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THE CONSEQUENCES OF SMALL RICE FARM MECHANIZATION PROJECT

Working Paper No. 54

AN EVALUATION OF MECHANIZATION DATA USING THE FAO's MANAGEMENT DATA COLLECTION AND ANALYSIS SYSTEM (FMDCAS)

By

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ABSTRACT

This paper has two major purposes. For readers directly concerned with the 'Consequences of Mechanization' project the aim is to provide a critical commentary on the strengths and weaknesses of information produced by the FMDCAS. The appendices contain some detail about the operation of the programs. Secondly, for readers outside the project the aim is to provide a record of the implementation of FMDCAS in the 'Consequences of Mechanization' project at IRRI; to give an idea of the modifications which were adopted and their consequences upon the use of the system. The paper opens with a brief introduction to the FMDCAS system. There follows an outline of the modifications, together with a discussion of some of the problems encountered in their implementation at IRRI. Finally there is discussion of the strengths and weaknesses of the FMDCAS in relation to the study of the consequences of mechanization upon small rice farms.

INTRODUCTION

The farm survey component of the 'Consequences of Mechanization' project is designed around the Farm Management Data Collection and Analysis System (FMDCAS) developed by the FAO (FAO, 1977). This system has a series of standardized survey instruments which also serve as coding forms for computer analysis. The data is processed using a series of programs provided by FAO and which summarize the data into analyses by individual farm and by individual crop. By selecting groups of farms or crops, averages can be calculated and comparisons made between groups.

The FMDCAS aims to provide a general-purpose analysis system for farm management data. Because of the complexity of the system and its programs, a brief introduction to it follows.

Description of Forms

Primary data is collected on to a series of standard forms. The forms are designed for punching directly to cards and the layout of the forms provides for up to eighty characters of data. Hence each form becomes an eighty-column record of data.

The subject of each form or record is indicated by a numeric code in the first three columns. The project number (identical for all farms in a 'project') lies in columns 78-80, and the farm number (identical for all records referring to a given farm) lies in columns 75-77.

'Subjects' may be broadly categorized as follows:

Codes	Subject
0-900	Resource Utilization
901-910	Project Description
911-921	Resource Inventory

Collection of Data

Data collection takes the form of a farm survey in which Resource Inventory forms are filled in for each farm. These described the farm and its resources at the start of the survey period. Then as the farming season progresses, the uses of resources (i.e. land, labour, cash etc.) are recorded on the Resource Utilization (RU) forms. Hence data collection can be at any time interval at the choice of the investigator. A major flexibility of the system as a whole is that it enables large or small amounts of detail to be gathered. The resource utilization form has a standard layout and relies extensively on the use of codes to identify the transaction being recorded.

Presentation of Data for Analysis

Data may be punched directly on to cards or tape. It is made available to the programs as two (tapes)/file. One contains the Project Description records and the other contains the Resource Inventory records plus the Resource Utilization records. The latter records may be in any order.

Outline of the Analytical Programs

The aim of the programs is to take the raw survey data and to produce farm summaries, farm group averages, crop summaries and crop averages. The process by which the final outputs are obtained is sequential: output files from one program serve as input files for the next. The sequence is shown in Diagram 1.

At IRRI data is initially validated and converted to the standard FAO formats using VALIDATA and WEBEDIT (see later). The FAO programs CRUDCH, BSORT (a standard sorting program) BREAK and BSPLIT are then used to change the data into a form suitable for the farm analysis program FTSCAL and the crop analysis program CTSCAL.

Appendix 1 lists the major FAO programs and gives a brief description of the function of each. Appendix 2 shows details of the operation of program FTSCAL together with flowcharts and annotated output. Appendix 3 gives similar details for program CTSCAL.

In addition to printed output, the programs store the farm and crop summaries on tape file which can be used as input to standard statistical packages (e.g. SAS, SPSS, etc.).

USING FMDCAS IN THE "CONSEQUENCES OF MECHANIZATION PROJECT"

Numbers of Households; Seasons recorded

There are four sites (one each in Philippines, and Thailand and two in Indonesia). There are approximately 320 households per site in the farm survey component and 50 households per site in the farm record-keeping component. The total numbers are 1320 survey households and 220 record-keeping households.

Depending on the date of termination of the project there will be between 2 and 5 seasons' data collected at each site.

Modifications to the FMDCAS Forms

The FMDCAS system is an attempt at a generalized farm management analysis system for use throughout the world. As such it has to make assumptions about what data should be included and how it should be analyzed. With this in mind the original FAO forms were modified at IRRI to allow further details to be gathered specific to the Asian rice-farms' situation (IRRI, 1978a). This meant that the analysis could not follow the FAO programs directly.

The changes were as follows:

Additional subjects. An additionalfifteen subject-forms 930-945 were designed. All but one dealt with data unrelated to that required by the FMDCAS system. The subjects included further details on machinery use, non-agricultural assets and the complete list is given in Table 1. None of these forms could be analyzed using the FMDCAS system and so other arrangements had to be made.

One form, 939 Disposal of Product, was designed to record all crop output which would, under standard FMDCAS procedure, have been recorded on resource utilization forms.

Modification to Resource Inventory Forms. Slight changes were made in the layouts of forms 911-020, 912, 913, 915, 916, 917 and 918.

Additional Codes. The FMDCAS uses many codes. The major categories include subject codes (Resource Utilization - crops, livestock, general farm, off-farm, and Resource Inventory), Type of Input-output codes (Labour, power, materials, etc.) and Activity codes. Modifications were made particularly to the type of input output codes to allow better specification of pesticide materials.

The precise specifications of FMDCAS codes and formats is given in FAO (1977), whilst the specification of the codes and formats in use at IRRI is given in IRRI (1980).

Editing IRRI codes and formats to FMDCAS specifications

A program WEBEDIT was written to convert the IRRI dataset to FMDCAS specification. Appendix 4 gives details of the structure and functions of this program.

SOME PRACTICAL DIFFICULTIES WITH FMDCAS

There is certainly a need for a general-purpose farm management survey package and FAO's contribution to this end is recognized. However, there have been some disadvantages in its use and these are presented here for the benefit of existing or potential users or potential system designers.

Documentation.

The system is quite specific as to data requirements and the output (e.g. from FTSCAL and CTSCAL) is fixed. Because of this the program can be used purely as a 'black box' with no understanding of the links between inputs and outputs. However, if even the slightest change is contemplated, in coding for instance, it is necessary to determine the effect.

At IRRI, as has been seen, many changes in the data collection instruments were incorporated and it was very difficult to assess just what their implications might be. The major source of information about the system is Bulletin 34 (FAO, 1977). However, there are intermingled in its pages general points about the objectives and conduct of farm surveys together with specific points about FMDCAS. In fact there is very little information given about how the programs work or what if any flexibility exists.

Program documentation is minimal and seems, to this writer at least, inadequate for applications in isolated situations where the inevitable shortage of trained personnel persists.

Use of Codes

The system makes extensive use of codes which provide much of the flexibility necessary. But problems naturally arise (e.g. pesticide identification at IRRI). In fact close inspection of the program shows that users can make up their own codes which are acceptable to the program by using the interstices of the existing set of codes. Allocation of the codes to headings on the output is generally straightforward but no precise information is given unless the programs are inspected. Appendices 2.41 and 2.42 provide some details.

A possible improvement to the system would be to specify only the broad headings to be used on the output and for the user to be given a series of code ranges for these headings. Within the code ranges he could set his own codes as he wished and the program would accept them.

Error Recognition, Checking and Correction.

Any computerized survey and analysis system involves a number of stages from field data collection, through key punching, to computerized analysis. Errors and inconsistencies in data collection are bound to arise particularly in farm survey work where many transactions are interlinked and where overall consistency can perhaps only be judged at the end of the cropping season.

The difficulty with the current FMDCAS system is that the first time the data for a farm is put together in any recognizable form is as output from FTSCAL, CTSCAL or LTSCAL. This is after at least four programs have been run in sequence from primary data. If an error is discovered at this stage then the programs must be re-run and the files re-created before the results can be seen again.

Furthermore the data is likely by now to be far removed in both time and space from its origin. Unfortunately there is no easy way of checking, for instance, subtotals of hours used on a crop. And once the data has left the immediate site the chances of any but major errors being spotted gets less, whilst the cost of correction increase.

The error-recognition problem can, of course, be alleviated by the use of such programs as VALIDATA which tests for particular values of variables, ranges etc. VALIDATA also can check for consistency across forms, specification of adequate checks is complex but when items need to be recognized under perhaps a range of codes.

Another means of alleviating the problem is to develop a program which decodes the records back into a 'human-readable' form. This has been done at IRRI for the resource-utilization records and eases the problem somewhat.

However it is hard to avoid the conclusion that capability for error recognition and correction must be designed into the data collection system before the data gets to the computer. Perhaps the sequence of forms should be designed in such a way that a broad picture of the farm's characteristics and performance is obtained before the data reaches the computer. If this operation were carried out at the survey sites the central data processing unit would be surer of getting 'clean' data.

Interpretation of the FTSCAL and CTSCAL Output.

The layout of these outputs takes the form of a fixed-design table; one page of output for each form or field (Appendices 2.5 and 3.6). Since the layout is fixed and it produces fewer numbers than are usually provided in the original data, logically some information must be lost. Obviously the importance of this loss varies from one application of FMDCAS to another. For the application under discussion here the main problems were considered to be the lack of detail on mechanical inputs, the lack of sexual differentiation of labour inputs, and the lack of information about cropping intensity.

The only way round the 'information-loss' problem is to allow the user to construct his own output tables, which is not possible using existing FMDCAS programs. Secondly, it is most important that the user be able to understand the derivation of the items shown in Tables. In most cases the derivation is obvious and needs no further explanation. But there are more obscure items where no definitions are provided. Examples are some of the resource productivities on the FTSCAL output and some of the overhead costs on the CTSCAL output. Again the user must investigate within the programs to clear these matters up.

Finally, there is a slight problem arising from the suppression of zeroes on many places. Admittedly this leads to a clearer output, but it does mean that if there is a blank shown in a particular position where there might possibly be a number then the user is unsure as to whether (1) the program does not calculate it, (2) the data was not recorded, or (3) the data was recorded and found to be zero.

POTENTIAL CONTRIBUTION OF FMDCAS PROGRAMS TOWARD THE TESTING OF 'CONSEQUENCES OF MECHANZIATION' HYPOTHESIS

A Methodological Note

The survey is a multi-site cross-sectional comparison of mechanized versus non-mechanized farms. As opposed to 'before-after' studies which look at the same farms at different stages in the mechanization process, this design aims to infer the effects of mechanization by comparing the two populations at a point in time. The danger of the present design is that it may attribute to mechanization many effects which may be due to other factors. The stratification procedure (Operations Handbook No. 1 p3) recognizes this with respect to irrigation, but the analysis should bear this issue in mind at all stages. A further point is that mechanization should be viewed as a continuing process. It is well known that farmers differ in their rates of uptake of new technology so it is hazardous to assume that if the non-mechanized farmers adopted mechanization, their farming systems and results would approximate to their mechanized neighbours.

Looking for the Consequences of Mechanization

The consequences of mechanization may be sought under a variety of headings. The search for mechanization implies the setting-up and testing of hypotheses as outlined in the Workshop Report (IRRI, 1978b) pages 6-9. The major categories of effects are those concerned with output, use of inputs, income from all sources, and employment.

Sources of growth in output among the mechanized farms might include a higher yield per hectare, higher cropping intensity, changes in cropping

pattern to higher-valued crops, and the inclusion of extra land into cropped cultivation. If significant differences were found in any of these categories, further analysis would be indicated.

Changes in use of inputs might occur as the result of substitution of direct labour or animal costs for machinery costs (fixed and variable) There may also be changes in credit costs or use of other inputs which might confound any yield effect found above.

Changes in total household income might arise from changes in output or inputs above, or there may be differences in household income due to increased opportunity for off-farm or non-farm income.

As far as employment is concerned, there may be direct replacement of labour by machines; seasonal operation effects; animal related effects; cropping intensity effects; and others (IRRI, 1978b, p6).

The foregoing is only a cursory glance at areas for investigation. Any analysis of data must expect to develop as the results become available.

How FMDCAS can help

The FMDCAS programs provide individual farm, crop and livestock summaries (see Appendices 2.5 and 3.5) plus means by groups of farms for similar variables. These should allow investigators to develop an over view of the data and also start testing some of the hypotheses listed in the 1978 Workshop Report (IRRI 1978).

The Farm Analysis Summary Table (Appendix 2.5) gives an income and expenditure account, an analysis of labour inputs by operation and month, a net worth statement and various other information. All this information is also provided as group means. Changes in labour used by operation will therefore be easily computed. Also possible will be a detailed analysis of the composition of changes in household income, cropping pattern and use of hired labour. The Crop Analysis Summary Table (Appendix 3.5) gives more details on levels of inputs and outputs in both physical and financial form. There is emphasis on powered inputs used and this will enable us to quantify the various degrees of mechanization within the broad groupings already defined. For example, we should be able to identify the degree of complementarity between irrigation, mechanization and the improved varieties. The Livestock Analysis Summary Table (FAO 1977, Table 3) will provide details on inputs used by carabaos which might be replaced by various forms of mechanization.

Gaps in the analysis provided by FMDCAS

None of the IRRI-designed forms 930-945 can be handled using the FMDCAS programs. These forms deal with such items as the details of sharecropping, cropping pattern history, machinery reliability and land reclamation. Furthermore, the FMDCAS programs do not provide analyses of labour in terms of hired, unpaid, regular or casual work. They aggregate man, woman and child hours to 'man-days' using a standard formula. Thus other means are needed to address questions as to the changes in the type of labour used for rice production which may in turn lead to conclusions about the employment prospects with and without mechanization. What happens to hired labour inputs? Are certain operations usually carried out by family labour under non-mechanized conditions? What happens to these operations when mechanization takes place? These and many other questions must be answered using other analysis packages.

Secondly the FMDCAS group-averaging programs produce means but do not provide variances for significance testing. This last type of analysis will need SPSS or some similar package.

Thirdly it is important not to accept differences in means as necessarily providing any evidence about causal relationships between mechanization inputs and yields, incomes and employment levels. Given the strictures at the start of this section it is to be expected that the observed effects have multiple causation. Some sort of multivariate statistical analysis must therefore be employed.

REFERENCES

F.A.O. (1977), Farm Management Data Collection and Analysis System; Agricultural Services Bulletin 34; Rome pp. 159.

F.A.O. (1980), FMDCAS Documentation Nov. 1980; Agricultural Services Division, FAO, Rome pp. 6.

I.R.R.I. (1978a), The Consequences of Small Rice Farm Mechanization - A Project Proposal; Los Baños, pp. 32.

I.R.R.I. (1978b), The Consequences of Small Farm Mechanization, A Workshop Report; Los Baños, pp. 27.

Moran P. and Unson D. (1980), Operations Handbook No. 1; Los Baños, Agricultural Engineering Dept., pp. 240.

Table 1: Additional subject forms

Subject Code	Subject
930	Demographic Information
931	Landlord's contribution to cultivation expenses
932	Cropping Pattern History
933	Machine use and changes in cropping pattern
934	Other Assets; non-agricultural land and vehicles
935	Other Assets; home consumer durables
936	Machinery purchase decisions
937	Machinery use, income, maintenance
938	Machinery breakdown, repair
939	Disposal of produce
940	Sale and Marketing
941	Land reclamation
942	Extension services used
943	Work opportunities/preferences of landless labourers
944	Actual/ideal dates for crucial farm activities
945	Animal diseases; accidents with animals.

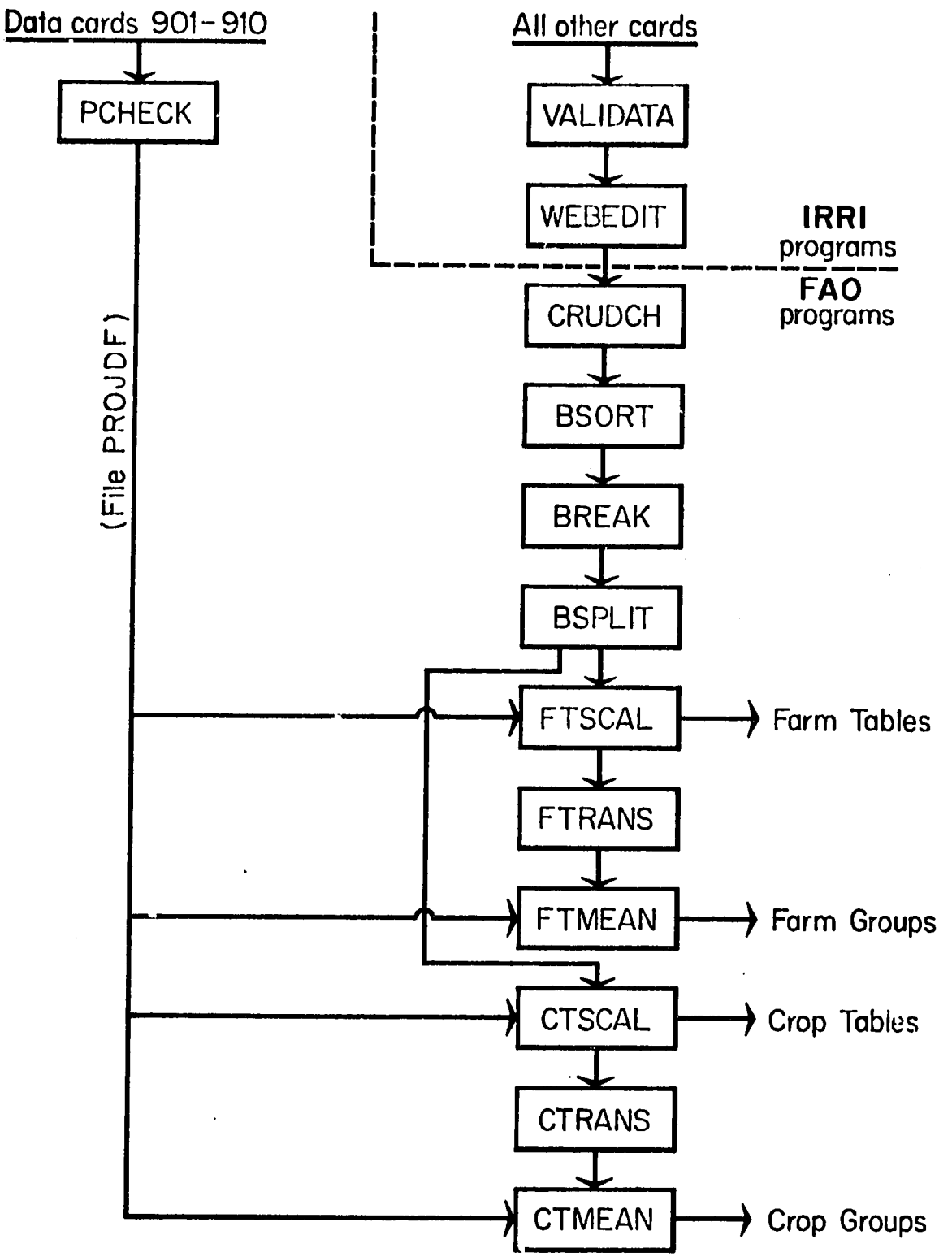


Diagram 1. Using the FAO system in the consequences of mechanization project.

APPENDICES

1. Functions of programs used in getting output from the FMDCAS system
2. Structure and functions of program FTSCAL.
3. Structure and functions of program CTSCAL.
4. Structure and functions of program WEBEDIT.

Apendix 1 Functions of programs used in getting output from the FMDCAS system.

Program	Function
VALIDATA	validates values and ranges of numbers in all subject records; IRRI - developed
WEBEDIT	converts formats and codes back to FAO specification; transfers contents of 939 records to RU records; deletes forms 930 - 945 from file; file output now ready for FMDCAS programs; IRRI - developed.
CRUDCH	performs simple checks on project codes, farm codes and subject codes; eliminates alphabetic characters.
BSORT	Standard SORT facility to sort the records by farm and by subject.
BREAK	transforms multi-information records (917 - 921 and RU) to single records; adds 922 to RU records.
BSPLIT	takes output from BREAK and creates 2 files, usable as inputs to FTSCAL etc.
REPFAC	takes output from BSORT and creates 1 file, usable as input to FTSCAL etc. (superseded by BREAK and BSPLIT)
FTSCAL	takes output from either REPFAC or BSPLIT and produces one output table per farm (except when no RU forms are present) plus a tape file; see Appendix 2.
FTRANS	takes tape output from FTSCAL and produces two files for input to FTMEAN.
FTMEAN	aggregates results across selected farms and produces group averages; similar tabular layout to output of FTSCAL
CTSCAL	take output from either REPFAC or BSPLIT and produces one output table per file, plus a tape file; see Appendix 3.
CTRANS	takes tape output from CTSCAL and produces two files for input to CTMEAN
CTMEAN	aggregates crop results on the basis of specified selection criteria and produces group crop averages; similar tabular layout to output of CTSCAL.

Appendix 2 Structure and Functions of program FTSCAL

2.1 Outline flowchart of program FTSCAL

2.2 Outline flow chart of subroutine INCUFT

2.3 Outline flow chart of subroutine FTSMAS

2.4 Functions of subroutines call by FTSMAS

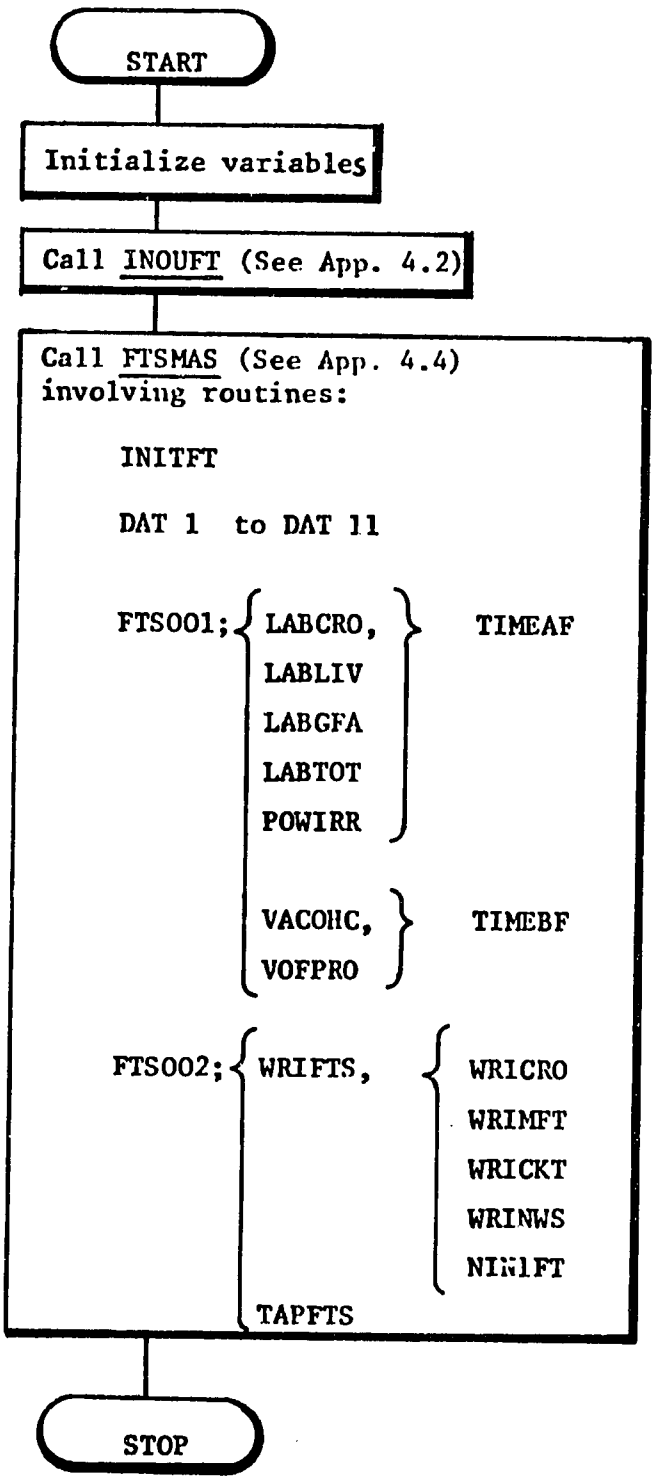
2.4.1 Translation of activity codes into row titles listed in Labour Input, Power Input, and Irrigation sections of FTSCAL output.

2.4.2 Translation of type of input-output codes into row titles listed in 'Farm Economics' section of FTSCAL output.

2.4.3 Definitions of Resource Productivites as used in FTSCAL output.

2.5 Output from FTSCAL showing identities of some important variables.

Appendix 2.1 Outline flow chart of program FTSCAL



Notes

Reads data file; stores farm identifiers, location of forms for each farm.

goes through list of farms

Clears Arrays

Analyses forms 911 - 921

Analyses RU. Forms

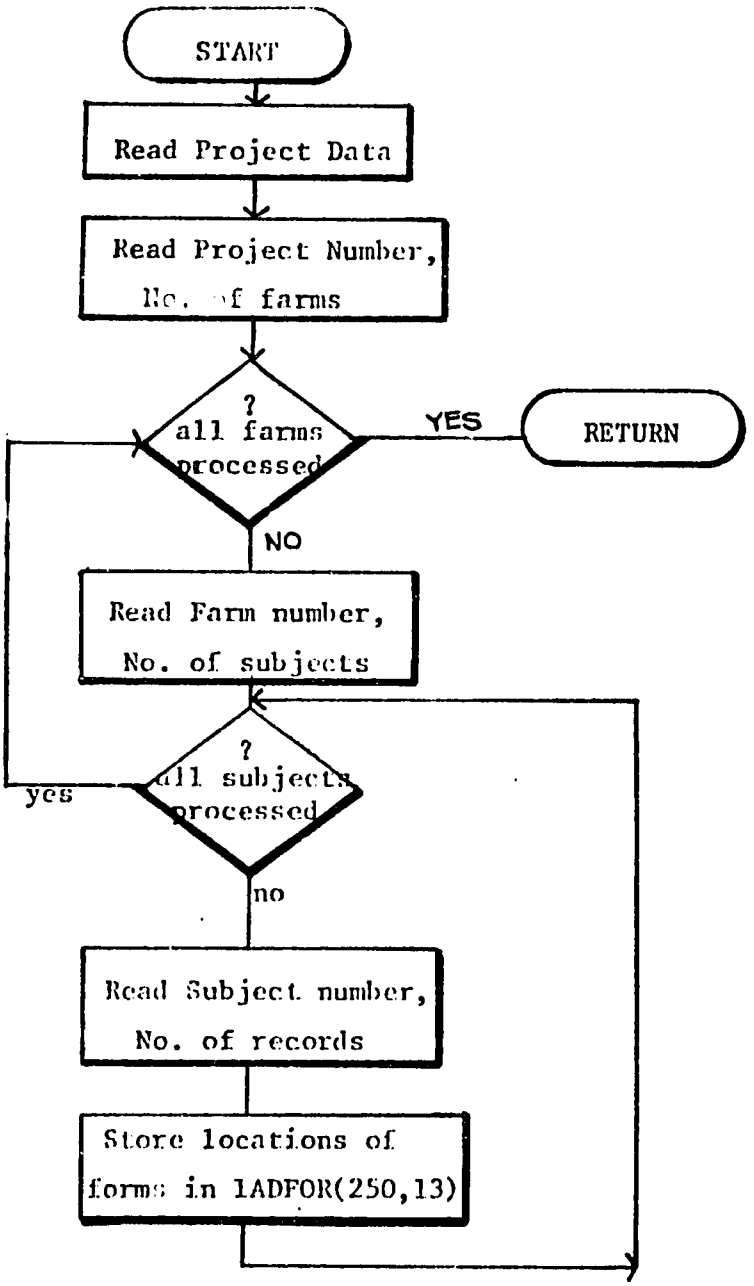
- crops
- livestock
- general farm activities
- power/irrigation

Trading Transactions

Finalizes, calculated and prints the output table (1 per farm)

Stores a copy on tape

Appendix 2.2 Outline flow chart of subroutine INOUFT



Notes

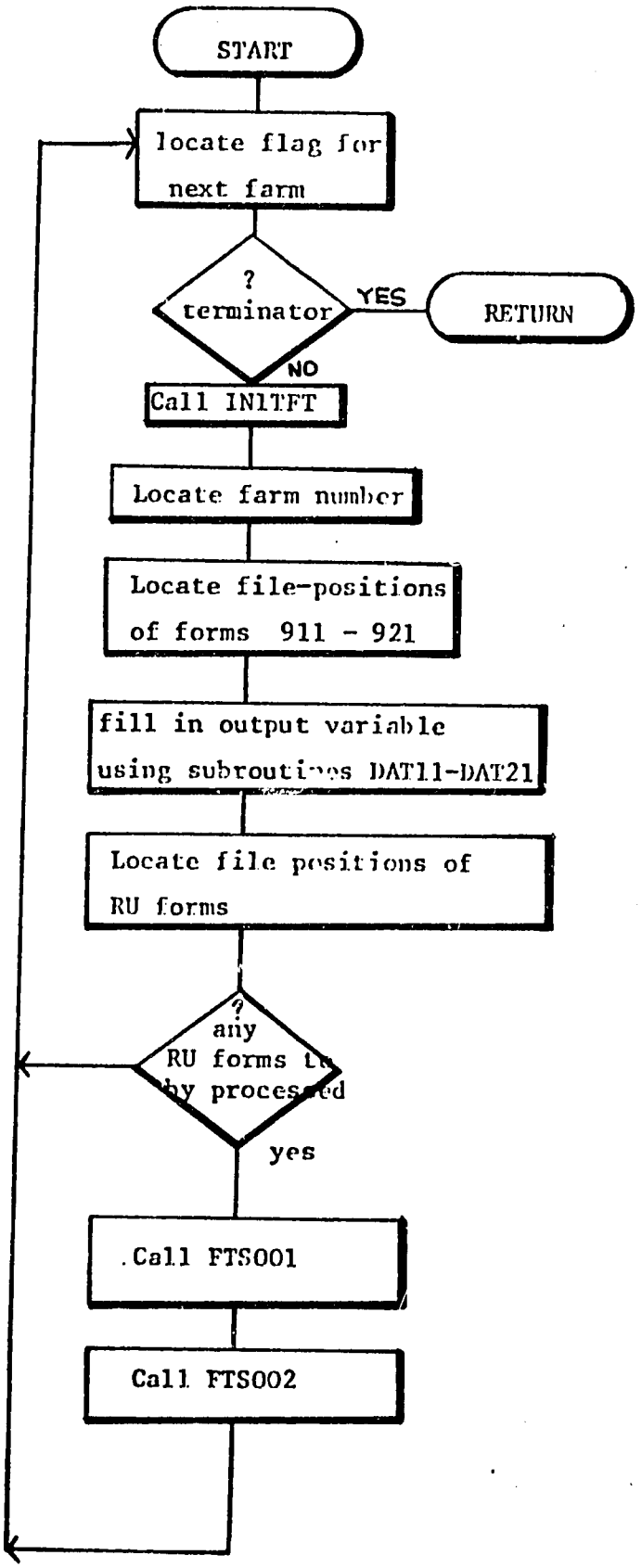
put into arrays CD1 - CD9

from file created by REPFAC

Farm number stored in IDATA, flags in IRELA1

forms 911 - 921 in IADFOR(J,1 to 11)
RU forms in IADFOR (J,13)

Appendix 2.3 Outline flow chart for FTSMAS



notes

takes each farm in turn from array IRELA

from array IDATA

from IADFOR (Farm, 1 to 11)

accumulates output variables from resourse inventory forms

from IADFOR (Farm, 12)

note that if no RU forms exist, no output is produced

accumulates output variables from RU. forms

finalizes prints and stores an output table for the farm under study.

Appendix 2.4 Functions of Subroutines called by FTSMAS

Subroutine	Function
INITFT	Clears output variables etc.
DAT41	Adds contents of form 911 (Farm Labour) to output variables
DAT12	" " " " 912 (Farm Land) " " "
DAT13	" " " " 913 (Crops) " " "
DAT15	" " " " 915 (Farm Machinery) " " "
DAT16	" " " " 916 (Draft Animals) " " "
DAT17	" " " " 917 (Productive Animals)" "
DAT18	" " " " 918 (Farm Buildings) " " "
DAT19	" " " " 919 (Farm Implements)" " "
DAT20	" " " " 920 (Liabilities) " " "
DAT21	" " " " 921 (Inventory Changes) " "

FTS001 Adds contents of RU form to output variables; calls LABCRO - TIMEBF

LABCRO, LABLIV, LABGFA, LABTOT and POWIRR all take the activity and type of input/output code from each relevant RU form, and accumulate the 'amount' into one or more rows of the output matrix RMATR (20,13), using subroutine TIMEAF (See appendix 4.41).

VOFPRO and VACOHC take the activity code and type of input/output code from each relevant RU form and accumulate the 'amount' into rows of the output arrays CASH (30), KIND (30), and TOTL (30), using subroutine TIMEBF (see appendix 4.42).

TIMEAF locates and accumulates values into output array RMATR

TIMEBF locates and accumulates values into output arrays CASH, KIND, and TOTL.

FTS002 calculates resource productivites; finalizes calculations for, prints and stores output table (see appendix 4.5); one for each farm having any RU forms; calls subroutines WRIFTS and TAPFTS

WRIFTS prints output table line by line (using format numbers as shown in appendix 4.5); calls subroutines WRICRO to NIN1FT

WRICRO prints numbers contained in cropping pattern section of output table.

WRICKT prints numbers contained in Cash, Kind, and Total columns of Farm Economics section of output table.

WRIMFT prints numbers contained in array RMATR in output table.

WRINWS prints numbers contained in array RNWS in output table.

NIN1FT converts real numbers to integers.

TAPFTS stores output variables on tape.

Appendix 2.41 Translation of 'activity codes' into row titles listed in Labour input, power input and irrigation sections of FTSCAL output

Subroutine	Activity Code	"Labour Inputs" row number	heading
LABCRO (Codes 1-499)	1 - 9	5	"Others"
	10 - 19	1	Land prep.
	20 - 22	1	" "
	23 - 39	2	Planting
	40 - 69	3	Cultivation
	70 - 79	4	Harvesting
	80	5	Others
	81 - 89	4	Harvesting
LABLIV (500-599)	100 - 199	7	Livestock
LABGFA 600	200 - 299	8	General
	type of input-output code		
LABTOT	1	10	Farmer
	2 - 19	11	Family
	20 - 29	12	P. Labour
	30 - 99	13	S. Labour
POWIRR	101 - 360	17	Tractors
	361	18	Irrigation water
	362 - 499	17	Tractors
	other values	16	Animals

Appendix 2.42 Translation of 'type of input/output' codes into row titles listed in the Farm Economics section of FTSCAL output

Subroutine	Type of Input/Output code	"Farm Economic" row number	heading
VOFPRO	900 - 949	1	Crops
	950 - 999	2	Livestock
VACOHC	200 - 329	4	Variable Costs
	330	30	(Livestock VC's)
	331	8	Rent
	332 - 359	30	(Livestock VC's)
	360 - 370	-	ignored
	371	8	Rent
	372	-	ignored
	373	11	interest
	374	9	Taxes
	375	10	Perm. Lab.
	376	12	Reps. maint.
	377 - 389	13	Others

Appendix 2.43 Definitions of Resource Productivites used in Output Table (FTSCAL)

1) Gross Margin/Unit area (crops)

= (Total Crop Production - Total VC's + Livestock VC's)/ Area managed.

2) Labour (MD)/Unit area (crops)

= Total Crops Labour Input/Area managed

3) Gross Margin/No. Cattle

= (Total Livestock Production - Livestock VC's)/ No.s of Cattle

4) Gross Margin/MD (crops)

= Total Crop Production - Total VC's + Livestock VC's/Total Crops Labour Input.

5) Gross Margin/MD (Cattle)

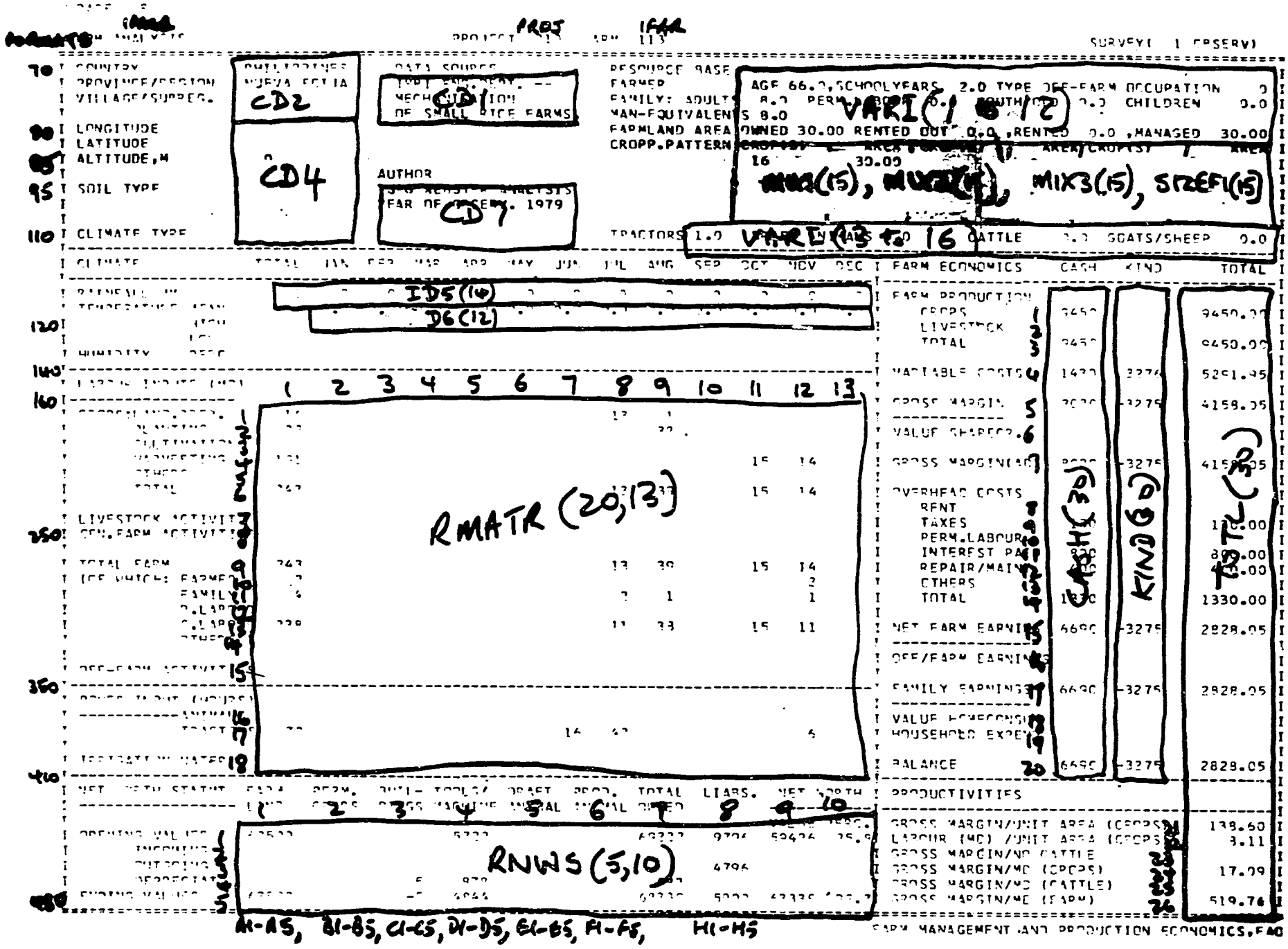
= (Total Livestock Production - Livestock VC's)/Total Livestock Activites Labour Input.

6) Gross Margin/M.E.

= Total Gross Margin/number of Man Equivalents

N.B. All the above quantities (except Livestock VC's, carried in TOTL(30),) can be checked by referring to the appropriate place on the output table.

Appendix Table 2.5. Output from FTSCAL showing identities of some important variables.



Best Available Document

Appendix 3 Structure and Functions of Program CTSCAL

3.1 Outline flow chart of program CTSCAL

3.2 Outline flow chart of subroutine INOUCT

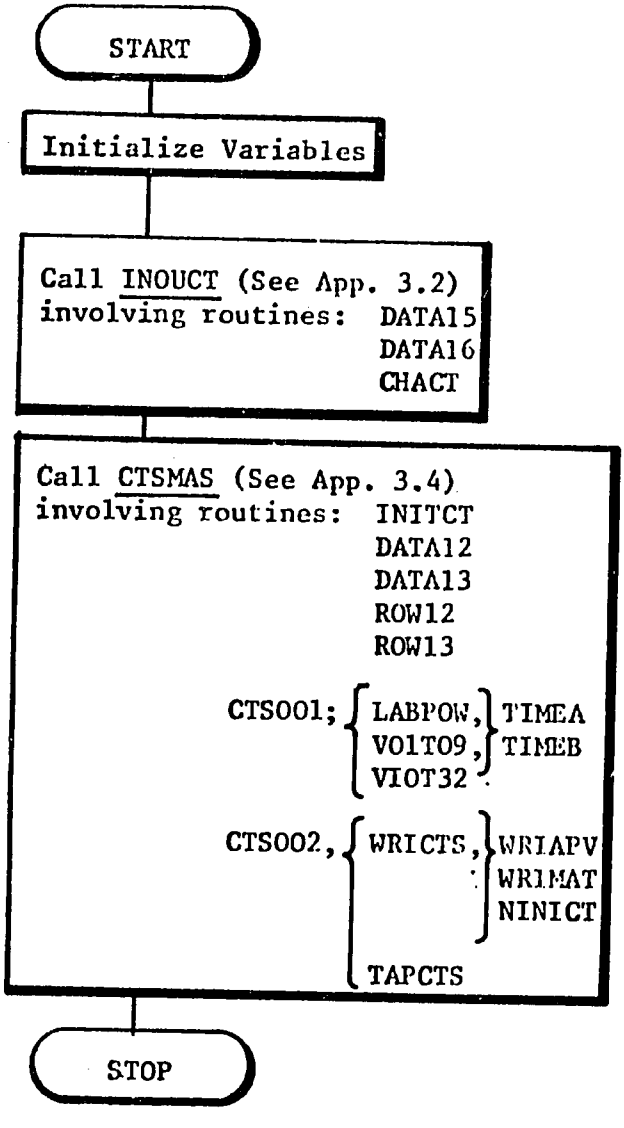
3.3. Functions of subroutines called by INOUCT

3.4 Outline flow chart of subroutine CTSMAS

3.5 Functions of subroutines called by CTSMAS

3.6 Output from CTSCAL showing identities of some important variables

Appendix 3.1 Outline flow chart of program CTSCAL



notes about functions

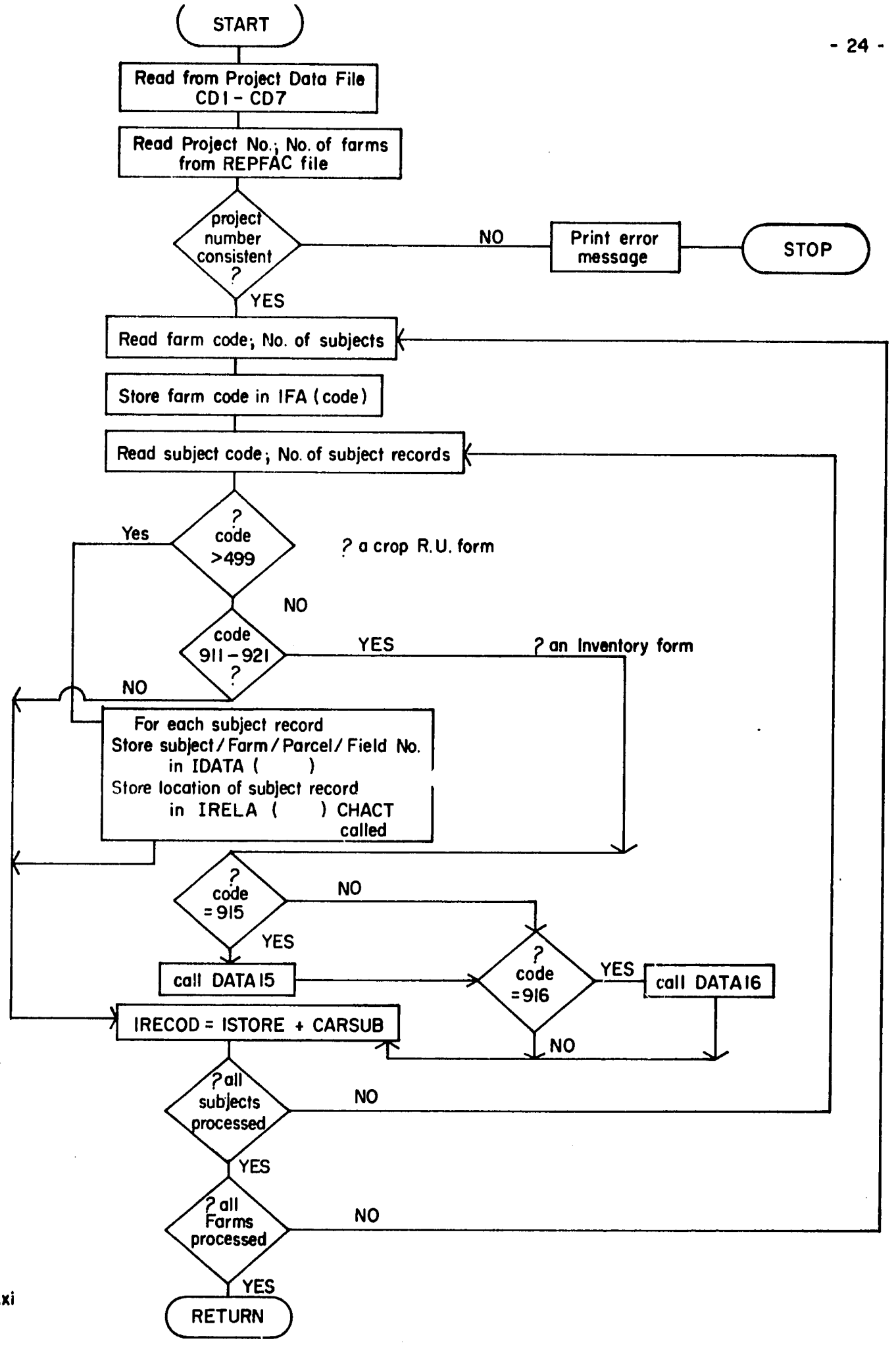
Reads through complete data file; stores locations of crop 'resource utilization' forms; calculates 'unit prices' for animals/machines

analyses crop resource-utilization forms on a field by field basis. Refers back to land (912) and crop (913) sheets

Allocates resources use etc. to relevant headings for output

Finalizes, calculates, and prints output table (1 per field)

stores a copy on tape

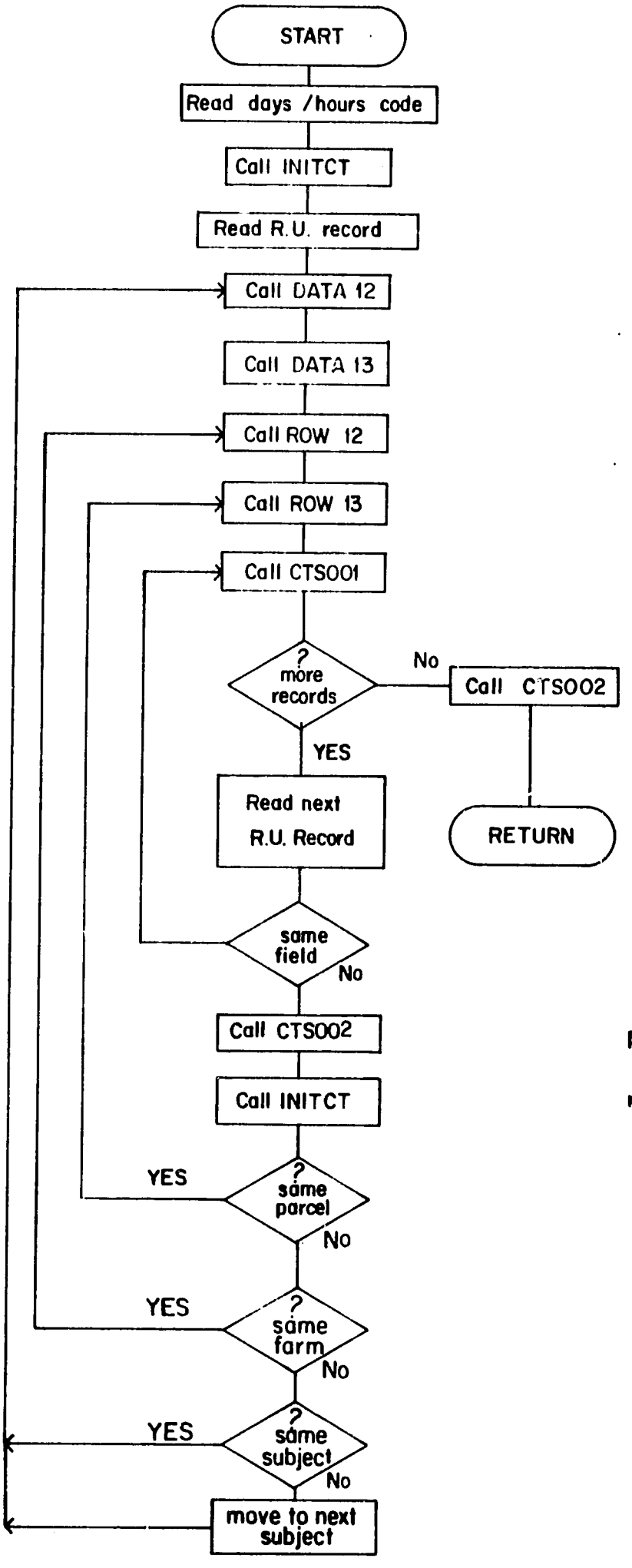


Appendix 3.2 Outline flow chart of subroutine INOUCT

Appendix 3.3 Functions of subroutines called by INOUCT

subroutine	function
DATA15	uses forms 915 for machinery associated with relevant crops; calculates an average running cost per hour across all machines used; placed in UNPR15 (Farm No.)
DATA16	uses forms 916 for draft livestock associated with relevant crops; calculates an average feed + vet. cost per hour across all categories of animal used (UNPR6(FARM NOJ).

Appendix 3.4 Outline flow chart of subroutine CTSMAS



Notes

Clears output variable

first one for this field/crop etc.

stores all 912 records

stores all 913 records

locates this parcel's 912 record

locates this field's 913 record

fill in output variables from this R.U. form.

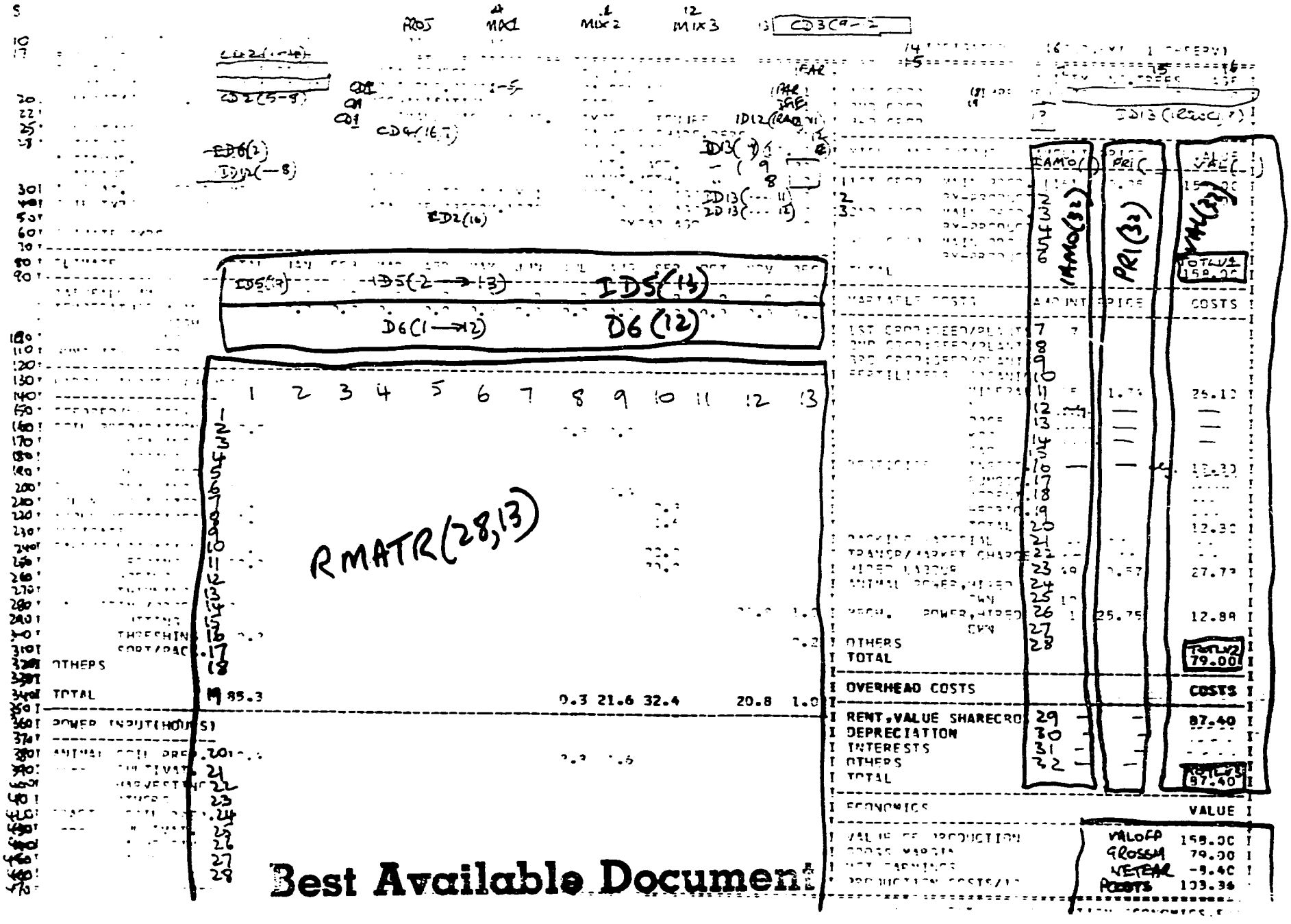
print this field's results.

re-initialize output variables for next field.

Appendix 3.5 Functions of Subroutines called by CTSMAS.

Subroutine	action
INITCT	initializes output variable MATR(13,30) IAMO(40), PRI(40), VAL(40), VTE(40).
DATA12	stores all the farm's 912 records in ID12(50,19) and D12(50,1)
DATA13	stores all the farm's 913 records in ID13(50,20) and D12(50,1)
ROW12	finds row number (of array ID12) relevant to parcel under study
ROW13	finds row number (of any ID13) relevant to field under study; finds 3 pointers which locate the 913 record of the crop mixture components
CTS001	allocates resources used (from RU forms) to output variables calls routines LABPOW to VIOT32
LABPOW	adds to labour inputs, power inputs, some VC's calls TIMEA, TIMEB
VO1TO9	locates relevant identifier (1 to 9) of output arrays IAMO, PRI, VAL, for analysis of current RU form; calls TIMEB
V10TO32	locates relevant identifier (10 to 32) of output variables IAMO, PRI, VAL: also 'irrigation water' in RMATR; calls TIMEA and TIMEB
TIMEA	locates and accumulates values into output array RMATR
TIMEB	locates and accumulates values into output arrays IAMO, VAL
CTS002	finalizes calculations for, prints and stores output table (see Appendix 3.6); one per field; calls subroutines WRICTS to TAPCTS
WRICTS	prints output table line by line (using format numbers as shown in Appendix 3.6); calls subroutines WRIAPU and WRIMAT
WRIAPV	prints numbers contained in mount, Price and Value arrays in output sheet; calls NINICT
WRIMAT	prints numbers contained in array RMATR in output sheet
NINICT	converts real numbers to integers
TAPCTS	stores output variables on tape

Appendix Table 3.6. Output from CTSCAL showing identities of variables.



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Appendix 4 Structure and functions of program WEBEDIT

4.1 List of data cards modified by WEBEDIT

4.2 Flowchart of main program of WEBEDIT

4.3 Notes on subroutines of WEBEDIT

subroutine C913

C915

C916

C919

C6391

C6392

RESUT

CODE

GETNUM

PUTNUM

Appendix 4.1 List of data cards modified by WEBEDIT.

Code	Subject	Outline of modification	Location in WEBEDIT
1 - 900	Resource utilization	Changes type-of-input codes back to FAO codes	RESUT
900	Supplementary Income	converted to 800, off-farm income	main
911-99	Labour	contents of cols. 13,14 transferred to 35,35	main
912	Land	col. 39 set to 0	main
913	Crops	splits into 2 FAO records	C913
915	Machinery	adjusts decimal point in fuel price	C915
916	Draft Animals	places totals in cols. 7 - 18	C916
917	Productive Animals	Col. 12 set to contents of Col 11; Col. 11 set to 0	main
919	Tools, Implements	adjusts decimal points	C919
939	Disposal of Product	converts to R.U. forms	C6391 and C6392
930-945	IRRI-designed cards not transferred to output file		

NB: See P. Moran and D. Unson "Operations Handbook No. 1" Agric. Eng. Dept., IRRI, May 1980 for precise specification of IRRI form layouts and codes

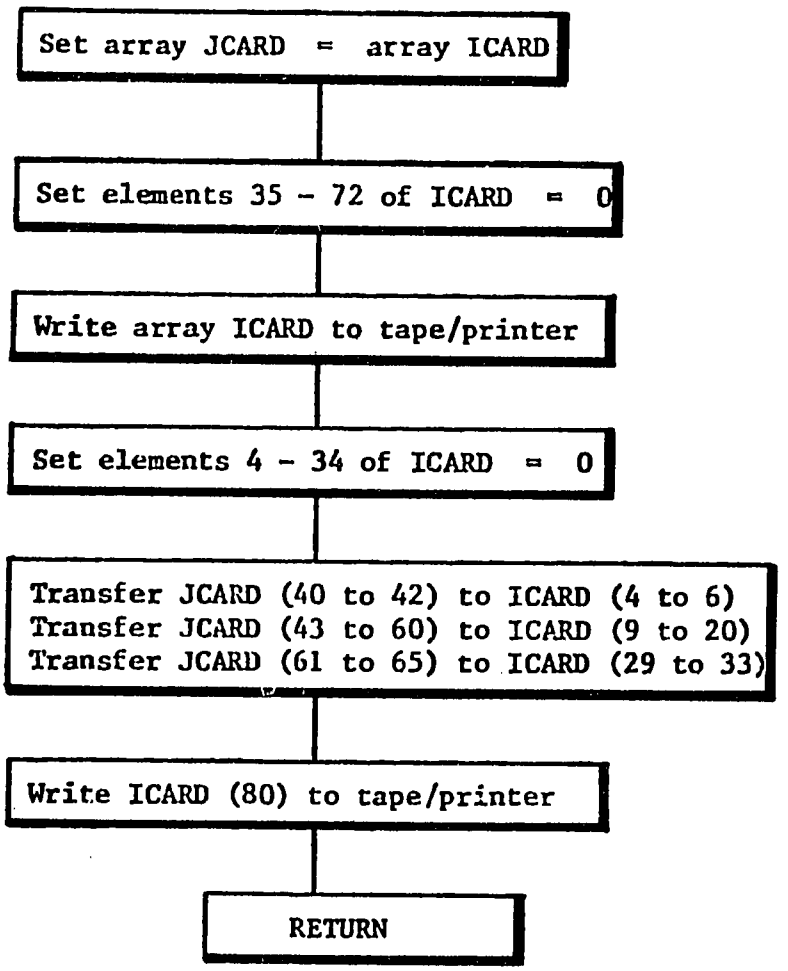
See FAO Agricultural Services Bulletin 34 for precise specification of FAO form layouts and codes.

Appendix 4.3. Notes on subroutines of WEDEDIT.

Subroutine C913

Function : Takes one IRRI card 913 and writes two FAO format cards.

Flowchart:



Subroutine C915

Function: Moves numbers in cols. 47, 48, 53 and 54 two columns to the left to allow the decimal point as required by FAO format for card 915.

Subroutine C916

Function: Totals the number and value of the subtypes of animals and places them in col. 7 - 9 and col. 13 - 18 as required by the FAO 916 format.

Appendix 4.3. continued.

Subroutine C919

Function: Moves numbers in fields 13 - 18, 25 - 30, 37 - 42, 49 - 54, 61 - 66 two columns to the left to allow the decimal point as required by the FAO 919 format.

Subroutine C6391

Function: Converts 939 card 1 into a FAO resource utilization card. Within the card (see Operations Handbook No. 1):

1. Total production is treated as crop output
2. Quantity paid to harvesters is treated as wages in kind
3. Quantity paid to landlord is treated as rent in kind
4. Quantity used to pay debts is ignored as not a trading transaction
5. Quantity sold is ignored as part of 'output'

Subroutine C6392

Function: Converts 939 card 2 into a FAO resource utilization card. Within the card (see Handbook No. 1):

1. Quantity left with farmer is ignored; already in output
2. Quantity used for other purposes is treated as miscellaneous expenses
3. By-products are treated as an addition to output
4. Product sold last season is ignored

Subroutine RESUT

Function: Converts the IRRI type-of-input codes to standard FAO type-of-input codes by finding the IRRI codes and using subroutine CODE to effect the change.

Appendix 4.3. continued

Subroutine CODE

Function: Accepts as an argument (IRRI) the IRRI type-of-input code and returns as an argument (IFAO) the standard type-of-input FAO code. Two types of conversions are carried out. The first involves the replacement of a single IRRI code (in LIST1) by a single FAO code (in LIST2). The second involves the replacement of IRRI codes within a range (whose limits are contained in LMIN and LMAX) by a single FAO code (from LIST3).

The program tests to see whether the code is within the 'single conversion' section (114 to 209) or the 'range conversion' section (329 to 499) and it uses the fact that the two sections are mutually exclusive.

The list of conversions is as follows:

Singles

IRRI Code	FAO code
114	111
115	112
165	164
183	180
188	180
209	270

Ranges

IRRI code	FAO code
329-359	291
372-374	300
370-370	300
381-383	291
390-390	305
400-404	300
410-416	310
424-459	291
480-483	291
490-499	291

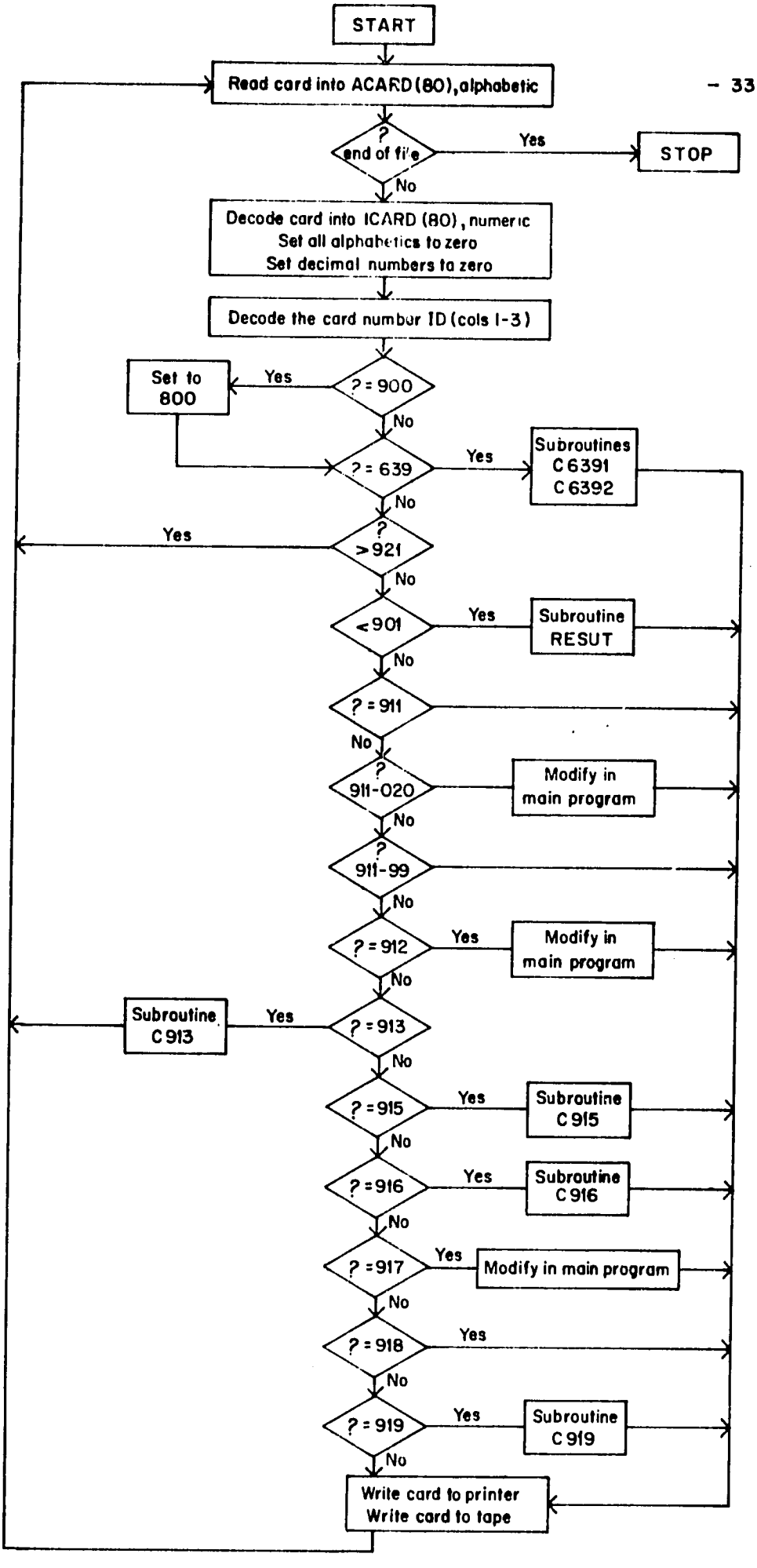
Note that a 'single' conversion can be effected by specifying a 'range' of one value (e.g. 490-490). Finally the subroutine omits the first-digit codes on types of labour.

Subroutine GETNUM

Function: Decodes a number from a given field on a card (in array ICARD(80)). The subroutine accepts a starting column number (ISTART) and an ending column number (IEND) as an argument. It returns the required number also as an argument (INUM).

Subroutine PUTNUM

Function: The inverse of subroutine GETNUM. It encodes a number into a given field on a card (in array ICARD(80)). It accepts the starting and ending column numbers plus the number itself (ISTART, IEND, INUM) and modifies array CARD accordingly.



Flowchart of main program of WEBEDIT.

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