

Appendices

Appendix A

Decision tree used by Peña-Barragán *et al.* (2011) for the OCIM methodology

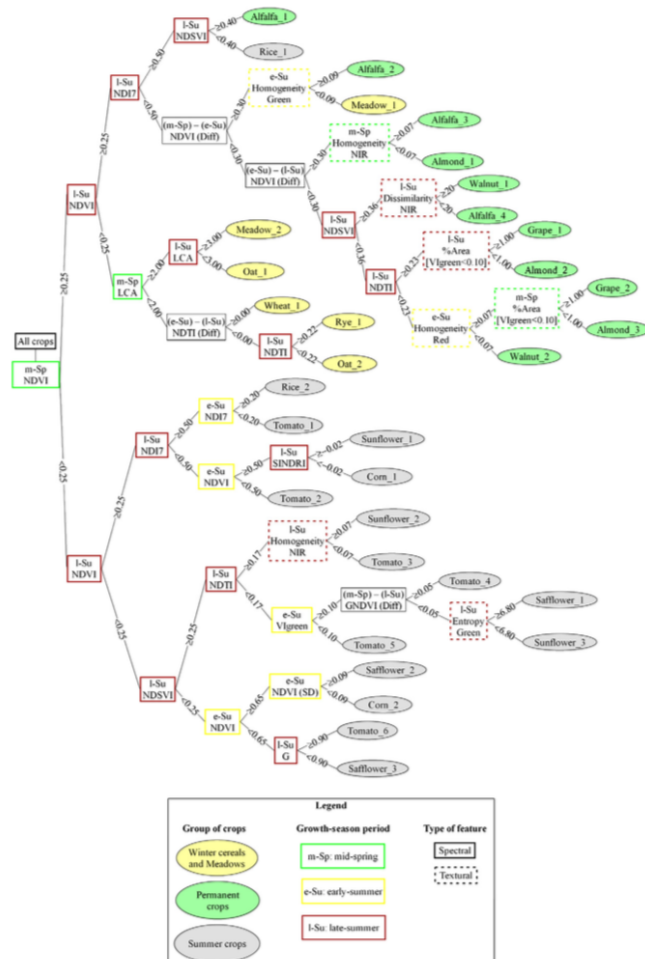


Figure A.1: Decision tree for the OCIM methodology developed by Peña-Barragán *et al.* (2011 [33])

Appendix B

NDVI standard profiles

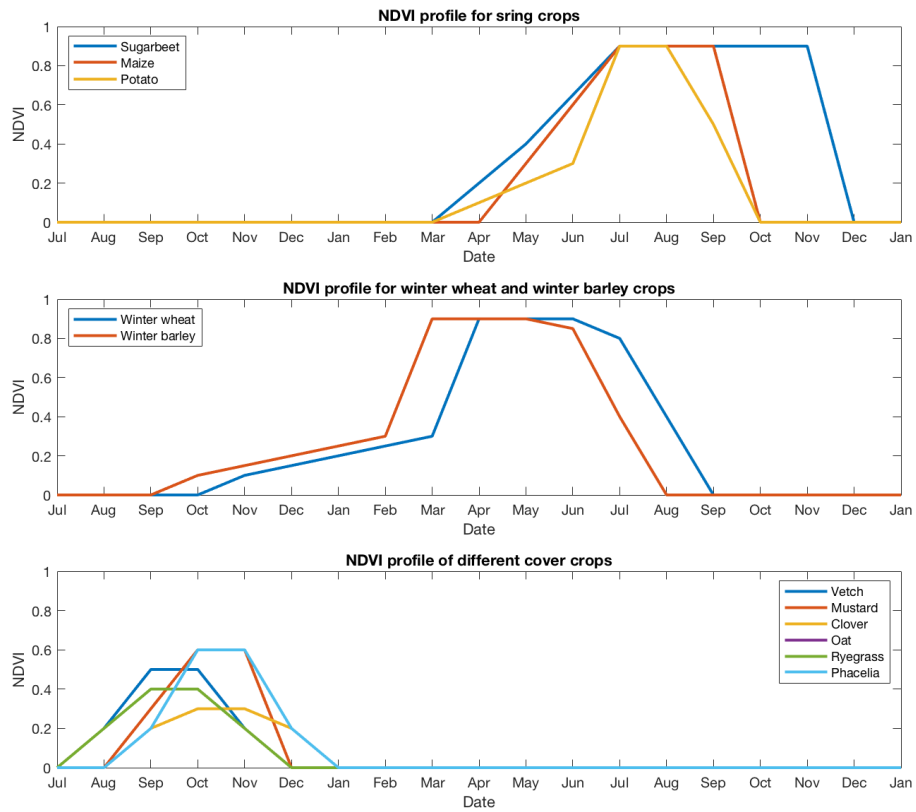


Figure B.1: NDVI standard profiles of the spring crops, the winter cereals and the cover crops

Appendix C

Rule-based classification: Confusion Matrices

Classes:

- 0.0 = Bare soil class
- 1.0 = Winter wheat class
- 2.0 = Winter barley class
- 3.0 = Winter cover crops (WCC) class

| 04/12/2016 & Parcel-based | | | | | | | | 04/12/2016 & Pixel-based | | | | | | | |
|---------------------------|-----------|--------|-------|--------|--------|-------|-------|--------------------------|-----------|--------|-------|--------|--------|-------|-------|
| Classif | Reference | | | Total | UA (%) | kappa | | Classif | Reference | | | Total | UA (%) | kappa | |
| | 0.0 | 1.0 | 2.0 | 3.0 | | | | | 0.0 | 1.0 | 2.0 | 3.0 | | | |
| 0.0 | 0 | 56449 | 0 | 44444 | 100893 | 0 | 0 | 0.0 | 0 | 57891 | 6 | 43009 | 100906 | 0 | 0 |
| 1.0 | 0 | 150815 | 937 | 27876 | 179628 | 83,95 | 0 | 1.0 | 0 | 152422 | 882 | 30191 | 183495 | 83,06 | 0 |
| 2.0 | 0 | 1598 | 25274 | 68399 | 95271 | 26,55 | 0 | 2.0 | 0 | 3126 | 24506 | 68662 | 96294 | 25,44 | 0 |
| 3.0 | 0 | 37258 | 3519 | 2344 | 43121 | 5,43 | 0 | 3.0 | 0 | 34021 | 4416 | 2163 | 40600 | 5,33 | 0 |
| Total | 0 | 246120 | 29730 | 143063 | 418913 | 0 | 0 | Total | 0 | 247460 | 29810 | 144025 | 421295 | 0 | 0 |
| PA (%) | 0 | 62,14 | 84,32 | 1,63 | 0 | 42,59 | 0 | PA (%) | 0 | 61,59 | 82,21 | 1,5 | 0 | 42,5 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0 | 0,176 | kappa | 0 | 0 | 0 | 0 | 0 | 0 | 0,173 |
| 15/02/2017 & Parcel-based | | | | | | | | 15/02/2017 & Pixel-based | | | | | | | |
| Classif | Reference | | | Total | UA (%) | kappa | | Classif | Reference | | | Total | UA (%) | kappa | |
| | 0.0 | 1.0 | 2.0 | 3.0 | | | | | 0.0 | 1.0 | 2.0 | 3.0 | | | |
| 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0 | 58 | 0 | 409 | 467 | 0 | 0 |
| 1.0 | 0 | 133921 | 966 | 15248 | 150135 | 89,2 | 0 | 1.0 | 0 | 125494 | 1067 | 14461 | 141022 | 88,98 | 0 |
| 2.0 | 0 | 27260 | 27346 | 7553 | 62159 | 43,99 | 0 | 2.0 | 0 | 30593 | 27233 | 8325 | 66151 | 41,16 | 0 |
| 3.0 | 0 | 61128 | 55 | 110508 | 171691 | 64,36 | 0 | 3.0 | 0 | 66863 | 39 | 110943 | 177845 | 63,38 | 0 |
| Total | 0 | 222309 | 28367 | 133309 | 383985 | 0 | 0 | Total | 0 | 223008 | 28339 | 134138 | 385485 | 0 | 0 |
| PA (%) | 0 | 60,24 | 96,4 | 82,89 | 0 | 70,77 | 0 | PA (%) | 0 | 56,27 | 96,09 | 82,71 | 0 | 68,39 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0 | 0,518 | kappa | 0 | 0 | 0 | 0 | 0 | 0 | 0,486 |
| 14/03/2017 & Parcel-based | | | | | | | | 14/03/2017 & Pixel-based | | | | | | | |
| Classif | Reference | | | Total | UA (%) | kappa | | Classif | Reference | | | Total | UA (%) | kappa | |
| | 0.0 | 1.0 | 2.0 | 3.0 | | | | | 0.0 | 1.0 | 2.0 | 3.0 | | | |
| 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.0 | 0 | 11 | 0 | 1 | 12 | 0 | 0 |
| 1.0 | 0 | 156464 | 1867 | 9178 | 167509 | 93,4 | 0 | 1.0 | 0 | 147891 | 1966 | 9366 | 159223 | 92,88 | 0 |
| 2.0 | 0 | 42444 | 27808 | 2575 | 72827 | 38,78 | 0 | 2.0 | 0 | 46948 | 27664 | 2652 | 77264 | 35,8 | 0 |
| 3.0 | 0 | 42795 | 55 | 128972 | 171822 | 75,06 | 0 | 3.0 | 0 | 47225 | 68 | 130301 | 177594 | 73,37 | 0 |
| Total | 0 | 241703 | 29730 | 140725 | 412158 | 0 | 0 | Total | 0 | 242075 | 29698 | 142320 | 414093 | 0 | 0 |
| PA (%) | 0 | 64,73 | 93,53 | 91,64 | 0 | 76 | 0 | PA (%) | 0 | 61,09 | 93,15 | 91,55 | 0 | 73,86 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0 | 0,604 | kappa | 0 | 0 | 0 | 0 | 0 | 0 | 0,574 |

Figure C.1: Confusion matrices rule-based classification test 1

| 04/12/2016 & Parcel-based | | | | | | | 04/12/2016 & Pixel-based | | | | | | | | |
|---------------------------|-----------|-------|--------|--------|--------|-------|--------------------------|---------|-----------|-------|--------|--------|--------|-------|--|
| | Reference | | | | | | | | Reference | | | | | | |
| Classif | 1.0 | 2.0 | 3.0 | Total | UA (%) | kappa | | Classif | 1.0 | 2.0 | 3.0 | Total | UA (%) | kappa | |
| 1.0 | 207264 | 937 | 72320 | 280521 | 73,88 | 0 | | 1.0 | 210313 | 888 | 73200 | 284401 | 73,94 | 0 | |
| 2.0 | 1598 | 25274 | 68399 | 95271 | 26,52 | 0 | | 2.0 | 3126 | 24506 | 68662 | 96294 | 25,44 | 0 | |
| 3.0 | 37258 | 3519 | 2344 | 43121 | 5,43 | 0 | | 3.0 | 34021 | 4416 | 2163 | 40600 | 5,32 | 0 | |
| Total | 246120 | 29730 | 143063 | 418913 | 0 | 0 | | Total | 247460 | 29810 | 144025 | 421295 | 0 | 0 | |
| PA (%) | 84,21 | 85,01 | 1,63 | 0 | 56,06 | 0 | | PA (%) | 84,98 | 82,21 | 1,5 | 0 | 56,25 | 0 | |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,208 | | kappa | 0 | 0 | 0 | 0 | 0 | 0,211 | |
| 15/02/2017 & Parcel-based | | | | | | | 15/02/2017 & Pixel-based | | | | | | | | |
| | Reference | | | | | | | | Reference | | | | | | |
| Classif | 1.0 | 2.0 | 3.0 | Total | UA (%) | kappa | | Classif | 1.0 | 2.0 | 3.0 | Total | UA (%) | kappa | |
| 1.0 | 133921 | 966 | 15248 | 150135 | 89,2 | 0 | | 1.0 | 125531 | 1067 | 14461 | 141059 | 88,98 | 0 | |
| 2.0 | 27260 | 27346 | 7553 | 62159 | 43,99 | 0 | | 2.0 | 30593 | 27233 | 8325 | 66151 | 41,16 | 0 | |
| 3.0 | 61128 | 55 | 110508 | 171691 | 64,36 | 0 | | 3.0 | 67073 | 39 | 111616 | 178728 | 62,45 | 0 | |
| Total | 222309 | 28367 | 133309 | 383985 | 0 | 0 | | Total | 223197 | 28339 | 134402 | 385938 | 0 | 0 | |
| PA (%) | 60,24 | 96,4 | 82,89 | 0 | 70,77 | 0 | | PA (%) | 86,24 | 96,09 | 83,04 | 0 | 68,5 | 0 | |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,518 | | kappa | 0 | 0 | 0 | 0 | 0 | 0,487 | |
| 14/03/2017 & Parcel-based | | | | | | | 14/03/2017 & Pixel-based | | | | | | | | |
| | Reference | | | | | | | | Reference | | | | | | |
| Classif | 1.0 | 2.0 | 3.0 | Total | UA (%) | kappa | | Classif | 1.0 | 2.0 | 3.0 | Total | UA (%) | kappa | |
| 1.0 | 156464 | 1867 | 9178 | 167509 | 93,4 | 0 | | 1.0 | 147891 | 1966 | 9366 | 159223 | 92,88 | 0 | |
| 2.0 | 42444 | 27808 | 2575 | 72827 | 38,18 | 0 | | 2.0 | 46948 | 27664 | 2652 | 77264 | 35,8 | 0 | |
| 3.0 | 42795 | 55 | 128972 | 171822 | 75,06 | 0 | | 3.0 | 47236 | 68 | 130302 | 177606 | 73,36 | 0 | |
| Total | 241703 | 29730 | 140725 | 412158 | 0 | 0 | | Total | 242075 | 29698 | 142320 | 414093 | 0 | 0 | |
| PA (%) | 64,73 | 93,53 | 91,64 | 0 | 76 | 0 | | PA (%) | 61,09 | 93,15 | 91,55 | 0 | 73,86 | 0 | |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,604 | | kappa | 0 | 0 | 0 | 0 | 0 | 0,574 | |

Figure C.2: Confusion matrices rule-based classification test 2

| 04/12/2016 | | | | | | | 27/12/2016 | | | | | | | | |
|------------|-----------|-------|--------|--------|--------|-------|------------|---------|-----------|-------|--------|--------|--------|-------|--|
| | Reference | | | | | | | | Reference | | | | | | |
| Classif | 1.0 | 2.0 | 3.0 | Total | UA (%) | kappa | | Classif | 1.0 | 2.0 | 3.0 | Total | UA (%) | kappa | |
| 1.0 | 207264 | 937 | 72320 | 280521 | 73,88 | 0 | | 1.0 | 163387 | 14957 | 76717 | 255061 | 96,75 | 0 | |
| 2.0 | 1598 | 25274 | 68399 | 95271 | 26,52 | 0 | | 2.0 | 1092 | 29798 | 0 | 30890 | 34,98 | 0 | |
| 3.0 | 37258 | 3519 | 2344 | 43121 | 5,43 | 0 | | 3.0 | 4379 | 40424 | 103639 | 148442 | 57,46 | 0 | |
| Total | 246120 | 29730 | 143063 | 418913 | 0 | 0 | | Total | 168858 | 85179 | 180356 | 434393 | 0 | 0 | |
| PA (%) | 84,21 | 85,01 | 1,63 | 0 | 56,06 | 0 | | PA (%) | 64,05 | 96,46 | 69,81 | 0 | 68,33 | 0 | |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,208 | | kappa | 0 | 0 | 0 | 0 | 0 | 0,486 | |
| 26/01/2017 | | | | | | | 15/02/2017 | | | | | | | | |
| | Reference | | | | | | | | Reference | | | | | | |
| Classif | 1.0 | 2.0 | 3.0 | Total | UA (%) | kappa | | Classif | 1.0 | 2.0 | 3.0 | Total | UA (%) | kappa | |
| 1.0 | 76912 | 18920 | 66363 | 162195 | 94,89 | 0 | | 1.0 | 133921 | 966 | 15248 | 150135 | 89,2 | 0 | |
| 2.0 | 205 | 23937 | 0 | 24142 | 40,58 | 0 | | 2.0 | 27260 | 27346 | 7553 | 62159 | 43,99 | 0 | |
| 3.0 | 3934 | 16127 | 73916 | 93977 | 58,69 | 0 | | 3.0 | 61128 | 55 | 110508 | 171691 | 64,36 | 0 | |
| Total | 81051 | 58984 | 140279 | 280314 | 0 | 0 | | Total | 222309 | 28367 | 133309 | 383985 | 0 | 0 | |
| PA (%) | 47,71 | 99,15 | 78,65 | 0 | 62,35 | 0 | | PA (%) | 60,24 | 96,4 | 82,89 | 0 | 70,77 | 0 | |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,418 | | kappa | 0 | 0 | 0 | 0 | 0 | 0,518 | |
| 14/03/2017 | | | | | | | 27/03/2017 | | | | | | | | |
| | Reference | | | | | | | | Reference | | | | | | |
| Classif | 1.0 | 2.0 | 3.0 | Total | UA (%) | kappa | | Classif | 1.0 | 2.0 | 3.0 | Total | UA (%) | kappa | |
| 1.0 | 156464 | 1867 | 9178 | 167509 | 93,4 | 0 | | 1.0 | 174012 | 65804 | 15245 | 255061 | 95,25 | 0 | |
| 2.0 | 42444 | 27808 | 2575 | 72827 | 38,18 | 0 | | 2.0 | 718 | 30172 | 0 | 30890 | 30,75 | 0 | |
| 3.0 | 42795 | 55 | 128972 | 171822 | 75,06 | 0 | | 3.0 | 7955 | 2141 | 138346 | 148442 | 90,07 | 0 | |
| Total | 241703 | 29730 | 140725 | 412158 | 0 | 0 | | Total | 182685 | 98117 | 153591 | 434393 | 0 | 0 | |
| PA (%) | 64,73 | 93,53 | 91,64 | 0 | 76 | 0 | | PA (%) | 68,72 | 97,67 | 93,19 | 0 | 78,85 | 0 | |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,604 | | kappa | 0 | 0 | 0 | 0 | 0 | 0,657 | |

Figure C.3: Confusion matrices rule-based classification 3 classes and a parcel-based approach

| 04/12/2016 | | | | | | | | 27/12/2016 | | | | | | | |
|------------|-----------|-------|--------|--------|--------|-------|--|------------|-----------|-------|--------|--------|--------|-------|--|
| | Reference | | | | | | | | Reference | | | | | | |
| Classif | 1.0 | 2.0 | 3.0 | Total | UA (%) | kappa | | Classif | 1.0 | 2.0 | 3.0 | Total | UA (%) | kappa | |
| 1.0 | 214620 | 965 | 118057 | 333642 | 64,32 | 0 | | 1.0 | 163387 | 1092 | 4379 | 168558 | 96,75 | 0 | |
| 2.0 | 1673 | 26306 | 86364 | 114343 | 23 | 0 | | 2.0 | 14957 | 29798 | 40424 | 85179 | 34,98 | 0 | |
| 3.0 | 38664 | 3694 | 4114 | 46472 | 8,85 | 0 | | 3.0 | 76717 | 0 | 103639 | 180356 | 57,46 | 0 | |
| Total | 254957 | 30965 | 208535 | 494457 | 0 | 0 | | Total | 255061 | 30890 | 148442 | 434393 | 0 | 0 | |
| PA (%) | 84,17 | 84,95 | 1,97 | 0 | 49,55 | 0 | | PA (%) | 64,05 | 96,46 | 69,81 | 0 | 68,33 | 0 | |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,156 | | kappa | 0 | 0 | 0 | 0 | 0 | 0,485 | |
| 26/01/2017 | | | | | | | | 15/02/2017 | | | | | | | |
| | Reference | | | | | | | | Reference | | | | | | |
| Classif | 1.0 | 2.0 | 3.0 | Total | UA (%) | kappa | | Classif | 1.0 | 2.0 | 3.0 | Total | UA (%) | kappa | |
| 1.0 | 78494 | 214 | 4019 | 82727 | 94,88 | 0 | | 1.0 | 135659 | 978 | 16927 | 153564 | 88,34 | 0 | |
| 2.0 | 19109 | 24715 | 16929 | 60753 | 40,68 | 0 | | 2.0 | 27654 | 27764 | 10920 | 66338 | 41,85 | 0 | |
| 3.0 | 67395 | 0 | 75727 | 143122 | 52,91 | 0 | | 3.0 | 62019 | 58 | 160841 | 222918 | 72,15 | 0 | |
| Total | 164998 | 24929 | 96675 | 286602 | 0 | 0 | | Total | 225332 | 28800 | 188688 | 442820 | 0 | 0 | |
| PA (%) | 47,75 | 99,14 | 78,33 | 0 | 62,43 | 0 | | PA (%) | 60,2 | 96,4 | 85,24 | 0 | 73,22 | 0 | |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,419 | | kappa | 0 | 0 | 0 | 0 | 0 | 0,553 | |
| 14/03/2017 | | | | | | | | 27/03/2017 | | | | | | | |
| | Reference | | | | | | | | Reference | | | | | | |
| Classif | 1.0 | 2.0 | 3.0 | Total | UA (%) | kappa | | Classif | 1.0 | 2.0 | 3.0 | Total | UA (%) | kappa | |
| 1.0 | 158625 | 1921 | 10982 | 171528 | 92,47 | 0 | | 1.0 | 174012 | 718 | 7955 | 182685 | 95,25 | 0 | |
| 2.0 | 43048 | 28211 | 6065 | 77324 | 36,48 | 0 | | 2.0 | 65804 | 30172 | 2141 | 98117 | 30,75 | 0 | |
| 3.0 | 43469 | 57 | 184070 | 227596 | 80,87 | 0 | | 3.0 | 15245 | 0 | 138346 | 153591 | 90,07 | 0 | |
| Total | 245142 | 30189 | 201117 | 476448 | 0 | 0 | | Total | 255061 | 30890 | 148442 | 434393 | 0 | 0 | |
| PA (%) | 64,7 | 93,44 | 91,52 | 0 | 77,85 | 0 | | PA (%) | 68,22 | 97,67 | 93,19 | 0 | 78,85 | 0 | |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,632 | | kappa | 0 | 0 | 0 | 0 | 0 | 0,657 | |

Figure C.4: Confusion matrices rule-based classification 3 classes extended and a parcel-based approach

Appendix D

Maximum-Likelihood classification: Confusion Matrices

3 classes:

1.0 = Winter wheat class

2.0 = Winter barley class

3.0 = Winter cover crops (WCC)

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 45683 | 0 | 13074 | 58757 | 77,74 | 0 |
| 2.0 | 53614 | 14540 | 22056 | 90210 | 16,11 | 0 |
| 3.0 | 38480 | 1283 | 31227 | 70990 | 43,98 | 0 |
| Total | 137777 | 15823 | 66357 | 219957 | 0 | 0 |
| PA (%) | 33,15 | 91,89 | 47,06 | 0 | 41,57 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,172 |

(a) 25/09/2016

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 126214 | 149 | 32999 | 159362 | 79,19 | 0 |
| 2.0 | 11518 | 15020 | 7331 | 33869 | 44,34 | 0 |
| 3.0 | 45 | 654 | 26027 | 26726 | 97,38 | 0 |
| Total | 137777 | 15823 | 66357 | 219957 | 0 | 0 |
| PA (%) | 91,61 | 94,92 | 39,22 | 0 | 76,04 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,519 |

(b) 04/12/2016

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 121149 | 285 | 9169 | 130603 | 92,76 | 0 |
| 2.0 | 10445 | 15532 | 20433 | 46410 | 33,43 | 0 |
| 3.0 | 6183 | 6 | 36755 | 42944 | 85,58 | 0 |
| Total | 137777 | 15823 | 66357 | 219957 | 0 | 0 |
| PA (%) | 87,93 | 98,16 | 55,39 | 0 | 78,84 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,618 |

(c) 27/12/2016

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 80585 | 502 | 7189 | 88276 | 91,28 | 0 |
| 2.0 | 14321 | 14233 | 5666 | 34220 | 41,59 | 0 |
| 3.0 | 34347 | 3 | 49461 | 83811 | 59,01 | 0 |
| Total | 129253 | 14738 | 62316 | 206307 | 0 | 0 |
| PA (%) | 62,34 | 96,57 | 79,37 | 0 | 69,93 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,496 |

(d) 15/02/2017

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 86570 | 1417 | 4946 | 92933 | 93,15 | 0 |
| 2.0 | 26059 | 14401 | 1899 | 42359 | 33,99 | 0 |
| 3.0 | 22554 | 5 | 59456 | 82015 | 72,49 | 0 |
| Total | 135183 | 15823 | 66301 | 217307 | 0 | 0 |
| PA (%) | 64,04 | 91,01 | 89,67 | 0 | 73,82 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,567 |

(e) 14/03/2017

Figure D.1: Confusion matrices ML classification 3 classes (one feature, one date): NDVI images

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 80832 | 509 | 3156 | 84497 | 95,66 | 0 |
| 2.0 | 46774 | 14219 | 22084 | 83077 | 17,11 | 0 |
| 3.0 | 10171 | 1095 | 41117 | 52383 | 78,49 | 0 |
| Total | 137777 | 15823 | 66357 | 219957 | 0 | 0 |
| PA (%) | 58,67 | 89,86 | 61,96 | 0 | 61,9 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,423 |

(a) 25/09/2016

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 127884 | 119 | 33142 | 161145 | 79,36 | 0 |
| 2.0 | 7260 | 15408 | 2934 | 25602 | 60,18 | 0 |
| 3.0 | 2633 | 296 | 30281 | 33210 | 91,18 | 0 |
| Total | 137777 | 15823 | 66357 | 219957 | 0 | 0 |
| PA (%) | 92,82 | 97,37 | 45,63 | 0 | 78,91 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,567 |

(c) 27/12/2016

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 123043 | 355 | 2555 | 125953 | 97,68 | 0 |
| 2.0 | 4908 | 15386 | 1776 | 22070 | 69,71 | 0 |
| 3.0 | 7232 | 82 | 61970 | 69284 | 89,44 | 0 |
| Total | 135183 | 15823 | 66301 | 217307 | 0 | 0 |
| PA (%) | 91,02 | 97,23 | 93,46 | 0 | 92,21 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,845 |

(e) 14/03/2017

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 128286 | 309 | 31498 | 160093 | 80,13 | 0 |
| 2.0 | 7085 | 15327 | 2536 | 24948 | 61,43 | 0 |
| 3.0 | 2406 | 187 | 32323 | 34916 | 92,57 | 0 |
| Total | 137777 | 15823 | 66357 | 219957 | 0 | 0 |
| PA (%) | 93,11 | 96,86 | 48,71 | 0 | 79,98 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,589 |

(b) 04/12/2016

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 116959 | 628 | 14268 | 131855 | 88,7 | 0 |
| 2.0 | 5802 | 14057 | 2077 | 21936 | 64,08 | 0 |
| 3.0 | 6492 | 53 | 45971 | 52516 | 87,53 | 0 |
| Total | 129253 | 14738 | 62316 | 206307 | 0 | 0 |
| PA (%) | 90,48 | 95,38 | 73,77 | 0 | 85,78 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,724 |

(d) 15/02/2017

Figure D.2: Confusion matrices ML classification 3 classes (one feature, one date): 10 bands images

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 80400 | 388 | 2770 | 83558 | 96,22 | 0 |
| 2.0 | 47180 | 14553 | 22905 | 84638 | 17,19 | 0 |
| 3.0 | 10197 | 882 | 40682 | 51761 | 78,59 | 0 |
| Total | 137777 | 15823 | 66357 | 219957 | 0 | 0 |
| PA (%) | 58,35 | 91,97 | 61,3 | 0 | 61,66 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,422 |

(a) 25/09/2016

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 127907 | 107 | 18130 | 146144 | 87,52 | 0 |
| 2.0 | 7310 | 15651 | 3537 | 26498 | 59,06 | 0 |
| 3.0 | 2560 | 65 | 44690 | 47315 | 94,45 | 0 |
| Total | 137777 | 15823 | 66357 | 219957 | 0 | 0 |
| PA (%) | 92,83 | 98,91 | 67,34 | 0 | 85,58 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,717 |

(c) 27/12/2016

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 121450 | 391 | 2712 | 124553 | 97,51 | 0 |
| 2.0 | 6828 | 15380 | 1780 | 23988 | 64,11 | 0 |
| 3.0 | 6905 | 52 | 61809 | 68766 | 89,88 | 0 |
| Total | 135183 | 15823 | 66301 | 217307 | 0 | 0 |
| PA (%) | 89,84 | 97,2 | 93,22 | 0 | 91,41 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,84 |

(e) 14/03/2017

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 129045 | 243 | 31161 | 160449 | 80,42 | 0 |
| 2.0 | 6683 | 15433 | 2836 | 24952 | 61,85 | 0 |
| 3.0 | 2049 | 147 | 32360 | 34556 | 93,64 | 0 |
| Total | 137777 | 15823 | 66357 | 219957 | 0 | 0 |
| PA (%) | 93,66 | 97,53 | 48,76 | 0 | 80,39 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,597 |

(b) 04/12/2016

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 117544 | 463 | 4329 | 122336 | 96,09 | 0 |
| 2.0 | 6348 | 14261 | 1954 | 22563 | 63,2 | 0 |
| 3.0 | 5361 | 14 | 56033 | 61408 | 91,24 | 0 |
| Total | 129253 | 14738 | 62316 | 206307 | 0 | 0 |
| PA (%) | 90,94 | 96,76 | 89,91 | 0 | 91,04 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,831 |

(d) 15/02/2017

Figure D.3: Confusion matrices ML classification 3 classes (two features, one date): NDVI & 10 bands images

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 129528 | 138 | 29967 | 159633 | 81,14 | 0 |
| 2.0 | 7148 | 15649 | 2049 | 24846 | 62,98 | 0 |
| 3.0 | 1101 | 36 | 34341 | 35478 | 96,79 | 0 |
| Total | 137777 | 15823 | 66357 | 219957 | 0 | 0 |
| PA (%) | 94,01 | 98,9 | 51,75 | 0 | 81,61 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,623 |

(a) 04/12 + 27/12

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 122082 | 170 | 27282 | 149534 | 81,64 | 0 |
| 2.0 | 6089 | 14547 | 1674 | 22310 | 65,02 | 0 |
| 3.0 | 1082 | 21 | 33360 | 34463 | 96,79 | 0 |
| Total | 129253 | 14738 | 62316 | 206307 | 0 | 0 |
| PA (%) | 94,45 | 98,7 | 53,53 | 0 | 82,39 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,639 |

(b) 04/12 + 27/12 + 15/02

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 121558 | 147 | 3332 | 125037 | 97,21 | 0 |
| 2.0 | 4187 | 14561 | 1724 | 20472 | 71,12 | 0 |
| 3.0 | 914 | 30 | 57204 | 58148 | 98,37 | 0 |
| Total | 126659 | 14738 | 62260 | 203657 | 0 | 0 |
| PA (%) | 95,97 | 98,79 | 91,88 | 0 | 94,92 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,903 |

(c) 27/12 + 15/02 + 14/03

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 121217 | 175 | 4217 | 125609 | 96,5 | 0 |
| 2.0 | 4188 | 14541 | 1797 | 20526 | 70,84 | 0 |
| 3.0 | 1254 | 22 | 56246 | 57522 | 97,78 | 0 |
| Total | 126659 | 14738 | 62260 | 203657 | 0 | 0 |
| PA (%) | 95,7 | 98,66 | 90,34 | 0 | 94,27 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,89 |

(d) 04/12 + 15/02 + 14/03

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 121906 | 142 | 10165 | 132213 | 92,2 | 0 |
| 2.0 | 3936 | 14573 | 1611 | 20120 | 72,43 | 0 |
| 3.0 | 817 | 23 | 50484 | 51324 | 98,36 | 0 |
| Total | 126659 | 14738 | 62260 | 203657 | 0 | 0 |
| PA (%) | 96,24 | 98,88 | 81,08 | 0 | 91,8 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,839 |

(e) 04/12 + 27/12 + 15/02 + 14/03

Figure D.4: Confusion matrices ML classification 3 classes (two features, several dates): NDVI & 10 bands images

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 121588 | 393 | 783 | 122764 | 99,04 | 0 |
| 2.0 | 3880 | 14322 | 1730 | 19932 | 71,85 | 0 |
| 3.0 | 1191 | 23 | 59747 | 60961 | 98 | 0 |
| Total | 126659 | 14738 | 62260 | 203657 | 0 | 0 |
| PA (%) | 95,99 | 97,17 | 95,96 | 0 | 96,07 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,925 |

(a) 27/12 + 15/02 + 14/03

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 121262 | 425 | 1324 | 123011 | 98,58 | 0 |
| 2.0 | 4120 | 14295 | 1801 | 20216 | 70,71 | 0 |
| 3.0 | 1277 | 18 | 59135 | 60430 | 97,85 | 0 |
| Total | 126659 | 14738 | 62260 | 203657 | 0 | 0 |
| PA (%) | 95,74 | 96,99 | 94,98 | 0 | 95,59 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,916 |

(b) 04/12 + 15/02 + 14/03

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 122188 | 368 | 3988 | 126544 | 96,55 | 0 |
| 2.0 | 3419 | 14352 | 1639 | 19410 | 73,94 | 0 |
| 3.0 | 1052 | 18 | 56633 | 57703 | 98,14 | 0 |
| Total | 126659 | 14738 | 62260 | 203657 | 0 | 0 |
| PA (%) | 96,47 | 97,38 | 90,26 | 0 | 94,85 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,901 |

(c) 04/12 + 27/12 + 15/02 + 14/03

Figure D.5: Confusion matrices ML classification 3 classes (two features, several dates): NDVI, 10 bands & SAVI images

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 121599 | 165 | 3117 | 124881 | 97,37 | 0 |
| 2.0 | 3698 | 14534 | 1696 | 19928 | 72,93 | 0 |
| 3.0 | 1362 | 39 | 57447 | 58848 | 97,62 | 0 |
| Total | 126659 | 14738 | 62260 | 203657 | 0 | 0 |
| PA (%) | 96 | 98,61 | 92,27 | 0 | 95,05 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,905 |

(a) 27/12 + 15/02 + 14/03

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 122020 | 145 | 7853 | 130018 | 93,84 | 0 |
| 2.0 | 3481 | 14564 | 1601 | 19646 | 74,13 | 0 |
| 3.0 | 1158 | 29 | 52806 | 53993 | 97,8 | 0 |
| Total | 126659 | 14738 | 62260 | 203657 | 0 | 0 |
| PA (%) | 96,33 | 98,82 | 84,81 | 0 | 92,99 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,863 |

(c) 04/12 + 27/12 + 15/02 + 14/03

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 121322 | 174 | 3347 | 124843 | 97,18 | 0 |
| 2.0 | 3865 | 14534 | 1761 | 20160 | 72,09 | 0 |
| 3.0 | 1472 | 30 | 57152 | 58654 | 97,43 | 0 |
| Total | 126659 | 14738 | 62260 | 203657 | 0 | 0 |
| PA (%) | 95,78 | 98,61 | 91,79 | 0 | 94,77 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,9 |

(b) 04/12 + 15/02 + 14/03

Figure D.6: Confusion matrices ML classification 3 classes (two features, several dates): NDVI, 10 bands & NDWI images

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 121760 | 170 | 2252 | 124182 | 98,05 | 0 |
| 2.0 | 4005 | 14544 | 1673 | 20222 | 71,92 | 0 |
| 3.0 | 894 | 24 | 58335 | 59253 | 98,45 | 0 |
| Total | 126659 | 14738 | 62260 | 203657 | 0 | 0 |
| PA (%) | 96,13 | 98,68 | 93,69 | 0 | 95,57 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,915 |

(a) 27/12 + 15/02 + 14/03

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 122189 | 153 | 8242 | 130584 | 93,57 | 0 |
| 2.0 | 3684 | 14570 | 1459 | 19713 | 73,91 | 0 |
| 3.0 | 786 | 15 | 52559 | 53360 | 98,49 | 0 |
| Total | 126659 | 14738 | 62260 | 203657 | 0 | 0 |
| PA (%) | 96,47 | 98,86 | 84,42 | 0 | 92,96 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,863 |

(c) 04/12 + 27/12 + 15/02 + 14/03

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 121342 | 199 | 2441 | 123982 | 97,87 | 0 |
| 2.0 | 4256 | 14527 | 1792 | 20575 | 70,6 | 0 |
| 3.0 | 1061 | 12 | 58027 | 59100 | 98,18 | 0 |
| Total | 126659 | 14738 | 62260 | 203657 | 0 | 0 |
| PA (%) | 95,8 | 98,56 | 93,2 | 0 | 95,2 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,908 |

(b) 04/12 + 15/02 + 14/03

Figure D.7: Confusion matrices ML classification 3 classes (two features, several dates): NDVI, 10 bands & Brightness images

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 121434 | 405 | 1262 | 123101 | 98,64 | 0 |
| 2.0 | 3605 | 14301 | 1725 | 19631 | 72,85 | 0 |
| 3.0 | 1620 | 32 | 59273 | 60925 | 97,28 | 0 |
| Total | 126659 | 14738 | 62260 | 203657 | 0 | 0 |
| PA (%) | 95,87 | 97,03 | 95,2 | 0 | 95,75 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,919 |

(a) 27/12 + 15/02 + 14/03

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 121122 | 422 | 1556 | 123100 | 98,39 | 0 |
| 2.0 | 3988 | 14291 | 1793 | 20072 | 71,19 | 0 |
| 3.0 | 1549 | 25 | 58911 | 60485 | 97,39 | 0 |
| Total | 126659 | 14738 | 62260 | 203657 | 0 | 0 |
| PA (%) | 95,63 | 96,96 | 94,62 | 0 | 95,41 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,912 |

(b) 04/12 + 15/02 + 14/03

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 121989 | 375 | 3958 | 126322 | 96,57 | 0 |
| 2.0 | 3272 | 14334 | 1614 | 19220 | 74,58 | 0 |
| 3.0 | 1398 | 29 | 56688 | 58115 | 97,54 | 0 |
| Total | 126659 | 14738 | 62260 | 203657 | 0 | 0 |
| PA (%) | 96,31 | 97,26 | 91,05 | 0 | 94,77 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,899 |

(c) 04/12 + 27/12 + 15/02 + 14/03

Figure D.8: Confusion matrices ML classification 3 classes (two features, several dates): NDVI, 10 bands, SAVI & NDWI images

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 121793 | 371 | 1186 | 123350 | 98,74 | 0 |
| 2.0 | 3204 | 14340 | 1654 | 19198 | 74,69 | 0 |
| 3.0 | 1662 | 27 | 59420 | 61109 | 97,23 | 0 |
| Total | 126659 | 14738 | 62260 | 203657 | 0 | 0 |
| PA (%) | 96,15 | 97,29 | 95,44 | 0 | 96,02 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,924 |

(a) 27/12 + 15/02 + 14/03

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 121249 | 417 | 1379 | 123045 | 98,54 | 0 |
| 2.0 | 3881 | 14300 | 1774 | 19955 | 71,66 | 0 |
| 3.0 | 1529 | 21 | 59107 | 60657 | 97,44 | 0 |
| Total | 126659 | 14738 | 62260 | 203657 | 0 | 0 |
| PA (%) | 95,73 | 97,02 | 94,93 | 0 | 95,58 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,916 |

(b) 04/12 + 15/02 + 14/03

| Classif | Reference | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | | | |
| 1.0 | 122269 | 347 | 3796 | 126412 | 96,72 | 0 |
| 2.0 | 3034 | 14366 | 1480 | 18880 | 76,09 | 0 |
| 3.0 | 1356 | 25 | 56984 | 58365 | 97,63 | 0 |
| Total | 126659 | 14738 | 62260 | 203657 | 0 | 0 |
| PA (%) | 96,53 | 97,47 | 91,52 | 0 | 95,07 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0,905 |

(c) 04/12 + 27/12 + 15/02 + 14/03

Figure D.9: Confusion matrices ML classification 3 classes (two features, several dates): NDVI, 10 bands, SAVI & NDWI images

4 classes:

1.0 = Winter wheat class

2.0 = Winter barley class

3.0 = Winter cover crops class preceded by winter wheat (WCCa)

4.0 = Winter cover crops class preceded by winter wheat (WCCb)

| Classif | Reference | | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | 4.0 | | | |
| 1.0 | 127513 | 240 | 26297 | 2534 | 156584 | 81,43 | 0 |
| 2.0 | 6588 | 15394 | 2127 | 403 | 24512 | 62,8 | 0 |
| 3.0 | 1331 | 105 | 24012 | 4503 | 29951 | 80,17 | 0 |
| 4.0 | 2345 | 84 | 4164 | 2317 | 8910 | 26 | 0 |
| Total | 137777 | 15823 | 56600 | 9757 | 219957 | 0 | 0 |
| PA (%) | 92,55 | 97,28 | 42,42 | 23,74 | 0 | 76,94 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0 | 0,547 |

(a) 04/12/2016

| Classif | Reference | | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | 4.0 | | | |
| 1.0 | 125663 | 107 | 6320 | 802 | 132892 | 94,56 | 0 |
| 2.0 | 7296 | 15637 | 2839 | 496 | 26268 | 59,53 | 0 |
| 3.0 | 568 | 79 | 15272 | 2652 | 18571 | 82,23 | 0 |
| 4.0 | 4250 | 0 | 32169 | 5807 | 42226 | 13,75 | 0 |
| Total | 137777 | 15823 | 56600 | 9757 | 219957 | 0 | 0 |
| PA (%) | 91,21 | 98,82 | 26,98 | 59,51 | 0 | 73,82 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0 | 0,55 |

(b) 27/12/2016

| Classif | Reference | | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | 4.0 | | | |
| 1.0 | 116246 | 463 | 2753 | 226 | 119688 | 97,12 | 0 |
| 2.0 | 6346 | 14262 | 1327 | 619 | 22554 | 63,23 | 0 |
| 3.0 | 2423 | 10 | 18148 | 2089 | 22670 | 80,05 | 0 |
| 4.0 | 4238 | 3 | 30581 | 6573 | 41395 | 15,88 | 0 |
| Total | 129253 | 14738 | 52809 | 9507 | 206307 | 0 | 0 |
| PA (%) | 89,93 | 96,77 | 34,36 | 69,14 | 0 | 75,24 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0 | 0,581 |

(c) 15/02/2017

| Classif | Reference | | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | 4.0 | | | |
| 1.0 | 121015 | 389 | 2397 | 69 | 123870 | 97,69 | 0 |
| 2.0 | 6825 | 15379 | 1129 | 648 | 23981 | 64,13 | 0 |
| 3.0 | 5497 | 54 | 16862 | 2289 | 24702 | 68,26 | 0 |
| 4.0 | 1846 | 1 | 36212 | 6695 | 44754 | 14,95 | 0 |
| Total | 135183 | 15823 | 56600 | 9701 | 217307 | 0 | 0 |
| PA (%) | 89,52 | 97,19 | 29,79 | 69,01 | 0 | 73,6 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0 | 0,559 |

(d) 14/03/2017

Figure D.10: Confusion matrices ML classification 4 classes (two features, several dates): NDVI & 10 bands images

| Classif | Reference | | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | 4.0 | | | |
| 1.0 | 129037 | 138 | 23453 | 2421 | 155049 | 83,22 | 0 |
| 2.0 | 7141 | 15649 | 1548 | 446 | 24784 | 63,14 | 0 |
| 3.0 | 538 | 30 | 23986 | 3673 | 28227 | 84,97 | 0 |
| 4.0 | 1061 | 6 | 7613 | 3217 | 11897 | 27,04 | 0 |
| Total | 137777 | 15823 | 56600 | 9757 | 219957 | 0 | 0 |
| PA (%) | 93,65 | 98,9 | 42,38 | 32,97 | 0 | 78,14 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0 | 0,575 |

(a) 04/12 + 27/12

| Classif | Reference | | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | 4.0 | | | |
| 1.0 | 121929 | 170 | 19281 | 2485 | 143865 | 84,75 | 0 |
| 2.0 | 6089 | 14545 | 1028 | 631 | 22293 | 65,24 | 0 |
| 3.0 | 590 | 23 | 22097 | 3188 | 25898 | 85,32 | 0 |
| 4.0 | 645 | 0 | 10403 | 3203 | 14251 | 22,24 | 0 |
| Total | 129253 | 14738 | 52809 | 9507 | 206307 | 0 | 0 |
| PA (%) | 94,33 | 98,69 | 41,84 | 33,69 | 0 | 78,41 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0 | 0,585 |

(b) 04/12 + 27/12 + 15/02

| Classif | Reference | | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | 4.0 | | | |
| 1.0 | 121494 | 147 | 633 | 71 | 122345 | 99,3 | 0 |
| 2.0 | 4186 | 14561 | 1082 | 655 | 20484 | 71,08 | 0 |
| 3.0 | 757 | 29 | 17343 | 2597 | 20726 | 83,67 | 0 |
| 4.0 | 222 | 1 | 33751 | 6128 | 40102 | 15,28 | 0 |
| Total | 126659 | 14738 | 52809 | 9451 | 203657 | 0 | 0 |
| PA (%) | 95,92 | 98,79 | 32,84 | 64,84 | 0 | 78,33 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0 | 0,628 |

(c) 27/12 + 15/02 + 14/03

| Classif | Reference | | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | 4.0 | | | |
| 1.0 | 121262 | 175 | 1552 | 87 | 123076 | 98,52 | 0 |
| 2.0 | 4190 | 14540 | 1152 | 657 | 20539 | 70,79 | 0 |
| 3.0 | 879 | 22 | 23668 | 3322 | 27891 | 84,85 | 0 |
| 4.0 | 328 | 1 | 26437 | 5385 | 32151 | 16,75 | 0 |
| Total | 126659 | 14738 | 52809 | 9451 | 203657 | 0 | 0 |
| PA (%) | 95,74 | 98,65 | 44,81 | 56,98 | 0 | 80,94 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0 | 0,668 |

(d) 04/12 + 15/02 + 14/03

| Classif | Reference | | | | Total | UA (%) | kappa |
|---------|-----------|-------|-------|-------|--------|--------|-------|
| | 1.0 | 2.0 | 3.0 | 4.0 | | | |
| 1.0 | 121963 | 142 | 2847 | 186 | 125138 | 97,46 | 0 |
| 2.0 | 3933 | 14574 | 1031 | 660 | 20198 | 72,15 | 0 |
| 3.0 | 532 | 22 | 20971 | 3053 | 24578 | 85,32 | 0 |
| 4.0 | 231 | 0 | 27960 | 5552 | 33743 | 16,45 | 0 |
| Total | 126659 | 14738 | 52809 | 9451 | 203657 | 0 | 0 |
| PA (%) | 96,29 | 98,88 | 39,71 | 58,74 | 0 | 80,06 | 0 |
| kappa | 0 | 0 | 0 | 0 | 0 | 0 | 0,651 |

(e) 04/12 + 27/12 + 15/02 + 14/03

Figure D.11: Confusion matrices ML classification 4 classes (two features, several dates): NDVI & 10 bands images