

## Potatoes

# Preparation, planting and ridging with fewer passes

For several years manufacturers have improved planting machinery in numerous ways: greater precision in regulating densities and more versatility for using various sizes of seed tubers, improvement in the quality of ridging, and also the search for better work rates. Combining the operations is now an avenue worth exploring for producers.



*Saving time at planting is valuable in potato growing*

The traditional machinery for potato planting includes quite a lot of equipment and means of traction: handling machinery, trailer(s), tractors and machinery for soil tillage, planting and ridging. The association, now available from all the manufacturers, of a ridging, device directly on the planter, makes it possible, without much extra traction, to plant and earth up in a single pass. This requires a well-prepared soil, cultivated to sufficient depth to provide enough fine soil to create well-formed hills. This in turns needs a suitable moisture content to assure optimal deep soil preparation without risk of compaction or smearing of the layer below. The simultaneous formation of ridges in good conditions and the flexibility gained for pre-emergence herbicide application are the main advantages of the planter-ridger.

**Planting and ridging in a single operation requires a soil prepared to a sufficient depth to have enough fine soil.**

On the other hand it is preferable in this case to apply the nitrogen fertiliser before planting, whereas previously it was applied before ridging up.

To progress further with the combining of tools, soil preparation and the planting-ridging operation can also be achieved now in a single pass using a combination of tractor-drawn, semi-mounted and mounted tools, including planting at a 90 cm ridge spacing. Thus, during the most recent SIMA the Paris international agri-business show at Villepinte (Parisian region), Miedema presented its latest combination of mounted planter, adapted to its new CP42 planter, while Grimme offered the option of its semi-mounted planter associated with its GL34 T unit, with the partnership of SatPlan, for a self-guided precision machine based on RTK technology. This however requires sufficient traction power – at least 230 – 250 HP. Compared with the combination planting - ridging, in this case yet another tractor is dispensed with. In view of the power required, which could be difficult to justify on a single farm, it is worthwhile considering sharing the work over several growers. But even more than before, it is essential to carry out the operation in good soil conditions: patience appears thus to be a quality needed to avoid all possible agronomic mistakes.



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## Variable reductions in the time and costs of the operation

Simulations made by the institute with its new tool for calculating production costs Compéti-LIS® have allowed us to compare the different choices (table 1).

Compared with the operations of preparation, planting and ridging carried out separately, the estimated time saving is in the order of 30% if one just does the ridging at the time of planting. It is about 45% if the three operations are carried out at a single pass.

**The time saving is estimated at 45% if one combines preparation, planting and ridging in a single operation.**

Regarding production cost, a reduction of 15-20% can be expected in the total cost of the planting operation when planting and ridging are done in one pass but with preparation being done separately. On the other hand the expected benefit falls sharply or completely disappears if all three jobs are done simultaneously, mainly due to the high-powered tractor needed.

For the different hypotheses, we find an expected saving of about 15% in fuel consumption by combining these different planting operations.

Technical and economic assessment of four types of planting techniques made with the Compéti-LIS® tool.						
Calculations done for a modeled farm of the Picardy / Somme / Artois region growing 60 ha of potatoes (tab. 1)						
	Tractor power used	Work rate (ha/h)	Time per operation (h)	Fuel consumption (litres/ha)	Fuel consumption per operation (litres)	Estimated cost of the system (€/ha)
<b>System 1</b>						
Surface tillage	130	2	30	6.2	372	15.67
Preparation	130	1.5	40	13.3	798	24.84
Planting	115	1.3	46.2	14.6	876	46.41
Ridging	130	0.8	75	25	1500	59.6
Total			191.2		3546	146.52
<b>System 2</b>						
Surface tillage	130	2	30	6.2	372	13.47
Preparation	190	1.2	50	22.5	1350	52.82
Planting	115	1.3	46.2	14.6	876	46.41
Ridging	130	1.1	54.5	18	1080	61.37
Total			180.7		3678	174.07
<b>System 3</b>						
Superficial tillage	130	2	30	6.2	372	13.47
Preparation	190	1.2	50	22.5	1350	52.82
Combined Planting / Ridging	130	1.1	54.5	21.8	1308	64.57
Total			134.5		3030	130.96
<b>System 4</b>						
Surface tillage	130	2	30	6.2	372	14.65
Combined Preparation / Planting / Ridging	230	0.8	75	44	2640	144
Total			105.0		3012	158.65
Characteristics of the systems : <ul style="list-style-type: none"> <li>• System 1 - traditional planting : surface tillage wide harrow (6 m) combined with a light tine cultivator (6 m)), then deep preparation with a rotary harrow (4 m), then planting at 90 cm spacing with a top class 4 rows planter, then ridging with a rotary ridger (90 cm).</li> <li>• System 2 - rotary tillage system : surface tillage wide harrow (6 m) combined with a light tine cultivator (6 m)), then preparation with a 4 m rotary hoe, then planting at 90 cm spacing with a top class 4 rows planter, then ridging with a rotary ridger.</li> <li>• System 3 - two pass preparation and planting/ridging : surface tillage/wide harrow (6 m) combined with a light tine cultivator (6 m)), then preparation with a 4 m rotary hoe then planting at 90 cm spacing with a top class 4 rows planter equipped with a ridging device.</li> <li>• System 4 - preparing/planting/ridging in one pass: surface tillage wide harrow (6 m) combined with a light tine cultivator (6 m)), followed by a single pass for preparation/planting/ridging using a 90 cm top class 4 rows planter combined with a ridging device</li> </ul>						
Combining several operations reduces production costs but in particular, saves time.						



The advantages of combining operations are both technical and organisational.

## Limited effects on crop behaviour

In view of the opinion often put forward that soil warms up more slowly after direct ridging, measurements made by the institute show that there is practically no difference in the mean temperatures recorded in the middle of the ridge over the planting-emergence period for different types of planting (table 2). In fact the large ridges warm up less during the course of the day, but also cool down less during the night. Observations made over three years on this type of planting show no differences in emergence for the different planting systems. To avoid any disappointment however, two conditions are required: to use well-stored seed tubers owning good germination vigour, and to plant in good soil conditions (dried sufficiently deep and in a good way of warming up). In these conditions, the grower can also limit the risks of compaction traditionally due to the wheelings resulting from the numerous passes across the field for preparation.

Temperature records collected in the ridges for different planting types over the planting - emergence period (ARVALIS-Institut du végétal – 2006) (Table 2)

	75 cm	90 cm	3 rows bed	90 cm (combined planting / ridging)
Mean temperature	13.8	13.5	13.6	13.9
Standard deviation	3.46	2.96	2.87	2.87
Minimal temperature	5.9	7.03	8.13	8.26
Maximal temperature	22.7	20.1	21.3	21.3

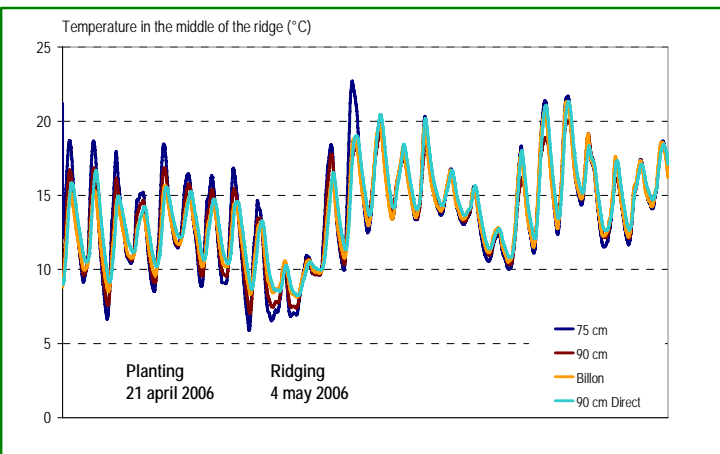
Apart from problems due to pathogens, difficulties of emergence are sometimes encountered. They are mostly due to poor structural stability of the ridges (heavy rainfall and very fine soil structure leading to the formation of a thick crust on the top of the ridge) than to the method of planting. In this particular case appearing after

**Problems with emergence are usually due to soil capping rather than to insufficient warming of the ridges.**

dry weather even with traditional planting systems, the use of specialised crust-breaking machinery should result in a more uniform emergence. Considering tubers quality, their dry matter content seems to be poorly affected. On the other hand, some problems of skin finish degradation have been detected with frequent observations of increase in attacks of rhizoctonia and silver scurf.

## Technical and organisational advantages

Although there are some limitations for the development of this type of system (high tractor power, the need to wait for an enough deep drying of the soil profile, specific equipment, precautions to take for preparing the plant and limiting soil parasitism), the advantages expected from the introduction of these techniques are either technical (limitation of compaction, more flexibility in the choice of weeding date), or especially organisational, by reducing the number of machines and workers needed for the planting operation. The cost of



To avoid problems at the time of emergence it is better to work with a well-stored seed tuber with good germination ability, and to plant into a soil suitably rewetted to depth, and in the process of warming up.

production can also be reduced for the global operation of planting, but usually to a lesser extent in comparison with the time saved for the work. The calculation of the ideal investment in and effective use of these specific machines need to be examined closely in the general context of the farm.



Creating a ridge at the time of planting using a suitable bed-former fixed behind the planter requires a sufficient volume of crumbly soil.

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