CASE STUDIES

# ‘THE CROP CULTIVATION BICYCLE’

## 1. Description of the case

### *1.1. Introduction*

Fragum BV is a company that cultivates strawberries in greenhouses. With 3.5 hectares of greenhouse surface, Fragum belongs to the big strawberry producers in The Netherlands. They sell their strawberries mainly on the English and German market. One plant delivers strawberries twice a year: in late fall and late spring. After the second delivery the plant is removed, the greenhouses are cleaned and disinfected and in august new slips are planted out. The number of employees at Fragum BV is about 30 during the whole year and an extra 10-20 for the second harvest in spring.

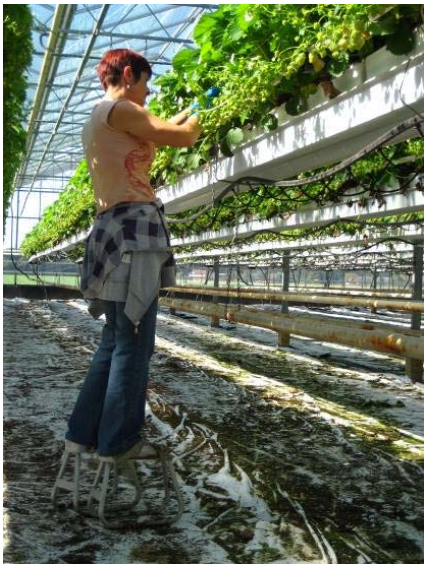
In greenhouse horticulture, cultivation of strawberries is done on high racks, so-called gullies. The strawberry plants are at a height of 150-160 cm. The manual activities of strawberry cultivation are: plant out the new slips; pull through the blossoms and remove bad leaves; harvest ripe strawberries; cut the plant so only new, fresh leaves remain; pull through the blossoms and remove bad leaves; harvest ripe strawberries; remove the whole plant. The blossoms have to be pulled to the side of the gully to make later harvesting easier and to prevent that strawberries rot in between the leaves. This activity is performed twice a year, during 2-3 weeks in a row.

Left: strawberry cultivation on 150-160 cm high racks. Right: pulling the blossoms through.

As the strawberries grow at a height of 150-160 cm, manually taking care of them poses a problem to the workers. They have to walk on stilts to be able to reach them, in the early growing stage when the strawberries are not yet hanging down. When the strawberries are ripe, they hang down at the side of the gullies about 20 cm lower than the plants. This height, 130-140 cm above floor level, is the optimal harvesting height for the employees of Fragum. Since harvesting is performed during more weeks than pulling the blossoms through, the height of the gullies is adjusted to the first activity rather than to the latter. A height adjustable system to have the gullies at the right height for both activities is too expensive.

Walking on the 30 cm high stilts implies several health and safety risks. Because of the height and resulting insecurity, the workers walk with undue tension in leg and back muscles. This may lead to

fatigue and discomfort in those body regions. Furthermore, walking on the stilts implies a risk for falls, as the centre of mass is 30 cm higher than normal. Workers at Fragum report pain in the lower back and the legs, especially the lower legs. Although some workers have experienced a loss of balance, no one has been seriously injured so far. Actual falls are often prevented by the racks, as workers can grab them after a loss of balance.



Left: standing on stilts while pulling blossoms through. Right: close-up of the stilts.

## *1.2. Aims*

To reduce the health and safety risks associated with walking on stilts, in 2003 one of the owners of Fragum BV, Mr Ger van den Bekerom, developed a special bicycle: the crop cultivation bicycle ("gewasverzorgingsfiets" in Dutch). The aim of the bicycle is to enable workers to pull the blossoms through while sitting on a stable, yet mobile device with an elevated seat. The main target group was the employees of Fragum, but the bicycle is also for sale for other people or companies.

## *1.3. What was done, and how?*

Mr van den Bekerom made the first sketch of the bicycle and two local cycle repairmen, Jac Bartels and Jan Hegger, supplied the necessary materials and production expertise. The bicycle looks like a kart, has four wheels and is propelled by a chain. The front wheels are operated by a steering handle. The pedals and seat are square to the driving direction. The seat, steering handle and pedals are height adjustable, enabling individual comfort. The three men first build a prototype, which was tested in practice. This test showed that the chain and pedals were positioned too much forward (introducing a large reaching distance for the workers) and that an ordinary bicycle seat was not comfortable enough. The chain and pedals were adjusted to a more vertical position and the bicycle seat was replaced by a moped seat. Next, the final bicycle was built.

The employees of Fragum have not been involved in the development process, other than for making sure that the dimensions of the bicycle fit them. When the final bicycle was ready, all employees got the opportunity to test it during work. Most of the Dutch employees took this opportunity; some liked it and still use the bicycle. Most of the foreign employees, however, were very reluctant to test the bicycle. Only a few took the opportunity, but none of them is using the bicycle at the moment. The crop cultivation bicycle was also demonstrated in other companies in the area.

Left: the crop cultivation bicycle. The handle that steers the front wheels is left to the seat, a holder to carry a bucket is right to it. Right: riding the bicycle while pulling blossoms through.

## *1.4. What was achieved?*

Taking care of the strawberries while sitting on the bicycle has several advantages compared to walking on stilts:

- the shoulder muscles are less strained, because the working height can be adjusted to the individual worker;
- prolonged standing is eliminated completely, thus reducing the development of discomfort in the legs and lower back;
- the risk of falling is eliminated completely;
- the working speed is not lower, nor higher on the bicycle.

The older employees of Fragum endorse the health and safety benefits described above. They use the bicycle, because they get pain in the legs and lower back when using the stilts. Thus, the bicycle enables older employees to continue working in a physically demanding situation. The younger employees do not report problems when using the stilts and find those handier. Therefore, they do not apply the bicycle, despite the short term safety and long term health benefits. Remarkably, the employees that use the bicycle are all Dutch. No one of the large number of foreign employees at Fragum applies it. This might be due to the difference in cycling culture between the countries. The bicycle use among young and foreign employees might have been somewhat larger if they had been involved in the development process from the start and if a well-considered implementation strategy had been used.

The development costs of the bicycle were about 500 euros and the bicycle is currently for sale for that price. One pair of stilts, on the other hand, costs only 50 euros. Although the bicycle is a very nice solution to a health and safety problem in strawberry cultivation, companies do not regard it as a financially profitable solution. This might be due to the fact that a company has to make short term investments to prevent long term problems. A cost-benefit analysis might provide companies with the necessary insight into the financial benefits associated with prevention of musculoskeletal disorders among their employees. In addition, a tax advantage when buying the bicycle could be a welcome incentive for the companies.

## 1.5. Success factors

The success of the crop cultivation bicycle at Fragum BV is that it enables older workers or those with back or leg problems to continue working in a physically demanding situation. For the employees this means that they can work without or with less pain and discomfort. For Fragum this means that the older workers or those with back or leg problems can remain in service of the company. This is valuable because that group is often very experienced and they can teach younger employees not only how to work, but also how to work in a safe and healthy way.

## 1.6. Further information

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## 1.7. Transferability

In greenhouse horticulture, tomatoes and paprika's are cultivated on high racks too. The crop cultivation bicycle might be applied in some parts of the care and harvest process. This has not been tested yet. Important prerequisites for use of the bicycle are: sufficient riding space for the bicycle between the rows of racks and sufficient space for the knees and pedals below the racks.

# 2. References, resources:

- Fragum BV, Mr Jac van den Bekerom
- STIGAS, Mr Ton Joosten