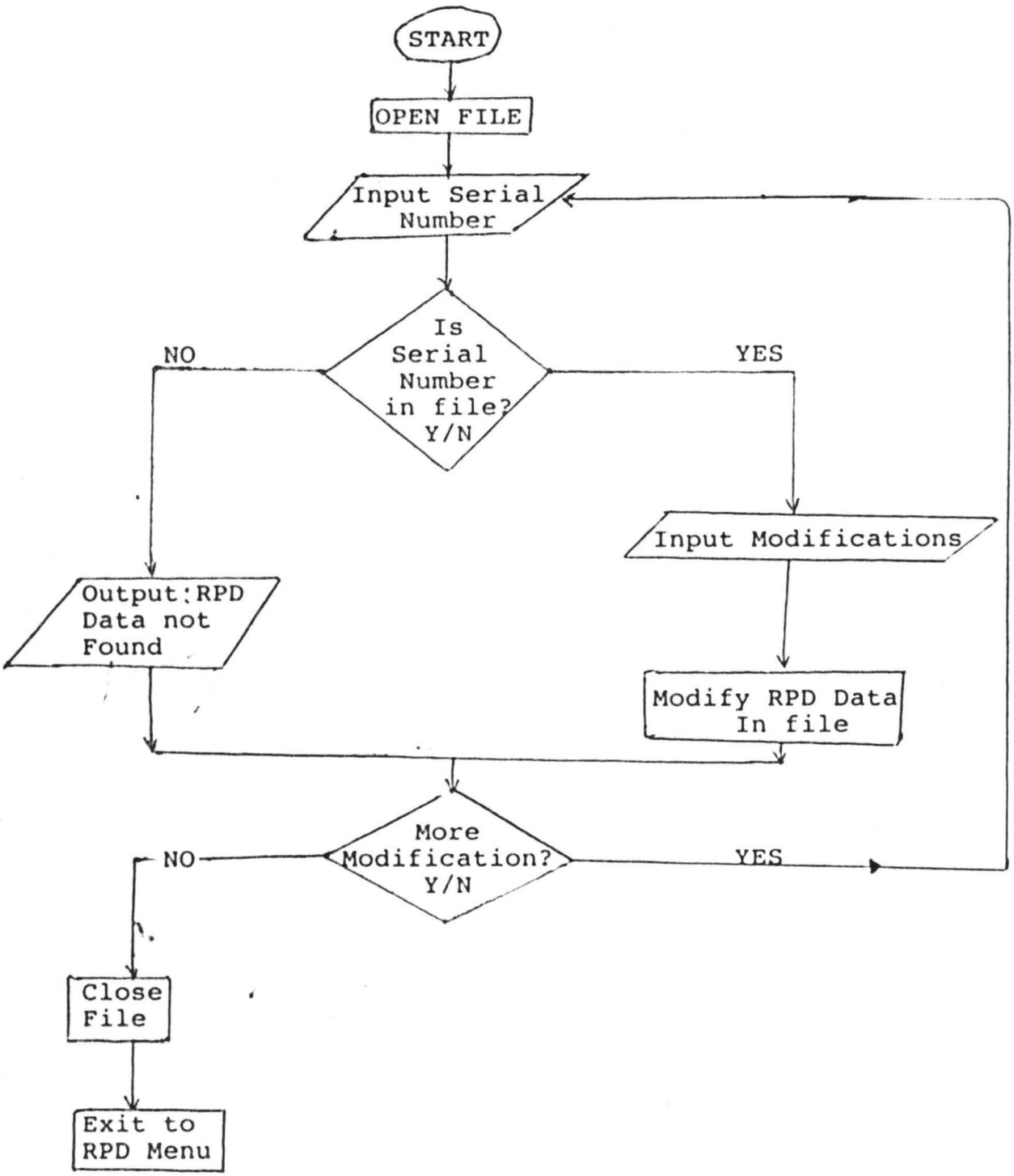
3.4.9 RABBIT POPULATION DYNAMICS (RPD DATA ENTRY PROGRAM FLOWCHART



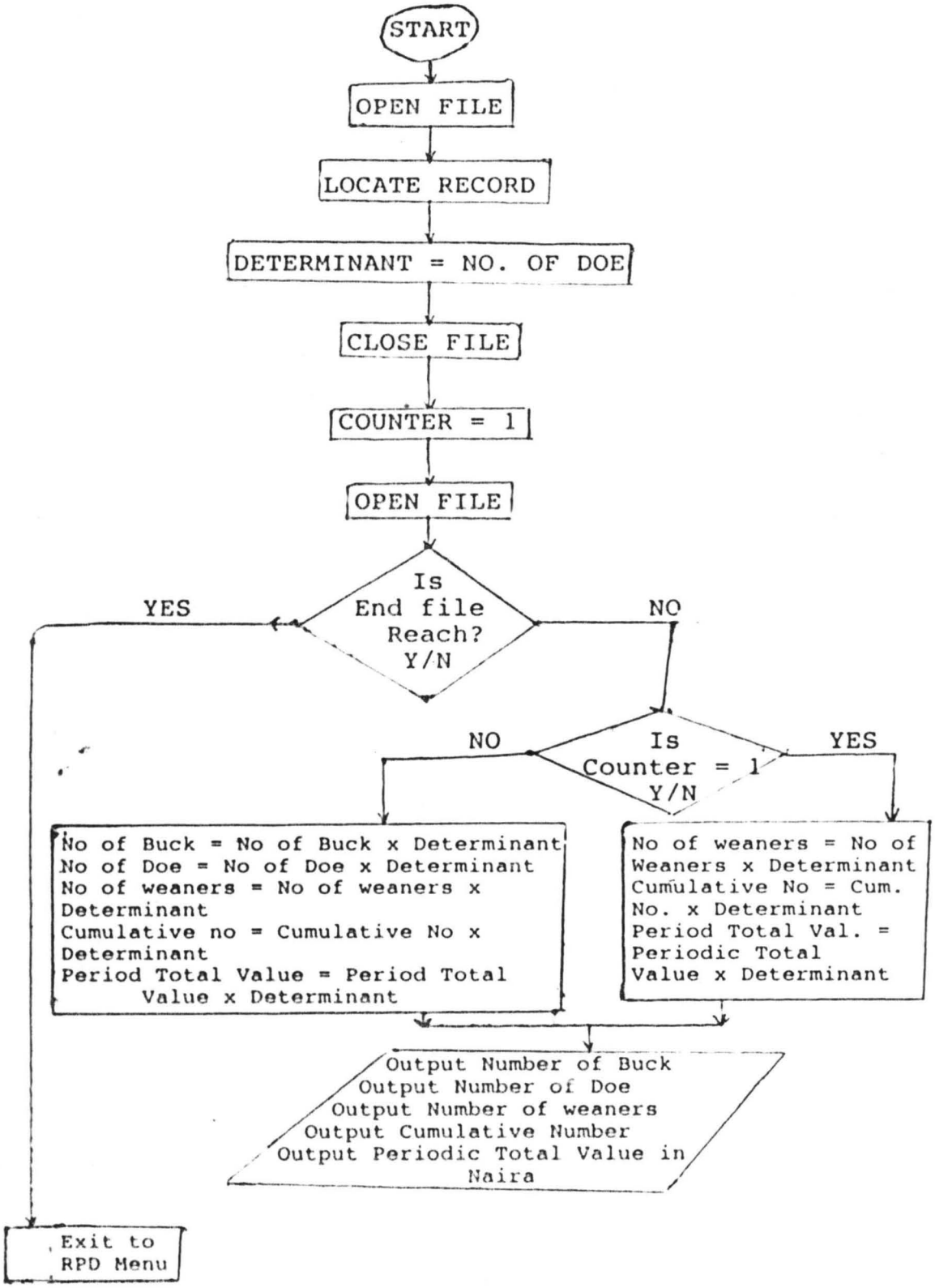
3.4.10 RABBIT POPULATION DYNAMICS (RPD) DATA DELETION FLOWCHART



3.4.11 RABBIT POPULATION DYNAMICS (RPD) DATE MODIFICATION FLOWCHART



3.4.12 RABBIT POPULATION DYNAMICS (RPD) REPORT GENERATING FLOWCHART



3.5 SYSTEM DESIGN FOR THE PIGS AND RABBITS POPULATION DYNAMICS

3.5.1 DEFINITION OF SYSTEM DESIGN

System design entails "how we are going to solve the defined Livestock population problem". There is no hard and fast rule and all that this project work is attempting here is to guide the reader into some paths of thought and action which have been found to be fruitful. The attention here is confined to the aspect of data processing and management in which the computer will be used to carry out the instructions designed by the researcher in order to achieve the designed solution.

The importance of the users of the system in this designed phase cannot be underestimated since they will continue to work with the program long after its installation. Having participated in the design phase, there is a better chance that the program will meet their required needs of improving dissemination of information on Pig and Rabbit population.

On the system input design shown on 3.5.2 and 3.5.3, field 1 which is either SNO or SNO2 means serial number each representing a record on the output. Field 2 which is either WTIME or WPERIOD fully means the month the weaners are introduced or produced. Field 3 which is either Boar or Buck is the number of male animals for servicing. Field 4 i.e. sow or doe represent the number of breeding female animals. While

field 5 i.e. MWE or Mweaner means the mean number of weaned animals at respective time. Field 6 i.e. CNO or CUMNO fully means total number of heads of animal in the pen at the current weaning time plus the previous ones produced. Finally is the field 7 i.e. PVAL or PERIODVAL which represent the current worthiness in Naira of the total number of animals possessed at a particular weaning time.

3.5.2 PIGS POPULATION DYNAMICS (INPUT DESIGN)

Structure for database: A:\PIGINTE.DBF

Number of data records: 9

Date of last update : 04/08/97

Field	Field Name	Type	Width	Dec	Index
1	S-NO	Numeric	4	1	N
2	WTIME	Numeric	8		N
3	BOAR	Numeric	6		N
4	SOW	Numeric	6		N
5	MWE	Numeric	6		N
6	CNO	Numeric	6		N
7	PVAL	Numeric	10	2	N
** Total **			47		

3.5.2 RABBIT POPULATION DYNAMICS (INPUT DESIGN)

Structure for database: A:\RABBIT.DBF

Number of data records: 15

Date of last update : 04/08/97

Field	Field Name	Type	Width	Dec	Index
1	S-NO2	Numeric	4	1	N
2	WPERIOD	Numeric	8		N
3	BUCK	Numeric	6		N
4	DOE	Numeric	6		N
5	MWEANER	Numeric	6		N
6	CUMNO	Numeric	6		N
7	PERIODVAL	Numeric	10	2	N
** Total **			47		

CHAPTER FOUR

LIVESTOCK POPULATION DYNAMICS (LPD) SYSTEM IMPLEMENTATION AND DOCUMENTATION:

4.1 INTRODUCTION TO SYSTEM IMPLEMENTATION

System implementation means the training and educating of users, testing and conversion to make the system operational (McDonald, 1989). In order words at this stage, the analysts train and co-ordinate user, personnel, instruct technicians test the new system and eliminate "bugs", install new procedures and forms and look for oversights or omissions. The overall aim of this chapter is to achieve a fully documented operational system for L.P.D.

4.2 DATABASE MANAGEMENT SYSTEM (DBMS):

This is a collection of programs that provide convenient access to data stored in a database as files (Raheem, 1996). The application program for the pigs and rabbits population dynamics has been designed to work on Database Management System called Dbase IV whose planning command structure allows the entry of command in a real time or immediate execution mode. Because of the volume and complexity of the procedure that may be involved in LPD, the database program used could provide an easy and user-friendly environment for filing, computing and recording of data that allow the user to store, sort, retrieve, delete, search and update large amount of information. Installation of Aston and Tate Dbase IV package in the hard disk should be done by a qualified personnel in

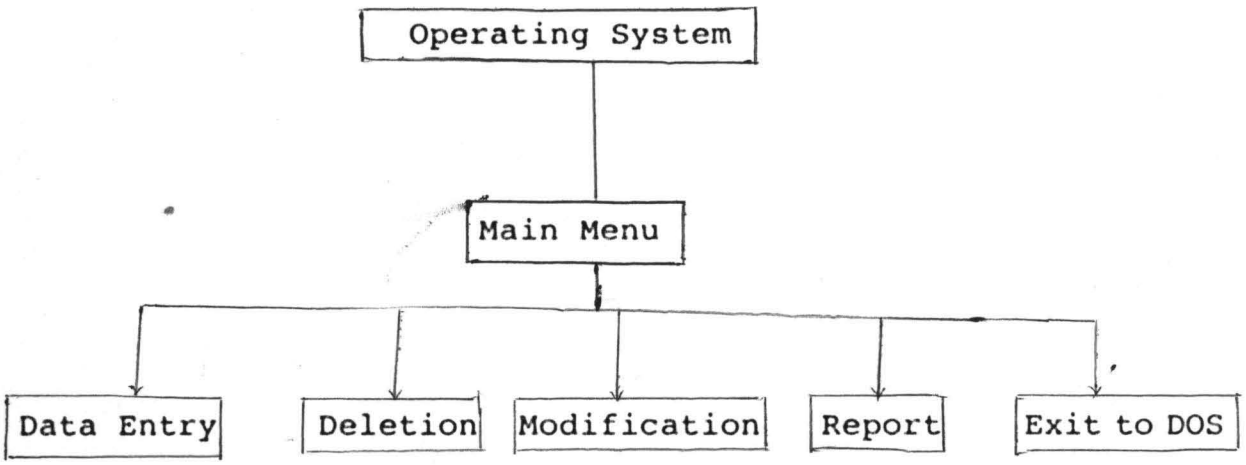
order to achieve maximum efficiency.

4.3 TEST-RUNNING OF THE DBASE APPLICATION PACKAGE:

The system is designed and programmed to manage the procedure involving prompt entry and computation of Pigs and Rabbits population dynamics data. As a menu-driven data management program, it will operate from menu of choices - through the use of independent priority structured multi-task logic in which the various operational functions of the records are separated into independent elements which interact through Dbase (3.4.3 & 3.4.8).

From the first run that displays the main menu, choices can be made so that it can perform the named operation.

SYSTEM LOGICAL STRUCTURE



The main program that controls the normal workings of the above system is shown in Appendix 1 while steps of process

involved is diagrammatised in chart 3.4.2.

The task of generating and producing system reports or output by the user involves the logic of queuing mechanism. Accordingly, the assembly and outputing of required reports to either the printer, the VDU or the magnetic tapes can be accompanied without having any impact on the function of the balance of the system. (Chart 3.4.3). From the Dbase program, written and shown in Appendices IId and IIId, different desired Pig and Rabbit population dynamics reports can be produced. The processes involved is diagrammatised in charts 3.4.7 and 3.4.12. The determining factor of computation is the number of breeding females at the commencement of the animal production business whose range is between 1 and 10. Modification option 3 of the main menu is employed to shift the counter as required.

The steps involved in inputing the presumed Pigs and Rabbit population dynamics data is shown by charts 3.4.4 and 3.4.9. This is a result of the prewritten Dbase program in Appendices IIa and IIIa. Each serial number represent a record containing the animal population data at varied weaning period.

In case a Livestock population record(s) is to be erased due to one reason or the other, the process involved is diagrammatised on charts 3.4.5 and 3.4.10. The programs that control this is appropriately spelt-out on Appendices IIb and IIIb. To modify or update a record in case there is a need for a change in the presumed L.P.D. data, follow the steps described by charts 3.4.6 and 3.4.11 which is a manifestation of the prewritten program shown on Appendices IIc and IIIc.

On Appendices Iva-f are some test or pilot runs with test data to make sure that the system achieves its predefined purpose and objective. Various desired computational L.P.D. could be obtained depending on the determining factor i.e. the number of female animal the farmer intends to start with.

4.4 LPD SYSTEM DOCUMENTATION

This subsection describes the workings of LPD program via database management system. This aids the users understanding and it enhances maintainability.

Getting started or existing from the database programs require the following steps and procedures:

Loading of access code which identifies a user before access to the computer. The access code comprises both password and program code e.g. Password ANJORIN

Program code Dbase IV

At dot (.) prompt, we use "create command" or list structure to create a file structure. Type at the dot prompt (.) modify command by program name. This will bring the file you have created and then present options highlighting insert or delete and if enter is pressed, it will either insert the missing field or delete an existing one.

To save record press control end and to go back to the dot (.) prompt you press Escape. To run the program at the dot prompt, type Do and name of the program. To open a file, type at the dot prompt Use ( ) filename. To close it as well, type at the dot prompt, close all. To exit from a Dbase program, type at the dot prompt Quit and press enter.

4.5 INPUT, OUTPUT AND FILE SPECIFICATIONS

Input Specification:

This includes the following:

i] Serial number of records

ii] Expected periodic weaning time in Livestock production business.

iii] Number of servicing male

iv] Number of breeding female

v] Expected number of weaners

vi] Cumulative number of animal at a particular weaning time

vii] Periodic total value of Livestock in Naira.

Output Specification:

There are:

i] Pigs population dynamics computation/report sheets.

ii] Rabbits population dynamics computation/report sheets.

File Specification:

The main specified files which could be accessed randomly from a magnetic core memory or a diskette include:

i] Pigs and Rabbits Population dynamics database files

ii] Pigs and Rabbits population dynamics program files

4.6 CHANGE OVER

The changeover from the old system of processing and giving a report on LPD to a new computerised means may take place when:-

i] The system has been proved to the satisfaction of the system analyst and other implementation activities have been completed.

ii] User Managers are satisfied with the result of the system tests, staff-training and reference manuals.

iii] The target data for changeover is due.

The changeover method recommended for this system is the parallel changeover. This process of processing current data by both the manual and new system to cross-check the result and proffer reasons for differences if any is resolved before it is accepted by the user thereby promoting user's confidence. It's main beauty is that the manual system is kept operational and output from the old system should continue to be distributed until the new system has been proved satisfactory for at least one system cycle, using full live data in the real operational environment of place, people, equipment and time.

The critic of this method may complain about the extra overhead cost and the difficulty of user staff having to carry out the different clerical operations for old and new systems in the time available for one.

CHAPTER FIVE

SUMMARY, RECOMMENDATION AND CONCLUSION

5.1 SUMMARY

Data processing of some livestock population dynamics (LPD) for Agricultural Development Projects (ADP) and Institutes many year back has been either unavailable or manually handled. Such a trend in this computer age prevent adequate and detailed information for easy and interesting management and extension of livestock production. If the computation is left in the manual data processors, cases of missing records, duplication of efforts, manual errors, inability to cope with daily workload abounds.

The design and usage of LPD application for the ADP's in Nigeria is a sign of dynamism and progress. With DBASE IV Management System, calculating organising, updating and retrieving large volume of information are faster and easier than with manual system.

5.2 RECOMMENDATIONS

In my desire to present a satisfactory computerisable LPD for the enhancement of efficiency of ADP's in Nigeria, the following recommendations are believed to be useful.

(a) REAL TIME DATA PROCESSING:

The recommended mode of processing LPD data is real time processing system in order to facilitate interaction with the extension clients and livestock managers from any terminal with computer management information software installed.

Under real time mode, the stimulus provided by the external operation or equipment is immediately accepted and processed by the computer system. Each types of animal with its breeding information and the initial number of male and female animals are maintained on-line and stored in a magnetic or floppy disc. Data are processed and system communicate with the user in an interactive or conversational manner with very fast response but not accumulated as in batch processing system.

(b) SECURITY OF DATA

Information security is one of the measures taken to safeguard the availability, integrity and validity of data and information assets. It is believed that LPD information and records are precious and valuable resources, there is a need to protect it from abuse and misuse. Based on this, physical and logical security must be considered. Usually, measures adopted for the physical protection of data and computer systems as sets include:

i] Copy protection to ensure only approved copies are made.

ii] Update protection to protect data validity and integrity.

iii] Backup/restore facility and process to ensure recovery in case of loss of accidental damage.

Logical security is usually provided via software, which controls files access and update activities. Access is possible through assigned passwords which may be changed frequently to minimise breaches (Idowu, 1996).

(c) FILE CONTROL PROCEDURE

To ensure that data about each type of livestock are inputed and outputed correctly. The following control measures should be put into practice.

i] There must be proper checking of input document of LPD. This should be verified manually before they are entered into the system to detect missing or prevent illegal entry.

ii] After input is made into the system, the contents of each field must be verified on the screen before they are finally processed.

(d) BROAD-BASED COMPUTATIONAL LPD AND ADEQUATE PUBLICITY

It is recommended that a broad-based studies on LPD Pigs and Rabbits; and other principal farm animal should be carried out. This is to provide a comprehensive LPD for the ADPs. Further studies should lead to the writing of more Dbase programs that will allow for computation of LPD involving more than one initial servicing male or more than ten initial breeding females.

The use and significance of LPD software in the country Agricultural Development Projects and Institutes should be given wide publicity so that its possible contribution to agricultural developments can be unveiled and acknowledged.

e) SYSTEM REQUIREMENT

The following specified hardware are recommended:

- 486 IBM Computer DX 100 NH2 with 4 MB RAM
- 850 MB Hard disk with 6.0 DOS and
- EPSON LQ 2170 printer.

CONCLUSION

The computerisation of LPD through the use of a Database management system to enhance management and extension activities of livestock production unit of ADP in Nigeria has been confirmed through this project report.

A system has been successfully designed, programmed, debugged, tested and certified workable, though modifications and maintenance could be made whenever deemed necessary. The embedded advantages of such a system like this include:

i] Accuracy

ii] Flexibility

iii] Stability

iv] High speed of operation

v] Multi-purpose

vi] Adequate security and

vii] High capacity/volume

Finally, vis-a-vis above inherent gains, a computational LPD application package is highly recommended for each ADP or any Livestock Production Project or Institute in the country.

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APPENDIX I: MAIN PROGRAM (PIG RAT)

```
SET TALK OFF
SET BELL OFF
SET TITLE OFF
SET STATUS OFF
SET SCOREBOARD OFF
SET CONFIRM ON
RESP=' '
RESP2=0
ANS=.T.
clear
DO WHILE ANS
CLEAR
SET COLOR TO R+/B
@1,15 say "[ RABBIT AND PIG POPULATION DYNAMICS ]"
@3,25 SAY "[ MAIN MENU ]"
set color to g+/b
@4,10 TO 18,60 double
@16,11 to 16,59
set color TO w+/b
@6,20 SAY "[1] RABBIT POPULATION"
@8,20 SAY "[2] PIG POPULATION    "
@10,20 SAY "[3] EXIT TO DBASE    "
@12,20 SAY "[4] EXIT TO DOS      "
SET COLOR TO R+/B
@17,15 SAY "ENTER OPTION." GET RESP
READ
SET COLOR TO W+/B
RESP2=VAL(RESP)
IF RESP2=1
DO RABBITPOP
ENDIF
IF RESP2=2
DO PIGPOP
ENDIF
IF RESP2=3

EXIT
ENDIF
IF RESP2=4

QUIT
ENDIF
ENDDO


SET CONFIRM OFF
SET TALK ON
SET BELL ON
SET TITLE ON
SET STATUS ON
SET SCOREBOARD ON
```

```
PROCEDURE PIGPOP
SET PROCEDURE TO PIGINTE
RESP='  '
RESP2=0
ANSS=.T.
clear
DO WHILE ANSS
CLEAR
SET COLOR TO R+/B
@1,15 say "[ RABBIT AND PIG POPULATION DYNAMICS ]"
@3,35 SAY "[ PIG MAIN MENU ]"
set color to g+/b
@4,10 TO 18,60 double
@16,11 to 16,59
set color TO w+/b
@6,20 SAY "[1] DATA ENTRY        "
@8,20 SAY "[2] DATA MODIFICATION"
@10,20 SAY "[3] DATA DELETION    "
@12,20 SAY "[4] REPORT           "
@14,20 SAY "[5] EXIT TO MAIN MENU"
SET COLOR TO R+/B
@17,15 SAY "ENTER OPTION:" GET RESP
READ
SET COLOR TO W+/B
RESP2=VAL(RESP)

IF RESP2=1
DO CREATEDATA
ENDIF

IF RESP2=2
DO PIGMOD
ENDIF
IF RESP2=3
DO PIGDEL
ENDIF
IF RESP2=4
DO PIGREPORT
ENDIF
IF RESP2=5
ANSS=.F.
ENDIF
ENDDO
SET PROCEDURE TO
RETURN
```

```
PROCEDURE RABBITPOP
SET PROCEDURE TO RABBIT
RESP=
RESP2=0
ANS3=.T.
clear
DO WHILE ANS3
CLEAR
SET COLOR TO R+/B
@1,15 say "[ RABBIT AND PIG POPULATION DYNAMICS ]"
@3,35 SAY "[ RABBIT MAIN MENU ]"
Set color to g+/b
@4,10 TO 18,60 double
@16,11 to 16,59
Set color TO w+/b
@6,20 SAY "[1] DATA ENTRY          "
@8,20 SAY "[2] DATA MODIFICATION"
@10,20 SAY "[3] DATA DELETION     "
@12,20 SAY "[4] REPORT            "
@14,20 SAY "[5] EXIT TO MAIN MENU"
SET COLOR TO R+/B
@17,15 SAY "ENTER OPTION." GET RESP
READ
SET COLOR TO W+/B
RESP2=VAL(RESP)
IF RESP2=1
DO RABBITDATA
ENDIF

IF RESP2=2
DO RABBITMOD
ENDIF
IF RESP2=3
DO RABBITDEL
ENDIF
IF RESP2=4
DO RABBITREPORT
ENDIF
IF RESP2=5
ANS3=.F.
ENDIF


ENDDO
SET PROCEDURE TO
RETURN
```

```
PROCEDURE RABBITPOP
SET PROCEDURE TO RABBIT
RESP='  '
RESP2=0
ANS3=.T.
clear
DO WHILE ANS3
CLEAR
SET COLOR TO R+/B
@1,15 say "[ RABBIT AND PIG POPULATION DYNAMICS ]"
@3,35 SAY "[ RABBIT MAIN MENU ]"
set color to g+/b
@4,10 TO 18,60 double
@16,11 to 16,59
set color TO w+/b
@6,20 SAY "[1] DATA ENTRY          "
@8,20 SAY "[2] DATA MODIFICATION"
@10,20 SAY "[3] DATA DELETION     "
@12,20 SAY "[4] REPORT            "
@14,20 SAY "[5] EXIT TO MAIN MENU"
SET COLOR TO R+/B
@17,15 SAY "ENTER OPTION:" GET RESP
READ
SET COLOR TO W+/B
RESP2=VAL(RESP)
IF RESP2=1
DO RABBITDATA
ENDIF

IF RESP2=2
DO RABBITMOD
ENDIF
IF RESP2=3
DO RABBITDEL
ENDIF
IF RESP2=4
DO RABBITREPORT
ENDIF
IF RESP2=5
ANS3=.F.
ENDIF


ENDDO
SET PROCEDURE TO
RETURN
```

Appendix IIa

```
PROCEDURE CREATEDATA
clear
ans=.T.
USE PIGINTE
DO WHILE ANS
 RESPP1=' '
 SSNOP1=0
 RESP2P1=' '
 CLEAR
   SET COLOR TO RB+/B
   @0,20 SAY "PIGS POPULATION DYNAMICS "
   @1,20 SAY "-------------------------"
   @3,30 SAY "[ RECORD CREATION ]"
   SET COLOR TO G/B
   @4,1 TO 23,75 DOUBLE
   SET COLOR TO W+/B
   @5,2 SAY "SERIAL NUMBER." GET SSNOP1
   READ
   LOCATE FOR S_NO=SSNOP1
   IF EOF()
   CLEAR
   SET COLOR TO RB+/B
   @0,20 SAY "PIGS POPULATION DYNAMICS "
   @1,20 SAY "-------------------------"
   @3,30 SAY "[ RECORD CREATION ]"
   SET COLOR TO G/B
   @4,1 TO 23,75 DOUBLE
   SET COLOR TO W+/B
   @5,10 SAY "SERIAL NUMBER.              " GET S_NO
   @7,10 SAY "WEANING PERIOD.             " GET WTIME
   @9,10 SAY "NUMBER OF BOAR.             " GET BOAR
   @11,10 SAY "NUMBER OF SOW.              " GET SOW
   @13,10 SAY "NUMBER OF WEANERS.          " GET MWE
   @15,10 SAY "CUMMULATIVE NUMBER.          " GET CNO
   @17,10 SAY "PERIODIC VALUE.             " GET PVAL
   @21,10 SAY "GROSS VALUE.                 " GET GVAL
   APPEND BLANK
   READ
   ELSE
   @15,20 SAY "RECORD ALREADY EXISTS"
   ENDIF
   @24,20 SAY "MORE RECORD TO ENTER(Y/N)?" GET RESP2P1
   READ
   IF UPPER(RESP2P1)="N"
   ANS=.F.
   ENDIF
   ENDDO
   CLEAR
   @20,20 SAY "END OF DATA ENTRY" GET RESPP1
   READ
   RETURN
```

Appendix IIIa

```
PROCEDURE RABBITDATA
clear
ans=.T.
USE RABBIT
DO WHILE ANS
RESPR1=' '
SSNOR1=0
RESP2R1=' '
CLEAR
SET COLOR TO RB+/B
@0,20 SAY "RABBITS POPULATION DYNAMICS "
@1,20 SAY "----------------------------"
@3,30 SAY "[ RECORD CREATION ]"
SET COLOR TO G/B
@4,1 TO 23,75 DOUBLE
SET COLOR TO W+/B
@5,2 SAY "SERIAL NUMBER." GET SSNOR1
READ
LOCATE FOR S_NO2=SSNOR1
IF EOF()
CLEAR
SET COLOR TO RB+/B
@0,20 SAY "RABBITS POPULATION DYNAMICS "
@1,20 SAY "----------------------------"
@3,30 SAY "[ RECORD CREATION ]"
SET COLOR TO G/B
@4,1 TO 23,75 DOUBLE
SET COLOR TO W+/B
@5,10 SAY "SERIAL NUMBER.              " GET S_NO2
@7,10 SAY "WEANING PERIOD.             " GET WPERIOD
@9,10 SAY "NUMBER OF BUCK.             " GET BUCK
@11,10 SAY "NUMBER OF DOE.              " GET DOE
@13,10 SAY "NUMBER OF WEANERS.          " GET MWEANER
@15,10 SAY "CUMMULATIVE NUMBER.         " GET CUMNO
@17,10 SAY "PERIODIC VALUE.             " GET PERIODVAL
APPEND BLANK
READ
ELSE
@15,20 SAY "RECORD ALREADY EXISTS"
ENDIF
@24,20 SAY "MORE RECORD TO ENTER (Y/N)?" GET RESP2R1
READ
IF UPPER(RESP2R1)="N"
ANS=.F.
ENDIF
ENDDO
CLEAR
@20,20 SAY "END OF DATA ENTRY" GET RESPR1
READ
RETURN
```

Appendix IIIb

```
PROCEDURE RABBITDEL
clear
ans=.T.
USE RABBIT
DO WHILE ANS
RESPR2=' '
SSNOR2=0
RESP2R2=' '
CLEAR

SET COLOR TO RB+/B
@0,20 SAY " RABBITS POPULATION DYNAMICS "
@1,20 SAY "----------------------------"
@3,30 SAY "[ RECORD DELETION ]"


SET COLOR TO G/B
@4,1 TO 23,75 DOUBLE
SET COLOR TO W+/B
@5,2 SAY "SERIAL NUMBER:" GET SSNOR2
READ
LOCATE FOR S_NO2=SSNOR2
IF .NOT. EOF()
CLEAR
SET COLOR TO RB+/B
@0,20 SAY "RABBITS POPULATION DYNAMICS "
@1,20 SAY "----------------------------"
@3,30 SAY "[ RECORD DELETION ]"
SET COLOR TO G/B
@4,1 TO 23,75 DOUBLE
SET COLOR TO W+/B
@5,10 SAY "SERIAL NUMBER:              " + STR(S_NO2)
@7,10 SAY "WEANING PERIOD:             " + STR(WPERIOD)
@9,10 SAY "NUMBER OF BUCK:             " + STR(BUCK)
@11,10 SAY "NUMBER OF DOE:              "+ STR(DOE)
@13,10 SAY "NUMBER OF WEANERS:          "+ STR(MWEANER)
@15,10 SAY "CUMMULATIVE NUMBER:         " + STR(CUMNO)
@17,10 SAY "PERIODIC VALUE:             " + STR(PERIODVAL)
@22,20 SAY "DELETE THIS RECORD (Y/N)?" GET RESPR2
READ
IF UPPER(RESPR2)="Y"
DELETE
PACK
ENDIF
ELSE
@15,20 SAY "RECORD NOT EXIST"
ENDIF
@24,20 SAY "MORE RECORD TO DELETE (Y/N)?" GET RESP2R2
READ
IF UPPER(RESP2R2)="N"
ANS=.F.
ENDIF
ENDDO
CLEAR
@20,20 SAY "END OF DELETION" GET RESPR2
READ

RETURN
```

Appendix IIIc

```
PROCEDURE RABBITMOD
clear
ans=.T.
USE RABBIT
DO WHILE ANS
RESPR3=' '
REPPR3=' '
SSNOR3=0
RESP2R3=' '
CLEAR
SET COLOR TO RB+/B
@0,20 SAY "RABBITS POPULATION DYNAMICS "
@1,20 SAY "----------------------------"
@3,30 SAY "[ MODIFYING RECORDS ]"

SET COLOR TO G/B
@4,1 TO 23,75 DOUBLE
SET COLOR TO W+/B
@5,2 SAY "SERIAL NUMBER:" GET SSNOR3
READ
LOCATE FOR S_NO2=SSNOR3
IF .NOT. EOF()
CLEAR
SET COLOR TO RB+/B
@0,20 SAY "RABBITS POPULATION DYNAMICS "
@1,20 SAY "----------------------------"
@3,30 SAY "[ MODIFYING RECORDS ]"
SET COLOR TO G/B
@4,1 TO 23,75 DOUBLE
SET COLOR TO W+/B
@5,10 SAY "SERIAL NUMBER:              " + STR(S_NO2)
@7,10 SAY "WEANING PERIOD:             " + STR(WPERIOD)
@9,10 SAY "NUMBER OF BUCK:             " + STR(BUCK)
@11,10 SAY "NUMBER OF DOE:              "+ STR(DOE)
@13,10 SAY "NUMBER OF WEANERS:          "+ STR(MWEANER)
@15,10 SAY "CUMMULATIVE NUMBER:         " + STR(CUMNO)
@17,10 SAY "PERIODIC VALUE:             " + STR(PERIODVAL)
@22,20 SAY "MODIFY THIS RECORD (Y/N)?" GET RESPR3
READ
IF UPPER(RESPR3)="Y"
CLEAR
SET COLOR TO RB+/B
@0,20 SAY "RABBITS POPULATION DYNAMICS "
@1,20 SAY "----------------------------"
@3,30 SAY "[ MODIFYING RECORDS ]"
SET COLOR TO G/B
@4,1 TO 23,75 DOUBLE
SET COLOR TO W+/B
@5,10 SAY "SERIAL NUMBER:              " GET S_NO2
@7,10 SAY "WEANING PERIOD:             " GET WPERIOD
@9,10 SAY "NUMBER OF BUCK:             " GET BUCK
@11,10 SAY "NUMBER OF DOE:              " GET DOE
@13,10 SAY "NUMBER OF WEANERS:          " GET MWEANER
@15,10 SAY "CUMMULATIVE NUMBER:         " GET CUMNO
@17,10 SAY "PERIODIC VALUE:             " GET PERIODVAL
READ
ENDIF
ELSE
@15,20 SAY "RECORD NOT EXIST"
ENDIF
@24,20 SAY "MORE RECORD TO MODIFY (Y/N)?" GET RESP2R3
READ
IF UPPER(RESP2R3)="N"
ANS=.F.
ENDIF
ENDDO
CLEAR
@20,20 SAY "END OF RECORDS MODIFICATION" GET REPPR3
READ
RETURN
```

Appendix IVa

COMPUTATION REPORT OF PIG POPULATION DYNAMICS (OUTPUT DESIGN)

RECOMMENDED BREEDS: Duroc, Large White/Black, Local or a Crossbreed.

SYSTEM OF MANAGEMENT: Intensive or Semi-Intensive

RIPE AGE FOR THE FEMALE TO BE MATED: 9 Months

TIME TO RE-SERVICE: 4 Months

RATIO OF BOAR TO BREEDING SOW: 1:10

AVERAGE GESTATION PERIOD: 114 days

EXPECTED AVERAGE LITTERS SIZE: 10

PIG WEANING AGE: 4 - 5 Months

AVERAGE NO OF WEANERS/LITTER: 8

PIGLET EXPECTED SIX RATIO/LITTER: 5 Males: 3 females

CURRENT VALUE OF AN ADULT AND A WEANER: ₦4,500 and ₦1,500 resp.

S/N	W.PER (MTH)	BOAR	SOW	M.WEAN	CUM NO.	PER.VAL(₦)
1	0.0	1	1	0	2	3000
2	13.0	0	0	8	10	12000
3	19.0	0	0	8	18	12000
4	25.0	0	0	8	24	12000
5	26.0	0	3	24	48	108000
6	31.0	0	0	8	56	12000
7	32.0	0	3	23	80	108000
8	37.0	0	0	8	88	12000
9	38.0	0	3	24	112	108000

Appendix IVb

COMPUTATION REPORT OF RABBIT POPULATION DYNAMICS (OUTPUT DESIGN)

RECOMMENDED BREEDS: California, Chinchila, New Zealand White.

SYSTEM OF MANAGEMENT: Intensive or Semi-Intensive

RIPE AGE FOR THE FEMALE TO BE MATED: 7 Months

TIME TO RE SERVICE: 7 - 8 weeks

RATIO OF BOAR TO BREEDING SOW: 1 : 8

AVERAGE GESTATION PERIOD: 31 - 32 days

EXPECTED AVERAGE LITTERS SIZE: 8

EXPECTED SEX RATIO/LITTER: 3 Males: 2 females

FRIER WEANING AGE: 7 - 8 Weeks

AVERAGE NO OF WEANERS/LITTER: 5

CURRENT VALUE OF AN ADULT AND A WEANER: ₦4,500 and ₦1,500 resp.

S/N	W.PER (MTH)	BOAR	SOW	M.WEAN	CUM NO.	PER.VAL(₦)
1	0.0	1	1	0	2	300
2	8.0	0	0	5	7	650
3	11.5	0	0	5	12	650
4	15.0	0	0	5	17	650
5	16.0	0	3	15	32	2700
6	18.5	0	0	5	37	650
7	19.5	0	3	15	42	2700
8	22.0	0	0	5	47	650
9	23.0	1	3	15	63	2700
10	24.0	1	9	45	107	8100
11	25.5	0	0	5	112	650
12	26.5	0	3	15	127	2700
13	27.5	2	9	45	172	8100
14	29.0	0	0	5	177	650
15	31.0	1	9	45	222	8100

Appendix IVc

COMPUTATION REPORT OF PIG POPULATION DYNAMICS (STARTING WITH FIVE SOWS)

RECOMMENDED BREEDS:	Duroc, Large White/Black, Local or a Crossbreed.
SYSTEM OF MANAGEMENT:	Intensive or Semi-Intensive
RIPE AGE FOR THE FEMALE TO BE MATED:	9 Months
TIME TO RE-SERVICE:	4 Months
RATIO OF BOAR TO BREEDING SOW:	1:10
AVERAGE GESTATION PERIOD:	114 days
EXPECTED AVERAGE LITTERS SIZE:	10
PIG WEANING AGE:	4 - 5 Months
AVERAGE NO OF WEANERS/LITTER:	8
PIGLET EXPECTED SIX RATIO/LITTER:	5 Males: 3 females
CURRENT VALUE OF AN ADULT AND A WEANER:	₦4,500 and ₦1,500 resp.

S/N	W.PER (MTH)	BOAR	SOW	M.WEAN	CUM NO.	PER.VAL(₦)
1	0.0	1	5	0	10	15000
2	13.0	0	0	40	50	60000
3	19.0	0	0	40	90	60000
4	25.0	0	0	40	120	60000
5	26.0	0	15	120	240	540000
6	31.0	0	0	40	280	60000
7	32.0	0	15	115	400	540000
8	37.0	0	0	40	440	60000
9	38.0	0	15	120	560	540000

Appendix IVd

COMPUTATION REPORT OF PIG POPULATION DYNAMICS (STARTING WITH 9 SOWS)

RECOMMENDED BREEDS: Duroc, Large White/Black, Local or a Crossbreed.

SYSTEM OF MANAGEMENT: Intensive or Semi-Intensive

RIPE AGE FOR THE FEMALE TO BE MATED: 9 Months

TIME TO RE-SERVICE: 4 Months

RATIO OF BOAR TO BREEDING SOW: 1:10

AVERAGE GESTATION PERIOD: 114 days

EXPECTED AVERAGE LITTERS SIZE: 10

PIG WEANING AGE: 4 - 5 Months

AVERAGE NO OF WEANERS/LITTER: 8

PIGLET EXPECTED SIX RATIO/LITTER: 5 Males: 3 females

CURRENT VALUE OF AN ADULT AND A WEANER: ₦4,500 and ₦1,500 resp.

S/N	W.PER (MTH)	BOAR	SOW	M.WEAN	CUM NO.	PER.VAL(₦)
1	0.0	1	9	0	18	27000
2	13.0	0	0	72	90	108000
3	19.0	0	0	72	162	108000
4	25.0	0	0	72	216	108000
5	26.0	0	27	216	432	972000
6	31.0	0	0	72	504	108000
7	32.0	0	27	207	720	972000
8	37.0	0	0	72	792	108000
9	38.0	0	27	216	1008	972000

Appendix IVe

COMPUTATION REPORT OF RABBIT POPULATION DYNAMICS (STARTING WITH FOUR DOES)

RECOMMENDED BREEDS: California, Chinchila, New Zealand White.

SYSTEM OF MANAGEMENT: Intensive or Semi-Intensive

RIPE AGE FOR THE FEMALE TO BE MATED: 7 Months

TIME TO RE-SERVICE: 7 - 8 weeks

RATIO OF MALE TO FEMALE: 1 : 8

AVERAGE GESTATION PERIOD: 31 - 32 days

AVERAGE NO OF WEANERS/LITTER: 5

EXPECTED SEX RATIO/LITTER: 3 Males: 2 females

CURRENT VALUE OF AN ADULT AND A WEANER: ₦4,500 and ₦1,500 resp.

S/N	W.PER (MTH)	BOAR	SOW	M.WEAN	CUM NO.	PER.VAL(₦)
1	0.0	1	4	0	8	1200
2	8.0	0	0	20	28	2600
3	11.5	0	0	20	48	2600
4	15.0	0	0	20	68	2600
5	16.0	0	12	60	128	2600
6	18.5	0	0	20	148	10800
7	19.5	0	12	60	168	2600
8	22.0	0	0	20	188	10800
9	23.0	4	12	60	248	32400
10	24.0	4	36	180	428	8100
11	25.5	0	0	20	448	2600
12	26.5	0	12	60	508	10800
13	27.5	8	36	180	688	32400
14	29.0	0	0	20	708	2600
15	31.0	4	36	180	888	32400

Appendix IVf

COMPUTATION REPORT OF RABBIT POPULATION DYNAMICS (STARTING WITH 8 DOES)

RECOMMENDED BREEDS: California, Chinchila, New Zealand White.

SYSTEM OF MANAGEMENT: Intensive or Semi-Intensive

RIPE AGE FOR THE FEMALE TO BE MATED: 7 Months

TIME TO RE-SERVICE: 7 - 8 weeks

RATIO OF MALE TO FEMALE: 1 : 8

AVERAGE GESTATION PERIOD: 31 - 32 days

AVERAGE NO OF WEANERS/LITTER: 5

EXPECTED SEX RATIO/LITTER: 3 Males: 2 females

CURRENT VALUE OF AN ADULT AND A WEANER: ₦4,500 and ₦1,500 resp.

S/N	W.PER (MTH)	BOAR	SOW	M.WEAN	CUM NO.	PER.VAL(₦)
1	0.0	1	8	0	16	2400
2	8.0	0	0	40	56	5200
3	11.5	0	0	40	96	5200
4	15.0	0	0	40	136	5200
5	16.0	0	24	120	256	5200
6	18.5	0	0	40	296	21600
7	19.5	0	24	120	336	5200
8	22.0	0	0	40	376	21600
9	23.0	8	24	120	496	5200
10	24.0	8	72	360	856	64800
11	25.5	0	0	40	896	5200
12	26.5	0	24	120	1016	21600
13	27.5	16	72	360	1376	64800
14	29.0	0	0	40	1416	5200
15	31.0	8	72	360	1776	64800