

# Recent advances to enhance sustainability in pasture-based systems: The Irish experience

Prof. Tommy Boland

*School of Agriculture and Food Science, University College Dublin*



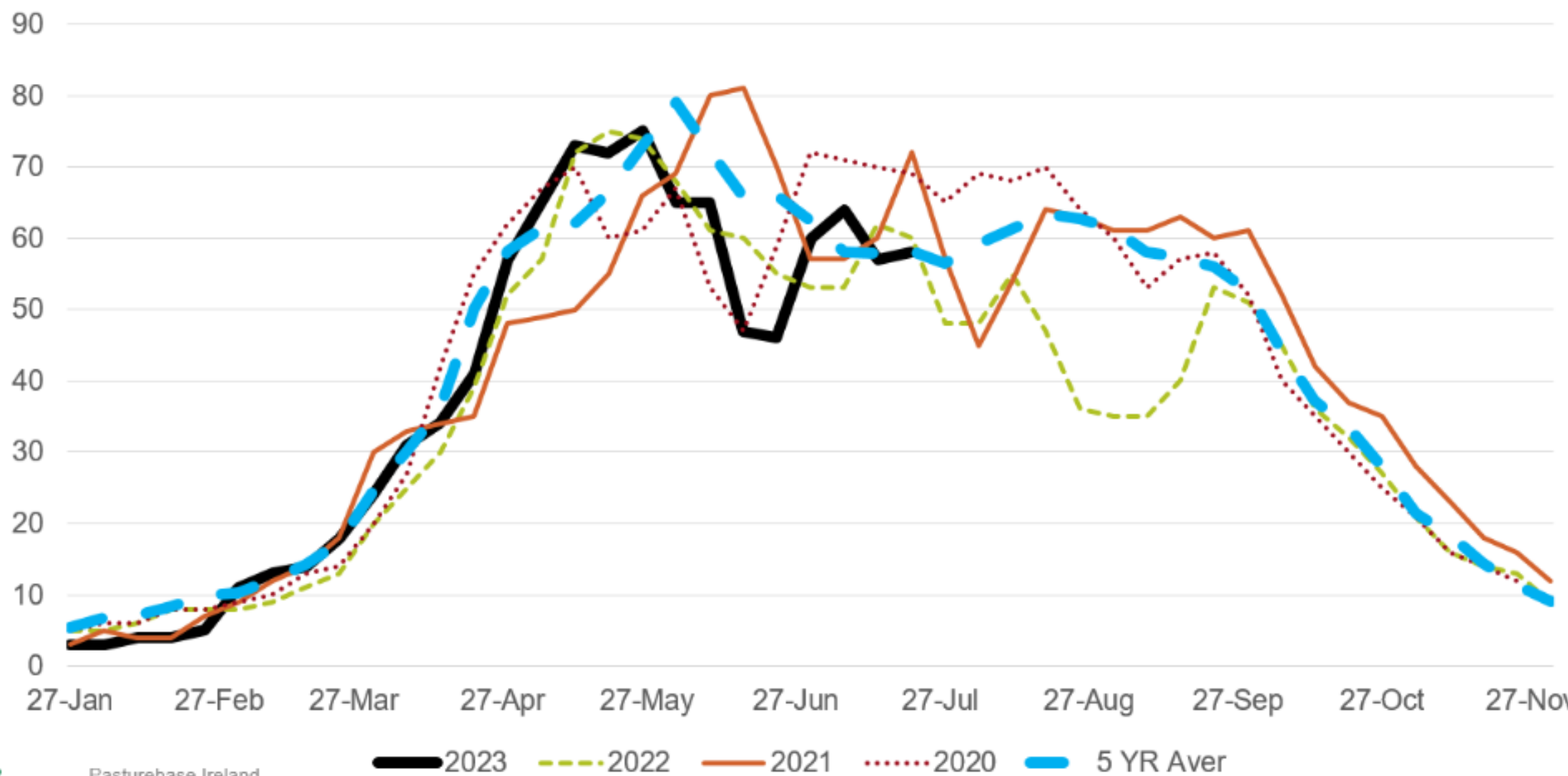
# Ireland's Grass Advantage

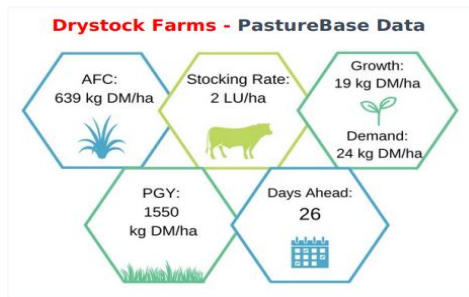


The Gulf Stream provides frequent rainfall and mild temperature range.

-Ireland has Europe's longest growing grass season

# Pasturebase Ireland Grass Growth 2023 - 2020





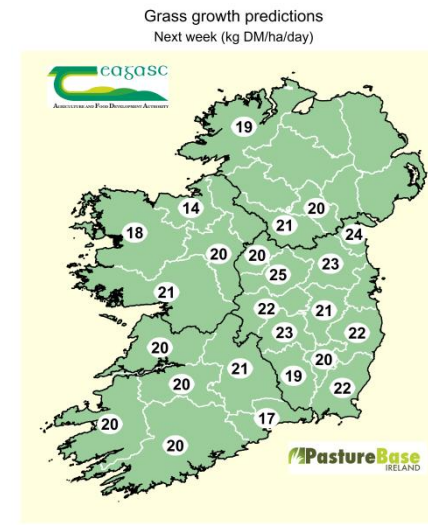
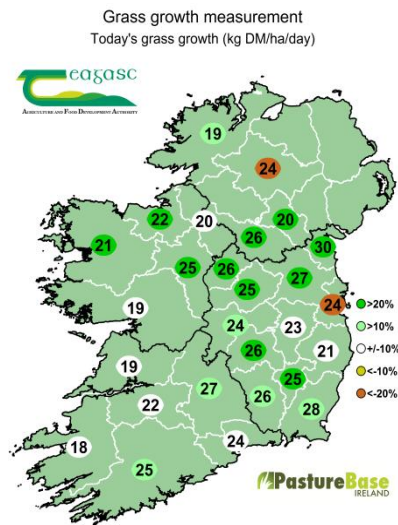
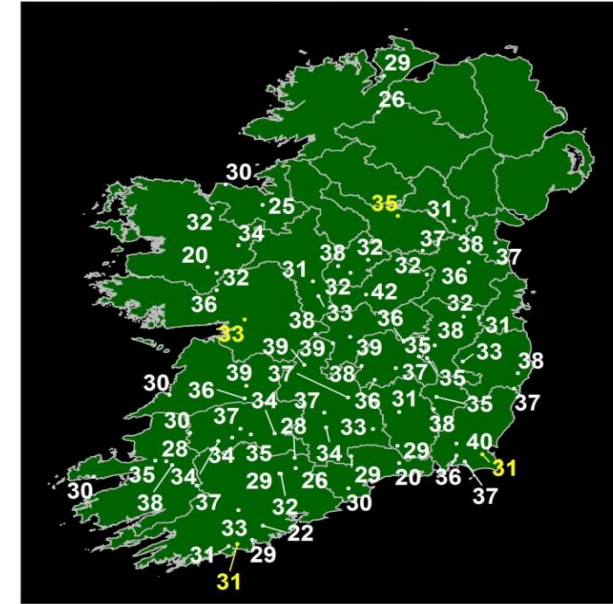
| Koperture                                      |                |     |            |         |
|------------------------------------------------|----------------|-----|------------|---------|
| Trenkummen - Year 5055 - Midgreen Birmingham - |                |     |            |         |
| Generated on 06/11/2022                        |                |     |            |         |
| 30.75.25                                       |                |     |            |         |
| A                                              |                |     |            |         |
| Item                                           | Unit           | QTY | UNIT PRICE | AMOUNT  |
| 1                                              | kg             | 100 | 1.50       | 150.00  |
| 2                                              | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 3                                              | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 4                                              | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 5                                              | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 6                                              | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 7                                              | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 8                                              | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 9                                              | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 10                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 11                                             | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 12                                             | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 13                                             | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 14                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 15                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 16                                             | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 17                                             | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 18                                             | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 19                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 20                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 21                                             | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 22                                             | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 23                                             | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 24                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 25                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 26                                             | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 27                                             | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 28                                             | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 29                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 30                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 31                                             | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 32                                             | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 33                                             | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 34                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 35                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 36                                             | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 37                                             | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 38                                             | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 39                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 40                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 41                                             | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 42                                             | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 43                                             | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 44                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 45                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 46                                             | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 47                                             | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 48                                             | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 49                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 50                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 51                                             | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 52                                             | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 53                                             | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 54                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 55                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 56                                             | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 57                                             | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 58                                             | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 59                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 60                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 61                                             | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 62                                             | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 63                                             | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 64                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 65                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 66                                             | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 67                                             | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 68                                             | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 69                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 70                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 71                                             | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 72                                             | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 73                                             | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 74                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 75                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 76                                             | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 77                                             | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 78                                             | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 79                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 80                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 81                                             | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 82                                             | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 83                                             | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 84                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 85                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 86                                             | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 87                                             | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 88                                             | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 89                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 90                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 91                                             | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 92                                             | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 93                                             | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 94                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 95                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 96                                             | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 97                                             | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 98                                             | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 99                                             | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 100                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 101                                            | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 102                                            | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 103                                            | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 104                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 105                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 106                                            | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 107                                            | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 108                                            | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 109                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 110                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 111                                            | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 112                                            | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 113                                            | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 114                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 115                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 116                                            | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 117                                            | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 118                                            | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 119                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 120                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 121                                            | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 122                                            | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 123                                            | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 124                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 125                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 126                                            | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 127                                            | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 128                                            | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 129                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 130                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 131                                            | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 132                                            | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 133                                            | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 134                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 135                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 136                                            | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 137                                            | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 138                                            | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 139                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 140                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 141                                            | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 142                                            | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 143                                            | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 144                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 145                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 146                                            | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 147                                            | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 148                                            | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 149                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 150                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 151                                            | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 152                                            | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 153                                            | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 154                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 155                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 156                                            | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 157                                            | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 158                                            | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 159                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 160                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 161                                            | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 162                                            | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 163                                            | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 164                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 165                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 166                                            | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 167                                            | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 168                                            | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 169                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 170                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 171                                            | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 172                                            | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 173                                            | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 174                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 175                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 176                                            | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 177                                            | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 178                                            | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 179                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 180                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 181                                            | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 182                                            | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 183                                            | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 184                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 185                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 186                                            | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 187                                            | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 188                                            | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 189                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 190                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 191                                            | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 192                                            | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 193                                            | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 194                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 195                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 196                                            | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 197                                            | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 198                                            | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 199                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 200                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 201                                            | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 202                                            | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 203                                            | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 204                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 205                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 206                                            | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 207                                            | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 208                                            | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 209                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 210                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 211                                            | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 212                                            | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 213                                            | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 214                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 215                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 216                                            | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 217                                            | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 218                                            | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 219                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 220                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 221                                            | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 222                                            | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 223                                            | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 224                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 225                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 226                                            | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 227                                            | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 228                                            | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 229                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 230                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 231                                            | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 232                                            | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 233                                            | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 234                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 235                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 236                                            | m <sup>2</sup> | 100 | 1.50       | 150.00  |
| 237                                            | m <sup>3</sup> | 10  | 120.00     | 1200.00 |
| 238                                            | m <sup>2</sup> | 50  | 2.00       | 100.00  |
| 239                                            | m <sup>3</sup> | 5   | 240.00     | 1200.00 |
| 240                                            | m <sup>3</sup> |     |            |         |

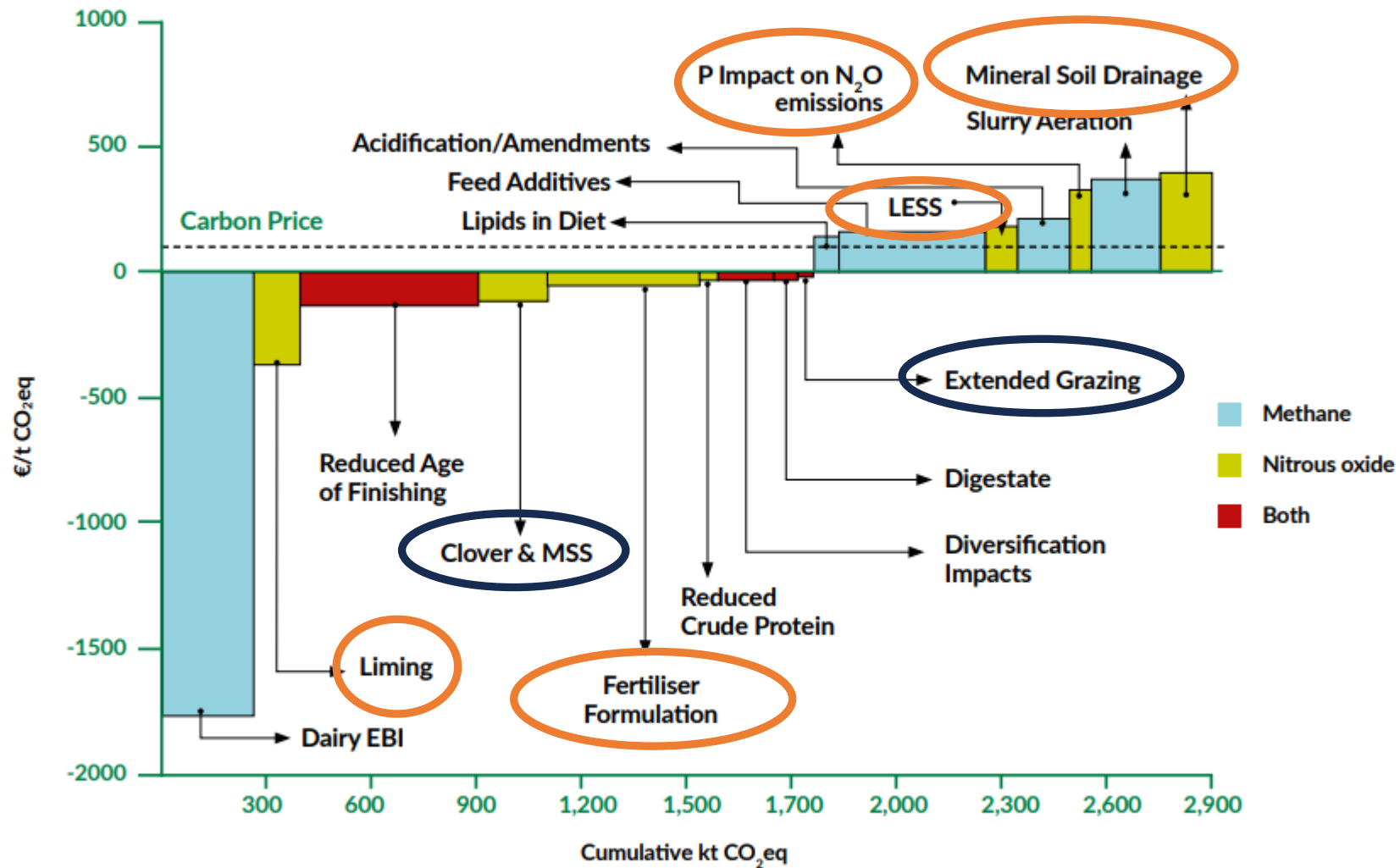
# MoSt Grass Growth Model - On farm grass predictions

- 87 farms -> National Representation
- Predictions completed twice weekly
- Weather farmer forecast (RTE 1)
- Grass 10 Newsletter
- National Fodder Committee Guidance



Grass growth prediction (kg DM/ha/day):  
13/10/2021-19/10/2021





# Can pasture quality alter methane emissions in dairy systems?



- Methane per day



15%

- Methane per kg milk



21%

- Methane per unit of energy intake



15%

Wims et al. (2010)

# Can pasture quality alter methane emissions in beef systems?

1300 kg DM



2800 kg DM



- Methane per day



7%

- Methane per kg ADG



22%

- Methane per unit of energy intake



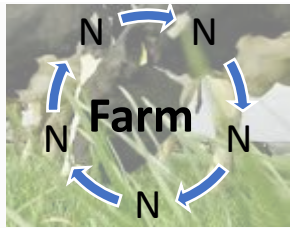
8%

What happens when we make swards more diverse?



# Dairy Farm gate nitrogen use efficiency (NUE)

N entering the farm



140% ↑ in NUE



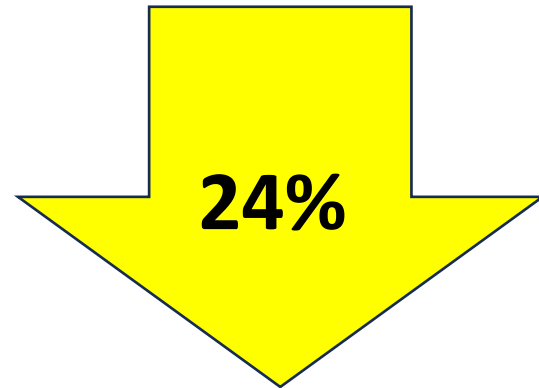
N leaving the farm



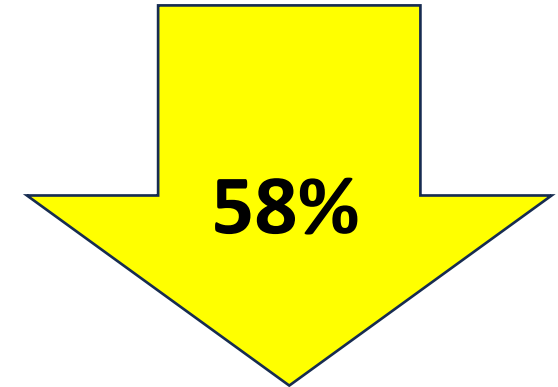
# Nitrous Oxide emissions



150 kg N per ha per year



300 kg N per ha per year



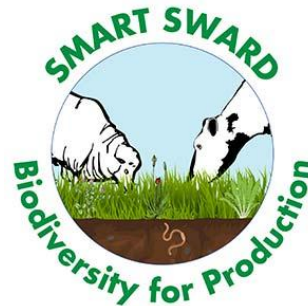
150 kg N per ha per year

150 kg N per ha per year

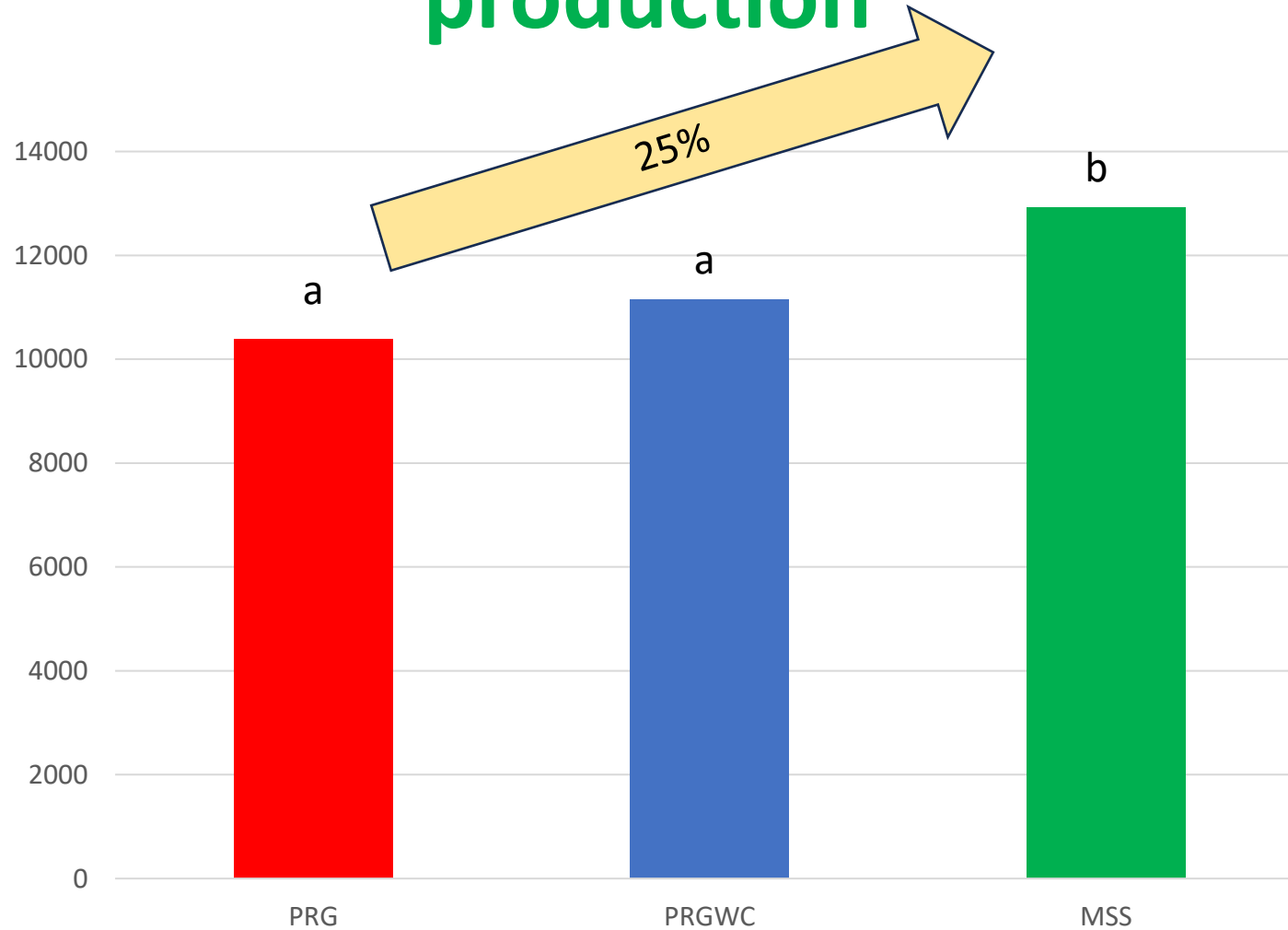


# Future proofing our beef sector

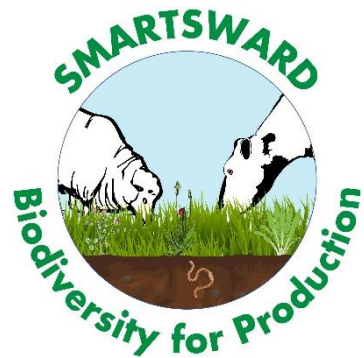
- More calves born to dairy cows entering the beef sector (dairy calf to beef)
- **Grass only** – 205 kg N/ha
- **Grass and white clover** - 90 kg N/ha
- **Multispecies sward (6 species)** - 90 kg N/ha



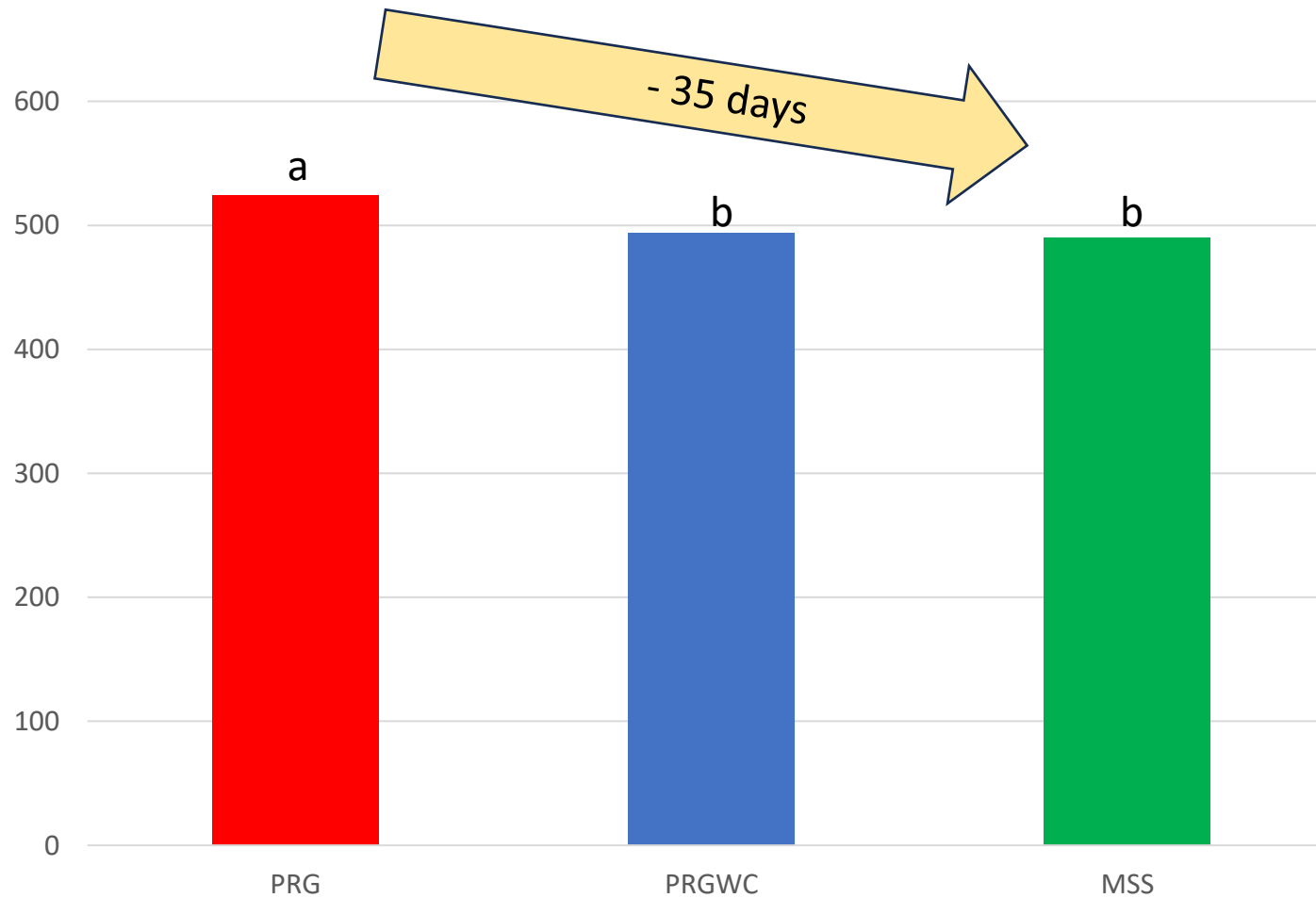
# The impact of diverse swards on dry matter production



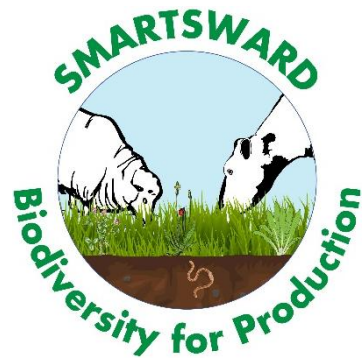
$P < 0.01$



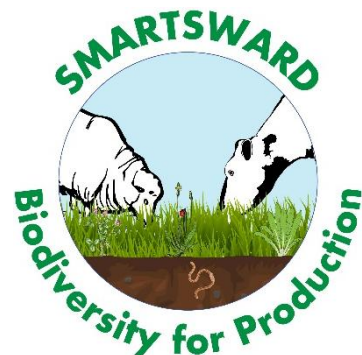
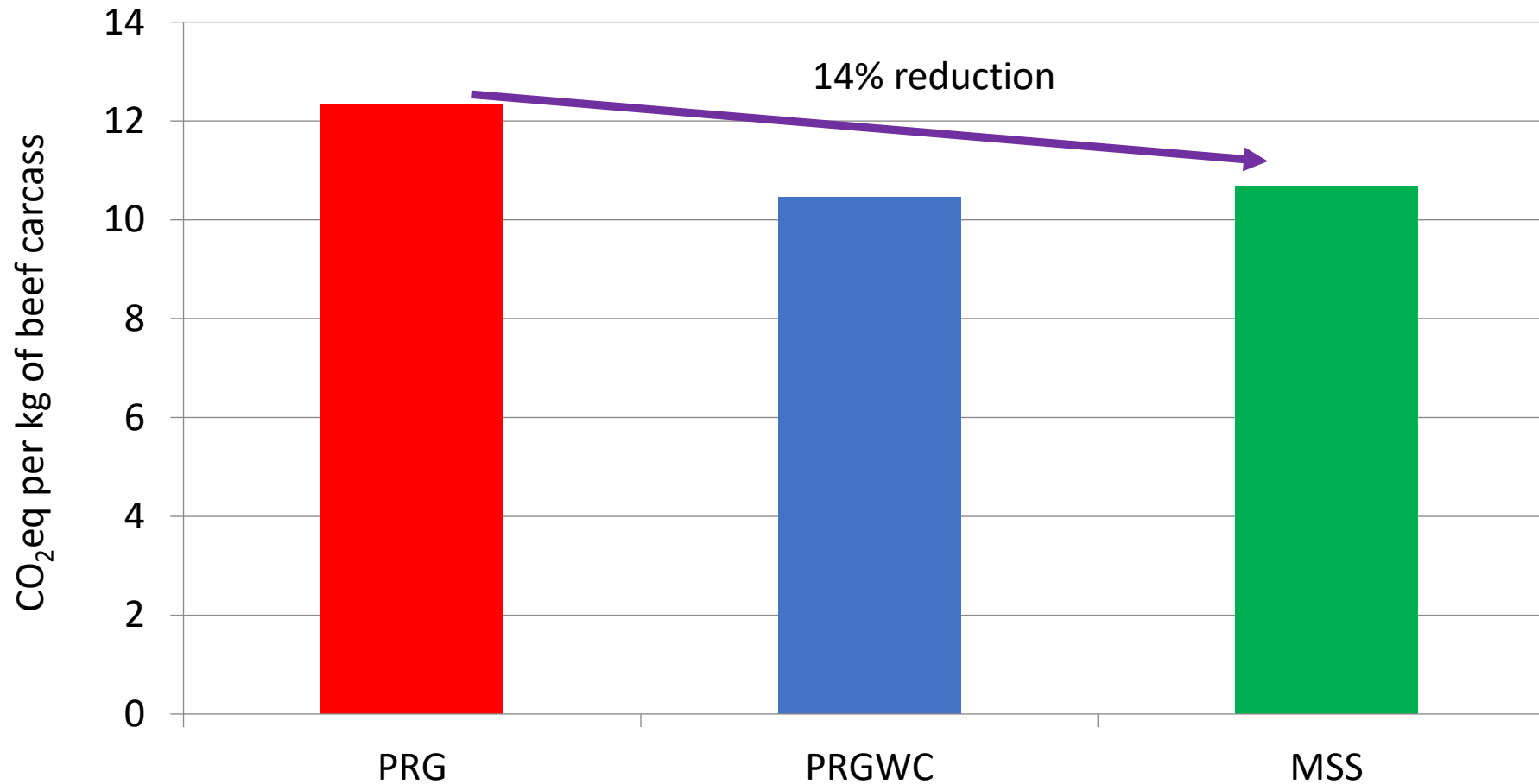
# The impact of sward type on days required to reach target slaughter weight



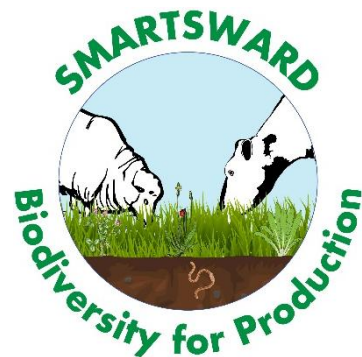
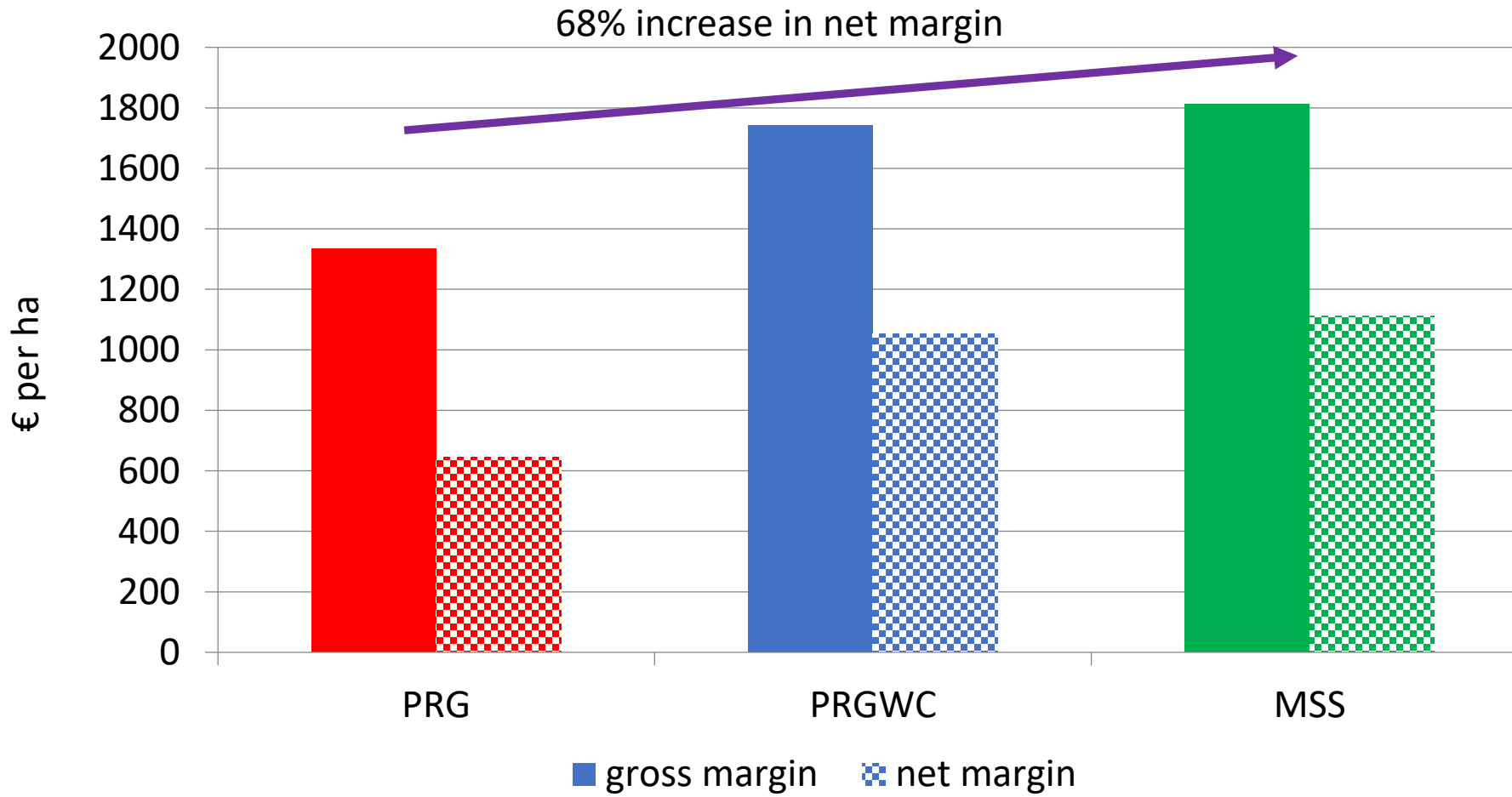
$P < 0.05$



# The effect of sward type on CO<sub>2</sub>eq per kg of beef carcass



# The effect of sward type on gross margin and net margin per ha

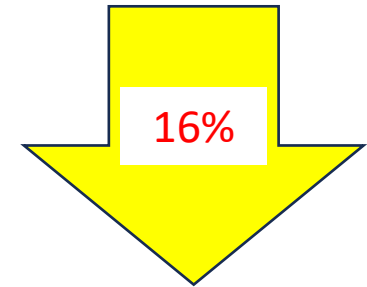
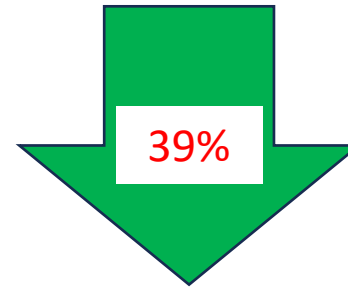


# Daily Methane emissions

Lactating ewes

Dry ewes

Lambs



# Key messages

- Pasture based livestock production upcycles an otherwise human unavailable biomass resource
- Research has shown how pasture management can be optimized to enhance efficiency and economic performance, and this has been adapted
- How we grow out pastures influences their environmental impact
  - Fertiliser
  - Sward quality
  - Clover
  - Multispecies swards
- Understanding baseline methane emissions and mitigating these in pasture based systems is a real and urgent need
- A necessity to look beyond GHG's only at wider ecosystem services and externalities
- Enhancing sward diversity (clover or multispecies swards) have multiple benefits, not just for GHG emissions
- Potential for adaptation in addition to mitigation

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An Roinn Talmhaíochta,  
Bia agus Mara  
Department of Agriculture,  
Food and the Marine



**DAERA**  
Department of Agriculture,  
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