Study on Evaluation of Cropping (Rice) with the Help of Crop Cutting Experiment

Mirza Hasanuzzaman, PhD
Professor
Department of Agronomy
Sher-e-Bangla Agricultural University
Email: mhzsauag@yahoo.com

Crop-cutting experiment:

Crop cut is a widely used technique around the globe for estimating yield of paddy, wheat and other major field crops. It is a technique of selecting plot randomly of a given size in the field of a specified crop and harvesting its produce by following specified methodology. Here the crop cut is a physical act of harvesting mature crop from the selected plot (called crop-cutting plot) of a specified area created within a crop field in order to estimate its yield.

Historically, both BBS and DAE have been involved with crop yield assessment but using two different crop methodology for crop estimation. The difference in estimates have been attributed to difference in methodologies or professional bias of the responsible agency. The main purpose of the crop-cutting experiments conducted by the Department of Agriculture Extension (DAE) is to assess the impact of their agricultural extension services on agricultural productivity. Their crop cutting experiments were conducted in selected rectangular plots, whereas BBS surveys have been following circular plots for crop cutting.

The circular crop cutting plot was recommended because:

- There existed a tradition in BBS to conduct crop-cutting on circular plots, and that BBS field staff was already familiar with circular crop cutting procedure.
- Circular shape gives less perimeter in same plot size. In this case perimeter of rectangular shape is 18 meter and 15.85 meters for circular shape which is 2.15 meter less. Reduced perimeter of the sample plot results in reduced border effect and hence increase the reliability of the estimates.

Equipments needed for the Proper Conduct of Crop Cutting Experiments:

The person responsible for conducting the crop cutting experiment should have the following equipments in hand:

- Equipment for harvesting of the crop in the field
- Measuring tape (30 or 50 meters)
- Weighing balance
- Cloth for threshing
- Two strong waterproof bags (one for keeping crop cutting equipment and the other for keeping schedules and papers etc.).
- Pegs for marking the plot selected for the conduct of crop cutting experiment
- Moisture meter

Procedures

1. Selection of Field for the Conduct of Crop Cutting Experiment

The field is a discrete piece of land for growing the crop under study, which should be clearly demarcated on all its sides. The selected field should be large enough to accommodate one experimental circular plot of recommended size i.e., 20 sq.m.

The field for experimental crop cutting which satisfies the following conditions must be selected.

- The area of the selected field should be more than the area of CCE plot, so that at least one CCE plot is accommodated in the selected field.
- If the field is sown with mixed crops, the experimental crop must constitute at least 10% of its crop area.
- The experimental crop in the field is not meant for prize competition or seed production or demonstration, and
- The experimental crop is not grown for fodder purpose.

It must, however be noted that if (a) the experimental crop has not germinated or has failed, (b) the field growing the experimental crop is grazed by cattle or damaged partially or completely by wildlife, or (c) the experimental crop is affected by pests/diseases / heavy rainfall / inadequate rainfall, in these circumstances, the fields should be considered for selection.

2. Identification of South-west Corner

Fixing the south-west corner of the field is mandatory because it helps in mainlining uniformity. It also helps to locate and verify the experimental plot during supervision of the field work in the absence of the primary worker.

In case the selected field is not exactly in north-south and east-west direction, the corner, which is nearly south-west should be considered as the south-west corner. Standing on the south-west corner facing north, the selected field should be in the front and to the right hand side.

3 Measurements of the Length and Breadth of the Field

(a) Regular shape of the selected field

After locating the south-west corner of the field, measurements of the length and breadth of the field, along the longer and shorter sides are to be measured in feet starting from the south-west corner of the field (Fig. 1).

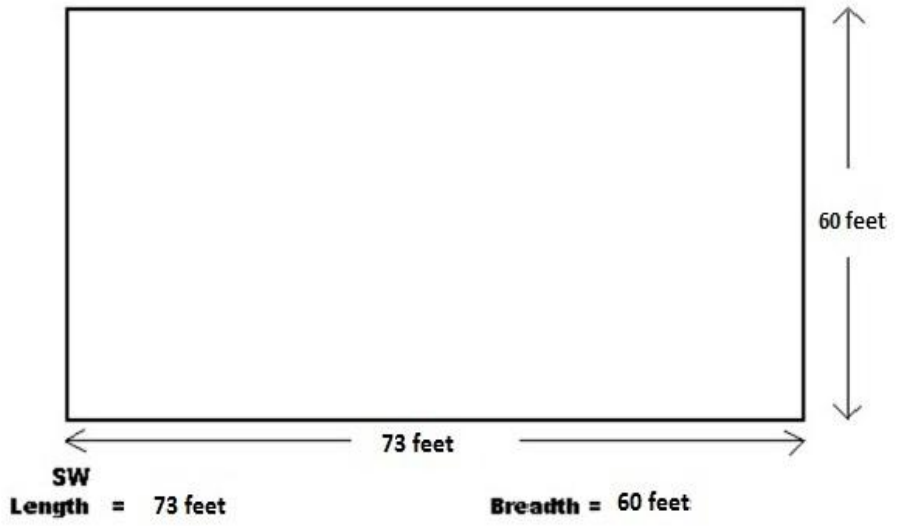

Fig. 1. Regular shaped field

(b) Irregular shape of the selected field

In case the selected field is irregular in shape, it is advisable to enclose the selected field in a regular shape by outer least possible dimensions. The length and breadth of the outer regular shape of the irregular field are to be measured for the purpose of locating the south-west corner of the experimental plot and to be demarcated. The south-west corner of the plot should be fixed with reference to the south-west corner of the outer regular shape of the irregular field (Fig. 2 and 3).

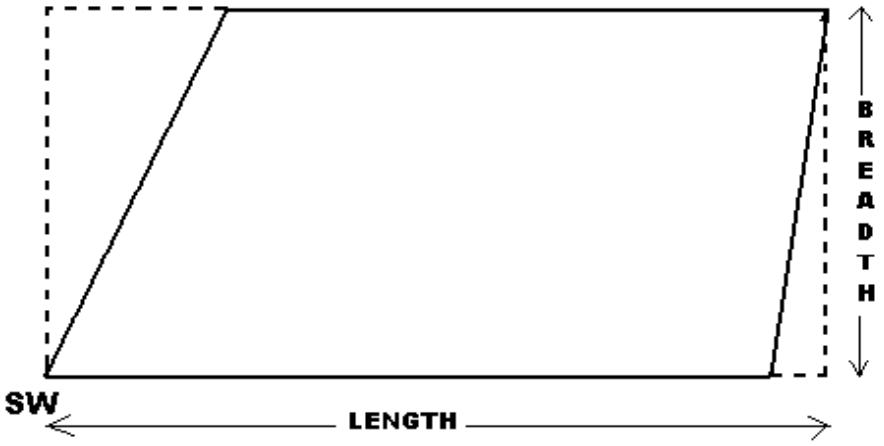

Fig. 2. Irregular shaped field

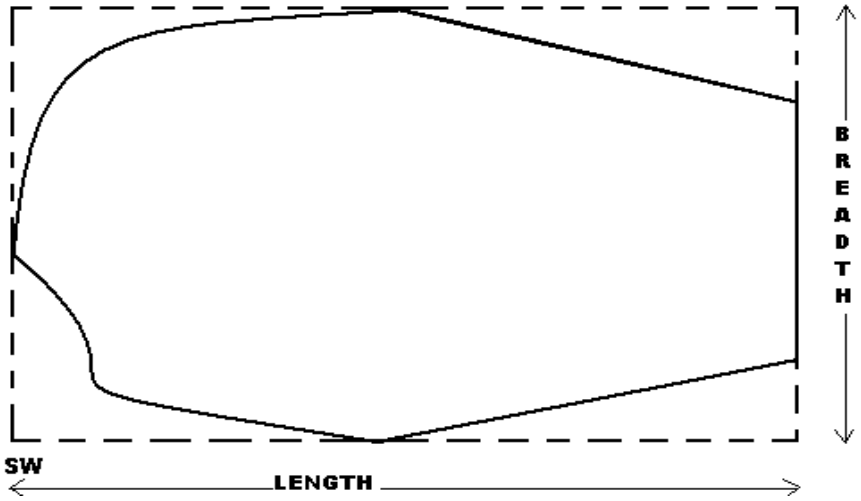

Fig. 3. Irregular shaped field

4 Determination of the Random Number Pair

After measuring the length and breadth of the selected field in feet, 9 feet each from the length and the breadth of the field should be deducted to ensure that the whole experimental plot is accommodated in the selected field.

Example:

Length of the selected field	= 73 feet
Deduct	= 9 feet
Net length	= 64 feet
Breadth of the selected field	= 60 feet
Deduct	= 9 feet
Net Breadth	= 51 feet

After making the above adjustments, two random numbers are to be selected, one corresponding to the length and the other corresponding to the breadth which are between 9 (inclusive) and less than or equal to the number of net lengthand net breath obtained for the length and breadth of the selected field. The random numbers are to be chosen from the column of random table assigned to the primary worker for determination of south-west corner of the experimental plot. Suppose the assigned column is 1, the random number for length should not be greater than 64. This random number is to be selected by referring to the two digit random number table (since 64 comprises two digits). From the Random Table a random number should be selected between 9 (inclusive) and 64, to get the experimental crop cutting plot inside the field. The first random number less than or equal to 64 is 47. The number 47 is selected for length.

The random number for breadth should not be greater than 51 and this should be selected by referring to the two digit random number table (since 51 comprises two digits). Similarly a random number should be selected between 9 (inclusive) and 64, to get the experimental crop cutting plot inside the field. The first number which is less than or equal to 51 is 37 in column 1 of two-digit random number table and this number should be selected for breadth. The pair of random numbers selected for locating the south west corner of the plot is (47, 37). If the assigned column is exhausted during the process of selection of random numbers, the next column on the right side should be referred.

In case the whole experimental plot does not lie within the field owing to the irregular shape of the field, the pair of random numbers should be rejected and a new pair of random numbers should be selected.

5 Marking the Experimental Plots

Since the random number pair selected is (47, 37), measure 47 feet along the length of the field from the south-west corner of the field and from this point measure 37 feet perpendicular to the length and parallel to the breadth of the field. The point, so reached is the point "A" as shown in Fig. 4. The point "A" is called as the key point, which is the center of the circle. A peg at the key point of the experimental plot should be fixed.

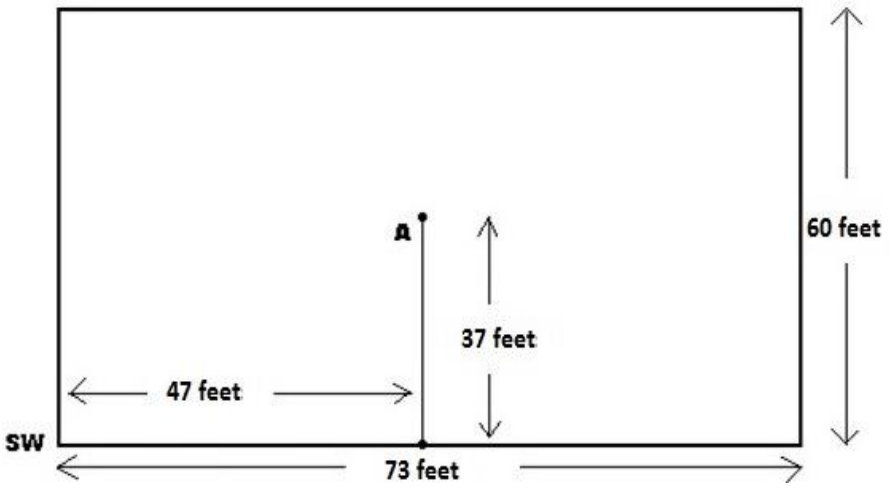

Fig. 4. Marking the plot (Step 1)

A length of 8.278 feet along the length of the field should be measured from corner "A" and reach the next corner of the experimental plot say corner "B". A peg should be fixed at the corner "B" (Fig.5). The line joining the point "A" and "B" is the radius of the circle of the experimental plot.

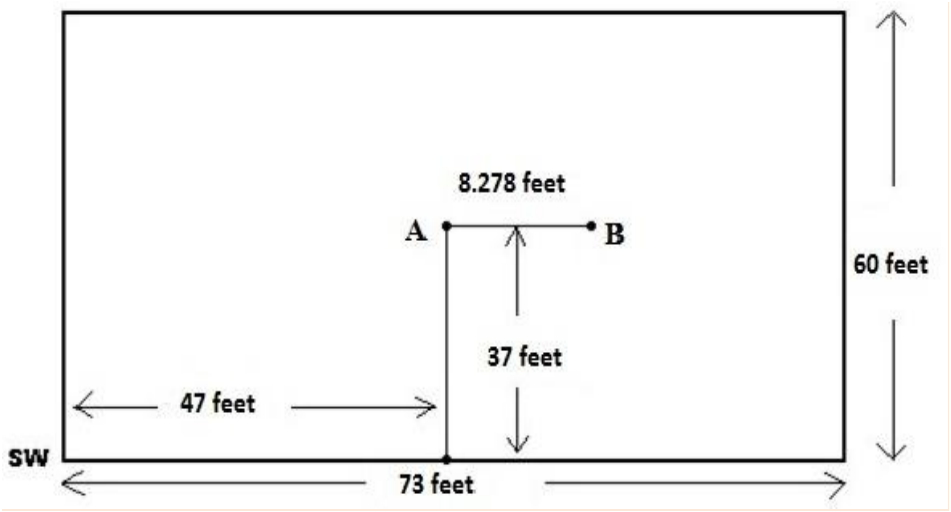

Fig. 5. Marking the plot (Step 2)

6 Determining crop cutting point and drawing the circular plot:

The area of the selected plot should be written in acre accurately. For example, if the plot size is one acre fifteen cents, 1 should be written in acre and 15 cents should be written in decimal

in the right spaces. Besides this, necessary information should be incorporated in this section accordingly.

It is suggested that, an iron rod should be placed deep at this point into the soil in the paddy field so that it remains strongly fixed. Using this iron rod as the center of crop cutting in circular system, a radius of 8.278 feet should be measured to draw a circle around the rod and all the crop plants within the circle should be harvested. This will cover the area equal to 215.278 square feet or 20 square meters. In case of irregular shape of the selected plot, the plot should be arbitrarily transformed in square / rectangular shape so as to determine the cutting point. If the crop cutting point falls outside the plot due to irregular shapes, further adjustments should be made for the selection of random points in south and west boundaries. Then a circle should be drawn by using the crop cutting instrument keeping the point 'A' as a center.

Sketch of Sample Crop (Rice) Cutting Experiment in Circular plot

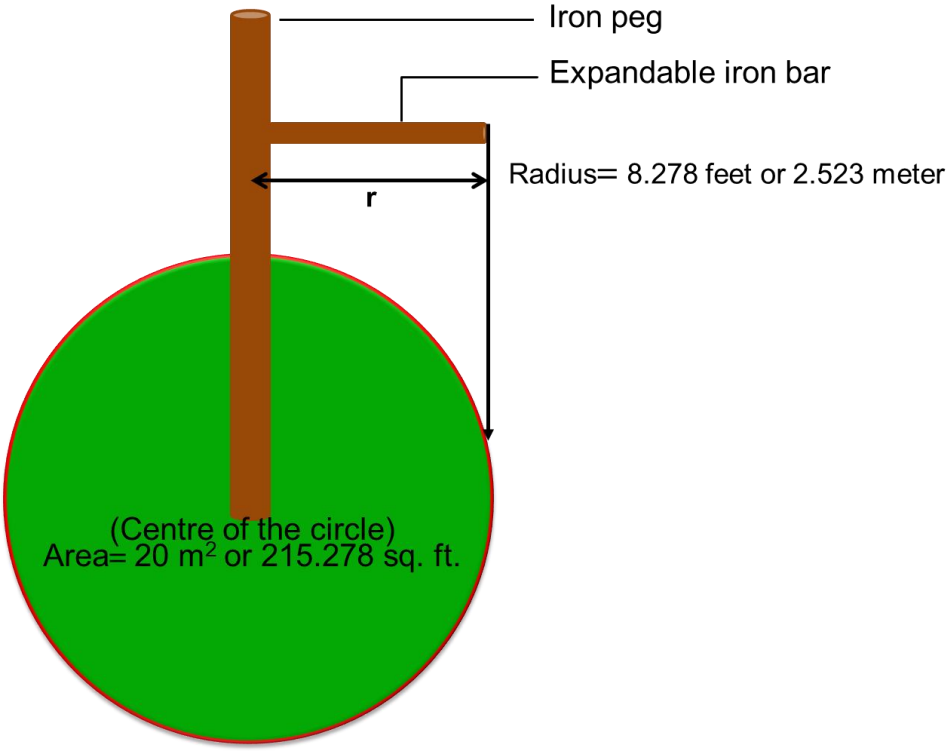

Fig. 6. Marking the plot and harvest in the grains (Step 3)

7 Harvesting Grains from the Selected Plot

The plants on the boundary of the plot should be harvested only if the roots/tillers are more than half inside the experimental plot. It should not be harvested if the roots/tillers are more than half outside the boundary of the experimental plot. Care should be taken to collect all the harvested plants and no ear-head is left in the experimental plot.

8 Threshing, winnowing and weighing of the harvested grains

The harvested plants should be spread on the threshing floor. A piece of cloth or mat should be placed on the threshing floor for drying and threshing the plants. The plants should be threshed carefully and all the grains should be separated by winnowing. The moisture percentage should be recorded by using a moisture meter and the clean and dry grains should

be stored in a gunny bag and weighed to the nearest possible weighing unit or the weighing machine provided.

The moisture level of the produce recorded and the normal moisture level of 14% of paddy should be applied as per the formula given below so as to obtain the weight of the dry and marketable produce.

FW = Fresh Weight (after harvesting, threshing and winnowing)
MC % = Moisture Content of grain when fresh (say 25% with the use of moisture meter)
W14% = Weight of Grain adjusted to 14% Moisture Content
W14% = FW x (100 - MC) / (FW x (100 - 14) = FW x (100 - 25) / (FW x 86)

Besides ensuring accuracy and timeliness of the enumeration of the area under crops, the statistical staff under the scheme is required to inspect the fieldwork of crop cutting experiments and ensure timely dispatch of the results.

Conversion Factor for Paddy to Rice

The official engaged in the conduct of crop cutting experiment for rice should note that the formula for conversion of produce of paddy into rice, which is followed in Bangladesh, is stated as below:

$$Rice = {}^{2}/_{3}\ Paddy$$