

PROFESSIONAL POTATO GROWING

Planting



CONTENTS

	Page
Planting	5
Seed bed	6
Soil structure	7
Moisture supply	7
Which seed to use?	8
The purpose of the crop	8
Stem density	8
Tuber size	9
Seed required	10
Examples	10
Planting density	11
Number of sprouts & spacing of tubers in the row	11
Row spacing	12
Planting depth	12
Earthing up	13
Ridging	13
Which method to use?	14
Manual planting	15
The semi-automatic planter	16
The automatic planter	17
Checks	19
Final consideration	19

Planting



For profitable potato production, many decisions have to be made. One of the most important aspects is planting. High yields of high quality potatoes are largely determined by the proper combination of healthy seed of the correct physiological age, an adequate seed-bed and careful planting.

Correct planting of high quality seed of the right cultivar in a well-prepared seed bed consisting of friable moist soil, forms the basis of a good crop. By correct planting we mean:

- the right planting date;
- planting at an optimum density;
- planting at an even and correct depth, which can be achieved only by a skilled tractor driver who has been well instructed.



It is very important to take adequate account of the actual conditions at the planting site and to make an accurate assessment of the consequences of certain choices. This edition of Professional Potato Growing discusses the management decisions, the necessary checks and actual operations involved during planting.



SEED BED

The period between planting and emergence is the most delicate stage of a potato crop. As optimum sprout development is highly influenced by the quality of the seed, age and sprouting stage, as well as by the proper soil conditions, especially temperature and moisture at planting time, the seed bed must meet high requirements.



SOIL STRUCTURE

In a good seed bed, the air, moisture and soil ratio is optimal. The environment then created will be conducive to a uniform emergence and undisturbed growth of the potato crop.



The seed bed should be level, free from clods and have a fairly fine-crumbled, loose soil layer with a depth of 8 to 10 cm, which is sufficiently firm and moist and permits the building of a well-formed ridge. A fine soil structure also helps to avoid rapid drying out of the ridge while, on the other hand, excessive soil tillage may lead to soil compaction and an unwanted reduction in the amount of soil water available to the crop. Potatoes are shallow-rooted, and both roots and tuber growth are extremely sensitive to soil compaction. For these reasons, the number of tillage operations must be minimized.

MOISTURE SUPPLY

Soil moisture markedly influences germination of the seed. If the soil is too dry, emergence is delayed and the number of stems is reduced. With normal soil moisture, emergence occurs rapidly and, soon after



planting, the sprouts produce roots which take up water from the soil. In saturated soil, the seed decays due to lack of oxygen. For this reason, heavy irrigation soon after planting is detrimental and pre-planting irrigation should be considered first. Thus, seed potatoes should be surrounded by moist soil or at least be planted in moist soil. The seed should be covered with a layer of soil sufficient to prevent the soil around the tuber from drying out too soon, while the subsoil should allow unhindered root development to guarantee an adequate moisture supply throughout the growing season.

Which seed to use?

THE PURPOSE OF THE CROP



To find out which seed stock is suitable, we must first establish the purpose of the crop. Are they to be seed potatoes, ware potatoes, a large-sized potato for the processing industry, or production for early markets perhaps? The combination of the required production purpose and harvesting time determines which seed stock should be used.

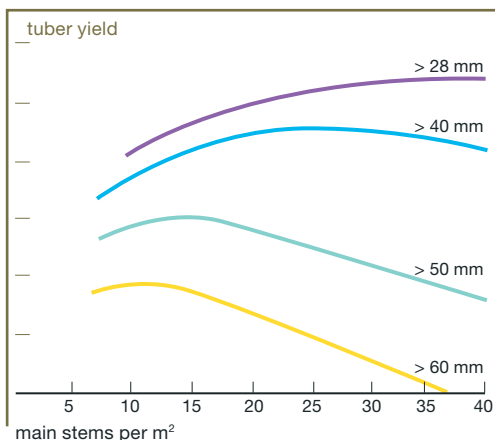
STEM DENSITY

Both the yield of the crop as well as the average tuber size are strongly influenced by the number of stems per hectare. Each main stem can be regarded as an independent production unit, which is why a

sufficient number of strong stems should develop per seed tuber. A greater stem density leads to higher yields but a finer grading, so the preferential density of a crop may be expressed in the number of stems per square metre and depends on the expected financial return. In addition to the number of tubers planted per hectare, the stem density is determined by:

- the physiological stage of the seed tuber;
- varietal characteristics;
- the number of sprouts per tuber;
- soil conditions;
- planter adjustments.

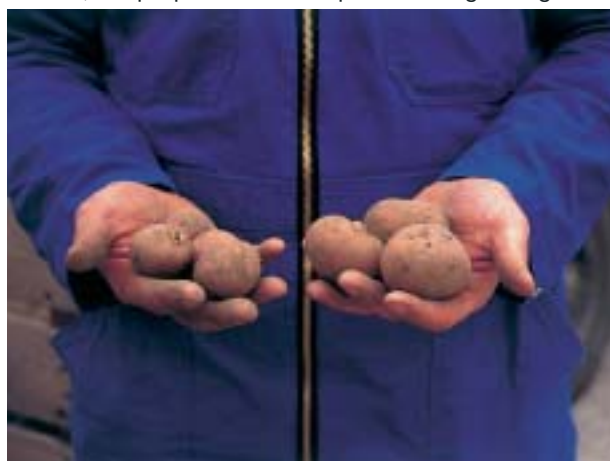




Relations between number of main stems per m² and tuber yield in the various grades (according to figures compiled by Reestman and Bodleander).

TUBER SIZE

If a reasonably high plant density is achieved, seed size has, under normal growing conditions, no great influence on yield. As a grower, you have the choice of different seed grades. This choice depends on economic factors, the purpose of the crop and local growing



conditions. A large seed potato will produce more stems. Nevertheless, a tonne of large seed potatoes will produce fewer stems than a tonne of small ones. A large seed potato has the advantage of having extra reserves in times of drought, cold, heat or in an inferior seed-bed. Under such growing conditions, the large seed potato will be more reliable than the small one. Small and large sizes usually differ in price. The grower can calculate which is the most economical: multiplying the price by the required number of kilograms will give the investment in seed stock. Given the right pre-treatment and depending on the size, the seed tubers should produce between three and six firm, short sprouts at the time of planting.

SEED REQUIRED



How does the grower calculate the quantity of seed potatoes required? In addition to the surface area of the field, two factors play a role in this:

- the required number of stems per square metre;
- the size of the seed tubers.

EXAMPLES



Those wishing to harvest a small size (28-45 mm) of seed should aim at a high stem density. Depending on variety, soil and climate, approximately 30-45 stems per square metre will suffice for this purpose under Dutch conditions. To obtain a high proportion of large tubers (>55 mm) to be sold to the processing industry for french fries, around 15-20 stems per square metre can suffice under Dutch conditions. In the latter case, four seed potatoes with four good sprouts will be sufficient for one square metre. If the average weight of a seed potato amounts to 50 grams, 2,000 kg of seed potatoes will be required per hectare (4 seed potatoes x 50 grams x 10,000 square metres).

Planting density

tuber diameter (mm)	tuber weight (grams)	expected number of stems/tuber	number of seed tubers/ha	seed weight kg/ha	spacing in the row		
					row distance		
					60 cm	70 cm	80 cm
28-35	25	2.5	60,000	1,500	28	24	21
35-45	50	4	38,000	1,900	44	38	33
45-55	90	5	30,000	2,700	55	48	42

If the number of sprouts has been established and the number of tubers per sack is known, the seed requirement for a parcel of land can be calculated. The figures in the table are based on a crop with 15 stems per square metre. The basic principle here is that the sizes 28-35 mm, 35-45 mm and 45-55 mm form 2.5, 4 and 5 stems per tuber, respectively.

required stem density/m²

$$\frac{\text{required stem density/m}^2}{\text{average number of sprouts/tuber}} \times \text{average tuber weight} \times 10,000 = \text{kg/ha}$$

NUMBER OF SPROUTS & SPACING OF TUBERS IN THE ROW

The average number of sprouts per tuber gives a good indication of the number of stems that can be expected. The number of stems determines the required spacing of the tubers in the row. Therefore, to be able to determine the correct distance, it is necessary to establish the average number of sprouts developing from the seed tubers. This is best done by counting the number of sprouts on a representative selection of tuber samples taken from the seed lot.



ROW SPACING

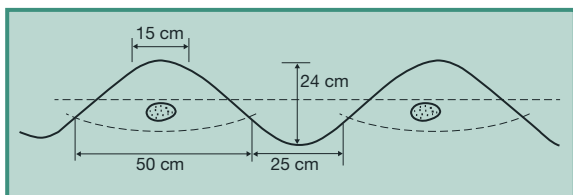


Potatoes can be grown in rows 50-100 cm apart. As a closed canopy at an early stage is conducive to production, it is important to aim at the quickest possible canopy closure when establishing the distance between the rows. The more favourable the growing conditions, the wider the distance between the row can be. A narrow row distance may give a better distribution of stems, but for technical reasons – the opportunity to make good sized ridges to protect the tubers – it is much better to grow potatoes at wider row distances (75-90 cm). In mechanized potato production, row spacing is determined by the standardized setting of the machinery.

PLANTING DEPTH



The planting depth should be adjusted according to the soil conditions. Under normal growing conditions, the top of the tuber will be level with the soil surface. As soil in the deeper layers dries out more slowly than surface soil, planting should be deeper in dry conditions. But while dry conditions make deeper planting essential, this is an advantage if temperatures are very high. A greater planting depth will also be important in circumstances in which the potato tuber moth poses a threat. Deep planting is not necessary in moist conditions, as there is no risk that the surface soil will dry out.



Shallow planting is also advantageous in cool conditions. The consequence of greater tuber depth is that a great deal of soil passes through the lifter during mechanical harvesting. Where the soil is heavy, this will be more detrimental than in the case of light soil. Varietal differences also play a role in planting depth variations. This is another reason why growers should be familiar with all the characteristics of their varieties.

EARTHING UP

In addition to planting depth, the depth of the soil cover also influences the development of the new haulm. When planting, only shallow earthing up is carried out if soil temperature is low or the seed is of inferior quality. A limited soil coverage also promotes a rapid initial

development. A deeper soil cover, on the other hand, can be applied when temperatures are high and the seed is sturdy.

RIDGING

In the case of shallow planting, or if the soil cover is thin, extra soil must be applied to the ridge at a later stage. A well developed ridge is very important for undisturbed tuber development. Moreover, a robust potato ridge prevents the developing tubers from becoming exposed, which could lead to them becoming green. Under wet conditions, the potatoes will not lie in waterlogged soil so soon, and a large ridge also

affords better protection against high temperatures and damage by the potato tuber moth. The period of time between planting and earthing up must be short if the climate is hot and dry, and if irrigation is needed soon after planting.

Which method to use?



To promote a rapid and even emergence with plenty of stems and growth of the crop, as well as to facilitate and optimize mechanical operations in the fields, planting should meet the following conditions:

- minimum damage of pre-sprouted seed during handling;
- straight rows and equal spacing between the rows, fairly accurate spacing in the row;
- uniform planting depth as shallow as possible, no contact between fertilizer and seed to prevent damage to sprouts and roots;
- covering of the potatoes immediately after planting to prevent damage to the seeds by heat and/or drying out of the soil around the seeds.

MANUAL PLANTING

Planting by hand is labour- and time-consuming. When planting in furrows, a toolbar with ridging bodies is generally used for opening the furrows. Special attention should be paid to a correct and uniform depth control. Fertilizer can be spread manually on to the bottom of the furrow and mixed with soil.



This method allows for an accurate spacing in the row and results in the least sprout damage. Covering of the seed after planting can be done by hand or mechanically by using a toolbar with ridging bodies. This must be carried out immediately after planting.



THE SEMI-AUTOMATIC PLANTER

Semi-automatic planters achieve an acceptable capacity and can save substantially on labour compared to planting by hand. These planters are very suitable for planting seeds with weak sprouts, because damage to sprouts is very limited. This system is suitable for both seed stock propagation and the cultivation of ware potatoes. Workers sitting on the machine place the seed by hand into planting cups mounted on a horizontal, ground-driven rotating wheel.



The machine is also fitted with furrow openers and covering discs. The capacity of these machines is limited by the number of planting units and human working speed. One person can place between 80 and 120 seed potatoes in planting cups a minute. The more planting units, the higher the output, but every unit needs an operator.



THE AUTOMATIC PLANTER

The advantage of the automatic planter is that it minimizes labour, as the only labour needed is the tractor driver. These planters are capable of very good work at high speed, provided that the seed has been graded well and has short, sturdy sprouts or eyes that are just open. The most common automatic planters are equipped with an automatic feeding mechanism, consisting of a vertical revolving chain or belt with two rows of cups.



The cups pick the seed from the hopper, bring it down behind a furrow opener and drop it at the required spacing into the furrow. Two adjustable discs or ridgers at the rear of the machine cover the seed.



Good alternatives for planting pre-sprouted seed have been adopted for gentle handling of sprouted seed.



Here, the planting system consists not of planting cups but a gutter-shaped belt for example. With this system, the potatoes are arranged in a continuous line on the planting belts to guarantee proper tuber spacing in the row.



CHECKS



Consult the instructions for proper planter settings. Check frequently for a correct seed drop, doubles and blanks, row spacing, planting depth and soil cover. Mechanized potato methods require straight planting, avoiding deviations in row spacing between the planter's passes. Correctly set markers are helpful in this, while the same stroke must be maintained during planting and ridging.

Final consideration

Certified seed: prerequisite



Rapid initial crop development and early canopy closure form the basis of a highly productive crop. The quality of the seed is of great importance here. Do not economize on the quality of the seed. The same applies to the seed bed preparation. Treat it with the utmost care. Any mistakes made during the planting stage will be very difficult, if not impossible, to rectify later during the season.

CREDITS

© 2002 NIVAA
Second edition
First edition: 1994

Authors

Mr. H.R. Baarveld (NIVAA)
Mr. H.M.G. Peeten (NIVAA)
Mrs. T.A. Sterk (NIVAA)

Photography

NIVAA

Production

Mrs. E.W.A. Campobello (NIVAA)
Mrs. H.H. Drenth
Mrs. S.R. Liefrink (NIVAA)

Printed by

De Groen Offset
Zoetermeer, The Netherlands



Publisher

NIVAA
The Netherlands Consultative
Potato Institute
Postbus 17337
2502 CH Den Haag
The Netherlands
Tel: +31 (0)70 312 30 00
Fax: +31 (0)70 312 30 01
info@nivaa.nl
www.nivaa.nl

1000.Eng.2002

Soil conservation

Bear in mind the danger of erosion and consider contour planting.

