



REGIONAL EARLY WARNING SYSTEM
FOR
FOOD SECURITY

TECHNICAL MANUAL

CROP PRODUCTION FORECAST
SAMPLE SURVEY

First produced: January 1994
Revised/reproduced: October 2009

FANR Directorate
SADC Secretariat,
Private Bag 0095,
Gaborone,
Botswana.
Tel: +267 3951863
Fax: + 267 3972848
Email: registry@sadc.int
Website: www.sadc.int

Copyright SADC, 2009. All Rights Reserved.

The handbook has been prepared by the SADC Secretariat's Food, Agriculture and Natural Resources (FANR) Directorate for use by SADC Secretariat staff and Member States' National Early Warning Units (NEWUs) for Food Security. Information contained in this publication may be freely used and copied for non-commercial purposes, provided that any information reproduced elsewhere be accompanied by an acknowledgement of SADC Secretariat as the source.

The SADC name and emblem are the exclusive property of Southern African Development Community. They are protected under international law. Unauthorised use is prohibited. They may not be copied or reproduced in any way without the prior written permission of SADC. Requests for permission should be sent to the Executive Secretary of the SADC Secretariat.

Further usage for details of this publication may be sourced from the SADC Secretariat.

Address:

SADC Secretariat,
Private Bag 0095,
Gaborone,
Botswana.
Tel: +267 3951863
Fax: +267 3972848
Email: registry@sadc.int
Website: www.sadc.int

PREFACE

This is one of several Technical Handbooks produced by the SADC Regional Early Warning Unit in the mid-1990, covering a wide range of topics related to the operation of the National Early Warning Systems (NEWS). Originally published in 1994, several of these handbooks have recently been revised and translated into French and Portuguese by the FANR Directorate to facilitate their use by all SADC Member States. This particular volume is a **Manual on Crop Production Forecast Sample Survey**.

This survey manual was originally written by Mr. Bentry P. Chaura, then Senior Statistician/Economist with the SADC Regional Early Warning Unit (REWU), in consultation with Swaziland NEWU. The manual provides, in details, the objectives, sampling design, method of field work and possible questionnaires to be used for data collection. It also illustrates method of analysing data. At various points in the manual, the method has been augmented with the help of examples. The manual is expected to serve as a reference material for the staff to be entrusted with the survey work. However, for facilitating its regular use, it is necessary that the staff should be given adequate training in the survey work. In addition to class room training, practical field training on various aspects of the survey should be provided.

This manual can easily be adjusted and replicated for other SADC Member States. It should therefore be the starting point in developing a simple method of Crop Forecasting for other countries.

The printing and translation of this document into French and Portuguese have been made possible through financial support from the Belgian Development Cooperation, through their Office in Pretoria, South Africa. The SADC Secretariat greatly appreciates this support.

Director,
SADC Food, Agriculture and Natural Resources Directorate
October 2009

CONTENTS

	Page
PREFACE.....	- 3 -
1.0 Introduction.....	- 6 -
2.0 Objectives of the Survey	- 6 -
3.0 Three Stages of Field Activities	- 8 -
4.0 Form 1 – Complete Enumeration of Homesteads in Sub-Area	- 10 -
5.0 Form 2- Summary Data of Sub-Areas in an Extention Area.....	- 14 -
6.0 Sample Design	- 16 -
7.0 Crop Area Measurement.....	- 20 -
8.0 Measurement of Crop Areas.....	- 23 -
9.0 Form 4: Crop Area and Expected Production for Selected Homesteads	- 27 -
10.0 Collection of Completed Forms	- 31 -
11.0 Calculation of Average Crop Area and Expected Production.....	- 32 -
12.0 Calculation of Crop Area and Expected Production at Agricultural Extension Area (EA) Level.....	- 34 -
13.0 Calculation of the Crop Area and Expected Production at Rural Development Area (RDA) Level	- 34 -
14.0 Calculation of Crop Area and Expected Production at Regional Level.....	- 35 -
15.0 Calculation of Crop Area and Expected Production at National Swazi Nation Land (SNL) Sub-Area Level	- 35 -
16.0 National Crop Forecasts.....	- 36 -
17.0 Missing Data	- 36 -
18.0 Training of Field Supervisors and Extension Workers.....	- 38 -

ANNEXES:

ANNEX 1: Calendar of Activities of the Crop Forecasting Survey - 39 -

ANNEX 2: Ready Reckoner..... - 40 -

ANNEX 3: Table 1 - One Digit Random Numbers..... - 41 -

ANNEX 3: Table 2 - Two Digit Random Numbers - 42 -

ANNEX 3: Table 3 - Three Digit Random Numbers..... - 43 -

ANNEX 3: Table 4 - Four Digit Random Numbers - 44 -

ANNEX 4: Definitions - 45 -

ABBREVIATIONS

EA	Agricultural Extension Area (Ext.Area)
EW	Agricultural Extension Worker (Ext.worker)
ITF	Individual Title-deed Farm
NEW	National Early Warning Unit (for food Security)
RDA	Rural Development Areas
REWU	Regional Early Warning Unit (for Food Security)
SADC	Southern African Development Community
SNL	Swazi Nation Land
Sub-Area	Sub-Extension Area

1.0 Introduction

- 1.1 Early forecast of crop production is extremely important for any country as it allows, among others, early assessment of food security situation. Early food security assessment is important because, for example, in the event of projected national food production shortages, it provides the government with critical time in which to plan the importation of food from abroad before people start suffering. It also allows early identification of food shortage areas and assessment of drought relief needs.
- 1.2 Decisions based on crop forecasts information can only be as good as the quality of data used. It is therefore important that the method used to obtain data should be objective as well as suitable for the local conditions. The data for Swaziland crop production forecast is collected through a sample survey.
- 1.3 The methodology of the crop survey as outlined in this manual was partly tested in April 1993 for the crop season 1992/93. Although only a few filled questionnaires were collected from the field, the results were quite encouraging. A discussion on the results between Swaziland National Early Warning Unit and SADC Regional Early Warning Unit led to the revised methodology given in this manual. The Department of Agriculture of the Ministry of Agriculture and cooperatives was also consulted and its views were incorporated into this manual.
- 1.4 All details of the survey, from data collected to analysis, have been presented in this manual. Section A outlines field activities while section B deals with the method of analysis of the data from the survey. Where ever possible examples have been provided to clarify the survey operations in both sections.

2.0 Objectives of the Survey

The main objectives of the survey are as follows: -

- ❖ To develop a suitable sampling methodology aimed at obtaining reasonably reliable crop area and production forecasts for maize and sorghum under Swazi National Land (SNL) agricultural sub-sector.
- ❖ To arrive at realistic forecasts of area planted and expected production of maize and sorghum crops at regional and national levels; and
- ❖ To help build up an agricultural data base at grass root level.

SECTION A
SURVEY FIELD ACTIVITIES

3.0 Three Stages of Field Activities

The field work in this survey is done by each Extension Worker in his/her Extension Area. The Extension Worker fills FORMS 1-4 in three stages of field work. The three stages and how to fill these forms are outlined below:

3.1 Stage One - Complete Enumeration of Homesteads in Each Sub-Area

- 3.1.1 The first stage of the survey involves complete enumeration of all homesteads within each of the sub-areas in an Extension Area. Each Extension Worker has to prepare homesteads lists for each of the sub-areas within his/her Extension Area. **FORM 1** is used for this purpose. Also included in this form is the data pertaining to crops to be grown by the listed homesteads.
- 3.1.2 Once these lists have been completed for each and every sub-area within the Extension Area, **FORM 2** is used to summarize these sub-area lists within each Extension Area.
- 3.1.3 The data recorded in these two forms should be complete, that is, all homesteads within each sub-area should be included in the list and all homesteads outside each sub-area should be excluded in the list. The Extension Worker should therefore clearly know the boundary of sub-area in his/her extension area.

3.2 Stage Two – Sampling of Sub-Areas and Homesteads

- 3.2.1 From the list of sub-areas within the Extension Area, one sub-area is randomly selected. Each Extension Worker conducts the survey in only one randomly selected sub-area within his/her extension area.
- 3.2.2 From the selected sub-area, two random samples of 10 homesteads each, one from total homesteads growing maize and another from those growing sorghum, are then selected. Maize and sorghum field areas and expected production data for the two crops are collected from these two randomly selected homestead samples in each selected sub-area. The two samples of homesteads may be the same, different or a combination of the two depending on whether the first selected group of sample homestead for one crop also grows the other crop.
- 3.2.3 The sampling method used in the random selection of both a sub-area and 10 homesteads depends very much on having a complete list of sub-areas within each extension area, a complete list of all homesteads within the selected sub-area and a complete knowledge of crops grown by each listed homestead. **Incomplete lists of any of the three would bias final forecasts.** This is because all these data sets are used in the homestead sample selection and survey data analysis.

3.3 Stage Three - Data Collection

- 3.3.1 Once the selected 10 homesteads growing each of the two crops are known, the actual survey can begin. **FORM 3** is used for area measurements of all maize and sorghum fields operated by the selected homestead. Total maize and sorghum field areas for each selected homestead from these forms are then transferred to **FORM 4** for **either maize or sorghum**. The Head of each selected homestead is also asked as to how much maize or sorghum he/she expects to produce in the current crop season (in 70 kg bags) from his/her maize or sorghum fields. The information given by the Head of the homestead is then clearly recorded in the space provided for maize or sorghum expected productions on **FORM 4**. In the case the EW feels that the information provided is very much on the

low side or high side, they should try to ascertain the reasons and record them in the remarks column.

- 3.3.2 REMEMBER that it is usually good style to complete recording of data of one homestead before moving to another homestead.

4.0 Form 1 – Complete Enumeration of Homesteads in Sub-Area

4.1 FORM 1 is used by each Extension Worker to list all homesteads within each and every sub-area in an Agricultural Extension Area. Depending on the number of homesteads, several of these forms could be used for one sub-area. Listed forms for each sub-area should be tagged together.

4.2 Please complete all identification particulars, which include names of Region, Ecological Zone, Rural Development Area (RDA), Extension Area, Sub-Area and also fill the Crop Season and name of the Extension Worker who is conducting the survey in the appropriate spaces provided for them at the top of the form.

4.3 Filling the Columns on FORM 1

Col. 1 Serial Number of Homestead

In this column give a serial number to every homestead within the sub-Area viz 1, 2, 3... etc. The numbers should be assigned to homesteads in order of their location so that it is subsequently easy to locate them on the ground.

Col. 2 Name of Head of Homestead

In this column write the name of the head of each homestead in the sub-Area.

Col. 3 Sex of Head

Here you record the sex of the head of the homestead, “M” for male and “F” for female.

Col. 4 Number of Fields Operated

In this column write the total number of crop fields a homestead is operating/going to operate in the current crop season. This number should also include fields leased in but not those leased out to other homesteads. The number of fields operating may be 0, 1, 2 ...etc.

Crops Grown

COL. 5, 6 and 7: Maize and Sorghum and others

Here you first put a tick(√) under each of the crops a homesteads is growing this crop season. Once the ticking has been completed for all homesteads in a selected sub-area, then give *serial numbers*, viz 1, 2, 3etc, for each tick, starting from the top of the table to the last tick, separately for maize and sorghum. Maize and sorghum columns are further divided into two sub-columns by a dividing line. Put a tick on the left side of the dividing line and a serial number on the right side of the dividing line.

If the homestead grows maize, sorghum, rice, cotton and groundnut then you tick under all three sub-divisions. In this case “other crops” include rice, cotton and groundnut. Re-serializing ticks (representing homesteads growing a particular crop) is only done for maize and sorghum which are of interest in this survey.

Col. 8 Remarks

In this column give any other relevant information pertaining to the completed row entries.

- 4.3 Once a complete enumeration of homesteads has been done, the Extension Worker should sign his/her name and put a date on the space provided at the bottom of the form. The form will then be checked/verified and whoever checks it will write his name and signature and a date when the form was checked.

5.0 Form 2- Summary Data of Sub-Areas in an Extension Area

- 5.1 This form is a summary of data obtained from various sub-areas using FORM 1.
- 5.2 As in FORM1, complete the identification particulars, write the Crop Season and name of the Extension Worker in appropriate places provide at the top of the form.

5.3 Filling the Columns on Form 2

Col. 1: Serial Number of Sub-Area

This column gives a serial number for every sub-extension area within an Extension Area. One row is provided for each sub-area

Col. 2 : Name of Sub-Area

Corresponding to serial number of a sub-area given in column 1 is the name of the Sub-area, which should be entered in column2.

Col. 3: TOTAL NUMBER OF HOMESTEADS IN SUB-AREA

From each batch of FORM 1s completed for a sub-area, transfer the total number of homesteads to this column. Once the transfer has been completed for all sub-areas add them up to enter the number in the last row of this column. **This is the total number of homesteads in an Extension Area.**

Number of Homesteads Growing

Col. 4 and 5: Maize and Sorghum

In these columns, against each sub-area as recorded in column 2, record under each crop, maize and sorghum, the number of homesteads growing that crop. This number is transferred, for respective crops, from **column 5 for maize and column 6 for sorghum, of FORM 1** which serially lists all homesteads growing a particular crop.

Col. 6: Remarks

In this column give any other relevant information pertaining to the first four filled in columns of a given row. This information should be such that it could help the analysis of data later on. For example if none of the homesteads in the sub-area grows sorghum, write that in this column.

- 5.4 After the form has been completely filled, the Extension Worker puts his/her signature and date on the spaces provided below the table. Then the supervisor checks it for completion and accuracy and writes his/her name, signature and a date when the form was checked on the spaces provided. The next step is the selection of one sub-area in each Extension Area and within each selected sub-area selection of 10 homesteads growing each crop.

**FORM 2: CROP FORECAST SAMPLE SURVEY 20...../20.....
SUMMARY DATA OF SUB-AREAS IN AN EXTENSION AREA**

Region..... Ecological Zone..... RDA.....
Extension Area..... Ext. Worker.....

Serial number of Sub-Area	Name of Sub-Area	Total number of Homesteads in Sub-Area	Number of Homesteads Growing		REMARKS
			Maize	Sorghum	
1	2	3	4	5	6
Total					

Ext. Worker signature:.....
Date:.....

Checked by:.....
Signature:.....
Date:.....

6.0 Sample Design

6.1 A stratified two stage random sampling design is used for the survey. The Agricultural Extension Areas (AEA) constitutes the **strata**. The sub-areas in each AEA constitute the **Primary Sampling Units (P.S.U)**, while homesteads in the selected sub-area who operate at least one maize or sorghum field constitute the **Secondary Sampling Unit (SSU)**.

6.2 Selection of Primary Sample Units (Sub-Extension Areas)

6.2.1 Each Agricultural Extension Areas (AEA) is, for purposes of extension services, subdivided into a number of sub-extension areas. In this survey, only one sub-extension area is randomly selected from each Agricultural Extension Areas (AEA) to serve as primary sampling unit. The following simple random sampling method is used to select one sub-area in an agricultural extension area:-

- (i) **List alphabetically** all sub-extension areas in the Agricultural Extension Area and then **serially number** them. For example, suppose Mkhuzweni Extension Area has 6 sub-areas, namely – Mahombe, Mcuba, Tincatsavana, Hhehhane, Mkhuzweni and Ntabinezimpisi, then these would be listed alphabetically and given serial numbers from 1 to 6 as follows:-

Example 1: Alphabetical listing and serially numbering sub-areas in an Extension Area:

1. Hhehhane,
2. Mahombe
3. Mcuba
4. Mkhuzweni
5. Ntabinezimpisi
6. Tincatsavana

- (ii) Once sub-areas in an AEA have been alphabetically and serially listed, then it remains a question of **randomly selecting one sub-area** from the list. Suppose, in Example 1 above, using the random number table, the selected random number is 5, then Ntabinezimpisi sub-area becomes the selected sub-area in which the Extension Worker for Mkhuzweni Extension Area will conduct the survey.

A Note on Choosing Random Numbers:

- (a) Turn to the random numbers tables (attached **ANNEX-3**). If the total number, you are selecting from, is a 3 digit number (e.g. 234) then use Table 3 (the three digit random numbers); if it is a two digit number, use Table 2 (two digit random numbers) and so on. In Example 1 above, selection is done from a one digit random number table (Table 1 – Annex 3) since 6 is a one digit number.
- (b) Look at the first number of Column 1 Row 1 of the table you are using. If this number is less than the number from which to choose, then this

becomes your selected number and referring to your serial list of sub-areas, the sub-area with that serial number becomes the selected sub-area. But if the first number is greater than the number to choose from, cross the number out and move to the next number in row 1. Repeat the procedure until you come to a number which is less than or equal to number to choose from. In Example 1 above if the first number in column 1 row 1 is 9, then cross it out and move to the next since 9 is greater than the number 6 from which to select one number. Using this procedure the first number between 1 and 6 you come across is to be selected. If the selected number is 5, then, in the serial list above, Ntabinezimpisi becomes the selected sub-area.

6.3 Selection of Secondary Sample Units (Homesteads)

Once the selected sub-area is known, the extension worker in an AEA uses the previously prepared list of homesteads in the selected sub-area to randomly select 10 homesteads for each crop. Depending on whether or not the first 10 selected homesteads for one crop also grow the other crop, the 10 sample homesteads for the second crop may be the same as in first or entirely different or made up of a combination of some homesteads from the first sample and others from remaining homesteads. The **systematic random sampling** procedure is used to select homesteads in this survey. The selection procedure is as follows:

- (i) Under **columns 5 and 6 of FORM 1**, for each of the two crops (maize and sorghum) check that all the ticks have been serially listed from the top to the bottom. If some ticks have not been serially listed or some rows with no ticks have been serially listed, re-serialize the sub-column for that crop starting from the top tick to the last to include all ticks for that crop.

Example 2 : Serial list of homestead growing maize

Suppose a selected sub-area, say Ntabinezimpisi sub-area, has 102 homesteads but this includes 6 homesteads who do not operate a maize field. In this case the number of ticks in the first column of column 5 FORM 1 will be 96 and the serial list under that column for maize should start from 1 to 96 by excluding the 6 who do not operate a maize field.

- (ii) **Find a sampling interval:** For each of the two crops, this is obtained by dividing the total number of homesteads growing that crop by the sample size, which is 10 for this survey. Note that the sampling interval is the inverse of the sampling fraction, which is itself the ratio of sample size to population size. The population in this case is the total number of homesteads in the selected sub-area who grow a particular crop. In Example 2 above where there are 96 serially listed homesteads who grow maize, the sampling interval is 9, calculated as following;

Example 3: Calculation of sampling interval

Total number of homesteads who grow maize = 96

Sample size = 10

Therefore,

Sampling Interval = (96/10) = 9.6 or 9

NOTE that the sampling interval has to be a whole number. For example 3 above, the calculated number, 9.6, is between whole numbers 9 and 10. In order to keep 10 as sample size in each sub-area then take a lower nearest whole number, which in the above example is 9 and not 10. If the selected homestead cannot be interviewed for some exceptional reasons, the next homestead in the serial list for that crop is taken as a replacement and interviewed.

- (iii) Then choose one random number which is not more than the calculated sampling interval. In the above example a random number, which is not more than 9 should be randomly selected. Random number tables as explained above are used to select one number within the sampling interval. The 1st randomly selected homestead will be the one with that serial number on the list of homesteads growing that crop (FORM 1). Using the sampling interval, the 2nd selected homestead will be a homestead whose serial number is equal to the number of the 1st selected homestead plus the sampling interval. Similarly the 3rd selected homestead will be a homestead with a number equal to the number of the 2nd selected homestead plus the sampling interval and so on for the 4th and up to the 10th selected homestead.

Example 4: Selection of homesteads

From example 3 above (where there are 96 homesteads growing maize and 9 as the sampling interval) suppose the randomly selected number, less than or equal to 9 is 7, then the selected homestead would be as follows:-

1 st sample homestead ...	=	7
2 nd sample homestead ...	7 + 9 =	16
3 rd sample homestead ...	16 + 9 =	25
4 th sample homestead ...	25 + 9 =	34
.	.	.
.	.	.
10 th sample homestead ...	79 + 9 =	88

Hence in this example, homesteads in the selected sub-area with the following serial numbers in sub-column 5 of **FORM 1** would be selected for the maize forecast sample survey:

7, 16, 25, 34, 43, 52, 61, 70, 79 and 88.

- (iv) For the second crop say sorghum, check if the selected homestead that grow maize also grow sorghum. If they do then this is the sample of

homesteads for the forecast survey on both crops. But if, for example, the first selected maize growing homestead does not also grow sorghum then, the next listed homestead that grows sorghum should be selected for sorghum area and production part of the survey.

Example: Suppose the first selected maize growing homestead number 7 does not also grow sorghum, then for sorghum, select the nearest listed homestead that grows sorghum starting with homestead number 8 and above. Similarly if the second selected maize growing homestead say number 16 does not grow sorghum, then for sorghum, select the nearest listed homestead above 16 that grows sorghum. This would make sure that 10 homestead are selected for each crop.

But if the selected sub-area has less than 10 homesteads growing either of the two crops, then all those homesteads growing that crop are included in the sample for that crop. In other words if in a selected sub-area, there are only 7 homesteads having sorghum fields then there is no need of sampling and all these 7 homesteads are surveyed on sorghum crop.

7.0 Crop Area Measurement

- 7.1 All fields of either maize or sorghum or both cultivated by the homesteads selected for the crop measured.
- 7.2 Crop fields are usually of irregular shapes and calculating areas for such fields poses some problems. In this survey, for irregular fields, the extension worker uses a “give” and “take” method in which each field of each selected homestead is first appropriately approximated by either a rectangle or a square. This method is illustrated below in **Figures A and B**.

In Figure A an irregular crop field has been approximated by a rectangle. Notice that some shaded areas inside the crop field (In) are not part of the rectangle while some shaded areas outside the crop field (Out) are included in the rectangle. This is what is meant by “give” and “take” method as the *blue-shaded areas* outside the rectangle are excluded or “given” away while the *red-shaded areas* inside (the rectangle) which are not part of the field are included or “taken” in as part of the crop field. By this “give” and “take” method shaded areas given away and those taken in cancel each other out with the result that the area of the rectangle closely approximates the whole area of the irregular shaped crop field.

Figure B illustrates a similar situation for another irregular shaped field where a square rather than a rectangle is more suitable. The same “give” and “take” method is used with shaded parts excluded or “given” away from the field assumed to cancel out those included or “taken” into the square.

Once the crop field has been approximated in terms of a square or rectangle, the length and width of the rectangle or square are then measured in terms of number of paces.

The number of paces along the length and width of the rectangle or square are then converted to metres by using the conversion table provided in **ANNEX – 2**. In order to use this table the Extension Worker needs to know his/her personal pace length or “**pacing coefficient**” when walking normally. Pacing length or pacing coefficient can be determined as follows:

- (i) With the help of a measuring tape mark a distance of 100 metres on the ground.
- (ii) Pace along the 100 metre distance marked on the ground, walking normally and record the total number of paces required to fully cover the 100 metre distance.
- (iii) Once the total number of paces required to cover the 100 metres is known, you divide 100 by that number. The answer obtained is the pacing coefficient. Remember to round the answer to the nearest two decimal places and then to the nearest 0.05.

Example 5: After calculating the pacing coefficient, conversion table on ANNEX – 2 is used to convert number of paces to metres as follows:

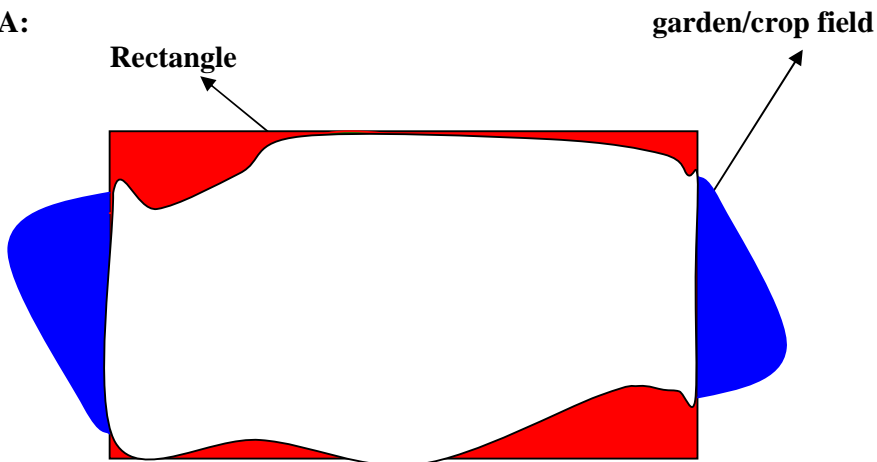
Read down the column entitled “No. of paces” until the line relating to the number of paces to be converted is identified. Next read across the columns on that line until reaching the number under the column relating to your length. The number so identified is the distance in metres of the number of paces to be converted. For example where the number of paces is 67 and the pace length is 0.90 the number of metres is 60.

Once the length and width of a rectangle or square are known in metres, the area can be obtained by multiplying length by width. The area in square metres can then be converted to hectares by dividing by 10,000 (since 10,000 square metres = 1 hectare)

The following examples show how area of a rectangle and a square can be calculated:

Example A: The Area of a Rectangle:

FIG A:



Length = 76 paces. If the extension worker’s calculated pacing coefficient is 0.80, then the length of the rectangle is 61 metres.

Width = 45 paces. With a pacing coefficient of 0.80, the width of the rectangle is 36 metres

The area of the rectangle is:

$$= 61 \text{ metres} \times 36 \text{ metres}$$

$$= 2196 \text{ square metres}$$

In hectares, this would be:

$$= (2196 \div 10,000) \text{ hectares}$$

$$= 0.2196 \text{ ha.}$$

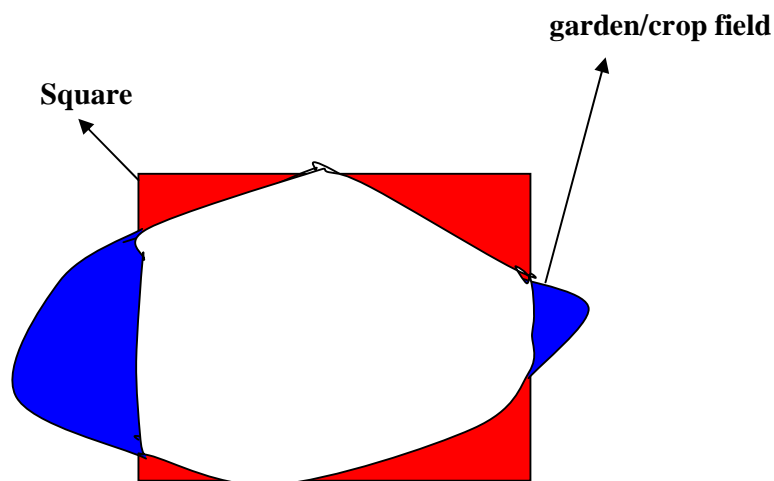
Or

$$= 0.22 \text{ ha. (two decimal places)}$$

The area of the crop field is therefore approximately equal to 0.22 hectares.

Example B: The Area of a Square Rectangle:

FIG B:



Length = 56 paces. With a pacing coefficient of 0.80, the length of the square is therefore 45 metres.

Width = length and width of a square are equal. Hence the width of a square is also 45 metres.

The area of a square is therefore:

$$\begin{aligned} &= 45 \text{ metres} \times 45 \text{ metres} \\ &= 2025 \text{ square metres} \end{aligned}$$

Area given in hectares:

$$\begin{aligned} &= (2025 \div 10,000) \text{ Hectares} \\ &= 0.2025 \text{ Ha} \end{aligned}$$

Area of square (to two decimal places) : = 0.20 Ha

The area of the crop field is therefore approximately equal to 0.20 hectares.

If the area is of regular shape, square or rectangle, then there is no need to approximate it by another square or rectangle. Its length and breadth should first be measured in paces and then converted to metres. Then the area in metres will be the length and breadth. The area can then be converted into hectares by dividing the area in metres by 10,000 as explained in the above example.

NOTE: The four corners of a rectangle or square representing the field should be clearly marked on the ground by the use of pegs or sticks. This work can also be facilitated if Extension workers are given notebooks in which they could draw a sketch of each field before they measure it.

8.0 Measurement of Crop Areas

- 8.1 This form is to be used by the Extension Worker to measure and calculate areas under **Maize and Sorghum** for each of the ten (10) selected homesteads. All maize and sorghum fields cultivated by the selected homesteads are to be measured. For irregular fields, “give” and “take” approach as explained above is to be used.
- 8.2 Complete the **identification particulars** including the current Crop season and of the name of the Extension Worker on top of the form. Use separate forms for maize and sorghum crops. Indicate the crop i.e. maize or sorghum at the top in the appropriate space provided.
- 8.3 The Extension Worker needs to know his/her pacing length or pacing coefficient before starting crop field measurements. The pacing coefficient should then be recorded on the space provided at the top right of the table on this form.
- 8.4 **Filling the column on FORM 3**

The table on this form is divided into columns as follows:

Col.1 Serial Number of Selected Homestead

In this column give the serial number of selected homestead. The number is the same for a selected homestead (for a crop) as in **Column 5 and 6 of FORM 1**.

Col.2 Name of Head of Selected Homestead

In this column write the name of the Head of the selected homestead whose serial number is in column 1. The name of the Head of the selected homestead is the same as in **Column 2 of FORM 1** for a re-serialized homestead number in **column 5 and 6 of FORM 1**.

Col.3 Field Number

Each of the crop fields a homestead has been selected for should be given a serial number (viz 1, 2, 3 etc), one field number for each sub-row. 10-field sub-rows are provided. If a selected homestead has more than 10 maize or sorghum fields, add a supplementary sheet to record them.

Number of Paces

Col. 4 and 5: Length and breadth

These columns record, respectively, the number of paces along the length and the breadth of the rectangle or square of a crop field.

Paces to Metres**Col 6 and 7: Length and breadth**

In these columns the number of paces along the length and breadth of a rectangle or a square recorded in column 4 and 5 respectively are converted to metres using the conversion table in **ANNEX – 2**.

Col.8 Area (Ha)

In this column record the calculated area of the crop field (in Hectares) by multiplying the length by the breadth of a rectangle or square in column 6 and 7 and then dividing by 10,000. The calculated area (in Hectares) should be expressed in 2 decimal places. The decimals should be on the right of the dividing line, the whole numbers on the left of this line and the decimal point on the line.

Once all individual homestead crop areas have been recorded, add them up and record the total area on the last row of this sub-column, for each of the ten rows of selected homesteads.

- 8.5 On the day all field area measurements are completed, the Extension Worker should sign this form and put a date in the spaces provided at the bottom of the form. The supervisor who checks the completed form should write his name, signature and the date when the form was checked in the spaces provided at the bottom right of the form.

9.0 Form 4: Crop Area and Expected Production for Selected Homesteads

- 9.1 This form is meant for recording area and expected production of maize or sorghum crops for the selected homesteads.
- 9.2 Complete the **identification particulars**, which include names of Region, Ecological Zone, RDA, Extension Area and Sub-area and also write the name of the Extension Worker and the crop Season in the spaces provided at the top of the form.
- 9.3 Use separate form for maize or sorghum. Indicate the crop i.e. maize or sorghum at the top of the table. The fillings of the columns under these forms are done as below.
- 9.4 Filling the columns on FORM 4

Col.1 Serial Number of Selected Homestead

In this column give the serial number of each of the selected homesteads growing maize or those growing sorghum (as per **Col.1 in FORM 3**).

Col.2 Name of Head of Homestead

In this column give the name of the head of homestead listed in Col.1. Note that the name is the same as in **Col.2 of FORM 3**.

Col.3 Area (Ha)

Record in this column field area for maize or sorghum, as the case may be, in hectares for each of the selected homesteads listed in Col.2. The records of the areas are actually transferred from the last row of **Col.8 in FORM 3** for each of the selected homesteads.

Once maize or sorghum areas for all 10 selected homesteads have been recorded, add them up and record the result in the last but one row (row 11) of this column. **This is the total maize area for the selected homesteads.** As in **Col.8 FORM 3**, the whole number should be recorded to the left of the dividing line while the decimals should be on the right with decimal point on the line.

On the last row record the average area per selected homestead. This is calculated by dividing the total area (row 11 column 3) by the total number of selected homesteads whose crop area adds up to the total area.

Col.4 Expected Production (70 Kilogramme bags)

In the column record the total number of (70 kilogramme) bags of maize or sorghum the farmer expects to produce in the current crop season. No measurement is done here. **The Extension Worker just ask the head of the**

homestead how many 70 kg bags of maize or sorghum he/she expects to harvest in the current crop season.

If the homestead expects to harvest one and a half bags, then in the space provided record as: -

1 | 50

If the homestead expects just a quarter of a bag, record as: -

0 | 25

Make sure the answer given is clearly written in the appropriate space with the whole number on the right of the dividing line, the decimal on the line itself and the decimals on the right of the dividing line.

NOTE: In case expected production is too low or too high, the Extension Worker should ascertain the reasons from the homestead before the figures are actually recorded in the columns. Record the reason in column 5.

Col. 5 Remarks

In the column give any other relevant information pertaining to completed row entries. For example, if the expected production is too high or too low and you have ascertained the reasons for that, record that reason in this column.

9.5 At the bottom of each of these forms, record the following; -

a) Total number of homesteads who grow Maize/ sorghum in the Extension Area.....

Record the total number of homesteads growing maize or sorghum in an Extension area. This number has already been recorded in the 11th row of col.4 for maize and col.5 for sorghum on **FORM 2**. Transfer these numbers to the dotted lines on the forms.

9.6 Once all the above details have been recorded, the Extension Worker has to sign on the space provided and then fill in the date on which he/she completed filling the form. The supervisor then checks and signs it and fills the date when the completed form was checked.

SECTION B
SURVEY DATA ANALYSIS

10.0 Collection of Completed Forms

- 10.1 As soon as field activities have been completed, **Forms 2, 3 and 4** are collected and brought to the National Early Warning Unit office for analysis. Form 1 should be left with the Extension Worker who will revise it later in the year in readiness for the next crop forecasting exercise. **Form 2 and 3** should be collected as they may be used in the data analysis office to check on minor recording problems in **Form 4**.

11.0 Calculation of Average Crop Area and Expected Production

- 11.1 Whether the data are manually analysed or analysed using a simple computer programme, similar steps starting with calculation of average crop area and average expected production per homestead are followed.
- 11.2 Crop data are collected from 10 selected homesteads in a sub-area. **Form 4**, completed for either of the crops summarises all data collected from each sub-area. On the last but one row of the maize and sorghum area and expected production columns of this form, the EW provides the total area (Ha) and total expected production (70 Kg bags) for the two crops for the 10 selected homesteads for each of the selected sub-areas. From these totals, average area and average expected production are calculated as follows (check that the average area and average production in 70 kg bags as given on last row of Form 4 are correct):-

A. Average Area (per homestead)

$$= \text{(Total Area (ha)} \div 10) \dots\dots\dots[1]$$

B. Average Expected Production

$$= \text{(Total exp. production} \div 10) \text{ bags per homestead.}$$

In Kilogrammes:

$$= \text{((Total exp. production} \div 10) \times 70) \text{ kilogrammes per homestead.}$$

In Tonnes:

$$= \text{((Total exp. Production} \div 10) \times 70) \div 1000) \text{ Tonnes per homestead} \dots\dots\dots [2]$$

Where in both A and B, the divisor (10) is the total number of selected homesteads from which data of field area and expected production has been collected. For computing purposes, use the formulae denoted by [1] for average area and [2] for average expected production.

NOTE that 10 is used if and only if a full sample of 10 homesteads has been surveyed for a crop. But if data on a crop has been obtained from less than 10 homesteads, the divisor to be used for that crop would be the exact number of homesteads from whom the data have actually been collected for that crop.

Example 1: Suppose the total maize field area for the selected sub-area, eg. Ntabinezimpisi is calculated as 11.2 hectares and expected maize production is given as 190 (70 kg bags) on **Form 4**, then, average area and expected production (for Ntabinezimpisi) can be calculated as follows:-

Average Area (per homestead) = $(11.2 \div 10) = 1.12$ ha.

Average expected production = $(190 \div 10) = 19$ bags

Or in kilogrammes = $((190 \div 10) \times 70)$

= 1330 kilogrammes.

Or in tonnes = $((((190 \div 10) \times 70) \div 1000)$

= 1.33 tonnes.

12.0 Calculation of Crop Area and Expected Production at Agricultural Extension Area (EA) Level

In order to forecast total area and total expected production of a particular crop at an Extension Area level, the following formulae is used:-

A. Total Field Area for a Crop in an Extension Area

= (average area per homestead for the crop for selected sub-areas (EA)) × (Total number of homesteads growing that crop in all selected sub-areas of the Extension Area).[3]

B. Total expected production of a crop in an Extension Area

= (average expected production per homestead for the crop in a selected sub-areas (EA)) × (Total number of homesteads growing that crop in all selected sub-areas of the Extension Area).[4]

13.0 Calculation of the Crop Area and Expected Production at Rural Development Area (RDA) Level

The RDA crop forecasts are formed by adding up all Extension Area forecasts in an RDA. Hence RDA forecasts are calculated out as follows:

A. Total Area of a Crop in an RDA.

= (Total Crop Area in Extension Area A + Total Crop Area in Extension B +etc)[5]

for all Extension Areas within the RDA.

B. Total expected Production of a Crop in an RDA

= (Total expected production of a crop in Extension Area A + Total expected production of a crop in Extension B +etc)[6]

for all Extension Areas within the RDA.

14.0 Calculation of Crop Area and Expected Production at Regional Level

Forecasts for each Region are made up of forecasts from each of the Rural Development Areas within the Region. Forecasts for each crop in a Region are, therefore, worked out as follows:

A. Total area of a Crop in a Region

$$= (\text{Total Crop Area in RDA A} + \text{Total Crop Area in RDA B} + \dots \text{etc}) \dots \dots \dots [7]$$

for all RDAs within a Region.

B. Total expected Production of a Crop in a Region

$$= (\text{Total expected production of a crop in RDA A} + \text{Total expected production of a crop in RDA B} + \dots \text{etc}) \dots \dots [8]$$

for all RDAs within a Region.

15.0 Calculation of Crop Area and Expected Production at National Swazi Nation Land (SNL) Sub-Area Level

Swaziland has 4 Regions, namely, Shiselweni, Manzini, Lubombo and Hhohho. From Section 14.0 above, crop forecasts for each of the four Regions of the country are known. The calculation at National SNL sub-sector level, therefore, involves, for each crop, adding up forecasts from each of the four Regions as follows:

A. Total Area of a crop in the Country (SNL)

$$= (\text{Crop area in Shiselweni Region} + \text{Crop areas in Manzini} + \text{Crop area in Lubombo} + \text{Crop area in Hhohho}) \dots \dots \dots [9]$$

B. Total expected production of a Crop in the Country (SNL)

$$= (\text{Expected production in Shiselweni} + \text{Expected production in Manzini} + \text{Expected production in Lubombo} + \text{Expected production in Hhohho}) \dots \dots \dots [10]$$

16.0 National Crop Forecasts

The forecasts from this survey are only for land area designated as **Swazi Nation Land (SNL)**. The forecasts from this survey, therefore, exclude crop area and expected production from **Individual Titleded Farms (ITF)**. Data from crop forecasts in the ITFs are collected by the **Swazi Central Statistical Office (CSO)**. These data should also be collected simultaneously along with the data from SNL so that crop forecasts for the whole country can be prepared and issued at the same time. National Crop Forecasts therefore involve adding up forecasts obtained through this manual and forecasts from data collected by CSO in the ITFs.

17.0 Missing Data

- 17.1 The National Early Warning Unit should make sure that each and every agricultural extension area is represented in the sample survey by one of its sub-areas. This becomes easy if each of the extension areas has an extension worker. Should this not be true for some extension areas, the NEWU in consultation with the Department of Agriculture should find someone who would be temporarily transferred to the area to carry out the survey. This action if taken timely would avoid delays in completing the survey.

- 17.2 However, in some cases possibly due to illness or other unforeseen problems, the survey may be delayed by an extension worker so that not all sub-area data will be available in time for analysis. In this case partial analysis should be done on available data while efforts are being made to get the missing data.

SECTION C
TRAINING OF SURVEY PERSONNEL

18.0 Training of Field Supervisors and Extension Workers

18.1 The survey should be carried out according to agreed timetable if the crop forecasts are to be done early as is required. The simplicity of the survey should ensure that Extension Workers complete the actual survey within the prescribed time. The method of analysing the survey is also simple and analysis can be done manually or using a simple computer programme, which should be tested before the survey data are received.

18.2 Despite the simplicity of the survey, however, there is need for a thorough training of involved in the survey work especially field supervisors and extension workers. This thorough training is especially required in the first two or three years of using the survey method. The training should be conducted in two stages.

18.2.1 Training of Trainers' of Trainers and Supervisors

The first stage of training involves training of supervisory staff from both the NEWU and the Department of Agriculture who may help in training and subsequent supervision of Extension Workers in the field.

Trained personnel especially field supervisors will be responsible for sample selection of both sub-areas in an Extension Area and selection of 10 homesteads for each crop from selected sub-area. Each supervisor is given one of this manual for reference purposes; but this is not a substitute for a proper practical training. A proper training for supervisors will be necessary to cover the following topics:

- (i) Objective of the survey;
- (ii) Sample design and selection;
- (iii) How to fill each of the four Forms;
- (iv) How to measure crop field areas;
- (v) Scrutiny of the data and supervision; and
- (vi) Calendar of survey activities.

18.2.2 Training of Extension Workers (Enumerators)

Extension workers are responsible for actual survey field work using Forms 1 to 4 to record the survey data. Hence, the whole survey and indeed the whole crop forecasting exercise depends on having properly trained extension workers who then can carry out the exercise without too many difficulties. In addition to the training, each extension worker is given a short manual which provides some guidelines on how to fill each of the four survey forms. In general, training sessions for the extension workers should include the following topics:

- (i) Objectives of the surveys;
- (ii) How to introduce oneself to respondents;
- (iii) How to measure field areas;
- (iv) How to fill survey forms; and
- (v) Deadlines for various survey operations.

ANNEX 1: Calendar of Activities of the Crop Forecasting Survey

	ACTIVITY	PROFORMA	RESPONSIBLE OFFICER	PERIOD
1.0	Training: listing of Sub-area and Homesteads	FORMs 1 & 2	NEWU	Ends by 30 th November
2.0	Listing of homesteads and Crops grown in each sub-area	FORM 1	Extension Workers	Ends by 31 st December
3.0	Summary listing of Sub-areas	FORM 2	Extension Workers	1 st week of January
4.0	Training on Actual Survey	FORMS 3 & 4	NEWU/Supervisors	Ends by 2 nd week of February
5.0	Selection of Sub-area and Homesteads	FORMs 1 & 2	Field Supervisors	Ends by 2 nd week of February
6.0	Field measurements	FORM 3	Extension Workers	3 rd week of February to 1 st week of March 2 nd week of March
7.0	Homestead heads interviews	FORM 4	Extension Workers	2 nd week of March
8.0	Collection of completed Forms	FORMs 2,3 & 4	NEWU/F. Supervisors	Ends by 21 st March
9.0	Data Analysis	FORMs 4	NEWU	Ends by end of March
10.0	Publication of Crop Forecasts	-	NEWU	1 st week of April

ANNEX 2: Ready Reckoner**READY RECKONER FOR CONVERTING PACES TO METRES**

No. of Paces	PACE LENGTH OR PACING COEFFICIENT (IN METRES)					
	0.65	0.70	0.75	0.80	0.85	0.90
11	7	8	8	9	9	10
12	8	8	9	10	10	11
13	8	9	10	10	11	12
14	9	10	11	11	12	13
15	10	11	11	12	13	14
16	10	11	12	13	14	14
17	11	12	13	14	14	15
18	12	13	14	14	15	16
19	12	13	14	15	16	17
20	13	14	15	16	17	18
21	14	15	16	17	18	19
22	14	15	17	18	19	20
23	15	16	17	18	20	21
24	16	17	18	19	20	22
25	16	18	19	20	21	23
26	17	18	20	21	22	23
27	18	19	20	22	23	24
28	18	20	21	22	24	25
29	19	20	22	23	25	26
30	20	21	23	24	26	27
31	20	22	23	25	26	28
32	21	22	24	26	27	29
33	21	23	25	26	28	30
34	22	24	26	27	29	31
35	23	25	26	28	30	32
36	23	25	27	29	31	32
37	24	26	28	30	31	33
38	25	27	29	30	32	34
39	25	27	29	31	33	35
40	26	28	30	32	34	36
41	27	29	31	33	35	37
42	27	29	32	34	36	38
43	28	30	32	34	37	39
44	29	31	33	35	37	40
45	29	32	34	36	38	41
46	30	32	35	37	39	41
47	31	33	35	38	40	42
48	31	34	36	38	41	43
49	32	34	37	39	42	44
50	33	35	38	40	43	45
51	33	36	38	41	43	46
52	34	36	39	42	44	47
53	34	37	40	42	45	48
54	35	38	41	43	46	49
55	36	39	41	44	47	50
56	36	39	42	45	48	50
57	37	40	43	46	48	51
58	38	41	44	46	49	52
59	38	41	44	47	50	53
60	39	42	45	48	51	54
61	40	43	46	49	52	55
62	40	43	47	50	53	56
63	41	44	47	50	54	57
64	42	45	48	51	54	58
65	42	46	49	52	55	59
66	43	46	50	53	56	59
67	44	47	50	54	57	60
68	44	48	51	54	58	61
69	45	48	52	55	59	62
70	46	49	53	56	60	63
71	46	50	53	57	60	64
72	47	50	54	58	61	65
73	47	51	55	58	62	66
74	48	52	56	59	63	67
75	49	53	56	60	64	68
76	49	53	57	61	65	68
77	50	54	58	62	65	69
78	51	55	59	62	66	70
79	51	55	59	63	67	71
80	52	56	60	64	68	72
81	53	57	61	65	69	73
82	53	57	62	66	70	74
83	54	58	62	66	71	75
84	55	59	63	67	71	76
85	55	60	64	68	72	77
86	56	60	65	69	73	77
87	57	61	65	70	74	78
88	57	62	66	70	75	79
89	58	62	67	71	76	80
90	59	63	68	(72)	77	81
91	59	64	68	73	77	82
92	60	64	69	74	78	83
93	60	65	70	74	79	84
94	61	66	71	75	80	85
95	62	67	71	76	81	86
96	62	67	72	77	82	86
97	63	68	73	78	82	87
98	64	69	74	78	83	88
99	64	69	74	79	84	89
100	65	70	75	80	85	90
101	66	71	76	81	86	91
102	66	71	77	82	87	92
103	67	72	77	82	88	93
104	68	73	78	83	88	94
105	68	74	79	84	89	95
106	69	74	80	85	90	95
107	70	75	80	86	91	96
108	70	76	81	86	92	97
109	71	76	82	87	93	98
110	72	77	83	88	94	99

NOTE: TO USE THIS RECKONER READ DOWN THE COLUMN ENTITLED "NO. OF PACES" UNTIL THE LINE RELATING TO THE NUMBER OF PACES TO BE CONVERTED IS IDENTIFIED. NEXT READ ACROSS COLUMNS ON THAT LINE UNTIL REACHING THE NUMBER UNDER THE COLUMN RELATING TO YOUR PACE LENGTH. THE NUMBER SO IDENTIFIED IS THE DISTANCE IN METRES OF THE NUMBER OF PACES TO BE CONVERTED. FOR EXAMPLE WHERE THE NUMBER OF PACES IS 90 AND THE PACE LENGTH IS 0.80, THE DISTANCE IN METRES IS 72 (circled)

ANNEX 3: Table 1 - One Digit Random Numbers

ROWS	COLUMNS																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	2	9	5	2	1	1	9	8	7	1	5	2	3	2	3	0	9	8
2	4	1	6	7	3	9	0	8	8	9	8	5	6	0	2	5	6	3
3	2	3	0	0	1	0	9	4	2	7	8	3	5	0	7	0	7	7
4	0	6	0	0	1	8	1	7	4	9	3	1	2	7	9	6	4	6
5	2	5	4	4	6	2	0	8	3	5	1	3	2	8	9	5	8	1
6	2	8	7	0	4	7	5	2	7	2	7	4	7	3	4	7	9	3
7	9	2	6	3	0	4	8	6	2	4	0	4	8	7	8	7	0	9
8	2	0	0	2	4	9	4	2	8	5	1	6	5	9	9	2	5	3
9	9	5	6	8	4	9	3	0	0	2	2	1	4	0	5	7	0	0
10	8	2	4	3	2	3	4	9	1	8	2	5	3	7	9	5	6	3
11	5	5	6	6	7	6	6	4	1	2	5	4	5	3	6	8	3	7
12	1	0	1	8	9	5	2	4	4	6	7	6	7	0	1	1	8	4
13	6	8	4	1	7	4	8	3	2	2	2	3	0	8	4	0	6	4
14	2	0	4	1	5	2	4	6	7	7	2	3	5	7	5	3	9	7
15	5	5	6	5	9	1	4	3	9	5	9	8	8	9	7	6	5	3
16	4	5	0	8	2	8	5	9	4	5	1	9	8	7	4	3	1	7
17	2	1	5	2	2	4	6	6	6	9	9	3	9	8	1	1	7	5
18	6	9	1	7	7	8	4	0	3	0	0	4	7	2	4	5	5	9
19	8	2	4	1	2	8	3	5	9	7	8	5	7	9	2	1	5	0
20	7	9	1	3	1	5	7	9	1	5	9	4	2	2	2	0	7	6
21	9	3	8	5	3	5	1	3	3	9	9	2	2	4	8	2	3	6
22	3	4	3	6	6	8	9	1	1	5	4	5	7	8	1	6	7	6
23	9	0	9	4	5	1	1	1	3	4	0	8	1	6	7	5	5	4
24	9	2	2	6	2	2	0	7	1	1	1	2	5	5	8	2	6	0
25	7	7	8	1	4	7	6	4	1	4	0	5	9	6	2	3	8	0
26	9	7	4	2	1	8	0	8	4	9	8	8	2	7	4	9	0	0
27	9	4	2	0	6	4	7	3	3	3	9	8	3	1	1	5	4	1
28	1	1	7	9	4	1	1	3	1	6	9	0	1	4	4	2	0	9
29	0	7	0	8	4	1	2	4	9	4	2	7	7	4	6	0	5	1
30	6	3	5	0	3	7	0	9	1	9	3	0	7	1	5	2	8	2
31	1	4	1	4	7	1	2	5	9	2	7	0	9	7	9	2	0	7
32	7	0	4	1	6	2	9	3	1	2	1	2	1	3	9	6	1	7
33	3	2	4	3	1	6	3	4	5	6	8	8	2	7	6	2	8	2
34	7	9	2	2	9	2	9	6	4	8	8	9	6	1	0	7	5	3
35	8	3	5	9	3	7	6	0	2	6	1	7	9	0	2	5	3	4
36	2	5	1	0	9	6	9	4	3	2	8	9	1	6	5	8	2	0
37	0	2	2	4	2	1	0	0	5	6	9	2	5	4	4	0	2	5
38	3	0	0	9	3	5	7	1	7	3	4	0	7	5	9	5	1	0
39	7	4	8	9	4	0	1	1	4	1	3	0	3	6	6	8	9	6
40	5	1	8	8	3	9	9	6	5	9	4	4	5	0	2	6	5	7

ANNEX 3: Table 2 - Two Digit Random Numbers

ROWS	COLUMNS														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	12	54	69	26	11	64	78	99	42	63	36	84	44	32	93
2	54	43	33	73	02	29	18	56	02	24	47	98	39	23	24
3	32	62	97	71	40	56	33	44	91	49	47	76	37	63	90
4	78	09	93	53	73	86	20	77	47	62	77	80	72	74	29
5	68	62	57	61	37	33	51	56	33	66	44	73	30	12	64
6	91	79	68	50	25	34	10	17	08	93	67	45	99	45	01
7	53	17	66	16	31	21	74	68	07	24	48	34	03	91	39
8	01	26	26	33	23	58	49	90	53	08	21	28	43	34	97
9	23	72	68	37	79	41	41	38	44	58	84	03	65	36	27
10	03	57	45	21	09	95	95	00	91	87	92	55	13	30	64
11	78	55	28	58	30	85	37	88	82	11	98	78	84	85	24
12	25	10	49	11	35	67	59	51	53	19	01	12	13	11	50
13	66	39	23	22	55	42	91	40	88	86	61	45	45	12	67
14	67	69	02	97	55	76	65	58	98	19	99	02	07	53	93
15	45	27	41	94	63	01	78	82	20	03	79	45	30	99	95
16	56	99	38	14	81	22	74	85	72	63	41	32	96	46	88
17	41	60	09	86	67	60	36	28	39	36	12	24	87	10	98
18	45	06	47	77	42	55	03	93	77	90	76	40	22	32	92
19	46	45	77	74	48	98	70	76	68	26	56	66	39	71	03
20	66	86	52	76	77	72	28	74	41	09	05	06	57	80	15
21	65	03	97	07	73	58	20	79	52	57	08	52	49	18	17
22	16	58	42	54	09	22	03	71	68	08	35	12	65	23	01
23	13	19	19	13	41	12	47	15	63	71	39	46	58	95	46
24	50	30	14	35	89	56	54	74	15	68	86	45	37	64	32
25	78	56	80	00	35	96	35	58	69	85	29	40	48	47	29
26	19	83	98	83	91	53	44	55	95	96	76	99	56	68	05
27	99	44	14	45	06	43	49	38	03	72	80	02	89	88	29
28	03	30	24	74	80	34	87	55	31	96	69	32	71	28	39
29	99	03	06	13	94	46	95	27	97	91	02	30	76	71	99
30	16	14	35	44	39	99	38	88	97	33	10	37	64	73	28
31	20	96	03	29	52	59	40	24	33	30	06	32	80	66	87
32	05	11	42	88	15	43	71	34	59	32	14	09	89	81	67
33	05	24	12	04	31	20	98	77	55	27	20	99	67	77	26
34	73	81	40	27	91	07	21	58	01	90	41	60	32	90	88
35	33	11	20	29	96	48	50	72	62	05	78	74	02	37	17
36	68	74	89	92	24	56	21	27	29	40	90	86	41	51	99
37	89	87	08	45	28	27	64	80	00	66	10	59	08	57	37
38	92	05	99	13	35	90	92	17	84	34	16	12	08	71	83
39	97	49	79	14	98	46	71	78	35	26	15	30	13	37	84
40	21	83	78	62	98	28	02	61	72	43	15	67	29	78	56

ANNEX 3: Table 3 - Three Digit Random Numbers

ROWS	COLUMNS									
	1	2	3	4	5	6	7	8	9	10
1	143	149	750	763	161	436	014	220	089	152
2	051	220	600	222	039	585	341	186	756	575
3	605	128	476	856	999	411	204	332	695	230
4	792	702	611	423	268	777	227	516	031	232
5	046	862	176	776	637	049	838	961	071	075
6	235	076	856	552	386	177	943	023	478	919
7	687	900	411	333	804	460	310	969	447	223
8	189	770	020	344	868	931	569	951	665	045
9	729	078	477	199	557	319	882	526	870	924
10	526	499	330	830	569	982	523	838	538	674
11	217	118	267	196	507	683	339	182	787	819
12	978	834	945	177	384	473	658	587	784	433
13	502	879	099	736	413	652	159	285	278	288
14	827	680	150	345	024	302	867	543	512	500
15	347	717	264	793	405	020	173	048	432	485
16	640	821	181	833	406	003	517	135	290	689
17	175	747	562	628	835	485	347	267	175	137
18	430	143	118	433	596	712	962	107	175	137
19	894	060	820	806	165	004	594	957	961	688
20	592	432	691	077	216	098	756	374	600	012
21	680	304	110	068	322	643	768	680	406	423
22	384	703	352	506	709	947	365	300	777	582
23	279	279	626	109	818	593	650	386	340	724
24	055	926	659	972	397	395	187	608	422	062
25	036	297	682	030	022	128	825	857	492	195
26	711	808	391	183	739	725	081	157	250	290
27	484	169	368	860	938	942	448	462	080	752
28	058	100	184	438	584	227	206	920	871	283
29	796	237	044	995	375	178	733	615	724	882
30	207	732	574	545	968	272	501	399	829	028
31	831	124	183	194	224	456	178	139	612	861
32	604	125	456	561	280	918	218	198	932	065
33	146	275	501	030	300	255	404	120	404	715
34	132	859	371	062	500	623	231	246	277	928
35	412	269	232	798	912	929	124	093	074	421
36	425	814	564	040	963	164	165	479	996	078
37	631	660	545	971	311	412	392	057	344	078
38	190	568	841	023	795	666	679	873	095	258
39	462	359	376	152	146	709	225	978	715	429
40	932	886	345	994	521	938	322	110	312	495

ANNEX 3: Table 4 - Four Digit Random Numbers

ROWS	COLUMNS									
	1	2	3	4	5	6	7	8	9	10
1	1370	0113	4930	7338	3725	1220	2967	5313	9155	3777
2	2699	0466	8212	6656	1525	5232	7726	8360	1097	3537
3	7253	6372	3017	8595	3374	5258	8816	1097	2835	5564
4	2208	0581	8643	4955	3127	2002	9429	9650	8691	2914
5	2161	1820	9078	2654	6030	8718	8697	9176	2486	1239
6	4738	2264	3552	4462	6832	3445	7778	1400	9021	4209
7	9668	5248	4057	4368	5336	1666	2169	6103	1897	0641
8	4592	5885	3297	3125	0510	6231	6529	4526	9582	1128
9	7885	8704	3482	1956	0784	5205	5719	6272	4781	6092
10	5199	8596	5873	2490	4610	0139	1172	4189	2550	3086
11	6762	4369	3072	7193	9211	4286	4115	5800	3309	4836
12	0308	8278	4907	7061	9213	5230	8091	7561	8782	1091
13	4510	9581	2344	9245	7972	9723	7310	4544	5241	5317
14	6248	0868	8156	1760	3855	2984	3598	4960	3560	6294
15	5959	9053	7451	5431	1805	1581	6011	5559	1439	8652
16	7263	5566	4610	4778	6718	2480	5278	8369	9870	6025
17	4628	1307	3116	0572	4709	0389	8109	9025	9831	0254
18	2103	7344	0634	3225	0932	9862	7269	9078	1795	5697
19	8482	7145	0458	0205	2748	0401	9320	4305	3316	7496
20	7568	5088	6147	7651	6859	9468	1870	7348	5621	7021
21	4277	3002	3881	0334	5423	8172	0032	7691	6594	7985
22	6355	8977	9905	8083	5703	9714	9311	3851	1920	4749
23	5429	0466	0798	9197	9675	7748	4097	4041	1117	8507
24	4297	4697	3716	0493	7514	8557	8535	4453	1373	9080
25	5230	3363	8572	5388	4974	7592	6759	3125	5801	0040
26	8617	6717	5096	2205	1619	0215	1392	3435	3173	6650
27	3417	1570	3129	6939	4751	6606	8374	3612	9640	0851
28	2383	0916	8372	6982	6510	5752	1415	2551	2964	1562
29	6442	5339	3216	0078	3753	2287	6617	7238	4599	6683
30	2801	4090	6254	2603	3007	7066	3910	1720	0829	5224
31	7327	2980	8817	8742	5328	5088	7557	8527	5092	0028
32	6896	0984	1241	2299	5405	2755	8727	1347	0917	8821
33	4927	7014	9470	1474	9192	0525	5792	7367	9051	8700
34	8191	5061	0436	3662	5390	9638	8508	1602	2387	1466
35	7011	4733	5343	8692	3798	3849	9508	4898	2230	7546
36	7660	9862	2455	9678	7694	5995	7936	7365	2092	9055
37	3204	1017	2898	7009	1868	5478	9696	2296	1703	5075
38	2804	2522	3148	2675	0932	2149	8805	5726	4074	8335
39	8723	0746	9214	5791	4329	6708	4190	4776	3397	2105
40	1641	5252	3995	9051	4329	2255	7313	8180	7503	4145

ANNEX 4: Definitions

1. Homesteads

A homestead is a family which lives together in one location. It may include more than one individual farmer e.g. a man may have two or three wives each her own field (and therefore each being a farmer) or a man living together within the compound with his adult/married son.

2. Heads of Homestead

A man or woman who is generally responsible for making day to day decisions regarding the operations of the homestead's land holding, the utilisation of agricultural resources and growing of crops on the holding.

3. Crop Field

A crop field is a piece of land within a homestead's total land holding which contains a different crop or crop mixture such as maize or sorghum or maize/beans mixture or maize/beans/sorghum mixture. The field must be a continuous piece of land and should not be split by a path of more than one metre in width. Some extension workers prefer to call this, a crop panel. Hence these are used interchangeably in this survey.

4. Swazi Nation Land (SNL)

This is the land which is generally allocated to individuals by traditional chiefs.

5. Individual Titledeed Farms (ITF)

This is a leasehold farm land owned by individuals or groups of people or companies.