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On-Farm Seed Improvement by the Potato Seed Plot Technique

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Marking the best potato plants in a field with stakes

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Objectives. Study of this bulletin should enable you to:

- explain the principle of the potato seed plot technique,
- describe the procedure of the technique,
- calculate the seed plot size needed for your conditions,
- explain principles of seed plot care.

Study materials

- Diseased and healthy potato plants.

Practical

- Identify and mark desirable plants in a potato field.
- Point out undesirable and diseased plants in the field.
- Select the most advantageous location of a potato seed plot under your farming conditions.
- Calculate examples for seed plot sizes in addition to examples in Section 3.

Questionnaire

- 1 What is the principle of the potato seed plot technique?
- 2 Is roguing required in the potato seed plot technique? What benefit would its application have?
- 3 What is the major requirement for applying the technique?
- 4 What potato crop would you select to begin the seed improvement program?
- 5 At which time can you best recognize the most desirable plants?
- 6 Which plants should you mark by staking, and which not?
- 7 How many plants should you stake?
- 8 Give reasons for eliminating some staked plants at harvest.
- 9 How should you store the tubers of the staked plants?
- 10 How should you use the tubers from the **selected** plants?
- 11 Why should you use **all** tubers for replanting the seed plot, not just the ideal-size seed tubers?
- 12 How should you use the tubers from the **unmarked** plants once the seed plot technique is in progress?
- 13 What does the "multiplication rate" indicate?
- 14 Why should the seed plot size be larger than actually calculated? How much larger should it be?
- 15 What results would you expect, and how may you improve the potato seed plot technique after some years of careful selection?

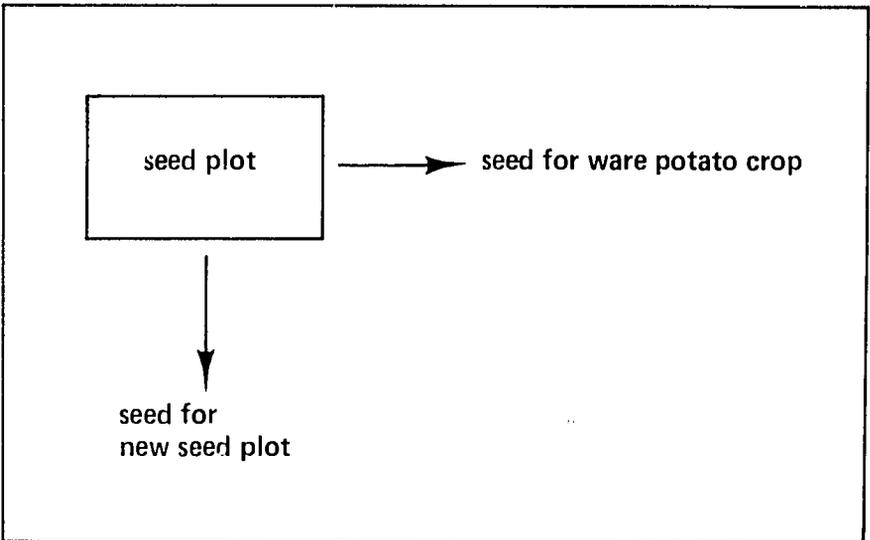
On-Farm Seed Improvement by the Potato Seed Plot Technique

- 1 Principle of the technique
- 2 Procedure
- 3 Calculating seed plot size
- 4 Seed plot care and anticipated results
- 5 Additional study

A potato grower can produce his own improved seed tubers and obtain a better crop through a planned process of selection of seed. The seed plot technique is especially useful in the absence of an official seed program.

1 PRINCIPLE OF THE TECHNIQUE

The objective is to improve the grower's seed stock by selecting the best plants from the current potato crop, storing the tubers from these selections separately, and using them the following season to plant the seed plot. The process is repeated each cropping season by selecting the best plants from the current seed plot for the new seed plot. The remaining tubers of the current seed plot are used as seed for the farmer's ware potato crop.



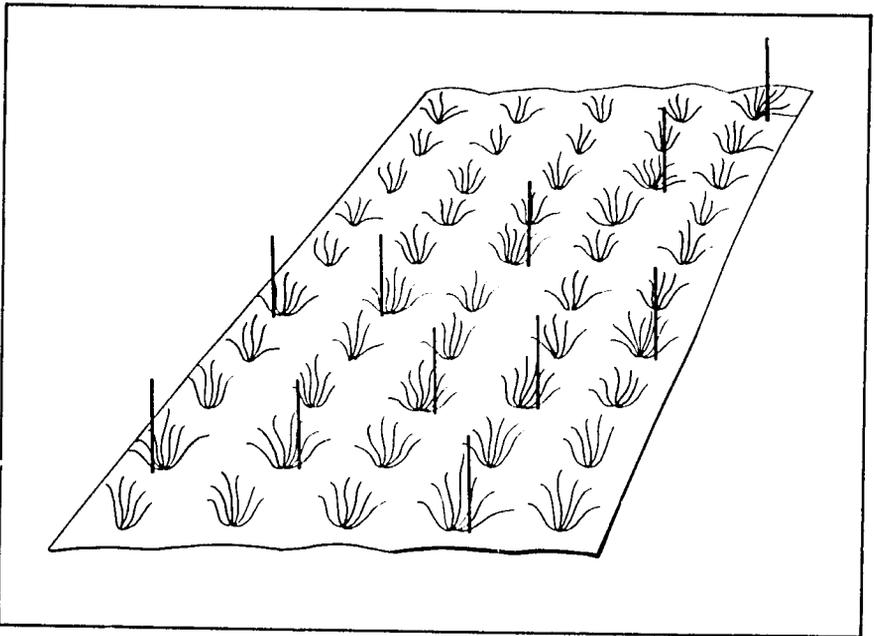
The best plants from the current seed plot are selected for the new seed plot. The remaining tubers are used as seed for the farmer's ware potato crop.

The selection process does not require roguing although this would improve the method's efficiency. The major requirement is ability of the grower to recognize symptoms of yield-reducing diseases. Such ability enhances selection of healthy plants.

2 PROCEDURE

The grower plans a selection program to fulfill the quantity of seed needed. This program includes the following steps.

- a The grower's best potato crop is used to begin the seed improvement program.
- b In the first year, selection at flowering time is best and easiest to recognize the desired variety so as to avoid mixtures. In subsequent seasons, select at the stage when plants almost touch each other and can still be recognized as individual plants. Mark the healthiest and most vigorous plants in the field with stakes. Stake all plants needed at the same time, and only those of the same variety. Do not select those with virus or other disease symptoms. Stake more plants than will be actually needed to plant the seed plot again next season.



Mark the healthiest and most vigorous plants in the field with stakes.

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- c Before harvesting the field, hand-harvest the staked plants to keep selected tubers separate. Some staked plants may be eliminated because of poor yields, tuber-borne diseases or deformities. Keep **all** tubers from the remaining staked plants, not just the ideal-size seed tubers. Tubers from the selected plants are too valuable to be used for purposes other than seed.
 - d Store tubers harvested from staked plants separate from the other potatoes to avoid mixtures and contamination.
 - e The following season plant the selected tubers in a newly-established potato seed plot. Plant the seed plot on land not used for potatoes the previous season or longer, and at some distance from other potato fields. Plant **all** tubers, not just the ideal-size seed tubers. Oversize tubers may be planted at wider spacing; smaller tubers at closer spacing.
 - f Again, as in "b", the best plants in the seed plot are staked; but this time it is done earlier, prior to flowering, when it is easy to recognize individual plants.
 - g **Selected** plants are harvested and tubers stored separately as in "c" and "d". These are needed to plant the seed plot again the following season. Tubers from the remaining **unmarked** plants of the seed plot are used as seed for the farmer's ware potato crop.
 - h Continue steps "f" and "g", always saving the best for the following season's seed plot and using the rest to plant the ware potato crop.

3 CALCULATING SEED PLOT SIZE

The seed plot size depends on the size of production area and multiplication rate of the variety being used. The multiplication rate indicates the average number of seed tubers produced by one plant.

Example 1:

Potato production area	1 ha
Seed required	2 500 kg/ha
Multiplication rate	10
Average seed weight	50 g/tuber

Calculate seed plot size and number of staked plants needed.

Seed plot size. Assuming a multiplication rate of 10, for 1 ha of production the required seed plot size is

$$\frac{1 \text{ ha}}{10} = 0.1 \text{ ha}$$

Number of staked plants. The amount of seed required to plant a 0.1 ha. seed plot is

$$\frac{2\,500\text{ kg}}{\text{ha}} \times 0.1\text{ ha} = 250\text{ kg}$$

Assuming an average seed weight of 50 g/tuber, the number of tubers required is

$$\frac{250\text{ kg}}{0.05\text{ kg/tuber}} = 5\,000\text{ tubers}$$

As the multiplication rate is 10, each potato plant produces 10 seed tubers. This implies that to produce 5 000 tubers the number of plants to be staked is

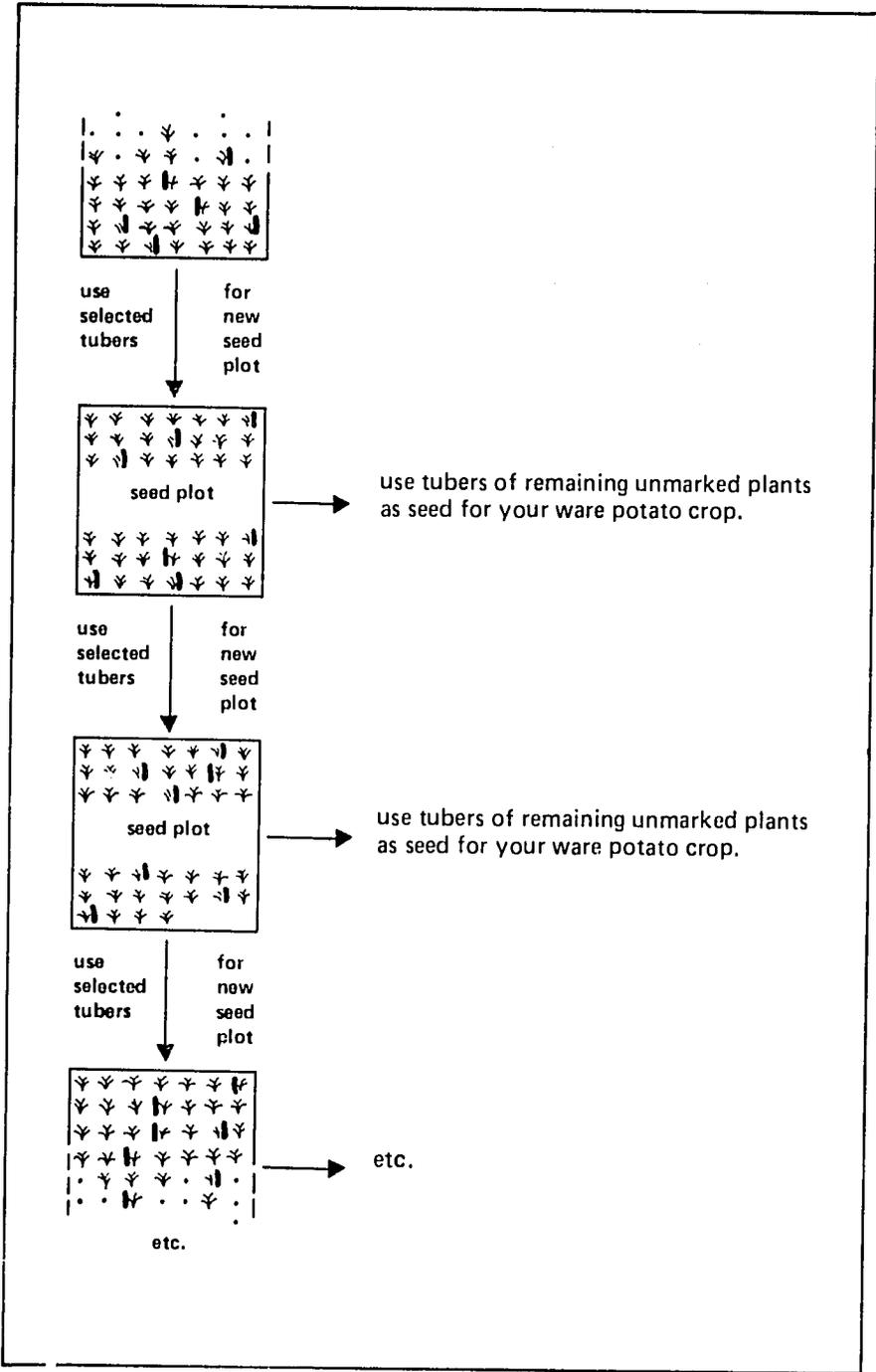
$$\frac{5\,000\text{ tuber}}{10\text{ tubers/plant}} = 500\text{ plants}$$

In practice, make the seed plot larger than calculated to compensate for plants selected to replant the seed plot (consider the multiplication rate), and for plants eliminated at harvest or tubers lost during storage.

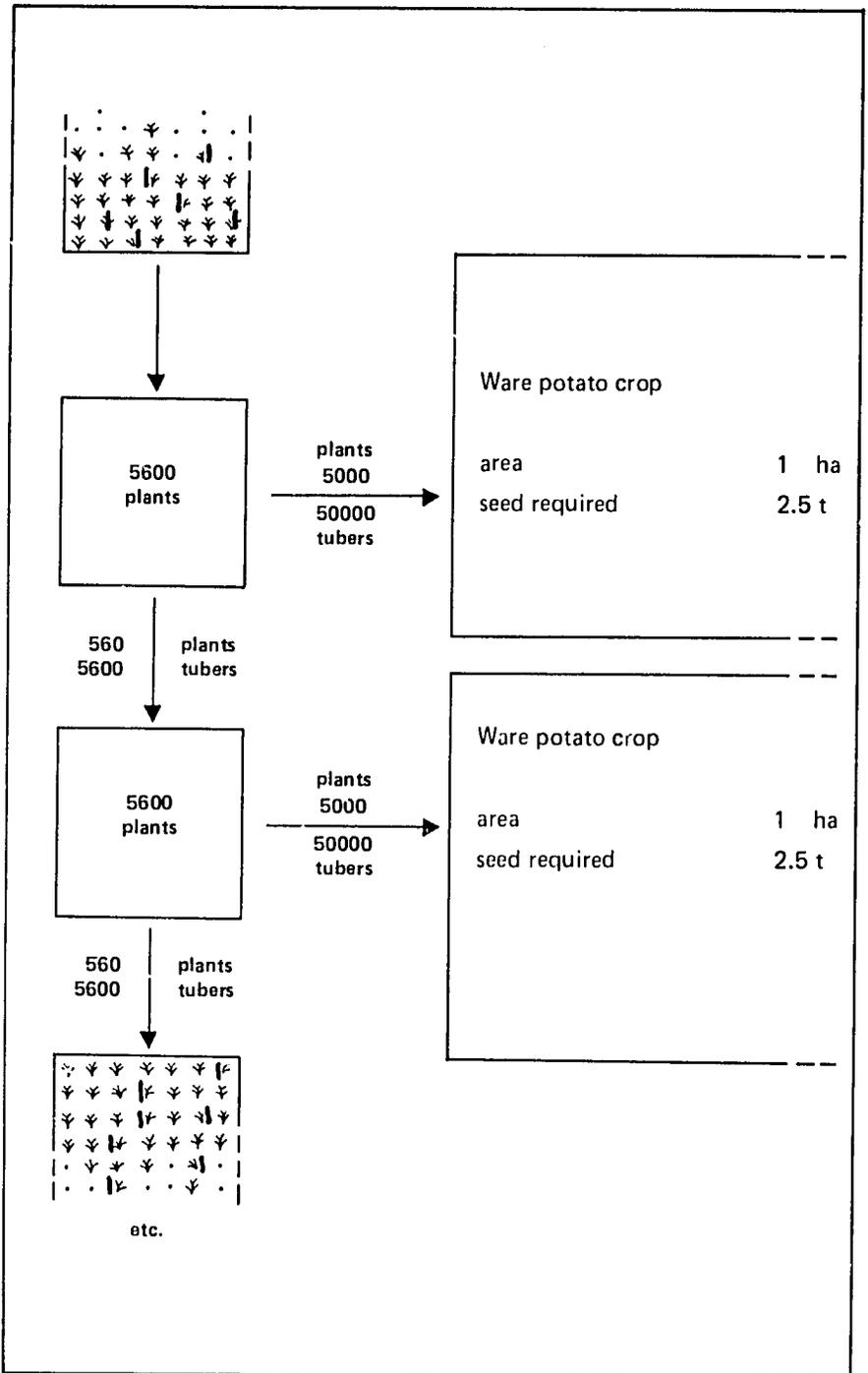
Example II:

Potato production area	0.5 ha
Planting distance	0.85 x 0.30 m
Multiplication rate	7

Calculate number of staked plants needed (result = 400 plants) and seed plot size (result = 714 m²).



Always use the tubers of the best plants of a seed plot to replant the next season's seed plot, and use the tubers of the remaining unmarked plants as seed for your ware potato crop.



In practice, make the seed plot larger than calculated (see example I).

4 SEED PLOT CARE AND ANTICIPATED RESULTS

The seed plot is the farmer's source of seed for the next season; special care should be taken to control aphids, the major virus vectors.

The farmer should attempt to control tuber size, in order to maximize number of useable (seed size) tubers and multiplication rate. This can be done by killing the vines as soon as the tubers have grown to seed size, and/or by adapting spacing to recommended stem density.

After the third year of careful selection, field appearance of the crop and its yield should have improved. At this time, roguing of plants with obvious off-type characteristics (diseases and mixtures) may be carried out.

In countries with more than one cropping season each year, seed plots should be grown so as to provide tubers that are physiologically ready for planting at the desired times.

Later, when justified by success of the potato seed plot technique, a higher level seed selection program, such as clonal selection, may be considered.

5 ADDITIONAL STUDY

Cortbaoui, R. 1980. Roguing Potatoes. Technical Information Bulletin 5. International Potato Center, Lima, Peru. 10 pp.

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