

# Integrating robots and grazing

**Is robotic milking compatible with producing milk from grazed grass? Yes is the answer, according to current research work carried out by the Irish Agriculture and Food Development Authority—Teagasc. Mike Green reports.**

A robotic milking unit was installed at the Teagasc Moorepark Research Centre's Dairygold Farm in County Cork in 2011. Since then it has been successfully integrated for a spring calving herd on a grazing based system with fresh grass encouraging cows to flow through the system.

"A critical factor to making the system successful is grassland management," explains research officer Cathriona Foley. "The motivation for cows to move through the system is fresh grass."

The 70-cow herd—a mixture of Friesian, Jersey, Norwegian Red and crossbred cows—are milked by a Fullwood Merlin robotic milker. The herd calves in a block in the spring—during February and March—and is dried off at the end of November. They are then housed in a slatted shed with cubicles and are put out to pasture as they calve.

The unit operates a three way (ABC) grazing system which encourages cows to walk to and be processed through robot collection and sorting area at least three times a day.

The unit has a grazing platform of 24 hectares and is split into three grazing sections, each with paddocks of around one hectare. Grazing is carefully allocated in the paddocks each day using an electric fence. Access times to the paddocks are as follows:

- Paddock A: 12:30am to 9:30am
- Paddock B: 9:30am to 4:30pm
- Paddock C: 4:30pm to 12:30am

"Each grazing section is managed individually and treated as a separate unit," explains Cathriona. "When there is surplus grass, pad-



*Cows get access to fresh grass three times a day and must visit the robot area to access new grass.*

docks will be closed and made into big bale silage."

The aim is to allocate enough grass so the cows consume 5.0 to 6.0kg of dry matter per cow per grazing. To do this a residual grazing height of 4.0 to 4.5cm in summer and 5.0 to 5.5cm in autumn is needed. "We want the paddocks to be well eaten but not for the cows to be hanging around in the yard before the next block of grazing opens," says Cathriona.

Cows are fed concentrates in the robot.

They get a minimum of 0.5kg per day when grass is plentiful up to a maximum of 4.0kg a day if grass supplies are short—a factor this year when drought in July affected grass growth. Average concentrate allocation over the lactation is around 1.4kg per day.

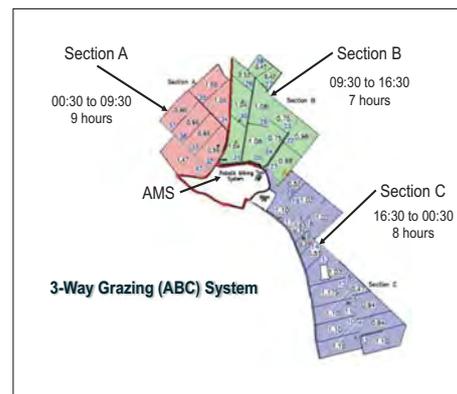
Silage is also buffer fed to minimise concentrate use and supplement grazed grass. During the drought this summer the herd were fed silage to allow the grazing pastures to get ahead of the cows. This was rotated between the grazing blocks so the cows still got two spells on fresh grass each day while allowing one of the grazing blocks an extra day to recover.

Supervising the day to day management of the herd is research technician James Daunt.

*Continued on page 20.*



*The Fullwood Merlin robotic milker was installed at Dairygold Farm three years ago.*



*A plan of the grazing paddocks.*



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Continued from page 18.



*Water is available at all times in and next to the milking area.*



*The pre shedding gate send cows to the robots or to back to pasture.*

From February to June when the cows and heifers are calving, training to use the robots and being served, his working day runs from 7:30am until 5:00pm.

From July to November James works from 8:30am to 5:00pm. The typical daily routine during this period is first to change the milk filter and then to go on the computer and check any cows

that the robot has highlighted as needing attention. The robot has Fullwood's Crystal sensing equipment and software which monitors milking intervals, yields, milk conductivity (an indicator for cell counts) and cow activity and produces action lists to aid management of the herd.

After dealing with any cows needing attention, James then does

a maintenance check of the robot.

He then goes to paddock B and moves the electric fence to allocate the cows the correct amount of grass for the grazing period. When this is done he washes and cleans the yard around the robot and is finished by 11:00am. Then he moves the electric fence to allocate fresh grass in paddock C before lunch. The rest of the

afternoon is allocated to managing the cows and routine jobs before he moves the fence in block A and then goes home at about 5:00pm.

James is responsible for allocating the grass and twice a week uses a quadrant and shears to harvest grass and accurately measure grassland cover. "This lets us record grass growth and helps me get my eye in for allocating grass

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Cathriona Foley.

in the paddocks," he says.

As with any robotic milking system the key factor is cow flow and getting them to visit the robots for milking. The key factors in this system are the availability of fresh grass, concentrates in the robot and water.

There is no water available in the paddocks and cows have to visit the milking yard to get water. Cows can freely access water at all times and therefore in an ABC grazing system have the opportunity to drink water in the yard at least three times a day on their way to new pasture. Copper and magnesium are added to prevent deficiencies.

Cow flow through the system

Cows coming to the robot area must go through a pre-selection gate. If the cow is due to be milked it will be sent into a holding area and given access to the robot. If not due to be milked the cow is sent back into the grazing paddock it came from or to a new paddock if this has been opened. "The only time we have to go and bring the cows to the robot is in the training period in March and April," says James. "After three to four weeks the cows learn the system and tend to know when a new grazing block has opened."

After milking cows go through a post selection gate which sends them to the current grazing paddock.



James Daunt.

The furthest grazing paddock is 750 metres away but cows are happy to walk this distance to be milked. "The cows are not rushed and stroll at their own pace and on a path that suits them when visiting and leaving the robotic milker," says Cathriona.

"The cows do learn when the grass paddocks are changed. Recently a study in Australia has shown that the advantage of the three way over a two way system is that there are more cow visits per day."

It is the third year the robot has been in service and the first year the current herd has been milked on through the system. Work in previous years, led by Dr. Bernadette O'Brien, showed cows have averaged 4,500 litres and a milk solids yield of 351kg per cow/year. The average number of milkings ranged from 125 a day in March to May to 80 per day in October-November—an average of 108 milkings per day and 2.0 to 1.5 visits to the robot per day (average 1.8 visits). Each milking averaged seven min-

utes.

Research on the automated milking system (AMS) at Moorepark is part of AUTOGRASSMILK ([www.autograssmilk.eu](http://www.autograssmilk.eu)), an EU research project being conducted from 2013 to 2015 to develop and implement sustainable dairy systems which integrate grazing of dairy cows with automated milking.

The project has created a lot of interest this year and farmers from Denmark, Norway, Finland, France, The Netherlands and the UK have visited the unit. "We have successfully shown that automated milking systems can be integrated with a grazing system," adds Cathriona. "We are currently looking at the economics and sustainability of



An underpass has been built for cows to access block A.

the system and this will determine if it is a viable option for dairy farmers to adopt."

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# System suits cows and farmer

Dairy producer James O'Brien installed a Fullwod Merlin robot on his farm at Croon, Co. Limerick, in the spring of this year and has successfully adopted the three way grazing system.

Mr O'Brien manages his 85-cow herd on his own. Seventy per cent of the herd calves in spring and 30% in autumn with a maximum of 77 cows milking at any one time. He has 75 acres and rents a further 45 acres.

"I needed to change the parlour and looked at the options," explains Mr O'Brien. "I have been milking cows for 20 years and have another 20 years to go so I looked at robots. I thought that if I did not put in a robot now then I never would."

## ABC grazing system

And so he did some research on the internet and visited seven units with robots, including Moorepark's operation at Dairygold Farm. "Moorepark was the only place I saw the ABC grazing system and I liked it," he says.

Another attraction was the pre-selection gate which means cows do not have to go through the robot to be able to get back to grass—if they do not need to be milked they are diverted back to the grazing area. "This is essential for managing the grazing system," he says.

Access to each grazing block is timed as follows:

—Paddock A: 10:30pm to 9:00am

—Paddock B: 9:00am to 4:30pm

—Paddock C: 4:30pm to 10:30pm



*Grass availability is key to cow flow through the robotic system.*

Mr O'Brien uses his eye to judge how much grass to allocate in each paddock every day. "If I allocate too much grass the cows are slower to come back in for milking," he says. "And if I do not allocate enough grass they will come back to the robots too early. Grass availability is the motivator on this system and that is a challenge."

Investment has been made to the infrastructure of the farm with roadways, fencing and water troughs being installed. "The shape of the farm is not an issue—it is accessibility that is most important," he maintains.

"The furthest paddock is 900 metres away which is not a problem for the cows—but it is for me

having to go and move the electric fence."

The cows are back fenced so that they only have access to the fresh grazing paddock. "This is helping produce a lot more grass," says Mr O'Brien.

Paddocks are closed off during the year and surplus grass is made into big bale silage.

The grazing area gets 25 units of nitrogen per acre every three weeks starting in the second week of February until October 1st. All the grassland gets 3,000 gallons per acre of slurry in winter.

Yields on the farm have averaged around 5,700 litres per cow but this will increase to over 6,000 litres after a full year on the robots says Mr O'Brien. "The better cows

produce a lot more milk with the highest yielders producing 9.5 gallons (36 litres) a day."

The Merlin's computer software decides how often cows should be milked although this is managed manually for new cows to the system. In summer the average number of visits to the robot is 2.4 and in autumn averages 1.8.

Concentrates are fed in the robot with cows producing over 20 litres allocated 4.0kg a day, those over 25 litres get 5.0kg and those over 30 litres get a maximum of 6.0kg per day.

## Cubicle and feed access

Due to the layout of the dairy unit, to access the robot and return to grazing, cows have to walk through a cubicle shed—this has been found to be very useful. "Before or after milking the cows can lie down in the cubicles if they want—and some of them do," says Mr O'Brien.

"If it is a cold miserable night I can have as many as thirty or forty cows in the cubicles—but they are never all in and there are always some out at grass. There is also a feed passage where I can feed straw and silage when they leave the robot."

Mr O'Brien's working day starts at 7:30am and he says he tries to finish before 7:30pm. "With this system I am producing more grass, producing more milk and have a lot more time to do my jobs," he concludes. "The cows have also adapted well and been very happy with it."



*James O'Brien.*



*Some tracks only need to be wide enough to allow two cows to pass.*



*Cows have access to cubicles after milking and a feed trough (top right).*