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Contents

NOTE: CROPWATCH RESOURCES, BACKGROUND MATERIALS AND ADDITIONAL DATA ARE AVAILABLE ONLINE AT WWW.CROPWATCH.COM.CN.

CONTENTS III

BULLETIN OVERVIEW AND REPORTING PERIOD XI

EXECUTIVE SUMMARY 13

CHAPTER 1. GLOBAL AGROCLIMATIC PATTERNS 15

1.1 Introduction to CropWatch agroclimatic indicators (CWAIs) 15
1.2 Global overview 15
1.3 Rainfall (Figure 1.2) 16
1.4 Temperatures (Figure 1.3) 17
1.5 RADPAR (Figure 1.4) 17
1.5 BIOMSS (Figure 1.5) 18

CHAPTER 2. CROP AND ENVIRONMENTAL CONDITIONS IN MPZ 19

2.1 Overview 19
2.2 West Africa 20
2.3 North America 21
2.4 South America 22
2.5 South and Southeast Asia 24
2.6 Western Europe 26
2.7 Central Europe to Western Russia 28

CHAPTER 3. CORE COUNTRIES 30

3.1 Overview 30
3.2 Country analysis 33

CHAPTER 4. CHINA 164

4.1 Overview 164
4.2 Regional analysis 166

CHAPTER 5. FOCUS AND PERSPECTIVES 175

5.1 CropWatch food production estimates 175
5.2 Disaster events 178
5.3 Update on El Niño 186

ANNEX A. AGROCLIMATIC INDICATORS AND BIOMSS 188

ANNEX B. QUICK REFERENCE TO CROPWATCH INDICATORS, SPATIAL UNITS AND METHODOLOGIES 195

DATA NOTES AND BIBLIOGRAPHY 203

ACKNOWLEDGMENTS 208

ONLINE RESOURCES 209

LIST OF TABLES

TABLE2.1 AGROCLIMATIC INDICATORS BY MAJOR PRODUCTION ZONE, CURRENT VALUE AND DEPARTURE FROM 15YA (OCTOBER 2019 TO JANUARY 2020) 19
TABLE2.2 AGRONOMIC INDICATORS BY MAJOR PRODUCTION ZONE, CURRENT SEASON VALUES AND DEPARTURE FROM 5YA (OCTOBER 2019 TO JANUARY 2020)) 19
TABLE 3.1 AFGHANISTAN'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020 36
TABLE 3.2 AFGHANISTAN'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 5YA, OCTOBER 2019 - JANUARY 2020 37
TABLE 3.3 ANGOLA AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020 40
TABLE 3.4 ANGOLA AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 40
TABLE 3.5 ARGENTINA'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JAUNARY 2020 43
TABLE 3.6 ARGENTINA'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 43
TABLE 3.7 AUSTRALIA'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020 47
TABLE 3.8 AUSTRALIA'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 47
TABLE 3.9 BANGLADESH'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020 50
TABLE 3.10 BANGLADESH'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 50
TABLE 3.11 BELARUS'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020 52
TABLE 3.12 BELARUS'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020. 53
TABLE 3.13 BRAZIL'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020 57
TABLE 3.14 BRAZIL'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 57
TABLE 3.15 CANADA'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020 59
TABLE 3.16 CANADA AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 59
TABLE 3.17 GERMANY AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, JULY-OCTOBER 2019 63
TABLE 3.18 GERMANY'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUE AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 63
TABLE 3.19 EGYPT'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020 65
TABLE 3.20 EGYPT'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 65
TABLE 3.21 ETHIOPIA'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020 68
TABLE 3.22 ETHIOPIA'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 68
TABLE 3.23 FRANCE'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020 71
TABLE 3.24 FRANCE'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUE AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 72
TABLE 3.25 UNITED KINGDOM'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020 75

TABLE 3.26 UNITED KINGDOM'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 75
TABLE 3.27 HUNGARY'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020........ 77
TABLE 3.28 HUNGARY'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 78
TABLE 3.29 INDONESIA'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020........ 80
TABLE 3.30 INDONESIA'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUE AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 81
TABLE 3.31 INDIA'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020........ 85
TABLE 3.32 INDIA'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 85
TABLE 3.33 IRAN'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020........ 88
TABLE 3.34 IRAN'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUE AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 88
TABLE 3.35 ITALY'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020........ 90
TABLE 3.36 ITALY'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUE AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 91
TABLE 3.37 KAZAKHSTAN AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020........ 93
TABLE 3.38 KAZAKHSTAN, AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 93
TABLE 3.39 KENYA'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020........ 96
TABLE 3.40 KENYA'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 96
TABLE 3.41 KYRGYZSTAN'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 TO JANUARY 2020 98
TABLE 3.42 KYRGYZSTAN'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE, OCTOBER 2019TO JANUARY 2020........ 99
TABLE 3.43 CAMBODIA AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020........ 102
TABLE 3.44 CAMBODIA, AGRONOMIC INDICATORS BYSUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 102
TABLE 3.45 SRI LANKA'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020 105
TABLE 3.46 SRI LANKA'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 105
TABLE 3.47 MOROCCO'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020........ 108
TABLE 3.48 MOROCCO'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 108
TABLE 3.49 MEXICO'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020........ 111
TABLE 3.50 MEXICO'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 111
TABLE 3.51 MYANMAR'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020........ 114
TABLE 3.52 MYANMAR'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 114
TABLE 3.53 MONGOLIA'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020........ 116

TABLE 3.54 MONGOLIA'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 116
TABLE 3.55 MOZAMBIQUE'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020 119
TABLE 3.56 MOZAMBIQUE'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 120
TABLE 3.57 NIGERIA'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020 122
TABLE 3.58 NIGERIA'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 123
TABLE 3.59 PAKISTAN'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020 126
TABLE 3.60 PAKISTAN'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 126
TABLE 3.61 PHILIPPINES'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020 129
TABLE 3.62 PHILIPPINES'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 129
TABLE 3.63 POLAND'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020 132
TABLE 3.64 POLAND'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 132
TABLE 3.65 ROMANIA'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020 135
TABLE 3.66 ROMANIA'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 135
TABLE 3.67 RUSSIA'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020 139
TABLE 3.68 RUSSIA'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 139
TABLE 3.69 THAILAND'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020 141
TABLE 3.70 THAILAND'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 142
TABLE 3.71 TURKEY'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020 144
TABLE 3.72 TURKEY'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 145
TABLE 3.73 UKRAINE'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020 147
TABLE 3.74 UKRAINE'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020. 148
TABLE 3.75 UNITED STATES'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020 151
TABLE 3.76 UNITED STATES'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 152
TABLE 3.77 UZBEKISTAN'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020 154
TABLE 3.78 UZBEKISTAN'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 154
TABLE 3.1 VIETNAM'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019-JANUARY 2020 1547
TABLE 3.2 VIETNAM'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 5YA/15YA, J OCTOBER 2019-JANUARY 2020 158

TABLE 3.81 SOUTH AFRICA'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020 161
TABLE 3.82 SOUTH AFRICA'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 161
TABLE 3.83 ZAMBIA'S AGROCLIMATIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA, OCTOBER 2019 - JANUARY 2020 163
TABLE 3.84 ZAMBIA'S AGRONOMIC INDICATORS BY SUB-NATIONAL REGIONS, CURRENT SEASON'S VALUES AND DEPARTURE FROM 15YA/5YA, OCTOBER 2019 - JANUARY 2020 163
TABLE 4.1 CROPWATCH AGROCLIMATIC AND AGRONOMIC INDICATORS FOR CHINA, OCTOBER 2019 - JANUARY 2020, DEPARTURE FROM 5YA AND 15YA 164
TABLE5.1 2019 CEREAL AND SOYBEAN PRODUCTIONS ESTIMATES IN THOUSANDS TONNES. NUMBERS IN BLACK ARE TREND-BASED WHILE RED BOLD NUMBERS CORRESPONDS TO MODELED CROPS THAT HAVE BEEN HARVESTED OR WERE GROWING AT THE TIME OF REPORTING. RICE IS EXPRESSED AS PADDY. Δ IS THE PERCENTAGE OF CHANGE OF 2019 PRODUCTION WHEN COMPARED WITH CORRESPONDING 2018 VALUES. 175
TABLE A.1 OCT 2019 - JAN 2020 AGROCLIMATIC INDICATORS AND BIOMASS BY GLOBAL MONITORING AND REPORTING UNIT (MRU) 188
TABLE A.2 OCT 2019 - JAN 2020 AGROCLIMATIC INDICATORS AND BIOMASS BY COUNTRY 189
TABLE A.3 ARGENTINA, OCT 2019 - JAN 2020 AGROCLIMATIC INDICATORS AND BIOMASS (BY PROVINCE) 190
TABLE A.4 AUSTRALIA, OCT 2019 - JAN 2020 AGROCLIMATIC INDICATORS AND BIOMASS (BY STATE) 191
TABLE A.5 BRAZIL, OCT 2019 - JAN 2020 AGROCLIMATIC INDICATORS AND BIOMASS (BY STATE) 191
TABLE A.6 CANADA, OCT 2019 - JAN 2020 AGROCLIMATIC INDICATORS AND BIOMASS (BY PROVINCE) 191
TABLE A.7 INDIA, OCT 2019 - JAN 2020 AGROCLIMATIC INDICATORS AND BIOMASS (BY STATE) 192
TABLE A.8 KAZAKHSTAN, OCT 2019 - JAN 2020 AGROCLIMATIC INDICATORS AND BIOMASS (BY OBLAST) 192
TABLE A.9 RUSSIA, OCT 2019 - JAN 2020 AGROCLIMATIC INDICATORS AND BIOMASS 193
TABLE A.10 UNITED STATES, OCT 2019 - JAN 2020 AGROCLIMATIC INDICATORS AND BIOMASS (BY STATE) 194
TABLE A.11 CHINA, OCT 2019 - JAN 2020 AGROCLIMATIC INDICATORS AND BIOMASS (BY PROVINCE) 194

LIST OF FIGURES

FIGURE 1.1 GLOBAL DEPARTURE FROM RECENT 15 YEAR AVERAGE OF THERAIN, TEMP AND RADPAR INDICATORS SINCE 2017-JFMA TO 2019-JASO PERIOD (AVERAGE OF 65 MRUS, UNWEIGHTED) 16
FIGURE 1.2 GLOBAL MAP OF RAINFALL ANOMALY (AS INDICATED BY THE RAIN INDICATOR) BY CROPWATCH MAPPING AND REPORTING UNIT: DEPARTURE OF OCTOBER 2019 TO JANUARY 2020 TOTAL FROM 2005-2019 AVERAGE (15YA), IN PERCENT 16
FIGURE 1.3 GLOBAL MAP OF TEMPERATURE ANOMALY (AS INDICATED BY THE TEMP INDICATOR) BY CROPWATCH MAPPING AND REPORTING UNIT: DEPARTURE OF OCTOBER 2019 TO JANUARY 2020 AVERAGE FROM 2005-2019 AVERAGE (15YA), IN °C 17
FIGURE 1.4 GLOBAL MAP OF PHOTOSYNTHETICALLY ACTIVE RADIATION ANOMALY (AS INDICATED BY THE RADPAR INDICATOR) BY CROPWATCH MAPPING AND REPORTING UNIT: DEPARTURE OF OCTOBER 2019 TO JANUARY 2020 TOTAL FROM 2005-2019 AVERAGE (15YA), IN PERCENT. 17
FIGURE 1.5 GLOBAL MAP OF PHOTOSYNTHETICALLY ACTIVE VRADIATION ANOMALY (AS INDICATED BY THE RADPAR INDICATOR) BY CROPWATCH MAPPING AND REPORTING UNIT (MRU), DEPARTURE FROM 15YA BETWEEN BETWEEN JANUARY AND APRIL 2019 18
FIGURE 2.1 WEST AFRICA MPZ: AGROCLIMATIC AND AGRONOMIC INDICATORS, OCTOBER 2019 TO JANUARY 2020. ... 20
FIGURE 2.2 NORTH AMERICA MPZ: AGROCLIMATIC AND AGRONOMIC INDICATORS, OCT 2019 TO JAN2020.. 21
FIGURE 2.3 SOUTH AMERICA MPZ: AGRO-CLIMATIC INDICATORS, OCTOBER 2019 - JANUARY 2020 23
FIGURE 2.4 SOUTH AND SOUTHEAST ASIA MPZ: AGROCLIMATIC AND AGRONOMIC INDICATORS, OCTOBER 2019 - JANUARY 2020 25
FIGURE 2.5 WESTERN EUROPE MPZ: AGROCLIMATIC AND AGRONOMIC INDICATORS, OCTOBER 2019-JANUARY 2020. 27
FIGURE 2.6 CENTRAL EUROPE-WESTERN RUSSIA MPZ: AGROCLIMATIC AND AGRONOMIC INDICATORS, OCTOBER 2019-JANUARY 2020. 29
FIGURE 3.1 NATIONAL AND SUBNATIONAL RAINFALL ANOMALY (AS INDICATED BY THE RAIN INDICATOR) OF OCTOBER 2019 TO JANUARY 2020 TOTAL RELATIVE TO THE 2005-2019 AVERAGE (15YA), IN PERCENT. 32
FIGURE 3.2 NATIONAL AND SUBNATIONAL TEMPERATUTE RAINFALL ANOMALY (AS INDICATED BY THE RAIN INDICATOR) OF OCTOBER 2019 TO JANUARY 2020 AVERAGE RELATIVE TO THE 2005-2019 AVERAGE (15YA), IN °C 32
FIGURE 3.3 NATIONAL AND SUBNATIONAL SUNSHINE ANOMALY (AS INDICATED BY THE RADPAR INDICATOR) OF OCTOBER 2019 TO JANUARY 2020 TOTAL RELATIVE TO THE 2005-2019 AVERAGE (15YA), IN PERCENT. 33

Figure 3.4 National and subnational biomass production potential anomaly (as indicated by the BIOMSS indicator) of October 2019 to January 2020 total relative to the 2005-2019 average (15YA), in percent. 33
Figure 3.5 Afghanistan's crop condition, October 2019 - January 2020 35
Figure 3.6 Angola's crop condition, October 2019 - January 2020 38
Figure 3.7 Argentina's crop condition, October 2019 - January 2020 41
Figure 3.8 Australia's crop condition, October 2019 - January 2020 46
Figure 3.9 Bangladesh's crop condition, October 2019 - January 2020. 48
Figure 3.10 Belarus's crop condition, October 2019 - January 2020 51
Figure 3.11 Brazil's crop condition, October 2019 - January 2020 55
Figure 3.12 Canada's crop condition, October 2019 - January 2020 58
Figure 3.13 Germany's crop condition, October 2019 - January 2020 61
Figure 3.14 Egypt's crop condition, October 2019 - January 2020 64
Figure 3.15 Ethiopia's crop condition, October 2019 - January 2020 66
Figure 3.16 France's crop condition, October 2019 - January 2020 70
Figure 3.17 United Kingdom crop condition, October 2019 - January 2020 73
Figure 3.18 Hungary's crop condition, October 2019 - January 2020 76
Figure 3.19 Indonesia's crop condition, October 2019 - January 2020 79
Figure 3.20 India's crop condition, October 2019 - January 2020 83
Figure 3.21 Iran's crop condition, October 2019 - January 2020 86
Figure 3.22 Italy's crop condition, October 2019 - January 2020. 89
Figure 3.23 Kazakhstan's crop condition, October 2019 - January 2020 92
Figure 3.24 Kenya's crop condition, October 2019 - January 2020 95
Figure 3.25 Kyrgyzstan's crop condition, October 2019 - January 2020 97
Figure 3.26 Cambodia's crop condition, October 2019 - January 2020 101
Figure 3.27 Sri Lanka's crop condition, October 2019 - January 2020 104
Figure 3.28 Morocco's crop condition, October 2019 - January 2020 106
Figure 3.29 Mexico's crop condition, October 2019 - January 2020 110
Figure 3.30 Myanmar's crop condition, October 2019 - January 2020 113
Figure 3.31 Mongolia's crop condition, October 2019 - January 2020 115
Figure 3.32 Mozambique's crop condition, October 2019 - January 2020 118
Figure 3.33 Nigeria's crop condition, October 2019 - January 2020 121
Figure 3.34 Pakistan's crop condition, October 2019 - January 2020 124
Figure 3.35 Philippines's crop condition, October 2019 - January 2020 127
Figure 3.36 Poland's crop condition, October 2019 - January 2020 130
Figure 3.37 Romania's crop condition, October 2019 - January 2020 133
Figure 3.38 Russia's crop condition, October 2019 - January 2020 137
Figure 3.39 Thailand's crop condition, October 2019 - January 2020 140
Figure 3.40 Turkey's crop condition, October 2019 - January 2020 143
Figure 3.41 Ukraine's crop condition, October 2019 - January 2020 146
Figure 3.42 United States's crop condition, October 2019 - January 2020 150
Figure 3.43 Uzbekistan's crop condition, October 2019 - January 2020 153
Figure 3.44 Vietnam's crop condition, October 2019 - January 2020 156
Figure 3.45 South Africa's crop condition, October 2019 - January 2020 160
Figure 3.46 Zambia's crop condition, October 2019 - January 2020 162
Figure 4.1 China spatial distribution of rainfall profiles, October 2019 - January 2020 165
Figure 4.2 China spatial distribution of temperature profiles, October 2019 - January 2020 165
Figure 4.3 China cropped and uncropped arable land, by pixel, October 2019 - January 2020 165
Figure 4.4 China maximum Vegetation Condition Index (VCIx), by pixel, October 2019 - January 2020 166
Figure 4.5 Crop condition China Northeast region, October 2019 - January 2020 167
Figure 4.6 Crop condition China Inner Mongolia, October 2019 - January 2020 168
Figure 4.7 Crop condition China Huanghuaihai, October 2019 - January 2020 169
Figure 4.8 Crop condition China Loess region, October 2019 - January 2020 170
Figure 4.9 Crop condition Lower Yangtze region, October 2019 - January 2020 171
Figure 4.10 Crop condition Southwest China region, October 2019 - January 2020 172
Figure 4.11 Crop condition Southern China region, October 2019 - January 2020 174
Figure 5.1 Location of Australian fires during this year (red) and last year (green) 179

FIGURE 5.2. DESERT LOCUST RISK MAP AS FOR DECEMBER 2019 ISSUED ON 6 JANUARY 2020 BY FAO.................... 182
FIGURE 5.3. TRACK OF VERY SEVERE CYCLONIC STORM BULBUL OVER BANGLADESH ON 9 NOVEMBER 2019 (LEFT) AND DAMAGED HOUSES IN SATKHIRA DISTRICT. 185
FIGURE 5.4. LOCATION OF TAAL ON SOUTH-WESTERN LUZON AND COFFEE PLANT COVERED WITH VOLCANIC DUST IN LAGUNA PROVINCE. 185
FIGURE 5.5. MONTHLY SOI-BOM TIME SERIES FROM OCTOBER 2018 TO OCTOBER 2019 186
FIGURE 5.6 MAP OF NINO REGION.. 186
FIGURE 5.7. JULY 2019 SEA SURFACE TEMPERATURE DEPARTURE FROM THE 1961-1990 AVERAGE.......................... 187

Abbreviations

5YA	Five-year average, the average for the four-month period from July from 2014 to 2018 to October next year; one of the standard reference periods.
15YA	Fifteen-year average, the average for the four-month period from July from 2004 to 2018 to October next year; one of the standard reference periods and typically referred to as "average".
AEZ	Agro-Ecological Zone
BIOMSS	CropWatch agroclimatic indicator for biomass production potential
BOM	Australian Bureau of Meteorology
CALF	Cropped Arable Land Fraction
CAS	Chinese Academy of Sciences
CWAI	CropWatch Agroclimatic Indicator
CWSU	CropWatch Spatial Units
DM	Dry matter
EC/JRC	European Commission Joint Research Centre
ENSO	El Niño Southern Oscillation
FAO	Food and Agriculture Organization of the United Nations
GAUL	Global Administrative Units Layer
GVG	GPS, Video, and GIS data
Ha	hectare
Kcal	kilocalorie
MPZ	Major Production Zone
MRU	Monitoring and Reporting Unit
NDVI	Normalized Difference Vegetation Index
OISST	Optimum Interpolation Sea Surface Temperature
PAR	Photosynthetically active radiation
PET	Potential Evapotranspiration
RADI	CAS Institute of Remote Sensing and Digital Earth
RADPAR	CropWatch PAR agroclimatic indicator
RAIN	CropWatch rainfall agroclimatic indicator
SOI	Southern Oscillation Index
TEMP	CropWatch air temperature agroclimatic indicator
Ton	Thousand kilograms
VCIx	CropWatch maximum Vegetation Condition Index
VHI	CropWatch Vegetation Health Index
VHIn	CropWatch minimum Vegetation Health Index
W/m^2	Watt per square meter

Bulletin overview and reporting period

This CropWatch bulletin presents a global overview of crop stage and condition between October 2019 and January 2020, a period referred to in this bulletin as the JASO (October, November, Desember, and Jaunary) period or just the “reporting period.” The bulletin is the 116th such publication issued by the CropWatch group at the Aerospace Information Research Institute (AIR), Chinese Academy of Sciences, Beijing.

CropWatch indicators

CropWatch analyses are based mostly on several standard as well as new ground-based and remote sensing indicators, following a hierarchical approach.

In parallel to an increasing spatial precision of the analyses, indicators become more focused on agriculture as the analyses zoom in to smaller spatial units. CropWatch uses two sets of indicators: (i) agroclimatic indicators—RAIN, TEMP, RADPAR, and potential BIOMSS, which describe weather factors and its impacts on crops. Importantly, the indicators RAIN, TEMP, RADPAR, and BIOMSS do not directly describe the weather variables rain, temperature, radiation, or biomass, but rather they are spatial averages over agricultural areas, which are weighted according to the local crop production potential; and (ii) agronomic indicators—VHIn, CALF, and VCIx, Cropping Intensity, and vegetation indices, describing crop condition and development. (ii) PAY indicators: planted area, yield and production.

For each reporting period, the bulletin reports on the departures for all seven indicators, which (with the exception of TEMP) are expressed in relative terms as a percentage change compared to the average value for that indicator for the last five or fifteen years (depending on the indicator).For more details on the CropWatch indicators and spatial units used for the analysis, please see the quick reference guide in Annex B, as well as online resources and publications posted at www.cropwatch.com.cn.

CropWatch analysis and indicators

The analyses cover large global zones; major producing countries of maize, rice, wheat, and soybean; and detailed assessments for Chinese regions, 42 major agricultural countries, and 201 Agro-Ecological Zones (AEZs).

This bulletin is organized as follows:

Chapter	Spatial coverage	Key indicators
Chapter 1	World, using Monitoring and Reporting Units (MRU), 65 large, agro-ecologically homogeneous units covering the globe	RAIN, TEMP, RADPAR, BIOMSS
Chapter 2	Major Production Zones (MPZ), six regions that contribute most to global food production	As above, plus CALF, VCIx, and VHIn
Chapter 3	42 key countries (main producers and exporters) and 206AEZs	As above plus NDVI and GVG survey
Chapter 4	China and regions	As above plus high resolution images; Pest and crops trade prospects
Chapter 5	Production outlook, and updates on disaster events and El Niño.	

Regular updates and online resources

The bulletin is released quarterly in both English and Chinese. E-mail **cropwatch@radi.ac.cn** to sign up for the mailing list or visit CropWatch online at **www.cropwatch.com.cn**, **http://cloud.cropwatch.com.cn/**

Executive summary

The current CropWatch bulletin describes world-wide crop condition and food production as appraised by data up to the end of January 2020.

The assessment is based mainly on remotely sensed data. It covers prevailing weather conditions, including extreme factors, at different spatial scales, starting with global patterns in Chapter 1. Chapter 2 focuses on agro-climatic and agronomic conditions in major production zones in all continents. Chapter 3 covers the major agricultural countries that, together, make up at least 80% of production and exports (the "core countries") while chapter 4 zooms into China. Special attention is paid to the production outlook of major cereal and oil crops (maize, rice, wheat and soybean) countries in the southern Hemisphere and some tropical and sub-tropical countries. Subsequent sections of Chapter 5 describe the global disasters that occurred from October 2019 to January 2020.

This bulletin covers the beginning of the rainy season in the southern hemisphere, as well as the sowing period and early vegetative growth of (winter) wheat in the northern hemisphere.

Agro-climatic conditions

Global agroclimatic conditions are assessed based on CropWatch Agroclimatic Indices which describe weather and climate over agricultural areas only. They are referred to as RAIN, TEMP and RADPAR and expressed in the same units as the corresponding climatological variables (rainfall, temperature and photosynthetically active radiation). BIOMSS is an estimate of the plant biomass production potential.

During this reporting period, yet another temperature record was set: No other month of January in NOAA's 141-year global temperature dataset was as warm as January 2020. The CropWatch TEMP indicator, which is calculated over cropped areas only, also showed that the average temperature between October 2019 and January 2020 was 0.3ºC above the 15 year average. This was not the only alarming news during this monitoring period: In Australia, wheat was negatively affected by drought conditions and above average temperatures. Similarly, dry conditions, partly caused by a delayed onset of the rains, induced yield losses for the main rice crops in South-East Asia.

On the positive side, rainfall in South America returned to normal after the delayed onset of the rainy season, ensuring normal to favorable conditions for wheat, maize and soybean production.

Wheat is the main crop that was sown and grown in the northern hemisphere during this monitoring period. Rainfall was above average in the southern USA and winter wheat production in the Southern Plains stands to benefit. Drier than normal conditions were observed for the north-west of the USA. The winter wheat production regions of Canada experienced normal conditions. In Europe, Siberia and the North China Plain, conditions for wheat sowing and its early vegetative growth were also favorable. However, below-average rainfall was observed for Romania and the Ukraine. But we are still early in the season: Soil moisture during spring green up in March and April will mainly determine the production potential for winter wheat. Conditions for wheat production in Pakistan and India are also favorable. In those countries, wheat is predominantly irrigated and does not go dormant.

Rainfall in many parts of Africa was more than 30% above average, partly due to a prolonged rainy season in the Sahel. A phenomenon called positive Indian Ocean Dipole, which is caused by warmer temperatures in the Indian Ocean, brought torrential rains to many East African countries. Similarly, the Arabian Peninsula, the Middle East, Pakistan and India experienced above average rainfall as well. For the Sahel, Horn of Africa and South Asia, the monitoring period covered the grain-filling phase of the cereals, which were predominantly harvested in October and November. Yield of these crops may have benefitted from above-average rainfall, as biomass production estimates were above average. Rainy and favorable conditions for crops and pastures also favored the outbreak of Desert locusts. Although losses of cereal crops as a result of desert locusts were limited and at local scales, locusts still pose a threat to other crops such as potatoes and to the crops in the coming season not only on the Horn of Africa, but on the on the Arabian Peninsula, Iran and Pakistan as well (See section 5.2 DISASTER EVENTS for more details).

Global Agricultural production estimates

The current production outlook focuses on major cereal and oil crops (maize, rice, wheat and soybean) producing countries in the southern Hemisphere and some tropical and sub-tropical countries. Production forecasts are generally favorable for all crops.

The production forecasts for the 2019/20 maize season in Brazil and Argentina, the 2nd and 3rd largest exporters of maize, are up by 1% and 3% compared to last year. Of the 10 maize producing countries being monitored, only Zambia and Mexico showed decreases in maize production by 5% and 7% respectively. The outlook for maize production in southern Africa is favorable, as the region is recovering from last year's drought: Forecasts for South Africa (+20%) and Angola (+5%) are positive. Rice production in the key 14 rice-producing countries in South and South-East Asia is also expected to recover from last year's dry conditions, with the exception of Indonesia (-3%). For most of the other countries, production is expected to be stable or even increase by more than 3%. Wheat is still in the vegetative stage in the five countries being monitored: Egypt, Ethiopia, Morocco, India and Pakistan. It will reach the flowering stage in early March. For Morocco, the only country where most wheat is rainfed, a yield decline of 25% is forecasted, due to the shortage of rain. In Egypt, India and Pakistan, which are predominantly irrigated, production is expected to be stable or increase by up to 4-5%. Brazil and Argentina combined account for about half of the world's soybean exports. Production in the two countries is expected to increase by 1-2% over last year.

China

This monitoring period covered the harvest of rice and maize, as well as the sowing of winter wheat in northern China. Weather conditions were favorable for harvest and the establishment of the wheat crop. Cropped area land fraction (CALF) is up for Huanghuaihai (+10%) and the Loess Region (+21%), although this could be partly due to above-average temperatures, which advanced the development of winter crops. BIOMSS estimates are also up for most regions, except for the Loess Region and southern China. Precipitation in the South and South East was below average. However, rice planting will start during the next monitoring period only.

Chapter 1. Global agroclimatic patterns

1.1 Introduction to CropWatch agroclimatic indicators (CWAIs)

This bulletin describes environmental and crop conditions over the period from October 2019 to January 2020, JASO, referred to as “reporting period”. In this chapter, we focus on 65 spatial “Mapping and Reporting Units” (MRU) which cover the globe, but CWAIs are averages of climatic variables over agricultural areas only inside each MRU. For instance, in the “Sahara to Afghan desert” MRU, only the Nile valley and other cropped areas are considered. MRUs are listed in annex C and serve the purpose of identifying global climatic patterns. Refer to Annex A for definitions and to table A.1 for 2020 JASO numeric values of CWAIs by MRU. Although they are expressed in the same units as the corresponding climatological variables, CWAIs are spatial averages limited to agricultural land and weighted by the agricultural production potential inside each area.

We also stress that the reference period, referred to as “average” in this bulletin covers the 15 year period from 2005 to 2019. Although departures from the 2005-2019 are not anomalies (which, strictly, refer to a “normal period” of 30 years), we nevertheless use that terminology. The specific reason why CropWatch refers to the most recent 15 years is our focus on agriculture, as already mentioned in the previous paragraph. 15 years is deemed an acceptable compromise between climatological significance and agricultural significance: agriculture responds much faster to persistent climate variability than 30 years, which is a full generation. For “biological” (agronomic) indicators used in subsequent chapters we adopt an even shorter reference period of 5 years (i.e. 2015-2019) but the BIOMSS indicator is nevertheless compared against the longer 15YA (fifteen-year average). This makes provision for the fast response of markets to changes in supply but also to the fact that in spite of the long warming trend, some recent years (e.g. 2008 or 2010-13) were below the trend.

Correlations between variables (RAIN, TEMP, RADPAR, BIOMSS) at MRU scale derive directly from climatology. For instance, the positive correlation between rainfall and temperature results from high rainfall in equatorial, i.e. in warm areas.

Considering the size of the areas covered in this section, even small departures may have dramatic effects on vegetation and agriculture due to the within-zone spatial variability of weather. It is important to note that we have adopted a new calculation procedure of the biomass production potential in the August 2019 bulletin. The new approach includes sunshine (RADPAR), TEMP and RAIN. Readers are referred to the August 2019 bulletin for details.

1.2 Global overview

Temperatures for January 2020 were the highest on record. Never since 1880, when the reference data set starts, has Earth experienced such high temperatures during that month. Temperatures during the ONDJ monitoring period exceeded the 15 year average as well, as shown in Fig 1.1. Data in this figure are based on the arithmetic means of the 65 MRUs, i.e., they are not weighted. The CropWatch indicators are computed over agricultural areas only. Rainfall also greatly departed from the 15 year average. This was mainly due to high precipitation in Africa, where flooding has affected millions of people, caused damage to infrastructure and soil erosion (Confirmed by Floods in Central-west Africa listed in the section on Disasters (Chapter 5.2)). The reasons for these floods are warmer temperatures in the Indian Ocean, a phenomenon called positive Indian Ocean Dipole. They cause higher evaporation rates off the East

African coastline. At a global level, RADPAR stayed close the average, despite of the higher rainfalls in many parts of the world. The combination of high moisture availability and close to normal RADPAR resulted in generally favorable conditions for BIOMSS production.

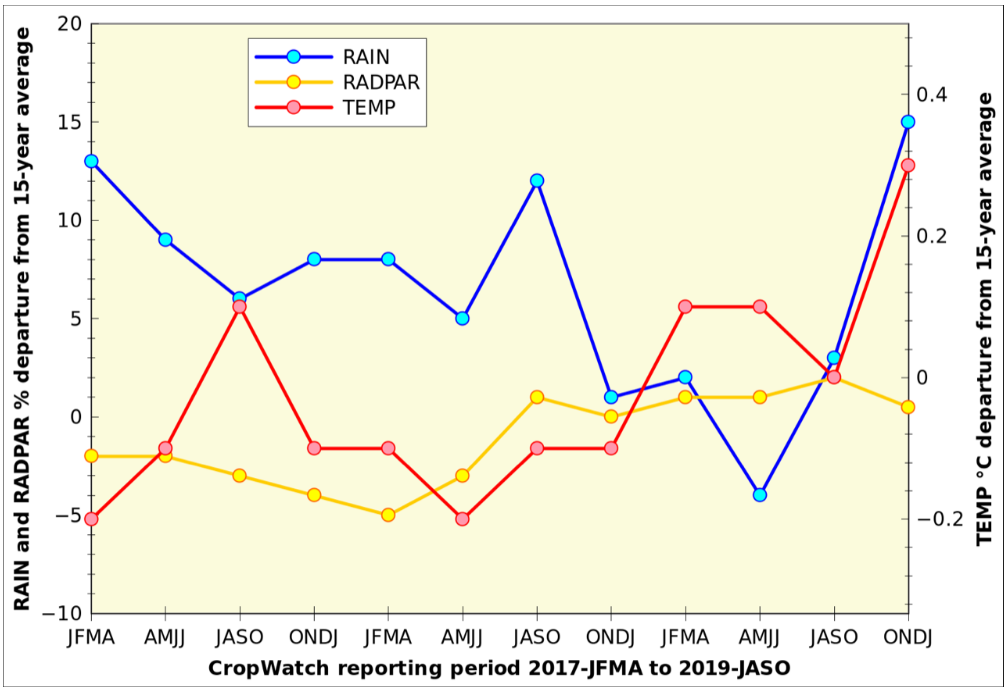


Figure 1.1 global departure from recent 15 year average of theRAIN, TEMP and RADPAR indicators since 2017-JFMA to 2019-JASO period (average of 65 MRUs, unweighted)

Currently, the situation for crop production continues to be unfavorable in Australia and the Maghreb only. The situation in South-East Asia improved in January, due to abundant rainfall. In all other regions, conditions are near normal.

1.3 Rainfall (Figure 1.2)

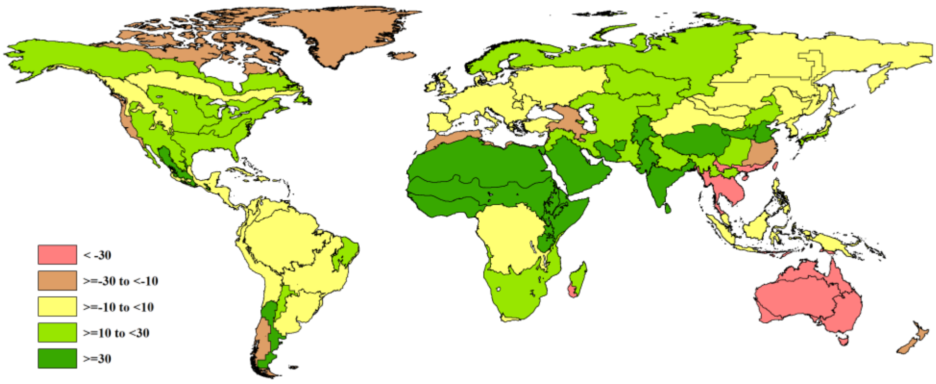


Figure 1.2 Global map of rainfall anomaly (as indicated by the RAIN indicator) by CropWatch Mapping and Reporting Unit: departure of October 2019 to January 2020 total from 2005-2019 average (15YA), in percent.

During the previous CropWatch monitoring period, which lasted from July to October, extreme rainfall deficits had been reported for Australia, most of Brazil, with the exception of the heart of the Amazon basin, the Andean countries, Portugal, Italy, Turkey, Georgia, Eastern China, the Philippines and Indonesia.

Severe drought conditions continued in Australia during this monitoring period. Precipitation was more than 30% below average. South-East Asia also suffered from a severe drought. Moderate drought conditions were observed for South-East China, the Maghreb, Southern Caucasus and the West coast of the USA. Most of South America experienced close to normal rainfall conditions. However, the late onset of the rainy season extended the dry period in most of Brazil until December. Rainfall was more than 30% above average in the northern half of Africa, with the already mentioned exception of the Maghreb, East Africa, the Arabian Peninsula, Pakistan and parts of Afghanistan and India. The higher-than-usual precipitation in the Sahel and South Asia was mainly due to a prolonged rainy season, which lasted until early November in some parts. The Tibetan plateau also experienced higher than normal precipitation. North America generally experienced normal and above-normal precipitation. Favorable rainfall conditions were observed for Europe, Siberia and most of China, with the exception of the South-East.

1.4 Temperatures (Figure 1.3)

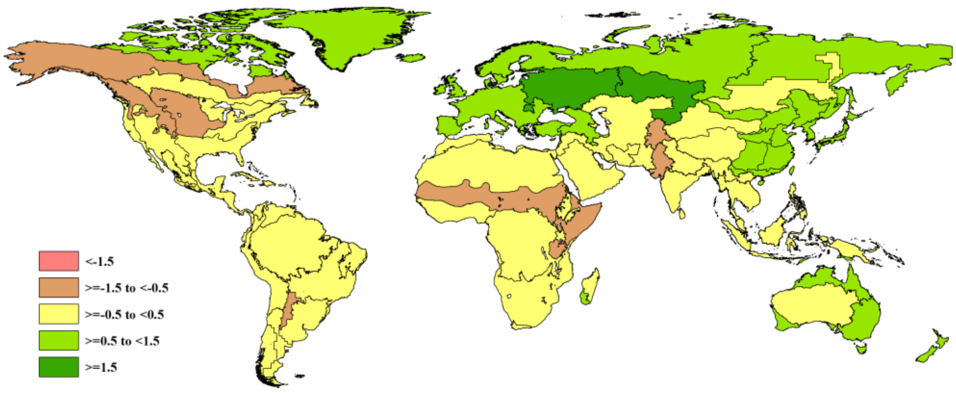


Figure 1.3 Global map of temperature anomaly (as indicated by the TEMP indicator) by CropWatch Mapping and Reporting Unit: departure of October 2019 to January 2020 average from 2005-2019 average (15YA), in °C .

Colder-than-normal (-1.5 to -0.5ºC) temperatures were observed for the Midwest in the USA, the prairies in Canada, as well as the Sahel. The rest of Africa, as well as South America, the Middle East, Central and South Asia experienced normal temperatures. However, temperatures were milder than usual in Europe and Siberia. In Eastern China, temperatures were 0.5 to 1.5ºC above average. Temperatures over cropland in drought-stricken Australia were also above average.

1.5 RADPAR (Figure 1.4)

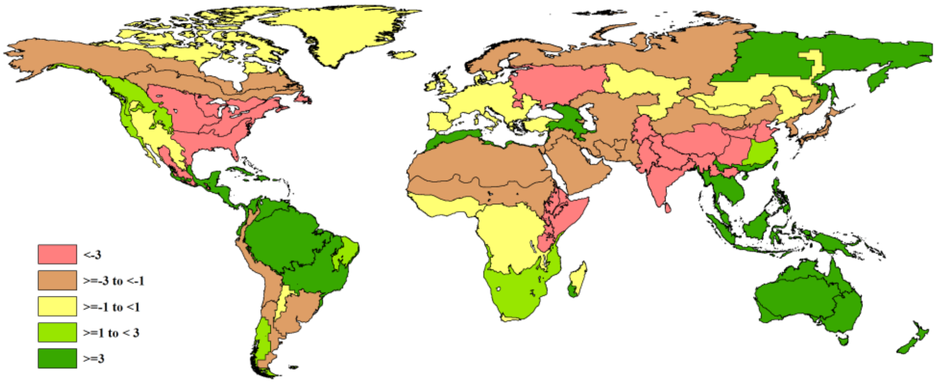


Figure 1.4 Global map of photosynthetically active radiation anomaly (as indicated by the RADPAR indicator) by CropWatch Mapping and Reporting Unit: departure of October 2019 to January 2020 total from 2005-2019 average (15YA), in percent.

Higher solar radiation increases photosynthesis and thus crop production potential and yields. Greatly above-average conditions (+3%) were recorded for Brazil, Venezuela, Central America, the Maghreb, Southern Caucasus, South East Asia and Australia. Most of these regions were plagued by prolonged drought conditions. Below-average solar radiation (-1 to -2%) was recorded for most of Argentina and the other Andean countries, the Sahel, the Arabian Peninsula and Central Asia. Severe radiation deficits (more than -3% below average) were observed for the USA and Canada east of the Rocky Mountains, the Horn of Africa, Russia west of the Ural, the Hindukusch, the Indian subcontinent and the Tibetan Plateau.

1.6 BIOMSS (Figure 1.5)

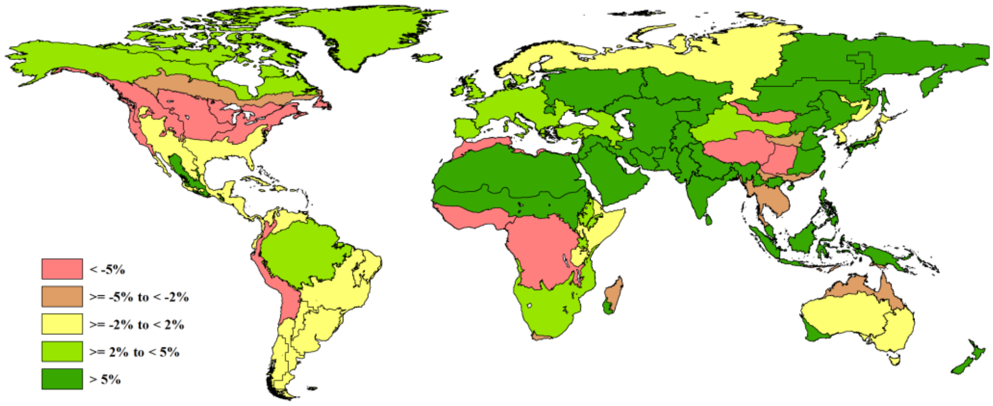


Figure 1.5 Global map of photosynthetically active vradiation anomaly (as indicated by the RADPAR indicator) by CropWatch Mapping and Reporting Unit (MRU), departure from 15YA between between January and April 2019

The BIOMSS indicator is controlled by temperature, rainfall and solar radiation. In some regions, rainfall is more limiting, whereas in other ones, mainly the tropical ones, solar radiation tends to be the limiting factor. Biomass production was more than 5% below average for Peru, Ecuador, Colombia, the northwest and central States of the USA, the Canadian Prairies, Central Africa, the Maghreb, the Tibetan Plateau and parts of Mongolia. It was also below average in Cambodia, Thailand, Laos and Vietnam due to rainfall deficits in the early part of this monitoring period. The indicator showed average values for the crop production regions of Brazil, Argentina, the southern USA, most of Australia and northern Siberia. In Europe and southern Africa, as well as the heart of the Amazon basin, production was 2-5% above average. Modeled BIOMSS production was more than 5% above average for North Africa, including the Sahel, the Arabian Peninsula, most of Russia, Central and South Asia, as well as Eastern China, the Philippines and Indonesia.

Chapter 2. Crop and environmental conditions in major production zones

Chapter 2 presents the same indicators—RAIN, TEMP, RADPAR, and BIOMSS— as those used in Chapter 1, and combines them with the agronomic indicators—cropped arable land fraction (CALF), maximum vegetation condition index (VCIx), minimum vegetation health index (VHIn) and cropping intensity index (CI)— to describe crop condition in six Major Production Zones (MPZ) across all continents. For more information about these zones and methodologies used, see the quick reference guide in Annex C as well as the CropWatch bulletin online resources at http://www.cropwatch.com.cn/htm/en/bullAction!showBulletin.action#.

2.1 Overview

Tables 2.1 and 2.2 present an overview of the agroclimatic (Table 2.1) and agronomic (Table 2.2) indicators for each of the six MPZs, comparing the indicators to their fifteen and five-year averages, respectively. The text mostly refers simply to "average" with the averaging period implied.

Table2.1 Agroclimatic indicators by Major Production Zone, current value and departure from 15YA (October 2019 to January 2020)

	RAIN		TEMP		RADPAR	
	Current (mm)	Departure (%)	Current (°C)	Departure (°C)	Current (MJ/m²)	Departure (%)
West Africa	288	41	24.9	-0.3	1221	-1
North America	379	24	5.2	-0.2	508	-5
South America	781	-2	22.9	0.2	1371	2
S. and SE Asia	312	14	20.6	-0.1	1007	-2
Western Europe	412	20	6.4	0.9	291	-5
C. Europe and W. Russia	220	-16	2.5	2.7	232	2

*Note: Departures are expressed in relative terms (percentage) for all variables, except for temperature, for which absolute departure in degrees Celsius is given. Zero means no change from the average value; relative departures are calculated as (C-R)/R*100, with C=current value and R=reference value, which is the fifteen-year average (15YA) for the same period (October to January) for 2005-2019*

Table2.2 Agronomic indicators by Major Production Zone, current season values and departure from 5YA (October 2019 to January 2020))

	BIOMSS (gDM/m²)		CALF (Cropped arable land fraction)		Maximum VCI Intensity
	Current	15A Departure (%)	Current	5A Departure (%)	Current
West Africa	407	-11	96	2	0.98
North America	121	-5	76	13	0.93
South America	833	0	98	0	0.74
S. and SE Asia	428	16	98	4	1.02
Western Europe	73	-7	93	3	0.94
Central Europe and W Russia	51	17	79	16	0.92

Note: See note for Table 2.1, with reference value R defined as the five-year average (5YA) for the same period (October to January) for 2015-2019.

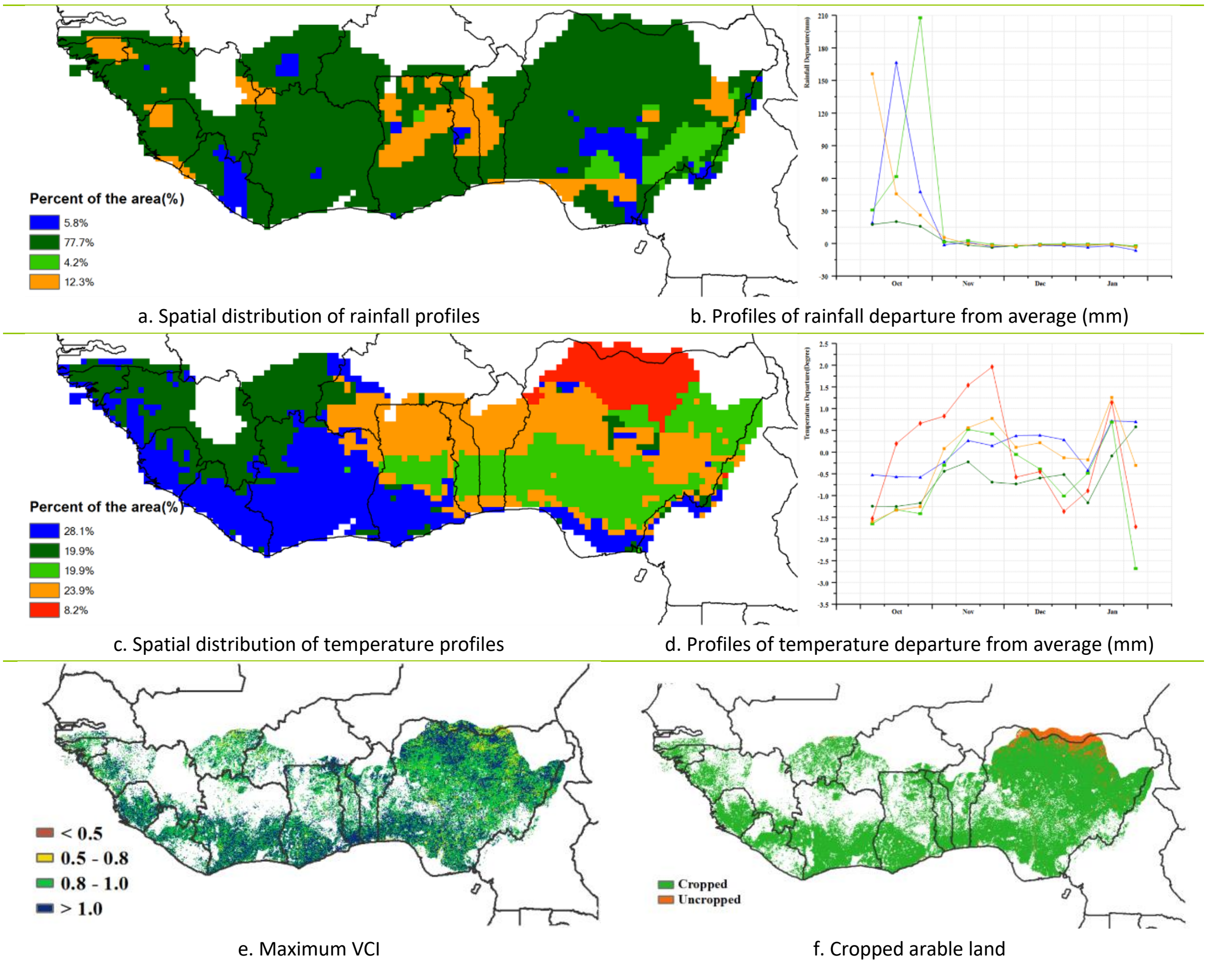
2.2 West Africa

The reporting period covers the harvesting of major food crops in the region except for the second maize and cassava growing in northern Nigeria which are harvested later in the reporting period. Cassava in its first year was still growing in the fields. The aggregated cereal output in 2019 was forecasted at 27.3 million tones for Nigeria, 4 percent higher than the previous five-year average.

The rainfall was well distributed in the MPZ averaging 288 mm (41% above the 15 year average) with extreme amounts recorded in Equatorial Guinea (1257 mm, -2% Departure) and Gabon (1420 mm, +1% Departure). The average temperature of the region was 24.7°C (down by 0.3%) and average solar radiation (RADPAR = 1221 MJ). It was slightly below average by 1%. The accumulated biomass potential of the MPZ was at 407 gDM/m2, down by 11%. Also the MPZ showed a marginal increase in cultivated area (CALF: 96%, +2% above average) and a high VCIx (0.98) indicating potentially good yields for most parts of the region.

These CropWatch indicators showed a stable climatic condition for the MPZ resulting from adequate cumulative rainfall amounts.

Figure 2.1 West Africa MPZ: Agroclimatic and agronomic indicators, October 2019 to January 2020.



a. Spatial distribution of rainfall profiles

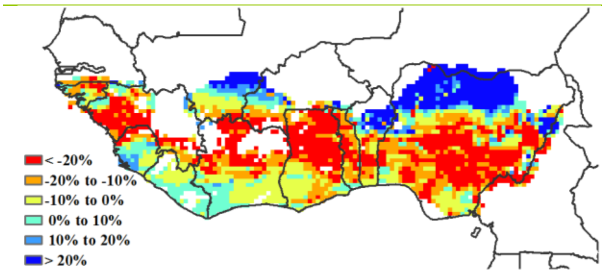
b. Profiles of rainfall departure from average (mm)

c. Spatial distribution of temperature profiles

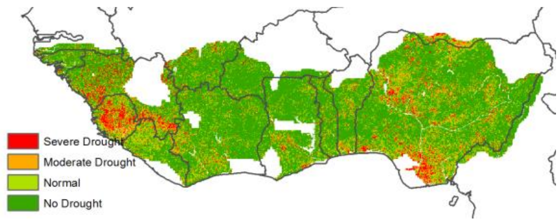
d. Profiles of temperature departure from average (mm)

e. Maximum VCI

f. Cropped arable land



g. Biomass accumulation potential departure



h. VHI minimum

Note: For more information about the indicators, see Annex B.

2.3 North America

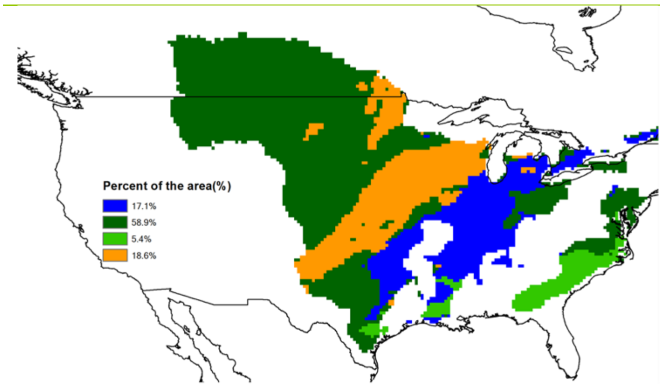
This report covers the end of the harvest season of summer crops and the sowing period of winter crops.

Cloudy and rainy weather dominated the agro-climatic conditions. As compared to the long-term average, precipitation was 24% higher, temperature 0.2℃ lower, and RADPAR 5% lower. Above average precipitation helps replenish soil moisture and thus benefits growth of winter crops. Temperature deviations varied greatly over time. It was much colder than normal in late October, and then the temperatures bounced back to average in the middle of November. In late December, above average temperatures were observed.

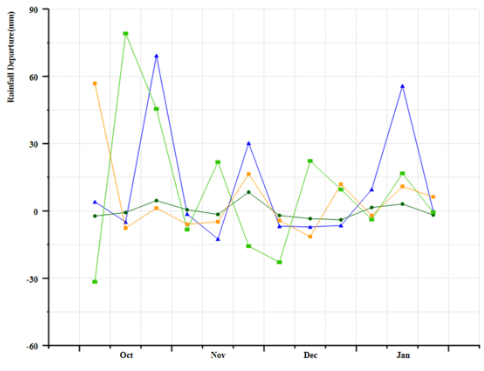
For all of North America, the potential biomass was 5% below average as compared to the last 15 years. However, above average potential biomass was observed in the central and southern plains, the most important winter wheat zone of the United States. This region benefitted most from the abundant precipitation. Due to the noise from harvest, the maximum VCI index in this monitoring period did not reflect the growing condition of winter crops in 2020. We therefore omitted the analysis of this parameter. It is noteworthy that the cropped land fraction was 13% above the previous 5 years, which restored from the low CALF in 2019 summer.

In summary, the agro-climatic conditions were favorable for the growth of winter crops between October 2019 and January 2020.

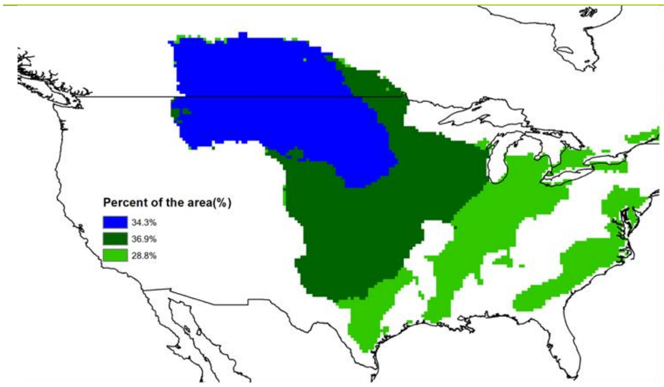
Figure 2.2 North America MPZ: Agroclimatic and agronomic indicators, October 2019 to January 2020..



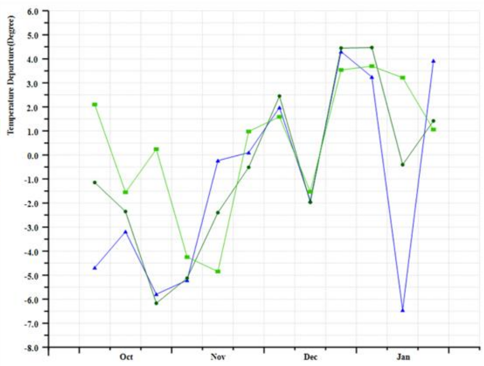
a. Spatial distribution of rainfall profiles



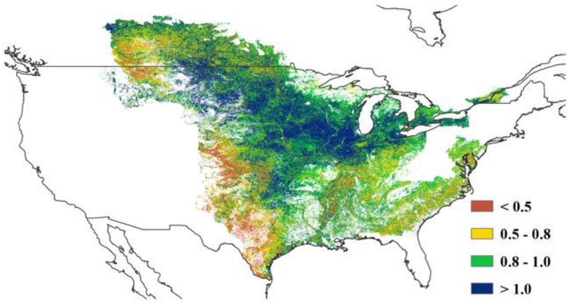
b. Profiles of rainfall departure from average (mm)



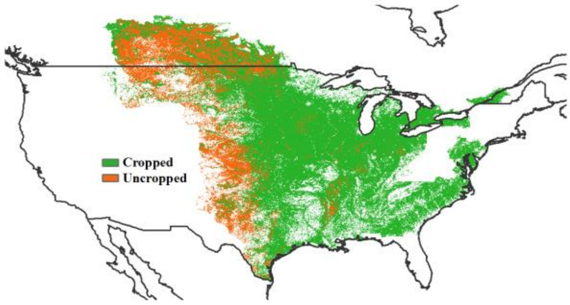
c. Spatial distribution of temperature profiles



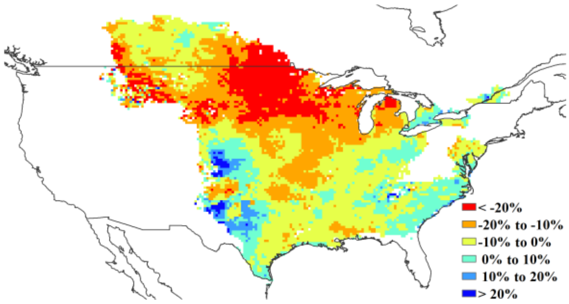
d. Profiles of temperature departure from average (mm)



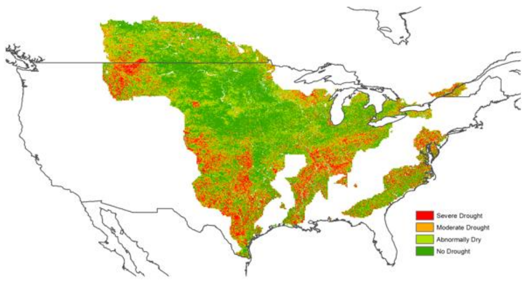
e. Maximum VCI



f. Cropped arable land



g. Biomass accumulation potential departure



h. VHI minimum

Note: For more information about the indicators, see Annex B

2.4 South America

This monitoring period covers the harvest of winter crops and the sowing and early growth stages of summer crops in the Major Production Zones (MPZ) of South America. The overall situation in South America during the monitoring period was slightly above average.

For RAIN, althought it is not enough, the Southern Area (including most of the Pampas) was dominated by a normal pattern with different characteristics at different times. In the North East Pampas there existed a region with several positive anomalies (Figure 2.3.a - blue area). The northern part of the MPZ showed a variable pattern with negative anomalies at the beginning and end of the period and a high positive anomaly during part of November and December. Areas around Mato Grosso Do Sul, Parana and Sao Paulo showed a similar pattern, but with a highly positive anomaly only in December. Southern Brazil and South Chaco in Argentina (Figure 2.3.a- light green area) showed a pattern with slightly positive and negative anomalies.

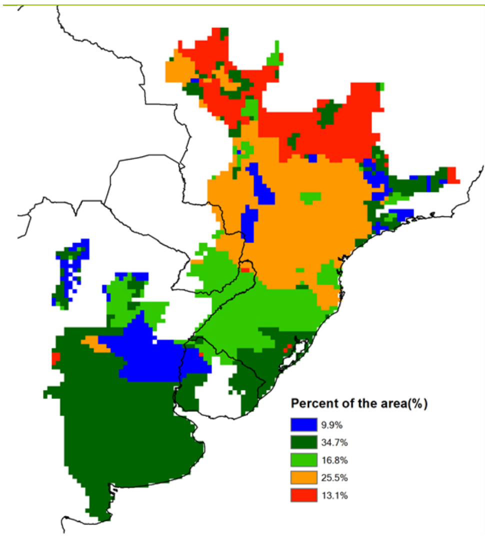
For TEMP, Argentina and West of Uruguay showed a variable pattern with positive and negative anomalies (Figure 2.3.c - red and orange areas). In particular, a high positive anomaly was observed in November. The Center of the Pampas area (Figure 2.3.c - red area) showed differences during December with lower or no negative anomalies. Other areas showed less variability, with dominance of negative anomalies in the North of the MPZ and positive anomalies in the Center.

BIOMSS revealed few anomalies. The Southern and Northern areas showed some positive anomalies, while the Center and the Coastal area of Brazil showed negative anomalies. CALF was almost complete, covering 98 % of the area. Uncropped areas were limited to the agricultural border in the southwest of the Pampas.

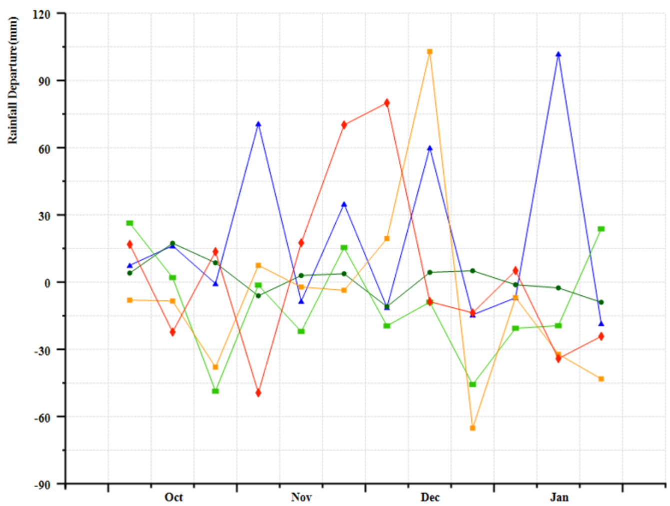
For the whole region, VCIx was 0.91, higher than during the last reporting period. Most of the region showed values higher than 0.8. Areas with lower values were observed in the South of the Pampas which coincided with the spatial pattern of uncropped farmlands. Also, the low VCIx values in south of Pampas probably still reflected the poor vegetation conditions that were due to the drought impacts observed during the last reporting period.

For this reporting period several indices showed rather good conditions (BIOMSS, VCIx), with the exception of areas with quite high positive anomalies in precipitation or TEMP.

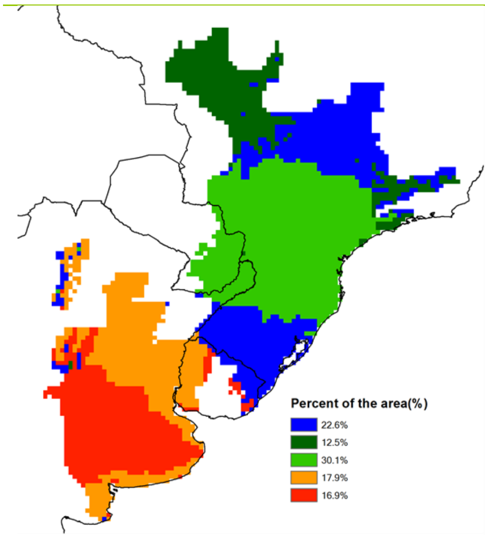
Figure 2.3 South America MPZ: Agro-climatic indicators, October 2019 - January 2020



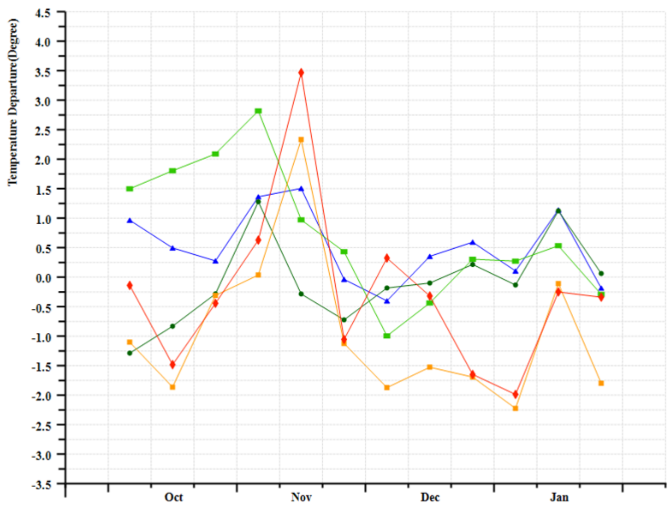
a. Spatial distribution of rainfall profiles



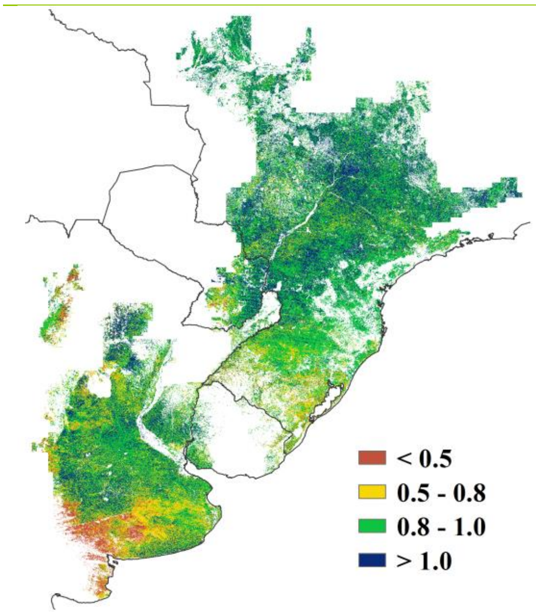
b. Profiles of rainfall departure from average (mm)



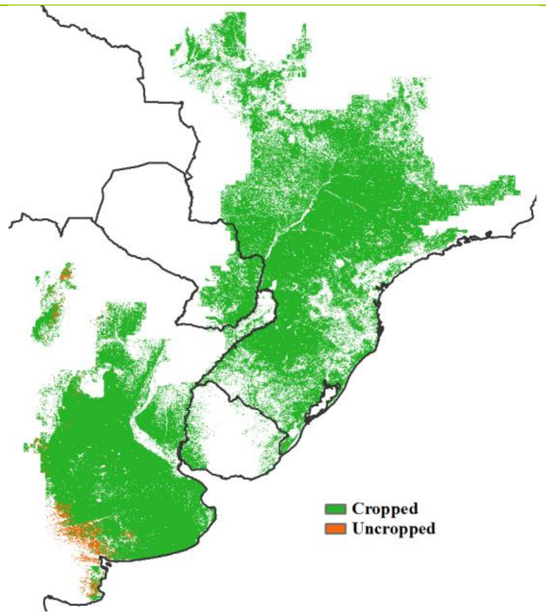
c. Spatial distribution of temperature profiles



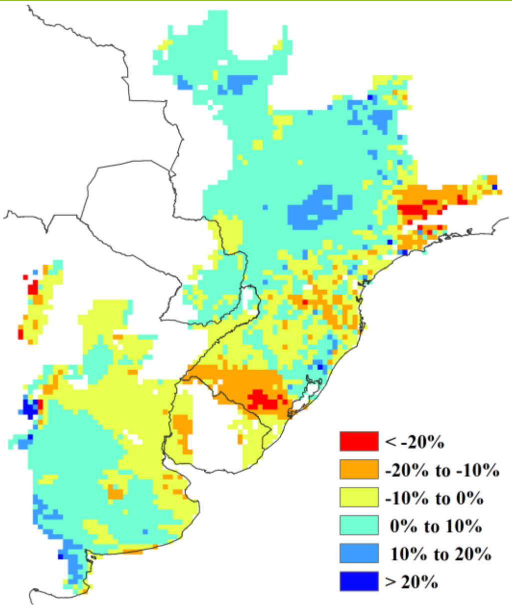
d. Profiles of temperature departure from average (mm)



e. Maximum VCI



f. Cropped arable land



g. Biomass accumulation potential departure

Note: For more information about the indicators, see Annex B.

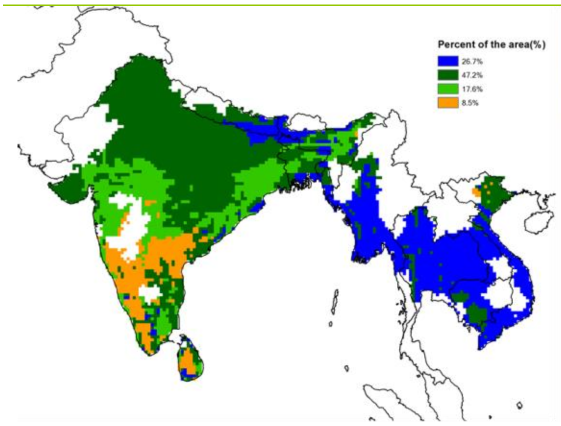
2.5 South and Southeast Asia

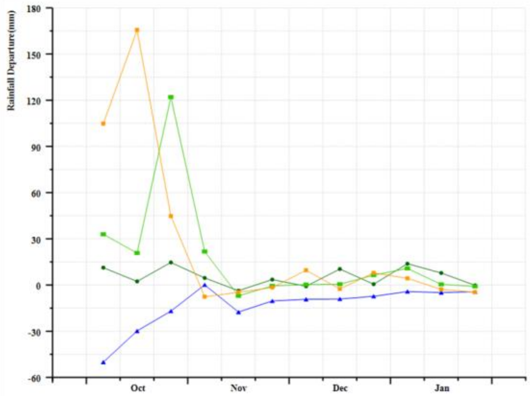
South and Southeast Asia includes India, Bangladesh, Cambodia, Myanmar, Nepal, Thailand and Vietnam. The main crops are maize, rice, wheat and soybean.

During this monitoring period, rainfall was 14% above average. Abnormally high rainfall was observed in India in October, but it has obviously regional differences. With sufficient precipitation and another normal agro-climatic indicator (RADPAR -1%), conditions during the grain filling period of rice in India and the sowing of wheat were favorable. Starting from November, rainfall was close to average in all regions. Temperature was normal (20.5 ° C, -0.1 ° C) on the whole, but there were some fluctuations in December and January in Southeast Asian countries such as Thailand, Cambodia and Laos, where the temperatures were 2.5°C above average. This is consistent with the low VHI values in this area.

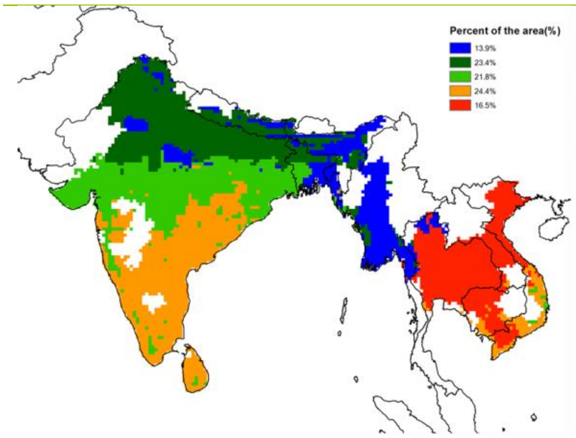
CALF reached 98% in the MPZ, 4% above the five-year average. Uncropped areas mainly occurred in India. VCIx reached 1.0 and the VCIx map shows that high values (>1.0) were concentrated in India and low values (0.5-0.8) mainly in southeast Asian countries. BIOMASS had the same trend as the VCIx map. It showed a marked discrepancy between South Asia and Southeast Asian countries. It was higher in India than in the Southeast Asian countries, where the lower biomass was also reflected on the VHI map. The VHI map shows that those countries experienced stress, presumably in October. In general, crops in south Asia had a better growing environment. Conditions are generally favorable.

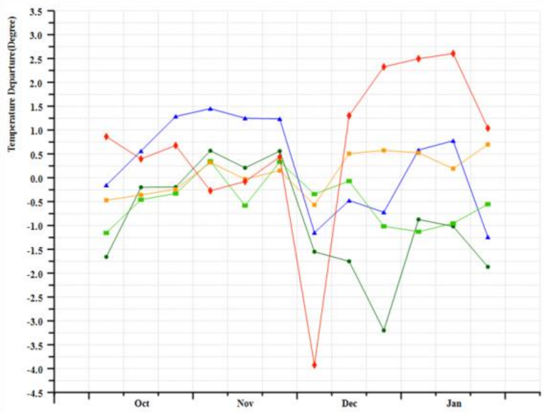
Figure 2.4 South and Southeast Asia MPZ: Agroclimatic and agronomic indicators, October 2019 - January 2020



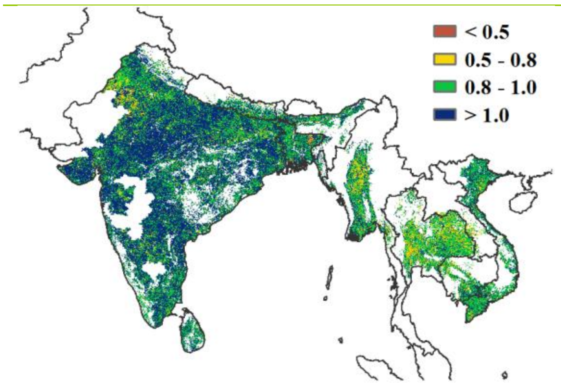


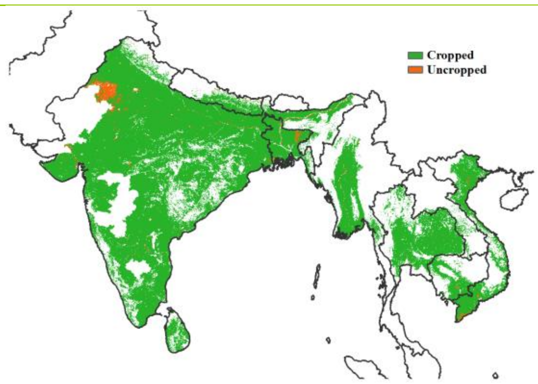
a. Spatial distribution of rainfall profiles b. Profiles of rainfall departure from average (mm)



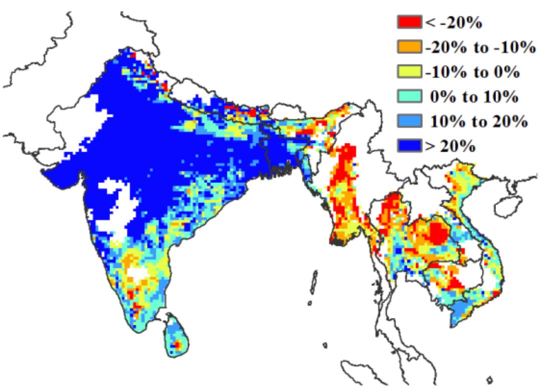


c. Spatial distribution of temperature profiles d. Profiles of temperature departure from average (mm)

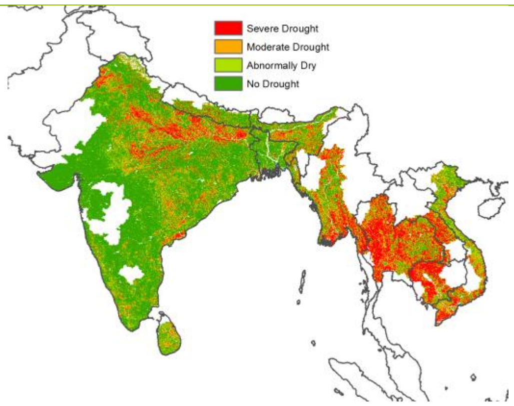




e. Maximum VCI f. Cropped arable land



g. Biomass accumulation potential departure



h. VHI minimum

Note: For more information about the indicators, see Annex B.

2.6 Western Europe

Generally, Crop condition was generally above average in most parts of the Western European Major Production Zone (MPZ) during this reporting period, resulting from a combination of positive temperature anomalies and overall significantly above-average precipitation in most areas. The harvest of summer crops was completed, and winter crops were planted and reached over-wintering stages.

The MPZ as a whole recorded above average RAIN (+20%). However, there were differences in precipitation between the countries. Over the entire monitoring period, rainfall in the western MPZ is above average, while rainfall in the eastern MPZ fluctuated around the mean, and the most severe shortfalls were observed in the Czech Republic (-21%), Hungary(-16%) and Germany (-5%). However, frequent and abundant rainfall was observed in France (+39%), Spain (+37%), Italy (+20%) and Denmark (+17%), which benefited summer crops to some extent in those regions. In addition, northern Italy and southwest France experienced two significantly higher precipitations in November and mid-December. RAIN deficit conditions were observed in Germany, the Czech Republic, Slovakia, Hungary and Austria in late-October, from late-November to early-December and January, where they affected the sowing and emergence of winter crops.

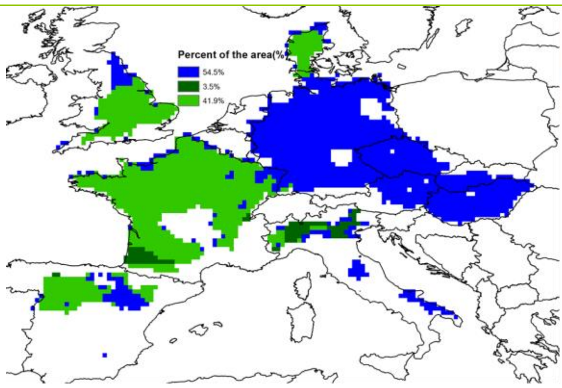
Temperature (TEMP) for the MPZ as a whole was above average (TEMP +0.9°C), but radiation was below average with RADPAR at -5%. During the entire monitoring period, most areas experienced warmer-than-usual conditions, while below-average temperature mostly occurred in (1) United Kingdom, western coastal region of France and Spain in October; (2) Spain, France, Germany, Denmark, the western Czech Republic and Austria, and northern Italy from early-November to mid-November; (3) Eastern part of the Czech Republic and Austria, Southern Slovakia, Hungary, northern and eastern Italy from early-January to mid-January; (4) most parts of the Western European MPZ in the early-December. No severe frost damage occurred during this monitoring period.

Due to low sunshine, the biomass accumulation potential was 7% below the recent 15-year average. The lowest BIOMSS values (-20% and less) occurred in most of Spain, northern Italy, western Germany and northeast Hungary. In contrast, BIOMSS was above average (sometimes exceeding a 10% departure) over eastern Germany, the Czech Republic, west-south Slovakia and Hungary, northern and eastern Italy.

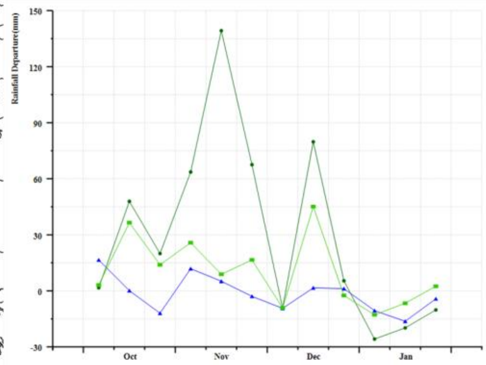
The average maximum VCI for the MPZ reached a value of 0.94 during this reporting period, indicating favorable crop condition in spite of low values in some regions. More than 93% of arable land was cropped, which was 3% above the recent five-year average. Most uncropped arable land was concentrated in Spain, and scattered areas in France, Italy, Hungary and east coast of UK.

Generally, the condition of winter crops in the MPZ was above average. However, more rain will be needed to ensure adequate soil moisture supply when the winter crops resume vegetative growth in spring.

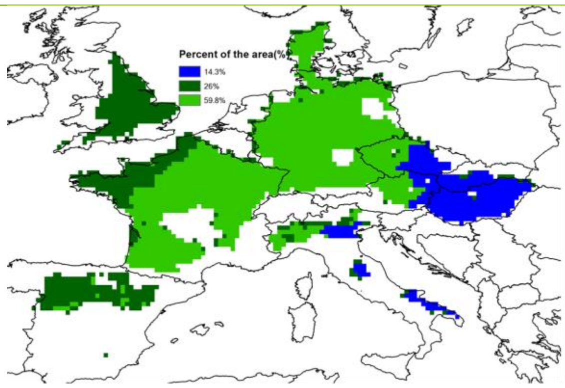
Figure 2.5 Western Europe MPZ: Agroclimatic and agronomic indicators, October 2019-January 2020.



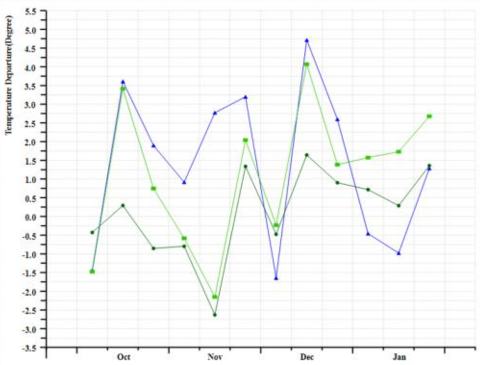
a. Spatial distribution of rainfall profiles



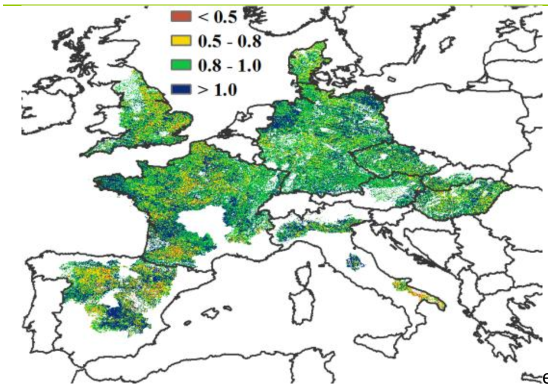
b. Profiles of rainfall departure from average (mm)



c. Spatial distribution of temperature profiles

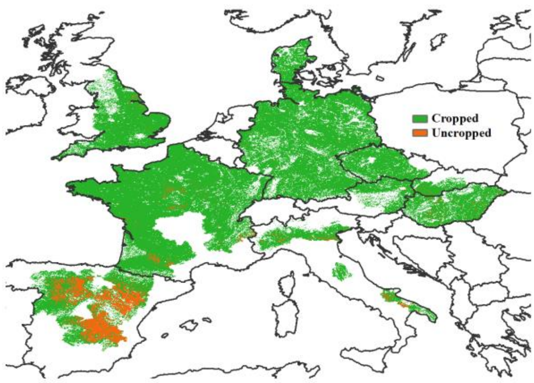


d. Profiles of temperature departure from average (mm)

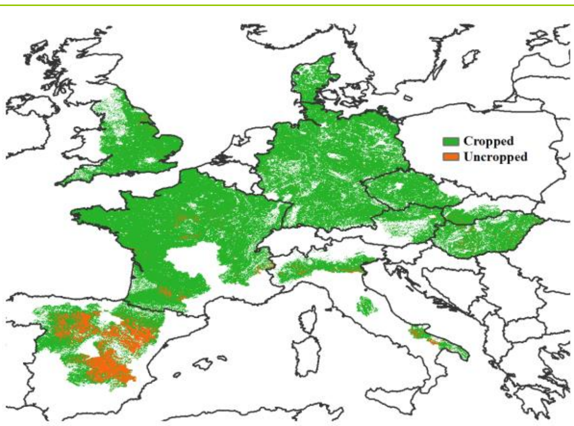


e.

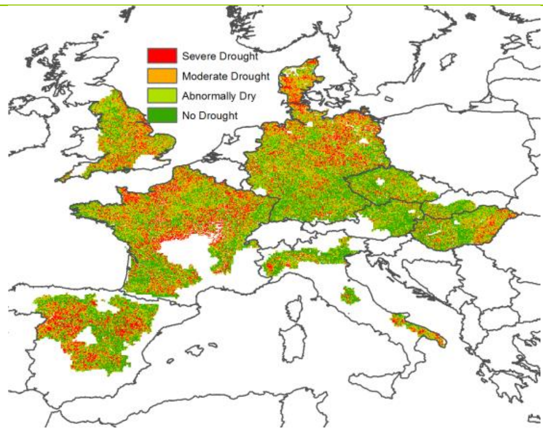
Maximum VCI



f. Cropped arable land



g. Biomass accumulation potential departure



h. VHI minimum

Note: For more information about the indicators, see Annex B.

2.7 Central Europe to Western Russia

For Central Europe and Western Russia, weather conditions between October 2019 and January 2020 were as follows: RADPAR increased 2%, rainfall was 16% below and temperatures were 2.7°C above the 15 year average.

According to the results of CropWatch, below-average rainfall was observed for large portions of the MPZ. The central part (33.7% of the MPZ) had a deficit from mid-October to early January. For the western part (almost 40.7% of the MPZ), below-average rainfall was observed from mid-October to mid-December. Regions affected were southern Poland, southern Belarus, central and western Ukraine, Romania and Moldova. Above-average rainfall was observed from mid-October 2019 to mid-November, early December and late-January 2020 in northern Poland and eastern Russia (25.6% of the MPZ). However, crop water use was relatively small during this period. In some areas, wheat was hibernating. Moreover, solar radiation and temperatures were generally low and evapotranspiration was minimal.

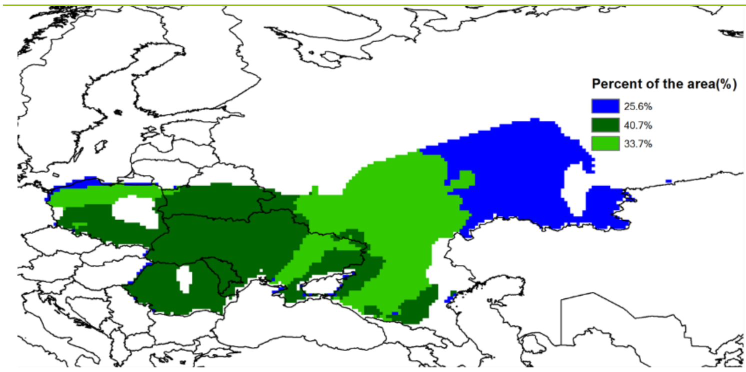
The temperatures of the MPZ were 2.7°C above average during monitoring period. From early October to late October, temperatures in Poland, Romania, Moldova, Ukraine, Belarus and western Russia were above average. From early November to late-November, the temperatures in the MPZ began to drop, and the minimum temperature departure from average reached -3°C. After December, the temperature departures of the MPZ began to rise and reached the maximum in late January. While the temperatures in southern Poland, Romania and southwestern Ukraine were relatively low, large positive temperature departures (+9°C) for western Russia were observed.

The biomass production potential in central Europe and western Russia was generally higher than average (17% higher than the recent 5-year average)，and the spatial distribution of biomass accumulation potential departure indicated the above-average condition in the southern MPZ, and below-average condition in the northern and western MPZ. From October 1, 2019 to January 31, 2020, the proportion of cultivated land was 79% (16% higher than the recent 5-year average). Uncropped arable land was mostly located in southern Ukraine, Yevpatoria, Simferopol and surrounding areas as well as southwestern Russia (including Orenburg, Soliylitsk, Volsk and the south of Saratov).

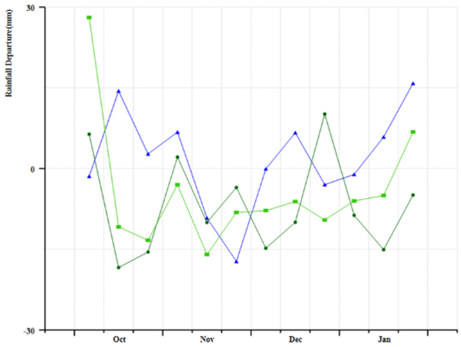
The maximum VCI for the Central Europe and western Russia MPZ reached a value of 0.92. The areas with high VCI values (>0.8) were mainly distributed in the west, central and northeast of the MPZ. Regions where the maximum VCI was below 0.5 were mainly found in the southeast MPZ, which was in agreement with the uncropped arable land map.

In general, with most parts indicating above-average crop conditions, prospects for crop production are promising in Central Europe to Western Russia.

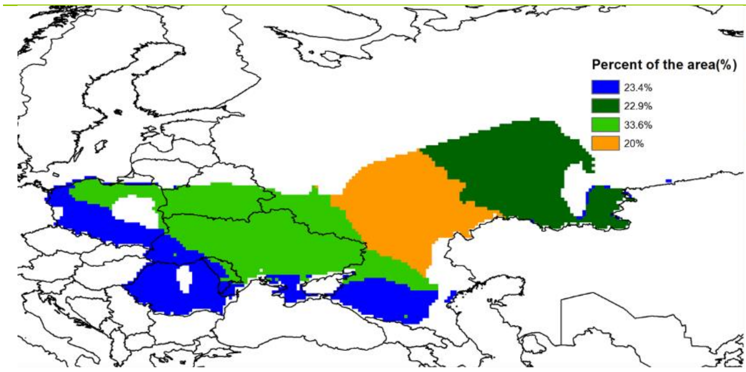
Figure 2.6 Central Europe-Western Russia MPZ: Agroclimatic and agronomic indicators, October 2019-January 2020.



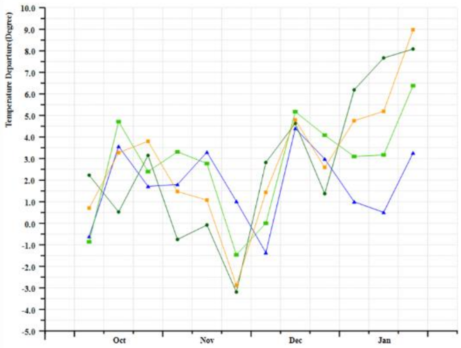
a. Spatial distribution of rainfall profiles



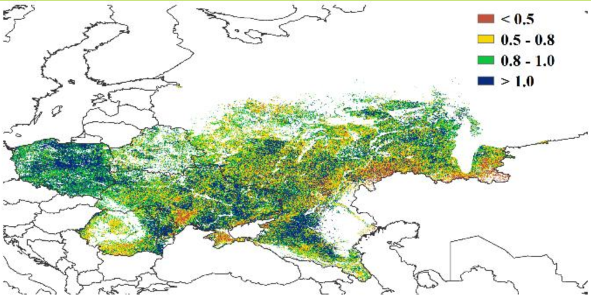
b. Profiles of rainfall departure from average (mm)



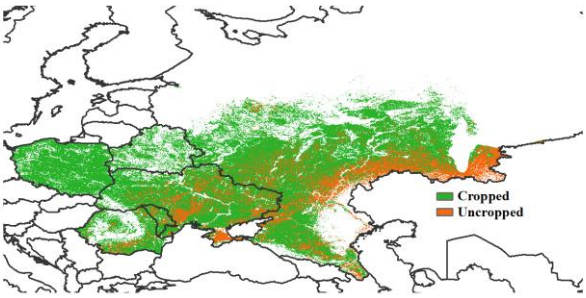
c. Spatial distribution of temperature profiles



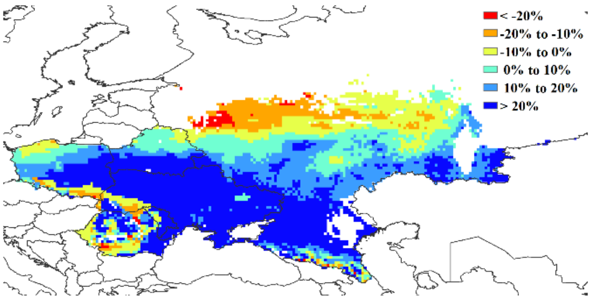
d. Profiles of temperature departure from average (mm)



e. Maximum VCI



f. Cropped arable land



g. Biomass accumulation potential departure

Note: For more information about the indicators, see Annex B.

Chapter 3. Core countries

3.1 Overview

Chapter 1 and 2 has focused on large climate anomalies that sometimes reach the size of continents and beyond. The present section offers a closer look at individual countries, including the 42 countries that together produce and commercialize 80 percent of maize, rice, wheat and soybean. As evidenced by the data in this section, even countries of minor agricultural or geopolitical relevance are exposed to extreme conditions and deserve mentioning, particularly when they logically fit into larger patterns.

1. Introduction

The global agro-climatic patterns that emerge at the MRU level (chapter 1) are reflected with greater spatial detail at the national and sub-national administrative levels described in this chapter. The “core countries”, including major producing and exporting countries, are all the object of a specific and detailed narrative in the later sections of this chapter, while China is covered in Chapter 4. Sub-national units and national agro- ecological zones receive due attention in this chapter as well.

In many cases, the situations listed below are also mentioned in the section on disasters (chapter 5.2) although extreme events tend to be limited spatially, so that the statistical abnormality is not necessarily reflected in the climate statistics that include larger areas. No attempts are normally made, in this chapter, to identify global patterns that were already covered in Chapter 1. The focus is on 166 individual countries and sometimes their subdivisions for the largest ones. Some of them are relatively minor agricultural producers at the global scale, but their national production is nevertheless crucial for their population, and conditions may be more extreme than among the large producers.

2. Overview of weather conditions in major agricultural exporting countries

The current section provides a short overview of prevailing conditions among the major exporters of maize, rice, wheat and soybeans, conventionally taken as the countries that export at least one million tonnes of the covered commodities. Just 20 countries include the top 10 exporters with the United States and Argentina exporting all four crops and Brazil, Ukraine and Russia exporting three of them each.

Maize: Harvest in the northern hemisphere was completed by last October. Its production conditions were discussed and summarized in the November 2019 bulletin. In the southern hemispheres, maize planting started at the beginning of the rainy season in November and December. In Brazil, however, most maize is sown as a second crop towards the end of the rainy season, after soybean harvest in February. The dry conditions in September and October delayed planting of soybean. This in turn may delay harvest of soybean and subsequent sowing of maize. However, rainfall situation during soybean harvest and sowing of the 2nd maize crop in February are important factors as well, determining the yield potential for the 2nd maize crop. Full season maize was sown in October. In Argentina, the second largest maize exporter, closely followed by Brazil in 3rd position, growth conditions are favorable. High production is expected for both countries. In Eastern and South Africa moisture availability is good. However, excessive rainfall may have caused prolonged periods of excessive soil moisture and leaching of nitrates. Fall army worm continues to be a threat for maize production in Africa, as well as South Asia. Growth conditions for irrigated winter maize in India as well as Bangladesh have been favorable.

Rice: Harvest of rainfed rice in China, Pakistan, India, Bangladesh and South-East Asia was completed by December. Conditions for rice were favorable for China and South Asia, although cyclone Bulbul caused damage to rice in the Delta region of Bangladesh and West Bengal in India in November 2019. Planting of irrigated winter rice will start in India and Bangladesh in February. The South-East Asian countries were hit by drought conditions in this monitoring period, which caused slight yield losses for Vietnam, Cambodia, Laos and Thailand. Rice production in the Philippines and Indonesia was also negatively impacted by droughts.

Wheat: The drought conditions in Australia had limited its wheat yields. Wheat in Argentina also suffered from periodic drought effects, especially in the south, whereas conditions in the north were more favorable. Overall production seems to be comparable to last year's. Brazil, where wheat production concentrated in its two most southern states, Paraná and Rio Grande do Sul, is another important wheat producer in the southern hemisphere. As in Argentina, the conditions for wheat growth were mixed. In the northern hemisphere, most (winter) wheat is sown in October and November. Conditions were generally favorable for wheat sowing and the early establishment of wheat in western and southern Europe. Eastern Europe, as well as the Ukraine suffered from below-average rainfall during this monitoring period. Thus, conditions for sowing were generally favorable, but subsequent development may have been hampered somewhat. In the more northern regions, wheat hibernates during the winter months. Conditions during spring green up in March and April will mainly determine the production potential for winter wheat in those regions. In the Middle East, South Asia, mainly Pakistan and India, as well as China conditions for wheat are favorable. However, locusts may pose a threat to wheat production on the Arabian Peninsula, Iran and Pakistan (See chapter 5.2 on Disaster Events for a more indepth discussion). The south of the USA is also benefitting from above-average rainfall. However, the northwest is experiencing drier than normal conditions. Conditions for the winter wheat growing regions in Canada are normal. Rainfall is below average in Morocco, limiting the production potential of wheat and barley.

Soybean: Soybeans are predominantly grown during the respective summer months in both hemispheres. Brazil is about to overtake the USA as the leading soybean producer. China, which does not export soybean, is third. Argentina is fourth, but its production is only about 20% of that of Brazil. Other important soybean producers are Paraguay, Canada and Uruguay. Thus, current crop conditions in South America are highly relevant for the soybean market. Lack of rainfall hampered timely sowing of soybean in South America. However, rainfall conditions have turned to normal levels in the meantime. This is reflected in the BIOMSS map, which shows generally above-average production levels in the soybean producing regions of South America.

3. Weather anomalies and biomass production potential changes

3.1 Rainfall (Figure 3.1)

Severe drought conditions continued until the onset of the rainy season in Australia, Indonesia, and parts of the Amazon rainforest. In Brazil and Indonesia, these drought conditions were used to set devastating fires in order to clear land for the production of soybeans and palm oil for export. Below average rainfall (>=-30 to <-10%) continued to be observed for Turkey and Georgia. Between October 2019 and January 2020, i.e, the current reporting period, the rainfall situation improved for South Australia, most of Brazil, the Pampas in Argentina, Colombia, Portugal and Italy. Noteworthy are the Cerrado and Pantanal regions of Brazil, where, after a delayed start of the rainy season, rainfall returned to normal levels. Most of South-East Asia continued to be affected by a rainfall deficit. It continued to be severe not only for Philippines and Indonesia, but Cambodia, Thailand and Laos got hit in this period as well. Abundant rainfall starting in late December brought some relief to this region. Other regions that became rainfall deficient during this monitoring period were the Northwest of the United States, Saskatchewan in Canada, Honduras, Columbia, Venezuela, the Maghreb and a large stretch from Eastern Europe and Southern Russia to the Central Asian countries. Countries with severe deficits were Romania, the Ukraine and Morocco.

Areas where rainfall was much above average (>=30%) included the northwest, Mexico, most of the central and eastern States in the USA, South-west of Europe, countries and islands along the eastern Mediterranean coast, the Sahara, East Africa and South Asia. In India and Pakistan, the abundant monsoon rains finally ceased in late October.

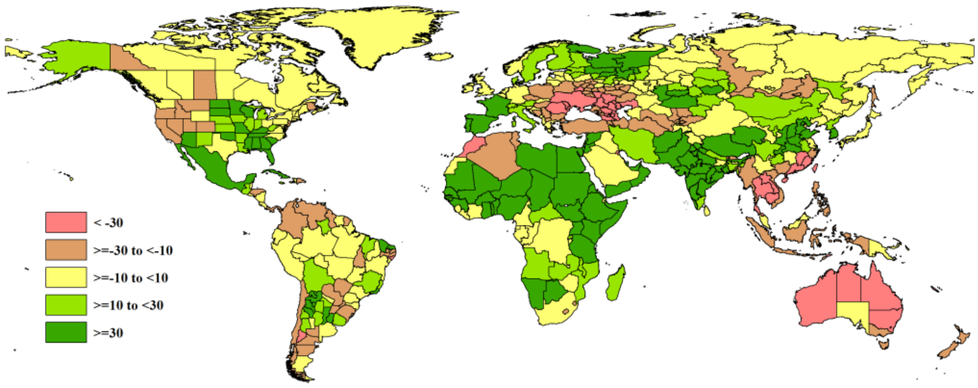


Figure 3.1 National and subnational rainfall anomaly (as indicated by the RAIN indicator) of October 2019 to January 2020 total relative to the 2005-2019 average (15YA), in percent.

3.2 Temperature anomalies (Figure 3.2)

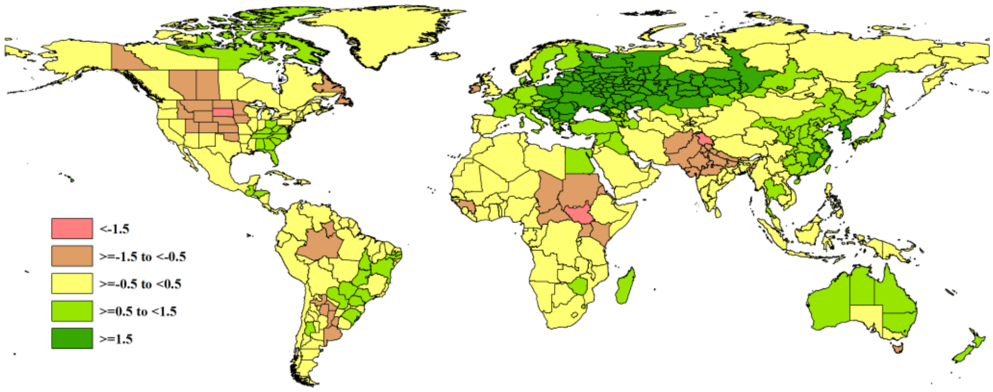


Figure 3.2 National and subnational temperatute rainfall anomaly (as indicated by the RAIN indicator) of October 2019 to January 2020 average relative to the 2005-2019 average (15YA), in °C

Colder-than-normal temperatures were observed in north-eastern Argentina, the heart of the Amazon basin, the Midwest and central-northern states of the USA, Saskatchewan and Alberta in Canada, Central Africa, as well as Pakistan and northern India. These colder temperatures did not negatively impact crop production. Moderately above average temperatures (0.5 to 1.5 ºC) were observed for most of Australia, eastern China, central and northern Europe and the countries bordering the eastern shores of the Mediterranean Sea, the East-coast of the USA, as well as eastern portions of Brazil. Large positive departures in the excess of 1.5ºC were observed for Eastern Europe and a large portion of Russia from its western border to central Siberia, as well as Kazakhstan. Warmer temperatures limit the depth and duration of snow cover and advance the phenological development of winter wheat. These conditions increase the risk of frost damage in case of cold snaps.

3.3 RADPAR anomalies (Figure 3.3)

Higher solar radiation increases photosynthesis and thus crop production potential and yields. Above-average conditions were recorded for Brazil, Colombia, Venezuela, Central America and the Western United States, the Maghreb, South-East Africa, Eastern Europe, the Ukraine, Turkey, north-east China as well as South-East Asia and Australia. The Pampas in Argentina, Peru, Ecuador, Mexico, Eastern halves of USA and Canada, Western Europe, East Africa and South Asia, as well as southern China were affected by below-average radiation. The impact of lower radiation in the northern hemisphere on crop production is negligible, since most crops are in the vegetative phase or hibernate. The situation is similar for the southern hemisphere, where the crops are sown at the beginning of the rainy season only, which typically starts in November. One exception is winter wheat in southern Africa and Argentina, where it is sown in June/July and harvested in December and January, thus the grain-filling phase fell into this period. However, in Argentina, soil moisture, which was favorable this season, is generally more limiting than solar radiation.

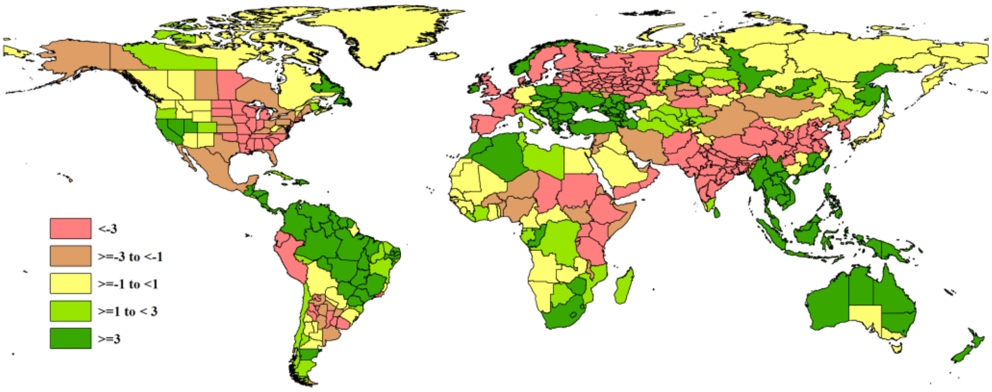


Figure 3.3 National and subnational sunshine anomaly (as indicated by the RADPAR indicator) of October 2019 to January 2020 total relative to the 2005-2019 average (15YA), in percent.

3.4 Biomass accumulation potential BIOMSS (Figure 3.4) and agro-climatic indices

The BIOMSS indicator is controlled by temperature, rainfall and solar radiation. In some regions, rainfall is more limiting, whereas in other ones, mainly the tropical ones, solar radiation tends to be the limiting factor. For parts of Brazil and the Pampas, the BIOMSS estimates were up or mixed. Mexico benefitted from the increased rainfall. In some regions, like the Sahel, the Horn of Africa and India, the monitoring period covered the grain-filling phase of the cereals, which were predominantly harvested in October and November. Yield of these crops may have benefitted from favorable conditions. In the other regions, such as Eastern China, Eastern Europe and Southern Russia, and the Middle East, the monitoring period covered the sowing phase of the winter crops. Good conditions for BIOMSS production help the plants get well established.

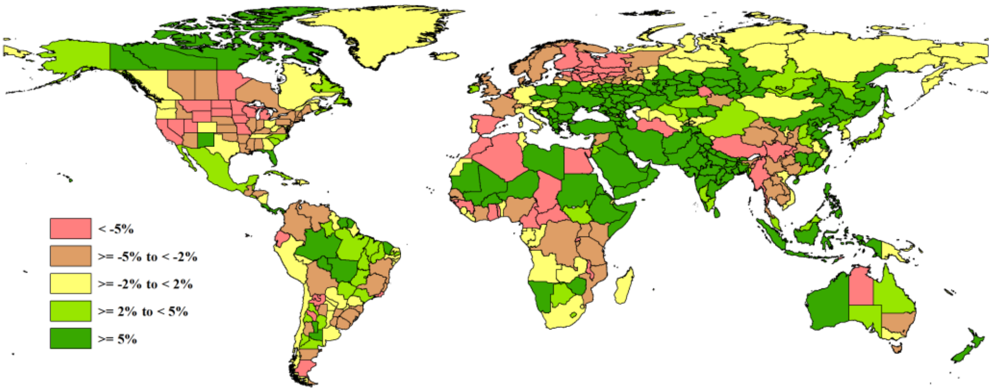


Figure 3.4 National and subnational biomass production potential anomaly (as indicated by the BIOMSS indicator) of October 2019 to January 2020 total relative to the 2005-2019 average (15YA), in percent.

3.2 Country analysis

This section presents CropWatch analyses for each of 42 key countries (China is addressed in Chapter 4). The maps and graphs refer to crop growing areas only: (a) Phenology of major crops; (b) Crop condition development based on NDVI over crop areas at national scale, comparing the October 2019 - January 2020 period to the previous season and the five-year average (5YA) and maximum; (c) Maximum vegetation condition index over arable land (VCI) for October 2019 - January 2020 by pixel; (d) Spatial NDVI patterns up to October 2019 - January 2020 according to local cropping patterns and compared to the 5YA; and (e) NDVI profiles associated with the spatial pattern under (d). Next, separate graphs (labeled as figures (f), (g), and subsequent letters) are included to illustrate crop condition development graphs based on NDVI average over crop areas for different agroecological zones (AEZ) within a country, again comparing the October 2019 - January 2020 period to the previous season and the five-year average (5YA) and maximum.

Refer to Annex A for additional information about indicator values by country. Country agricultural profiles are posted on www.cropwatch.com.cn/htm/en/bullAction!showBulletin.action

Figures 3.5 - 3.45; Crop condition for individual countries ([AFG] Afghanistan to [ZMB] Zambia) including agroecological zones (AEZ) from October 2019 - January 2020.

AFG AGO ARG AUS BGD BLR BRA CAN DEU EGY ETH FRA GBR HUN IDN IND IRN ITA KAZ KEN KGZ KHM LKA MAR MEX MMR MNG MOZ NGA PAK PHL POL ROU RUS THA TUR UKR USA UZB VNM ZAF ZMB

[AFG] Afghanistan

Rice is the main cereal crop harvested in Afghanistan during the reporting period. Winter wheat started to be planted in October in the northern border provinces (to be harvested in May). RAIN was 194 mm (+43%), but both RADPAR and TEMP were below average (RADPAR at 746 MJ/m2, down 5%; TEMP 3.8°C, down 0.7°C). The favorable weather conditions resulted in 21% higher BIOMSS than average. In January, precipitation was higher than average and close to the 15 years maximum. The agro-climatic conditions were favorable, and the significant increase of rainfall will benefit the crop growth after the winter period.

Regional analysis

CropWatch subdivides Afghanistan into four zones based on cropping systems, climatic zones and topography. They are described below as Dry region, Central region with sparse vegetation, Mixed dry farming and irrigated cultivation region and Mixed dry farming and grazing region.

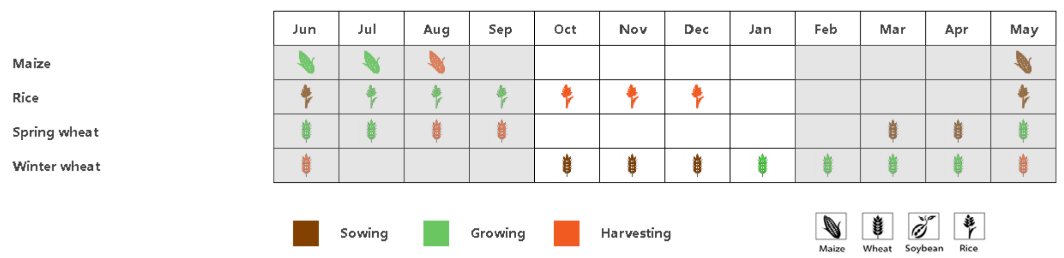
RAIN in the Central region with sparse vegetation was 158 mm (+44%), TEMP was -1.0°C (-1.0°C), and RADPAR was average at 768 MJ/m2. BIOMSS increased by 12% and indicated the good weather condition for vegetation in this region.

The Dry region recorded 162 mm of RAIN, 83% above average, TEMP (-0.7° C) and RADPAR （-6%） were below average. The favorable agro-climatic condition resulted in an increase of BIOMSS by 52%

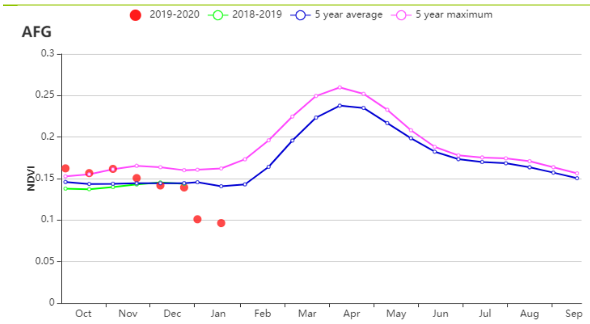
In the Mixed dry farming and irrigated cultivation region, the following indicator values were observed: RAIN 245 mm, +27%; TEMP 2.5°C, -0.5°C; RADPAR 681 MJ/m2, -5%. The combination of indicators resulted in BIOMSS being close to average. CALF was 7% in this area.

Mixed dry farming and grazing region recorded 155 mm of RAIN, 54% above average. TEMP was 5.0° C , 0.6℃ lower than average, and the RADPAR was 769 MJ/m2, 3% below average.

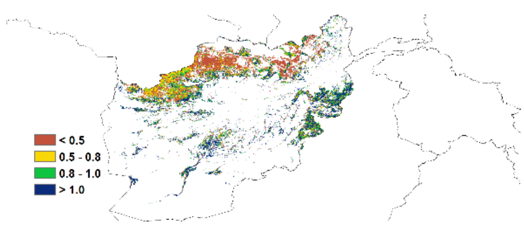
Figure 3.5 Afghanistan's crop condition, October 2019 - January 2020



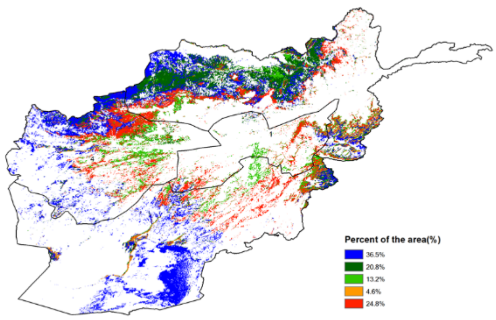
(a). Phenology of major crops

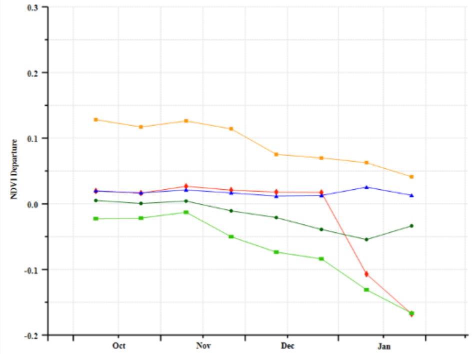


(b) Crop condition development graph based on NDVI

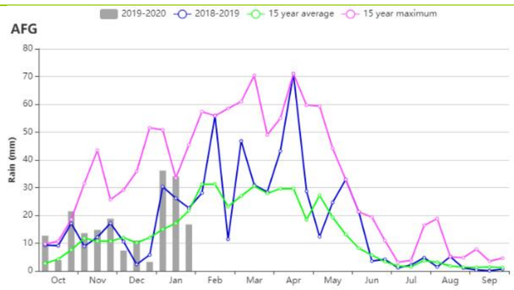


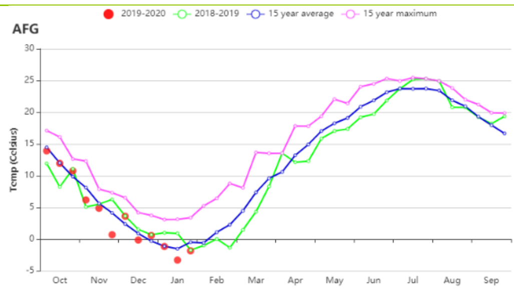
(c) Maximum VCI



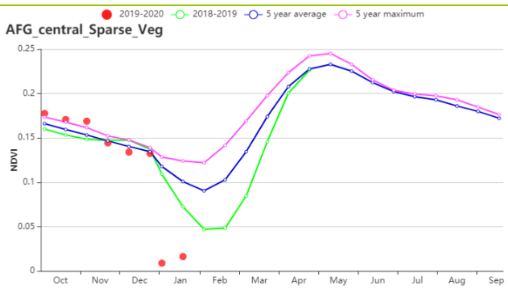


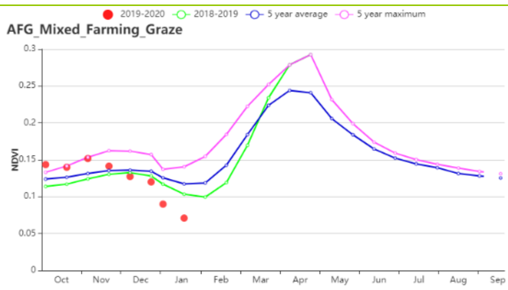
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



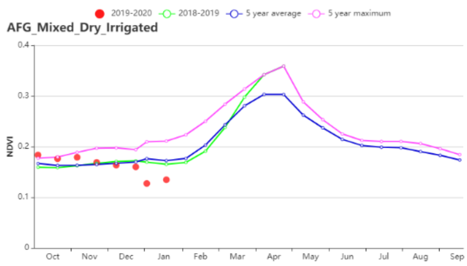


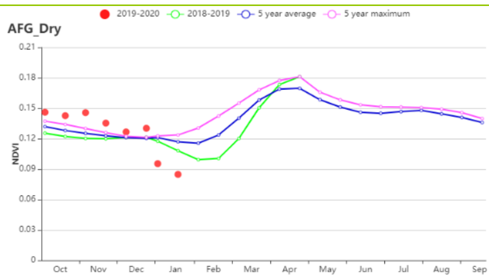
(f) Rainfall profiles (g) Temperature profiles





(h) Crop condition development graph based on NDVI (central_Sparse_Veg Region (left) and Mixed_Farming_Graze Region (right))





(g) Crop condition development graph based on NDVI (Mixed_Dry_Irrigated Region (left) and Dry (right))

Table 3.3 Afghanistan's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Central region with sparse vegetation	158	44	-1	-1	768	-5
Dry region	162	83	6.9	-0.7	817	-6
Mixed dry farming and irrigated cultivation region	245	27	2.5	-0.5	681	-5
Mixed dry farming and grazing region	155	54	5	-0.6	769	-3

Table 3.4 Afghanistan's agronomic indicators by sub-national regions, current season's values and departure from 5YA, October 2019 - January 2020

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current (%)	Departure from 5YA (%)	Current
Central region with sparse vegetation	121	12	4	-	0.97
Dry region	190	52	2	-	0.59
Mixed dry farming and irrigated cultivation region	127	-1	7	-	0.65
Mixed dry farming and grazing region	127	12	0	-	0.66

AFG **AGO** ARG AUS BGD BLR BRA CAN DEU EGY ETH FRA GBR HUN IDN IND IRN ITA KAZ KEN KGZ KHM LKA MAR MEX MMR MNG MOZ NGA PAK PHL POL ROU RUS THA TUR UKR USA UZB VNM ZAF ZMB

[AGO] Angola

The October 2019 - January 2020 monitoring period covers the first half of the main growing season in Angola, which lasts until March. During this period, maize and rice are in the vegetative stages. Wheat harvest was completed by late October 2019. Nationwide, the agroclimatic parameters showed diverse patterns. Both rainfall and radiation increased by about 20% and 1% respectively, and the temperature recorded a slight decrease by about 0.2ºC from the fifteen-year average. Above-average rainfall occurred in late December 2019 and early January 2020, supplying crops with enough water during the critical plant developmental stages. The favourable agroclimatic conditions led to slightly above-average BIOMASS (+2%). Above the past five-year-average conditions were also observed in CALF (+10%) and maximum VCI was close to 0.95.

Analyzing the NDVI profiles, it is noticeable that conditions were below average in October but improved to average by January. The provinces of Zaire, Cuandocubango and northern areas of Huila counting to 61.5% of the total cropped area showed positive NDVI anomalies. On the other hand, negative NDVI anomalies were verified in the provinces of Cunene and the southern regions of Huila, about 38.5% of the total cropped area. Overall, the crop conditions are close to average.

Regional Analysis

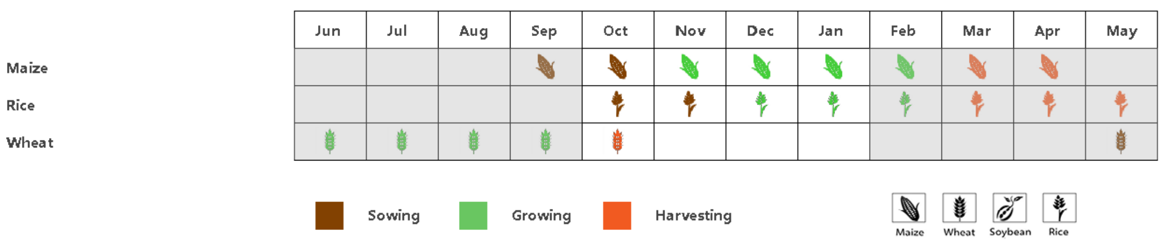
CropWatch subdivides Angola into five zones based on cropping systems, climatic zones, and topography. They are referred to as the Arid zone, Central Plateau, Humidzone, Semi-arid zone, and Sub-humid zone.

The crop condition development graph based on NDVI for the different agroecological regions reveals that most of the period was characterised by below-average crop conditions. The maximum VCIx in all zones was located between 0.93 and 0.98. In the Arid Zone, rainfall (RAIN +70%) increased while both temperature and radiation decreased by 0.1ºC 4%, respectively. Their combined effect led to an increase in biomass by about 9%. The CALF also recorded a significant boost by about 67%.

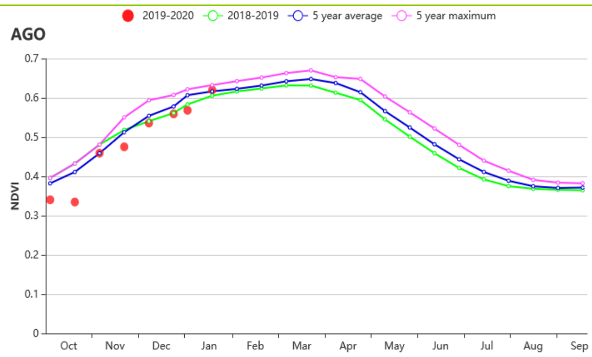
The central plateau experienced an increase in both rainfall and radiation by 23% and 2% respectively. Temperature decreased by about 0.3ºC. In this region, while the biomass decreased (BIOMASS -8), the CALF increased by 7%. Increases in both rainfall (RAIN +6%) and radiation (RADPAR +3%) were also verified in the Humid zone. This region recorded a slight decrease in temperature by 0.2ºC. At the meantime, the Biomass decreased by about 7% and CALF was about the average.

In the Semi-arid zone, both rainfall and temperature increased by about 23% and 0.1ºC, respectively, and the radiation remained about the average. In this region, the potential biomass increased by 6%. CALF also recorded an increase of 19%. The Subhumid zone recorded an increase in rainfall by 16%; the temperature decreased by about 0.3ºC and radiation also increased by 2%. In the agronomic indicators, an increase of 2% was verified on CALF.

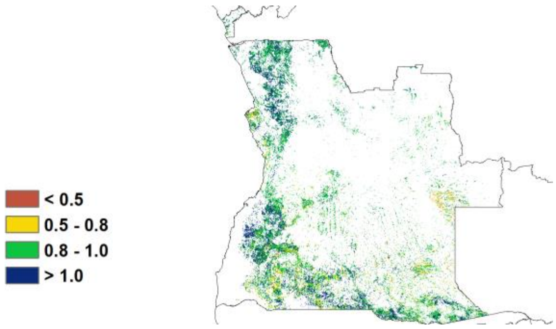
Figure 3.6 Angola's crop condition, October 2019 - January 2020



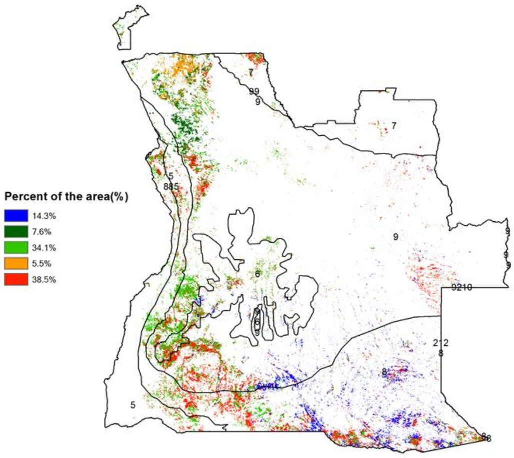
(a). Phenology of major crops



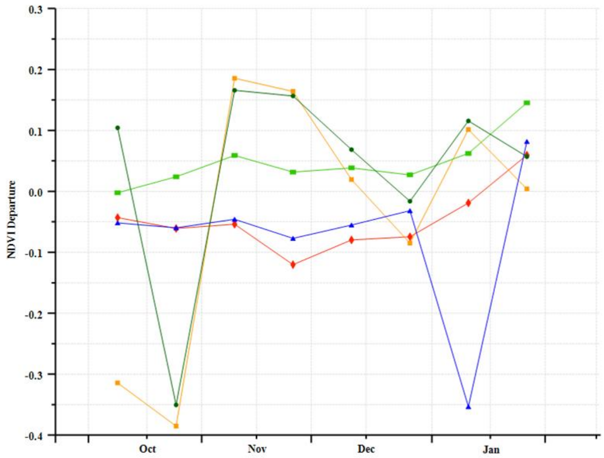
(b) Crop condition development graph based on NDVI



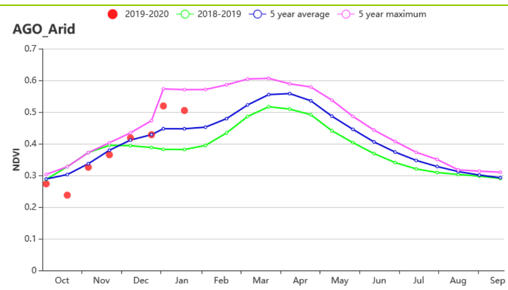
(c) Maximum VCI



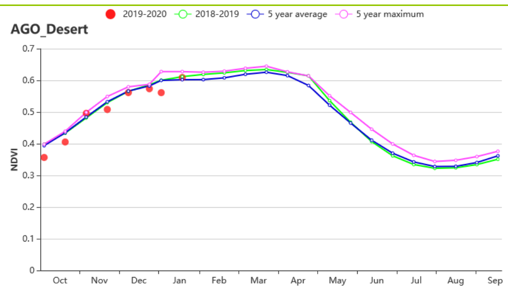
(d) Spatial NDVI patterns compared to 5YA



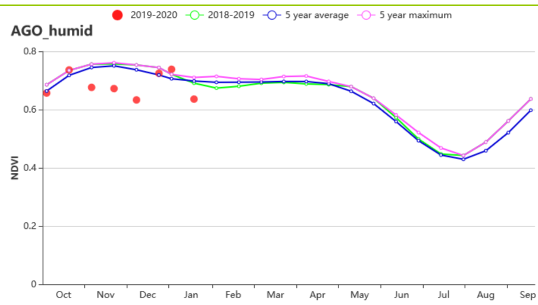
(e) NDVI profiles



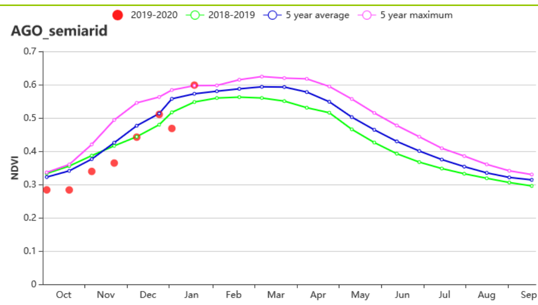
(f) Crop condition development graph based on NDVI- Arid zone



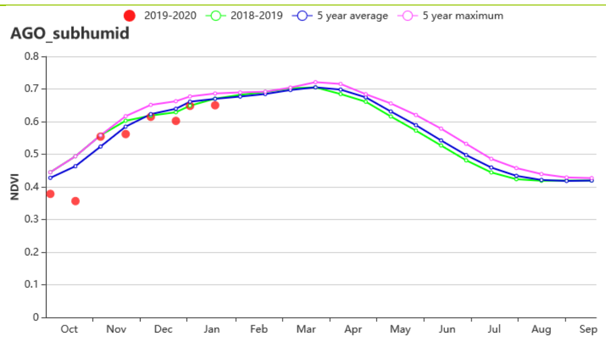
(g) Crop condition development graph based on NDVI - Central Plateau



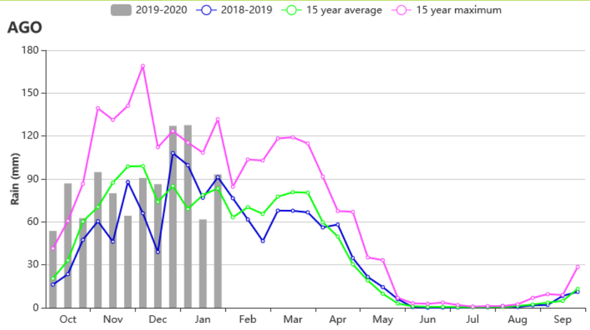
(h) Crop condition development graph based on NDVI- Humid zone

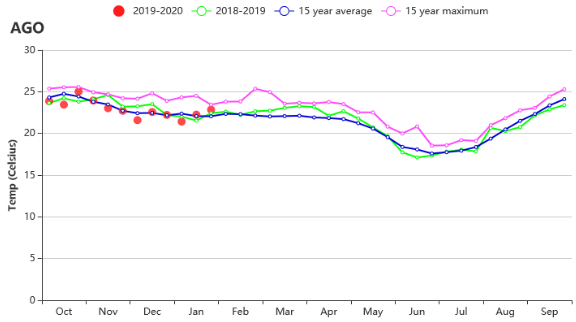


(i) Crop condition development graph based on NDVI - Semi-arid zone



(j) Crop condition development graph based on NDVI- Sub-humid zone





(k) National time-series rainfall profiles (l) National time-series temperature profiles

Table 3.5 Angola agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Arid Zone	623	70	25.3	0.1	1322	-4
Central Plateau	1401	23	18.8	-0.3	1162	2
Humid zone	1450	6	22.0	-0.2	1175	3
Semi-Arid Zone	751	23	24.4	0.1	1305	0
Sub-humid zone	1164	16	22.4	-0.3	1206	2

Table 3.6 Angola agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 5YA (%)	Current (%)	Departure from 5YA (%)	Current
Arid Zone	867	9	84	67	0.93
Central Plateau	574	-8	97	7	0.94
Humid zone	701	-7	100	0	0.98
Semi-Arid Zone	847	6	97	19	0.95
Sub-humid zone	734	0	99	2	0.95

[ARG] Argentina

The reporting period covers the harvesting of wheat, the main growing season of maize and rice, as well as the sowing for early and late soybean (Figure 3.7.a). For the whole country rainfall showed a positive anomaly of 15%. Temperature was 0.5°C below average and RADPAR fell 2%. BIOMSS showed a decrease of 1% compared to average. Overall, crop conditions were favorable during the monitoring period.

CropWatch subdivides Argentina into eight agro-ecological zones (AEZ) based on cropping systems, climatic zones, and topography; they are identified by numbers on the NDVI profiles map. During this monitoring period, most crops were grown in the following four agro-ecological zones: **Chaco**, **Mesopotamia**, **Humid Pampas**, and **Subtropical highlands**. The other four agro-ecological zones were less relevant for this period.

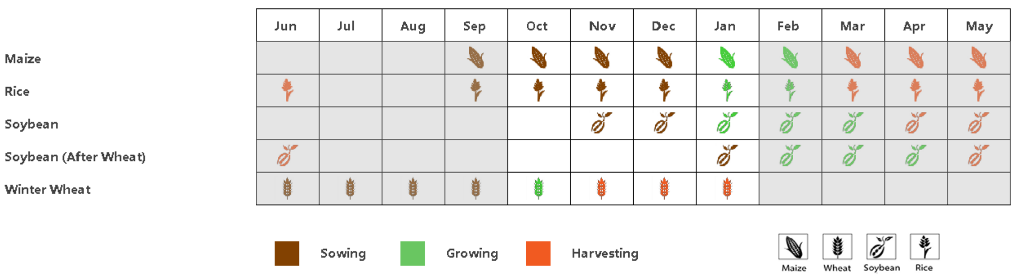
During the monitoring period, the rainfall of Argentina's four main agro-ecological zones was above average: Chaco (+ 17%), Mesopotamia (+ 2%), Humid Pampas (+ 12%), and Subtropical highlands (+ 36%) . However, both TEMP and PADPAR were lower than the 15-year average. Only Humid Pampas had increased BIOMSS by 1%, while Chaco (-2%), Mesopotamia (-4%), and Subtropical highlands (-10%) all decreased. Compare with the average of previous years, the CALF of Chaco (+ 6%) and Humid Pampas (+ 2%) increased. Only Subtropical highlands (-1%) decreased relative to the average. The VCIx in general showed good crop condition, with VCIx values of the four agro-ecological zones greater than 0.8.

BIOMSS increased in the Humid Pampas due to the previous abundant rainfall, and CALF increased by 2%, potentially favorabl for wheat production. The increase of rainfall in Chaco, Mesopotamia, and Subtropical highlands was not compensated for by the decrease in temperature and sunshine, resulting in a decrease in BIOMSS. For Chaco, CALF had increased by 6%. Therefore, we conclude that the wheat production for the Chaco region was fair, while crop production in Mesopotamia and Subtropical highlands might decrease.

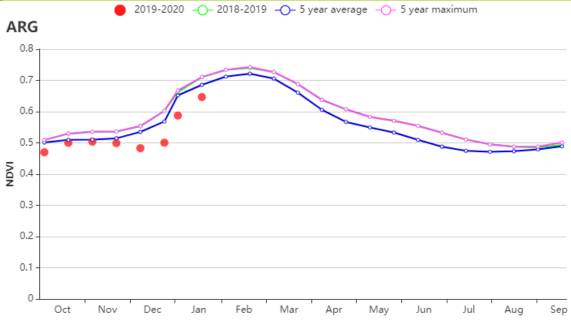
From the graph of Argentina NDVI development (Figure 3.7.b), the values of the earlier period (October-November 2019) were close to the average of previous years, while they were significantly lower than the 15-year average in the later period (December 2019 - February 2020).

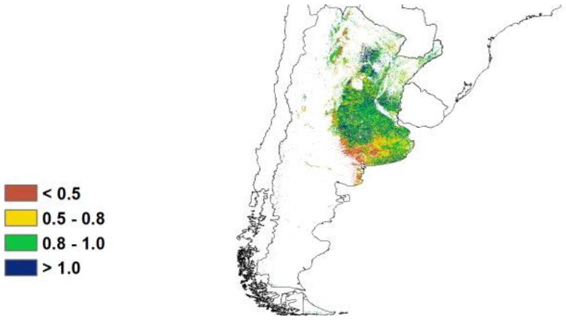
In general, although wheat production in the Mesopotamia and Subtropical highlands had decreased in the earlier period, crop production had increased in Humid Pampas which accounts for most of the crop area. Therefore, the wheat production in Argentina was better than the corresponding period of previous years. However, growth of summer crops during December and January was sub-par.

Figure 3.7 Argentina's crop condition, October 2019 - January 2020

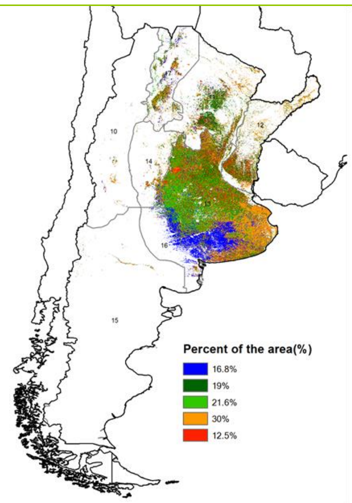


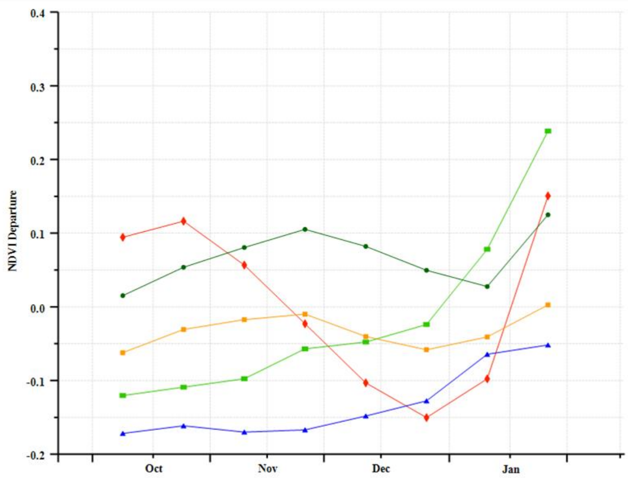
(a). Phenology of major crops



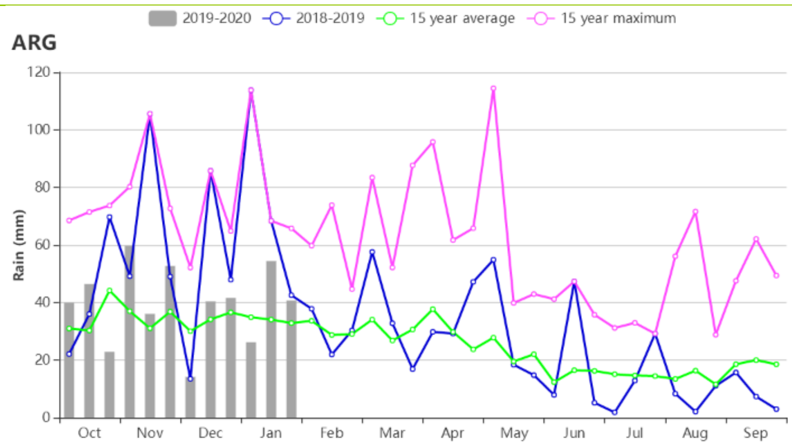


(b) Crop condition development graph based on NDVI (c) Maximum VCI

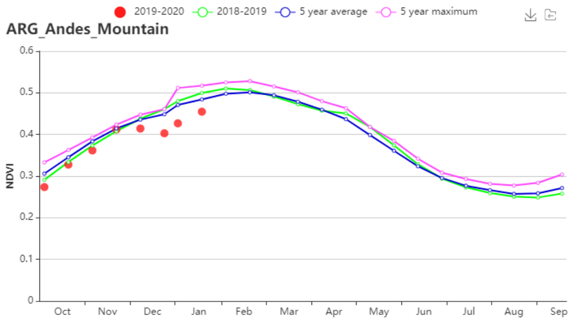


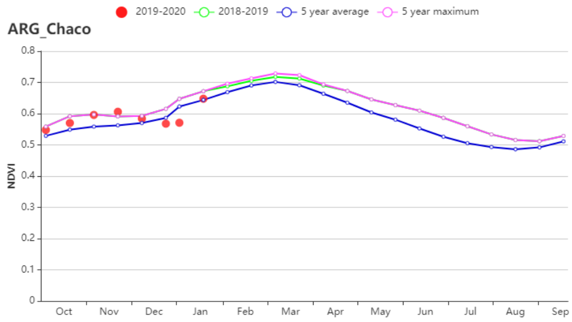


(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles

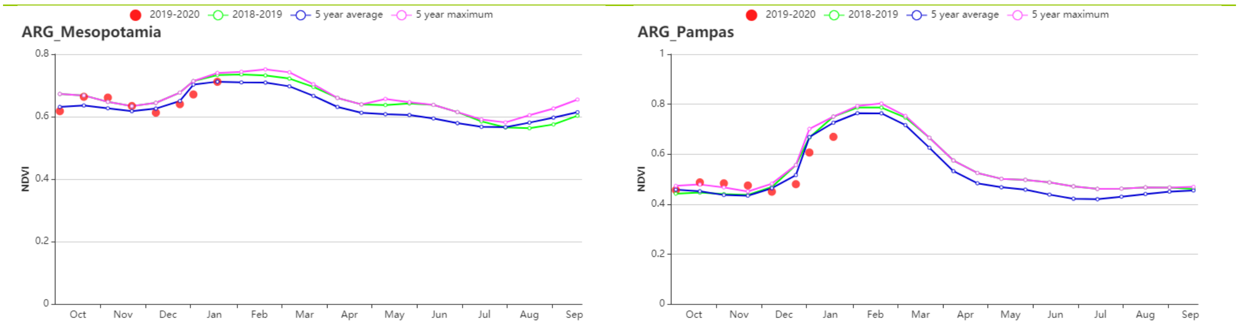


(f) Rainfall profiles

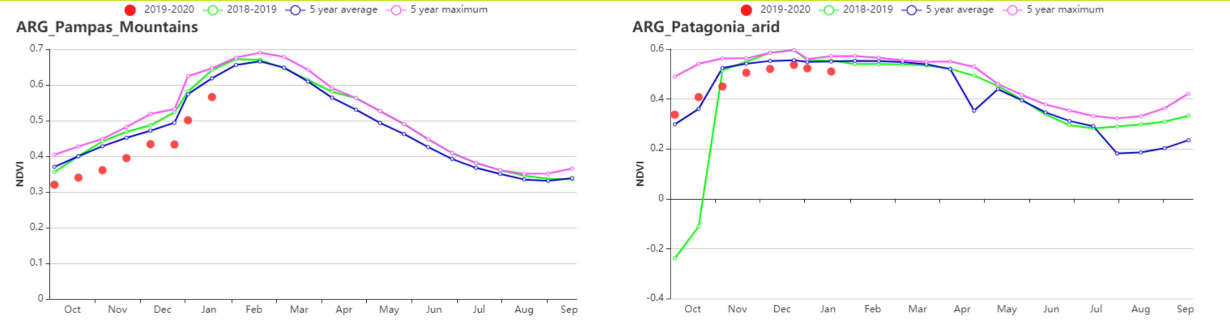




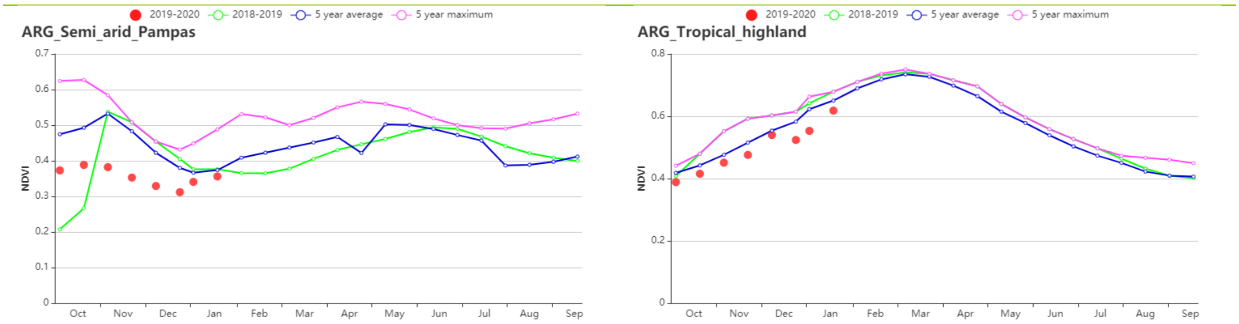
(g) Crop condition development graph based on NDVI (NDVI_Andes (left) and Chaco (right))



(h) Crop condition development graph based on NDVI (NDVI_Mesopotamia (left) and Humid Pampas (right))



(i) Crop condition development graph based on NDVI (NDVI_Pampas hills (left) and Arid part of Patagonia (right))



(j) Crop condition development graph based on NDVI (NDVI_Dry Pampas (left) and Subtropical highlands (right))

Table 3.7 Argentina's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - Jaunary 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Andes	442	74	16.5	0.2	1629	-4
Chaco	607	17	24.3	-0.8	1334	-2
Mesopotamia	585	2	22.7	-0.4	1384	-3
Humid Pampas	315	12	20.9	-0.5	1472	-3
Pampas hills	306	29	21.9	-0.1	1532	-1
Arid part of Patagonia	200	-13	10.7	-0.2	1439	3
Dry Pampas	151	-18	20.5	-0.5	1584	1
Subtropical highlands	936	36	21.9	-0.4	1314	-4

Table 3.8 Argentina's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS	Cropped arable land fraction	Maximum VCI

	Current (gDM/m^2)	Departure from 15YA (%)	Current (%)	Departure from 5YA (%)	Current
Andes	706	0	63	-3	0.84
Chaco	852	-2	99	6	0.95
Mesopotamia	830	-4	100	0	0.93
Humid Pampas	834	1	98	2	0.85
Pampas hills	898	4	90	15	0.81
Arid part of Patagonia	461	0	84	4	0.92
Dry Pampas	877	8	51	-46	0.57
Subtropical highlands	777	-10	90	-1	0.80

[AUS] Australia

The main crops of Australia are wheat and barley, which are planted mainly from May to July and harvested from October to January. The monitored time period thus covers the harvest of wheat and barley. Based on spatial NDVI patterns and profiles, the crop condition was average from October to November, but dropped to below average in December and January. To be more detailed: the south-eastern part of Queensland, eastern and south-eastern parts of New South Wales, the northern part of Victoria, the small part of South Australia, and south-western West Australia all show poor crop conditions with VCIx below 0.5. Rainfall was reduced by -45%, accompanied by hotter temperatures (+0.7℃) and higher RADPAR (+7%). The potential accumulated biomass kept stable (+1%). However, the south-western part of Victoria showed above average condition from October to December with VCIx above 0.8, accounting for only about 13.7% of the cropland. The CALF fell significantly by 29% below the recent 5-year average.

The national temperature profile showed average levels from October to the middle of December, 2019. The temperature returned to above average levels afterwards, except for some short periods with below average condition, i.e., during the middle of October, 2019, the beginning of November, 2019 and the end of January, 2020. The national rainfall profile showed below average levels until early January, except for average conditions during the beginning of November. Starting in mid January 2020, rainfall reached average levels.

Combining the agronomic and agroclimatic indicators, CropWatch estimates that crop production is below average for this season in Australia.

Regional analysis

This analysis covers five agro-ecological zones (AEZ) for Australia, namely the South-eastern wheat zone, South-western wheat zone, Arid and semi-arid zone, Wet temperate and subtropical zone, and Sub-humid subtropical zone.

The crop condition in the **South-eastern wheat zone**, showed average crop condition from October to the beginning of December, 2019 and dropped to below average after then. For the central and north-eastern parts of this agro-ecological region, the VCIx mainly stayed in the range below 0.5 with CALF decreasing by 54%, possibly due to the decreased rainfall (-38%) , compared to the last 15-year average. Below average production is likely.

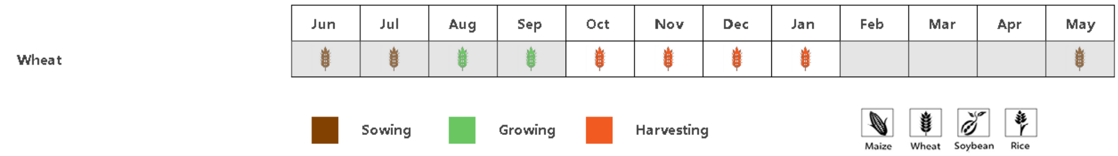
The crops in the **South-western wheat zone** showed below average condition at this period of harvesting. The VCIx reached only 0.61 with CALF down 23%, possibly resulting from the apparently decreased rainfall (-57%), relatively high temperature (0.8℃) and RADPAR (7%), compared to the last 15-year average. Below average production is expected.

Crop condition in the **Arid and semi-arid zone** was generally below average possibly due to the below average rainfall -41%, temperature +0.8℃, RADPAR 8% and BIOMASS -12%. With VCIx at 0.60 and a CALF decreasing by 6%, below average crop condition is likely.

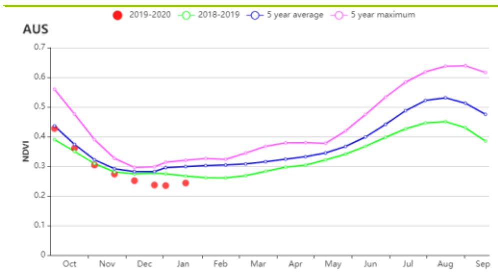
The **Wet temperate and subtropical zone** showed average condition before the middle of October but the crop condition dropped sharply to below average after then until the end of the monitoring period, possibly due to the decreased rainfall (-43%), relatively high temperature (0.6℃) and RADPAR (9%), compared to the last 15-year average. The VCIx of 0.62 also indicated a below average condition with CALF decreasing further by 17%.

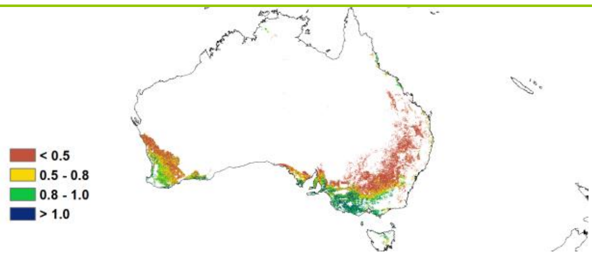
Crop conditions in the **Sub-humid subtropical zone** were below average throughout the season, due to below average rainfall (-54%) and hot temperatures (1.4℃ above average). RADPAR was 10% above average. BIOMASS was reduced by 5%. Furthermore, CALF dropped by 96% and VCIx is 0.11, indicating very poor production for this AEZ.

Figure 3.8 Australia's crop condition, October 2019 - January 2020



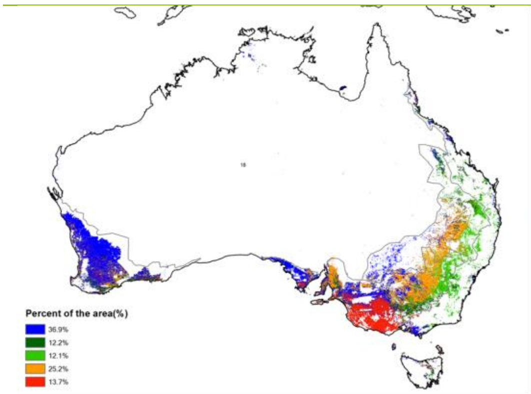
(a). Phenology of major crops

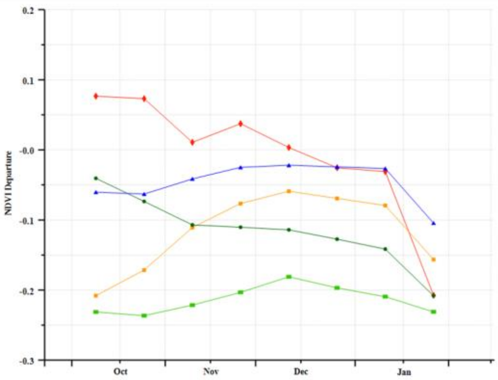




(b) Crop condition development graph based on NDVI

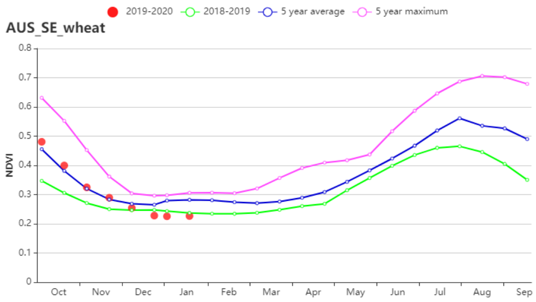
(c) Maximum VCI

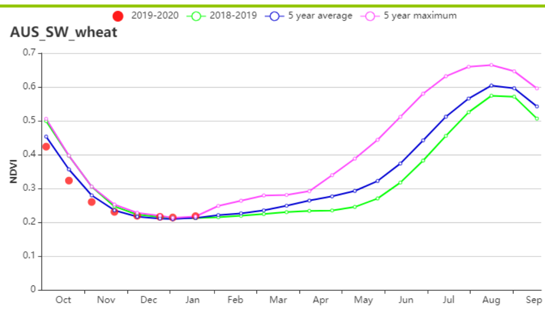




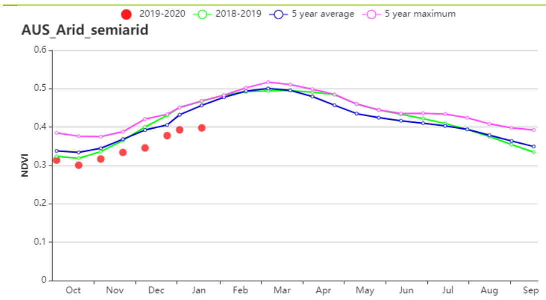
(d) Spatial NDVI patterns compared to 5YA

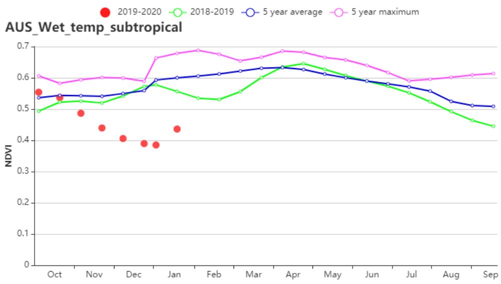
(e) NDVI profiles



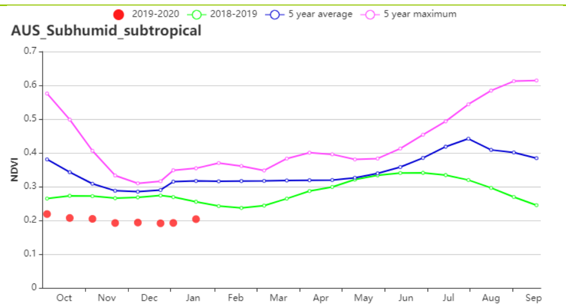


(f) Crop condition development graph based on NDVI (Southeastern wheat zone (left) and Southwestern wheat zone (right))

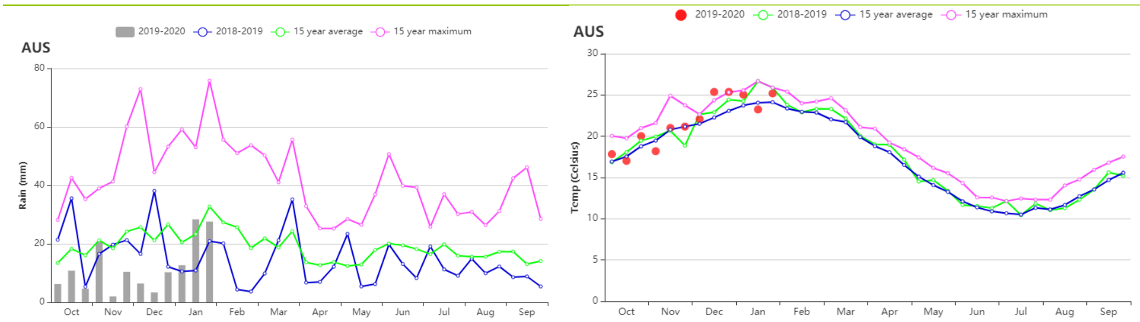




(g) Crop condition development graph based on NDVI (Arid and semi-arid zone (left) and Wet temperate and subtropical zone (right))



(h)Crop condition development graph based on NDVI (Subhumid subtropical zone)



(i)Time series rainfall profile (left) and temperature profile (right))

Table 3.9 Australia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)
Southeastern wheat zone	115	-38	20.3	0.1	1523	3
Southwestern wheat zone	48	-57	20.3	0.8	1619	7
Arid and semiarid zone	375	-41	28.7	0.8	1467	8
Wet temperate and subtropical zone	210	-43	20.0	0.6	1528	9
Subhumid subtropical zone	119	-54	25.6	1.4	1657	10

Table 3.10 Australia's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m²)	Departure from 15YA (%)	Current	Departure from 5YA (%)	Current
Southeastern wheat zone	766	1	54	-21	0.56
Southwestern wheat zone	813	8	47	-23	0.61
Arid and semiarid zone	724	-12	53	-6	0.60
Wet temperate and subtropical zone	780	5	80	-17	0.62
Subhumid subtropical zone	833	-5	2	-96	0.11

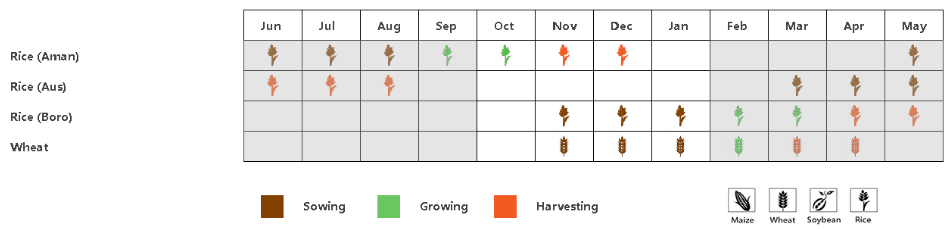
[BGD] Bangladesh

During the reporting period, the growing and harvesting of Aman rice and the sowing of irrigated dry season Boro rice and wheat were the main farming activities. The country recorded 306 mm of rainfall, which is above the average by 17%. Most rainfall occurred between October and the beginning of November. Both temperature and RADPAR were below average by 0.2°C and 5% respectively. The overall biomass accumulation potential (BIOMSS) exceeded the five-year average by 26%, while the crop arable land fraction (CALF) was 2% above average. Increasing BIOMSS and CALF can be attributed to good rainfalls. The national NDVI profile was above the recent 5-year average in October until the first of November, and then it dropped below the average until the end of December. Later in January, it rose above the average. The NDVI spatial pattern shows that 4.6% of the cultivated area was above the 5YA, 52.1% was below the 5YA, and 43.3% was above the average except for late December and January. In the Sylhet basin, the spatial NDVI profile during October exceeded not only the 5YA but also the 5YM. During the rest of the season, it was average except for late December. Over other zones, the spatial NDVI profile was above the average in October and then dropped to the average during November and December. Later in the season, it surpassed the average. Over the whole country, the VCIx mostly ranged from 0.8 to 1. All CropWatch indicators, as well as the VCIx map, indicate favorable crop conditions nationwide.

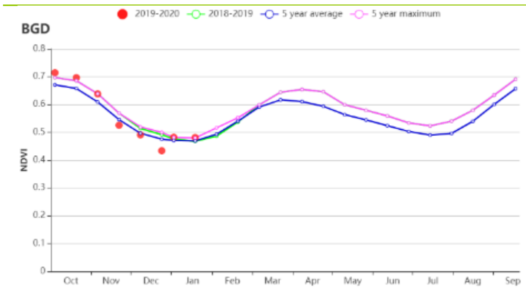
Regional analysis

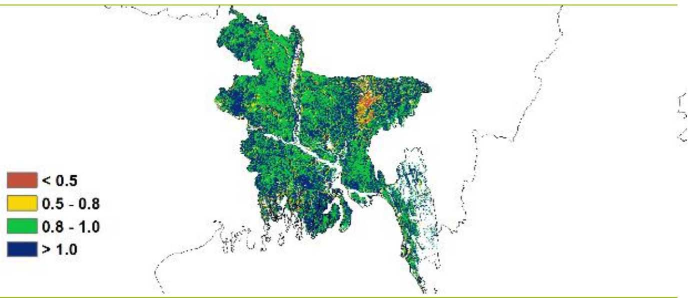
Bangladesh includes four Agro-ecological zones (AEZ) referred to hereafter as **Coastal region**, **Gangetic plain, the Hills and the Sylhet basin**. The coastal region recorded 299 mm of rain (+14%). Average temperature was 21.9°C (+0.1°C). RADPAR was 2% below the average. BIOMASS and CALF exceeded the 5YA by 33% and 2% respectively, while the VCIx at 1.05 indicates good crop conditions. The Gangetic plain received 284 mm of rainfall (+34%). Both temperature and RADPAR were below the averages, by 0.4°C and 6% respectively, while BIOMSS and calf were above the average by 30% and 2% respectively. The VCIx of 1.00 indicates favorable crop conditions. In the Hills, the precipitation and temperature were below average by 14% and 0.1°C respectively, while RADPAR was just 0.2% above the average. The BIOMASS was 15% above the 5YA. The CALF did not change relative to the 5YA, and VCIx was as high as 1.05, which indicates good crop conditions. The Sylhet basin recorded 331 mm of rainfall, 22% above average. Temperature and RADPAR were below the average by 0.1°C and 6% respectively, while BIOMSS and CALF were above the average by 24% and 3% respectively. The VCIx was 0.98 indicating suitable crop conditions.

Figure 3.9 Bangladesh's crop condition, October 2019 - January 2020.

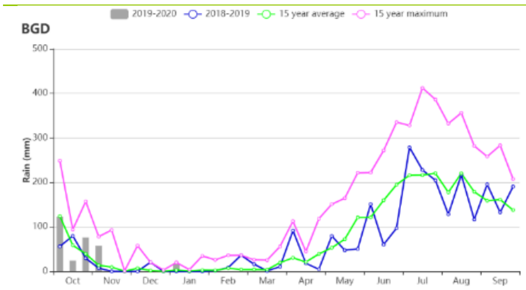


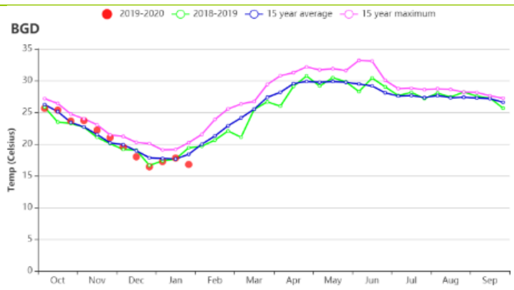
(a). Phenology of major crops



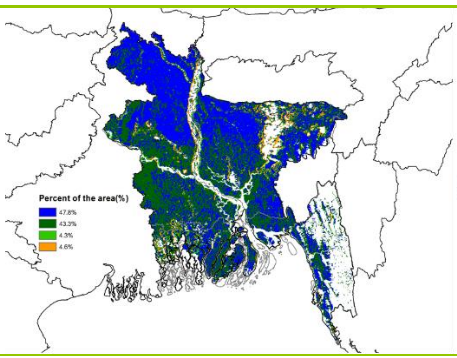


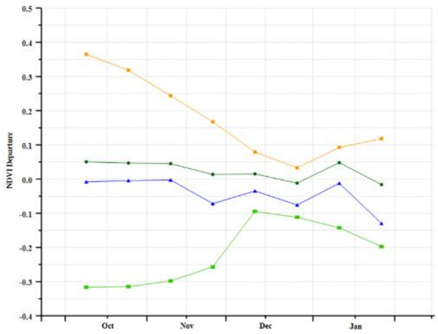
(b) Crop condition development graph based on NDVI (c) Maximum VCI



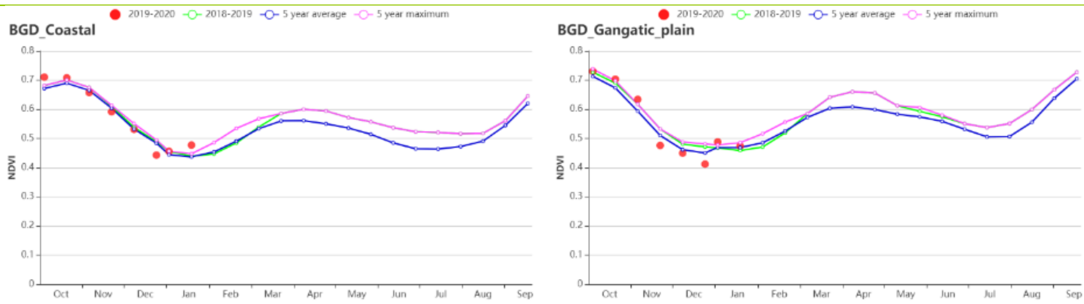


(d) Rainfall Index (e) Temperature Index

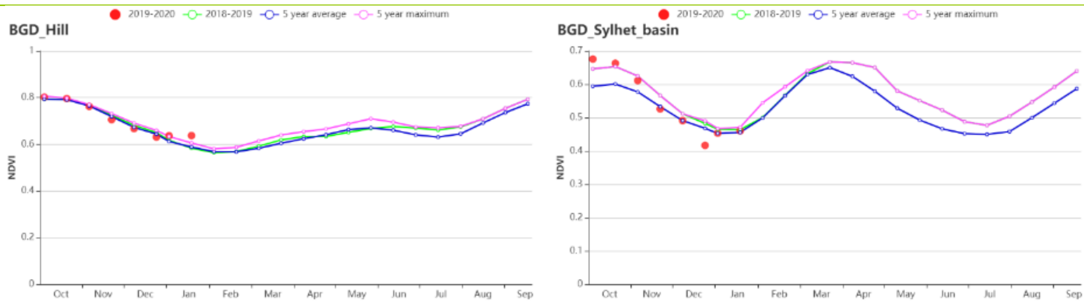




(f) Spatial NDVI patterns compared to 5YA (g) NDVI profiles



(k) Crop condition development graph based on NDVI(Coastal Region (left) and Gangetic Region (right))



(l) Crop condition development graph based on NDVI(Hill Region (left) and Sylhet Basin (right))

Table 3.11 Bangladesh's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Coastal region	299	14	21.9	0.1	1017	-2
Gangetic plain	284	34	20.4	-0.4	911	-6
Hills	299	-14	20.4	-0.1	1025	0.2
Sylhet basin	331	22	20.5	-0.1	910	-6

Table 3.12 Bangladesh's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current (%)	Departure from 5YA (%)	Current
Coastal region	447	33	93	2	1.05
Gangetic plain	423	30	97	2	1.00
Hills	416	15	99	0	1.02
Sylhet basin	400	24	91	3	0.98

AFG AGO ARG AUS BGD **BLR** BRA CAN DEU EGY ETH FRA GBR HUN IDN IND IRN ITA KAZ KEN KGZ KHM LKA MAR MEX MMR MNG MOZ NGA PAK PHL POL ROU RUS THA TUR UKR USA UZB VNM ZAF ZMB

[BLR] Belarus

Winter wheat, which was sown in October, is the major crop in the field during this monitoring period. Agro-climatic conditions were generally stable as compared to average, except for a slight rainfall deficit but with very sunny weather (RAIN 240 mm or -15%, TEMP 3.9℃ or +3.2°C above average, RADPAR 155 MJ/m2 equivalent to a -5%). Nearly all the arable land was cropped (CALF at 99%) and the maximum vegetation condition index (VCIx) was high (0.90). As a result, weather based projected biomass increased by 19%. At the national level, NDVI was below average in October, but started to exceed the 5YA and maximum in November. According to the spatial distribution maps, VCIx was satisfactory in most areas of the country (>0.8). NDVI fluctuated very widely over the country; across most central region (48.1% of cropped area), the value persistently increased from -0.1 in October to 0.2 by the end of January. Crop conditions were generally favorable for Belarus.

Regional analysis

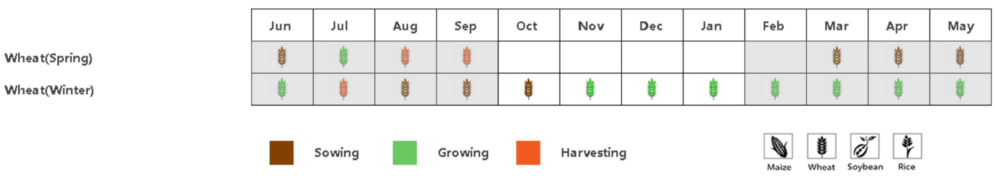
Based on cropping system, climatic zones and topographic conditions, regional analyses for three agro-ecological zones (AEZ) are provided, including Northern Belarus (028), Central Belarus (027) and Southern Belarus (029).

Northern Belarus (Vitebsk, northern area of Grodno, Minsk and Mogilev) was slightly lower than average for rainfall (-3%), but with increased temperature (+3.4°C) and deficit radiation (-14%). Biomass production is estimated to be 5% higher than 15YA. Agronomic indicators show very satisfactory values: 100% for CALF and 0.88 for VCIx. Crop condition is good.

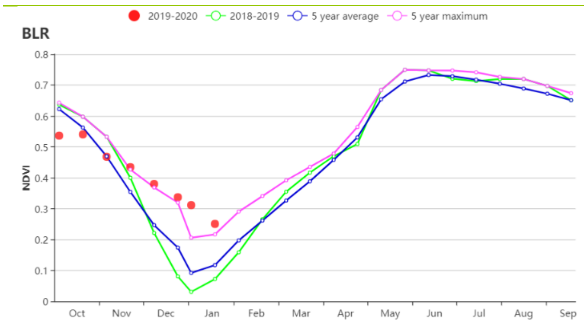
In **Central Belarus**, the regions of Grodno, Minsk and Mogilev recorded rainfall 20% lower than reference values, and higher temperature (+3.1°C) and lower radiation (-2%). The BIOMSS is projected to increase by 24%. Fully cropped arable land (CALF at 99%) and a VCIx value of 0.88 show good prospects for winter crops. NDVI curve also showed a recovering trend since January. In summary overall situation was favorable for winter crops.

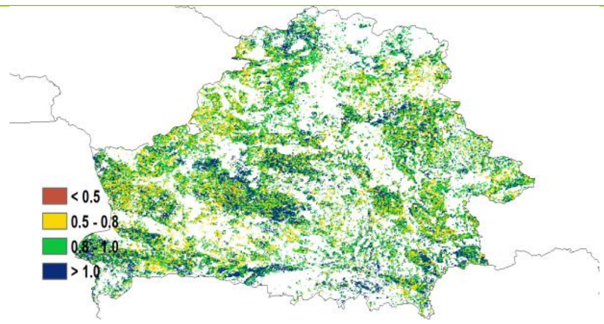
The **Southern Belarus** (southern halves of Brest and Gomel regions) experienced the same agro-climatic condition as Northern and Central area. Lower rainfall (-33%) has not adversely affected the crops. Other favorable agro-climatic conditions (TEMP +2.9°C; RADPAR +6%) and favorable agronomic indicators (CALF 98%, VCIx 0.95 and BIOMSS up 33%) as well as rapidly recovering NDVI should ensure satisfactory crop production.

Figure 3.10 Belarus's crop condition, October 2019 - January 2020



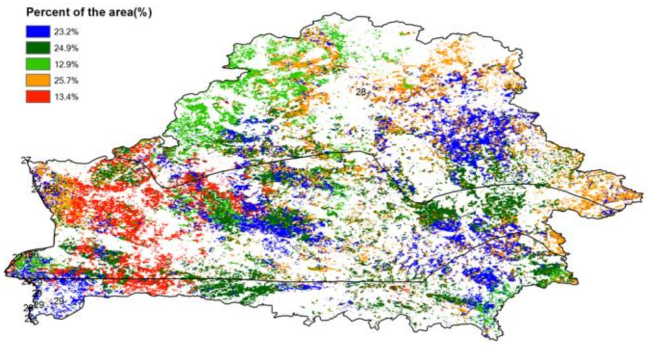
(a). Phenology of major crops

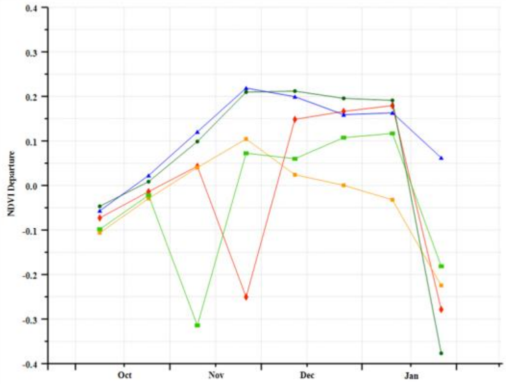




(b) Crop condition development graph based on NDVI

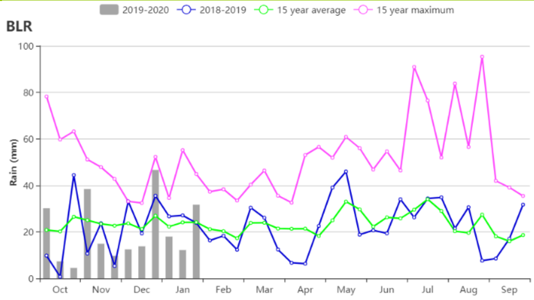
(c) Maximum VCI

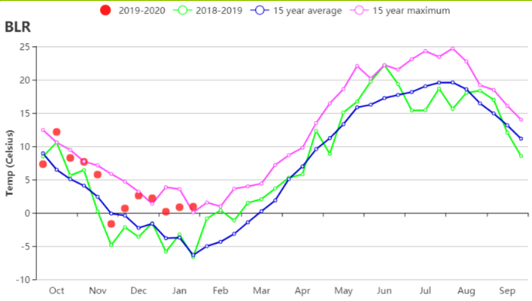




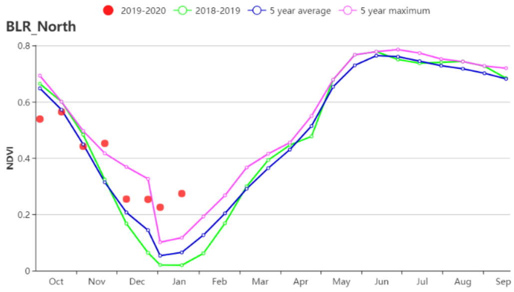
(d) Spatial NDVI patterns compared to 5YA

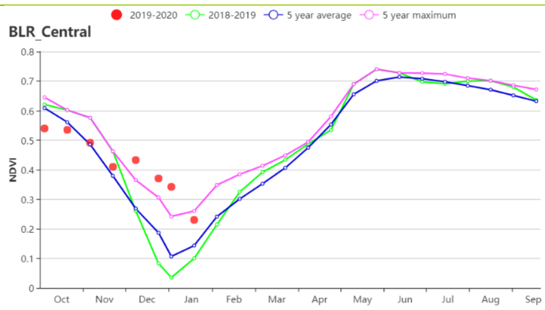
(e) NDVI profiles





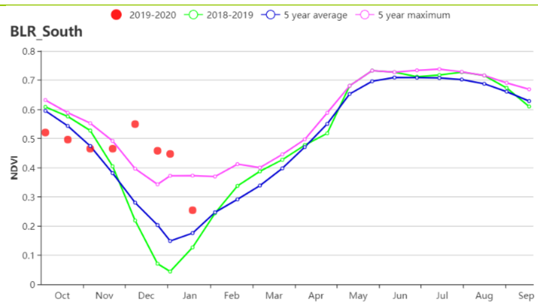
(f)Rainfall time series (g) Temperature time series





(h) Crop condition development graph based on NDVI (North Belarus)

(i) Crop condition development graph based on NDVI (Central Belarus)



(j) Crop condition development graph based on NDVI (South-west Belarus)

Table 3.13 Belarus's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020.

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Center	223	-20	4.2	3.1	167	-2
North	279	-3	3.4	3.4	126	-14
South-west	177	-33	4.4	2.9	202	6

Table 3.14 Belarus's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020.

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current (%)	Departure from 5YA (%)	Current
Center	40	24	99	1	0.89
North	28	5	100	0	0.88
South-west	50	33	98	1	0.95

AFG AGO ARG AUS BGD BLR **BRA** CAN DEU EGY ETH FRA GBR HUN IDN IND IRN ITA KAZ KEN KGZ KHM LKA MAR MEX MMR MNG MOZ NGA PAK PHL POL ROU RUS THA TUR UKR USA UZB VNM ZAF ZMB

[BRA] Brazil

The reporting period covers the sowing to early growth stages of maize, rice and soybean and the harvest of maize in the North-East. The harvest of wheat in Central to Southern Brazil was concluded by the end of December. Generally, crop conditions in Brazil were slightly below average compared to the previous five years.

Nationwide, agro-climatic indicators show close to average conditions with 2% lower rainfall, 0.3℃ higher temperatures and RADPAR up 4% as compared to the average. Average weather conditions resulted in close to average potential biomass, 1% above average according to the simulation model. Seasonal temperature profiles present generally above average values except for early and late January. Rainfall and temperature are strongly correlated: In early and late January, rainfall was above average, whereas temperatures were below average. As for the spatial variation, significant differences among the agricultural states were observed: rainfall departures ranged from -41% in Alagoas to +67% in Rio Grande Do Norte. Large positive departures were also observed in some major agricultural States including Ceara (Northeast) with 66% above average. However, rainfall was 25% below average in Rio Grande Do Sul and 12% below average in Mato Grosso Do Sul. The temperatures in most major agricultural states were above average except for Mato Grosso and Ceara where temperature remained near average. Similar patterns were identified for radiation with above average RADPAR in all 9 major agricultural states except for Rio Grande do Sul. Rio de Janeiro is the only state where below average (-5%) radiation were observed. The insufficient radiation in Rio de Janeiro resulted in the largest negative BIOMSS departure (-11%) although the state received the highest rainfall (1536mm, +33% above average). Large BIOMSS departures were also observed in Rio Grande do Sul (-6%), where below average rainfall limited crop growth, and in Ceara (+8%) where it benefitted from above average rainfall.

The national NDVI development profile for Brazil presents slightly below average values throughout the reporting period. According to the NDVI departure clustering maps and profiles, below average conditions were mostly located in Rio Grande do Sul and Northeast coastal areas after mid-November. Scattered areas in Mato Grosso Do Sul and western Parana also presented below average crop conditions throughout the monitoring period. Those areas mentioned above coincided with the areas with relatively low VCIx values (below 0.8). National VCIx is 0.94 and CALF is 2% above average. Significant below average potential biomass in Rio Grande do Sul also confirmed the poor situation. In this major wheat producing state, the adverse weather conditions and below average BIOMSS indicate that below average wheat yields resulted.

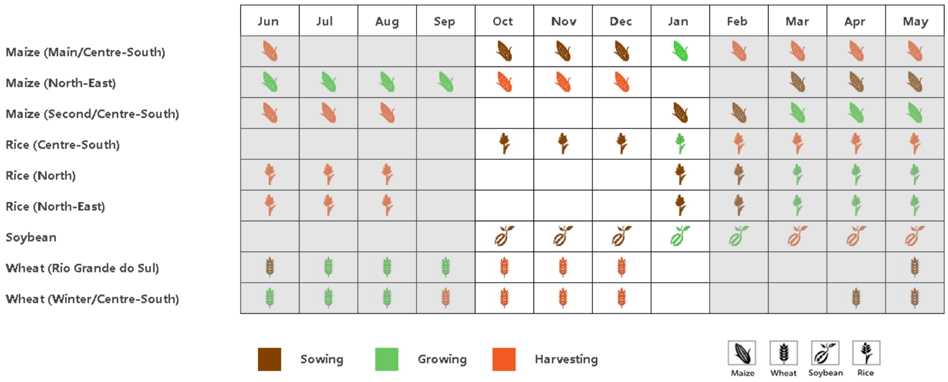
Regional analysis

Based on cropping systems, climatic zones and topographic conditions, eight agro-ecological zones (AEZ) are identified for Brazil. These include the Central Savanna, the east coast, Parana river, Amazon zone, Mato Grosso zone, Subtropical rangeland zone, mixed forest and farmland, and the Nordeste. Over the recent reporting period, 4 zones received below average rainfall, including Central Savanna, Mato Grosso, Parana Basin and Southern subtropical rangelands which might hamper the early development of summer crops; while Nordeste, and Southern subtropical rangelands received above average rainfall, and rainfall in Amazonas as well as Northeastern mixed forest and farmland were close to average. Amazonas and Mato Grosso are the only two zones with below average temperatures. Radiation in most of AEZs was above average except for southern subtropical rangelands with 1% lower RADPAR. By integration of rainfall, temperature and radiation, achievable biomass is simulated and compared to the last 15YA. Large BIOMSS departures were only identified in Mato Gross with 6% above average mainly due to the above average radiation, and in Southern subtropical rangelands with 10% below average, because rainfall was 15% below average. The Nordeste zone presents the largest positive departure from 5YA of CALF at 81%. Meanwhile, Southern subtropical rangelands and Nordeste present lowest VCIx at 0.78 and 0.80 respectively while all other six AEZs present higher VCIx with values larger than 0.90.

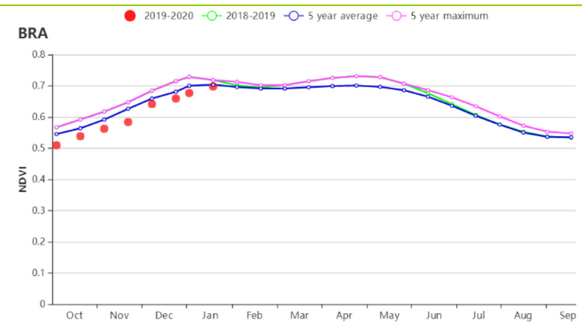
Normal or favorable conditions in Central Savanna, Mato Grosso, Nordeste, and Parana Basin resulted in average to slightly above average crop condition as indicated by the NDVI based crop development profiles in the four zones. Since summer crops in those four zones are still at the early development stage, CropWatch will keep track on the meteorological conditions and crop progresses.

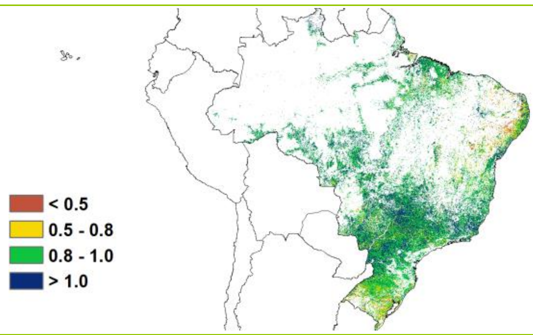
Below average NDVI values as reflected by the crop development graphs were identified in Amazonas, Coast, Northeastern mixed forest and farmland, and Southern subtropical rangelands. Among the four zones mentioned here, Southern subtropical rangelands represent the key agricultural producing area with wheat as the dominant crop. Low rainfall in Southern subtropical rangelands potentially hampered the grain-filling in the end of growing season but it was beneficial for the wheat harvest. Considering the average CALF and low VCIx value in the zone, CropWatch assesses wheat production prospects over the four zones as below average, following the same trend as reported in the November 2019 Bulletin.

Figure 3.11 Brazil's crop condition, October 2019 - January 2020



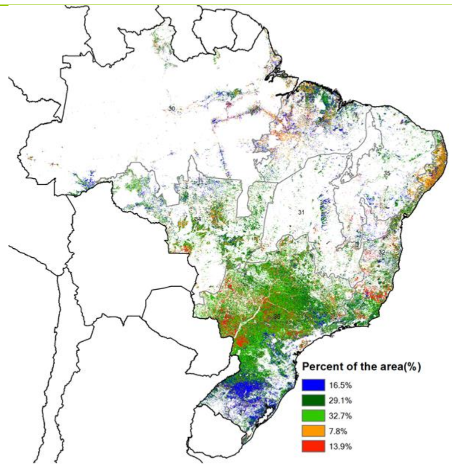
(a). Phenology of major crops

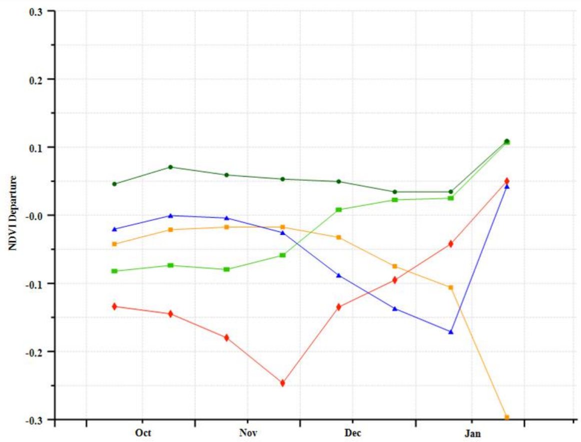




(b) Crop condition development graph based on NDVI

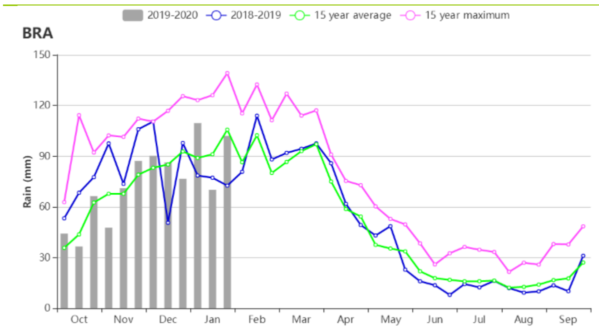
(c) Maximum VCI



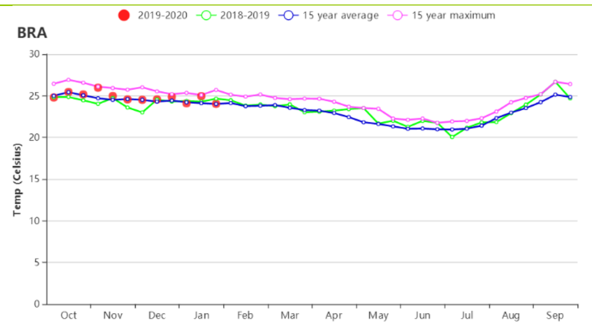


(d) Spatial NDVI patterns compared to 5YA

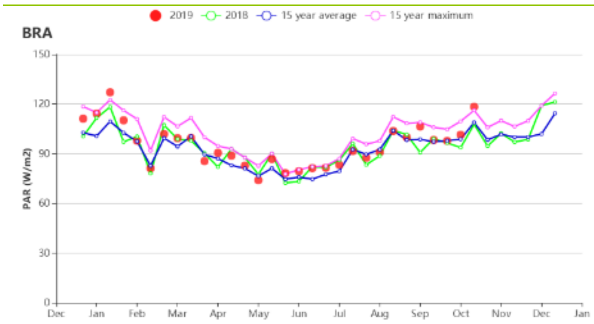
(e) NDVI profiles



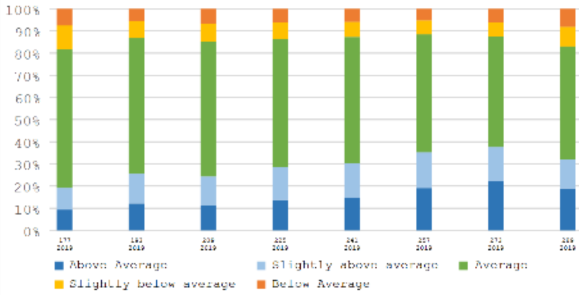
(f)Time series profile of rainfall



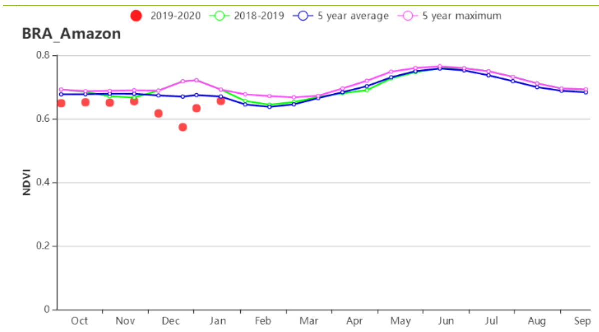
(g)Time series profile of temperature

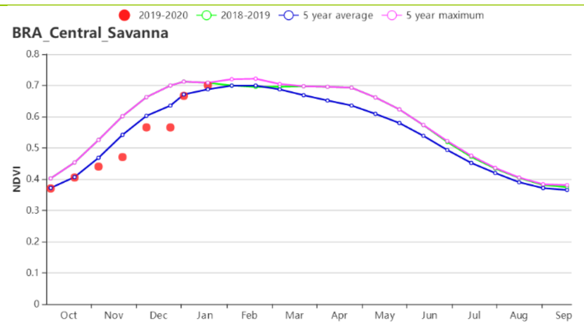


(h)Time series profile of rainfall

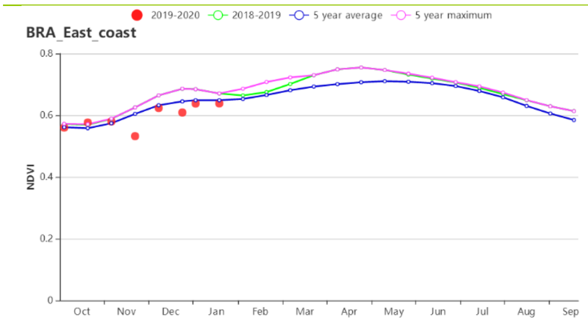


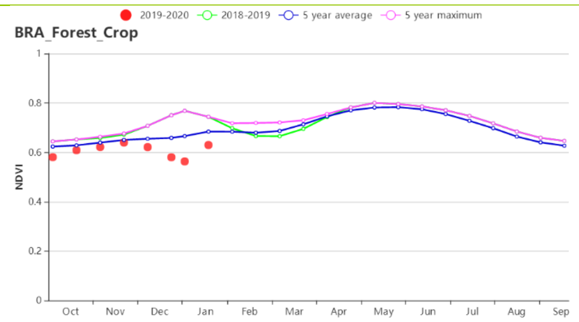
(i) (i) Potential Biomass departure from 5YA



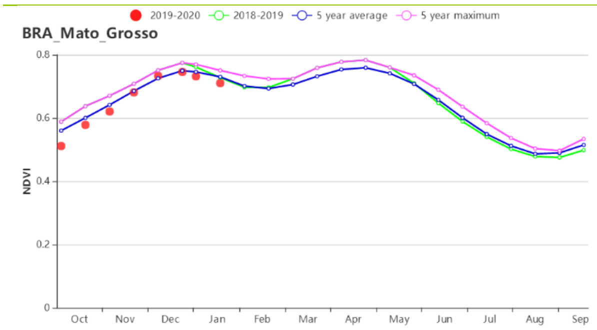


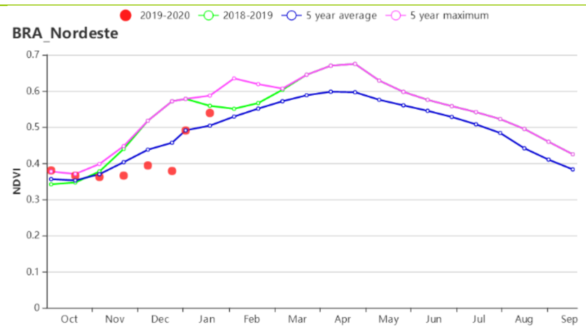
(j) Crop condition development graph based on NDVI ((Amazonas) (left) and (Central Savanna) (right))



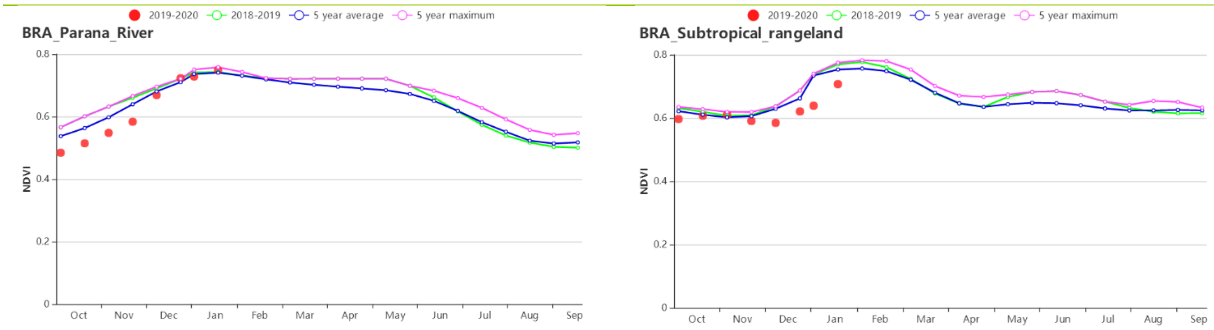


(k) Crop condition development graph based on NDVI (Coast (left) and Northeastern mixed forest and farmland (right))

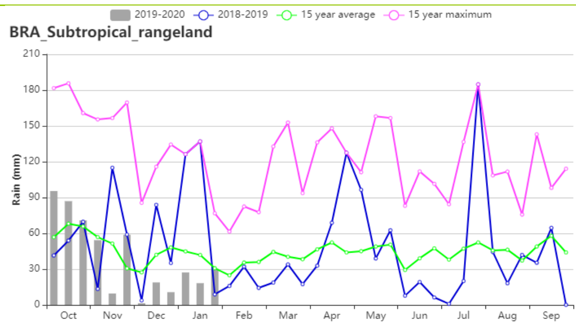




(l) Crop condition development graph based on NDVI (Mato Grosso region (left) and Nordeste (right))



(m) Crop condition development graph based on NDVI (Parana basin (left) and Southern subtropical rangelands (right))



(n) Time series of rainfall profile of Southern subtropical rangelands

Table 3.15 Brazil's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Amazonas	910	2	26.1	-0.4	1218	5
Central Savanna	870	-7	25.4	0.7	1296	3
Coast	855	17	23.2	0.2	1274	2
Northeastern mixed forest and farmland	714	1	26.7	-0.1	1248	4
Mato Grosso	1191	-3	25.4	0.0	1226	8
Nordeste	288	16	26.8	0.4	1383	2
Parana basin	976	-5	23.3	0.6	1344	4
Southern subtropical rangelands	483	-15	22.3	0.7	1387	-1

Table 3.16 Brazil's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current (%)	Departure from 5YA (%)	Current
Amazonas	818	3	100	1	0.97
Central Savanna	826	1	99	5	0.92
Coast	795	-3	97	4	0.94
Northeastern mixed forest and farmland	846	4	99	1	0.94
Mato Grosso	822	6	100	0	0.97
Nordeste	822	-1	81	34	0.80
Parana basin	833	1	100	0	0.96
Southern subtropical rangelands	776	-10	100	0	0.78

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[CAN] Canada

The current reporting period covers the harvest of summer crops, including maize and soybean, as well as the sowing and early growth of winter wheat in Canada. Situation of summer crops was reported in last bulletins, so that the following section focuses on crop condition of winter crops. In general, below average crop conditions were observed for the Prairies, while average conditions prevailed for the Saint Lawrence basin.

The agro-climatic conditions were dominated by the snow and cold weather in this monitoring period. All the agro-climatic indicators were more or less below average (RAIN -3%, TEMP -0.4°C, RADPAR -1%), which was unfavorable to the replenishment of soil moisture of winter wheat and led to the drop of the potential biomass (-5%). In the Prairies region, Alberta (-5%) and Saskatchewan (-19%) suffered from the shortage of precipitation. This led to a drop in potential biomass (Alberta -8%, Saskatchewan -7%). In Manitoba, precipitation was above average (+9%), but its potential biomass was 22% lower than the average, due to a low RADPAR (-12%). The negative departure of NDVI confirmed the negative impact of the agro-climatic conditions on wheat growth in the Prairies. The agro-climatic conditions indicated a relatively poor start of winter crops in the Canadian Prairies, while in the Saint Lawrence basin, conditions were more favorable.

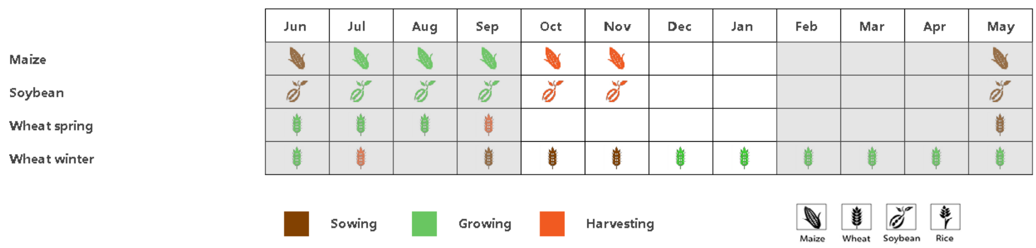
Regional analysis

The **Prairies** (area identified as 53 in the NDVI clustering map) and **Saint Lawrence basin** (49, covering Ontario and Quebec) are the major agricultural regions.

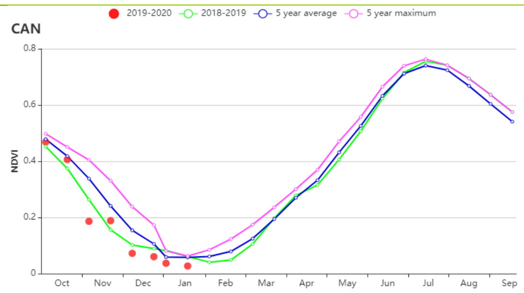
In the **Prairies**, the main food production area in Canada, the agro-climatic indicators were below average (RAIN -7%, TEMP -0.8°C, RADPAR -4%). Attributed to the shortage of precipitation of Alberta and Saskatchewan and serious deficit of RADPAR in Manitoba, the potential biomass was below average (BIOMSS -11%).

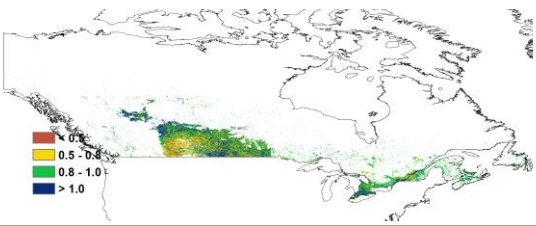
In the **Saint Lawrence basin** region, the agro-climatic indicators are mostly average, which resulted in average potential biomass.

Figure 3.12 Canada's crop condition, October 2019 - January 2020

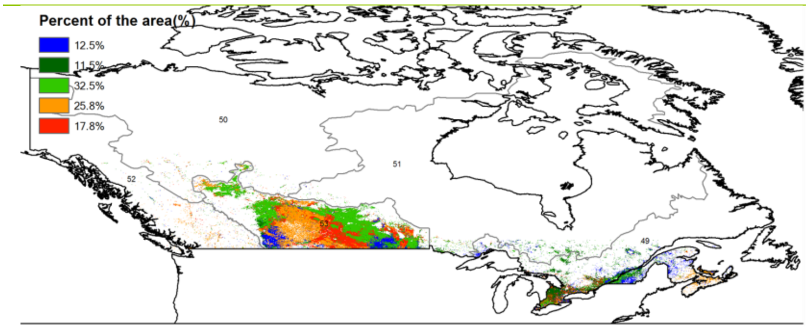


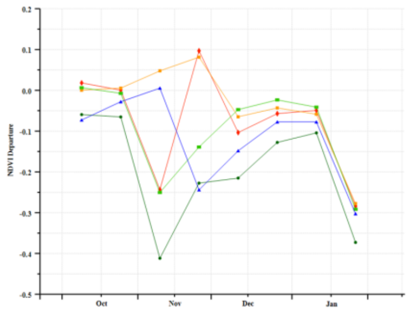
(a). Phenology of major crops





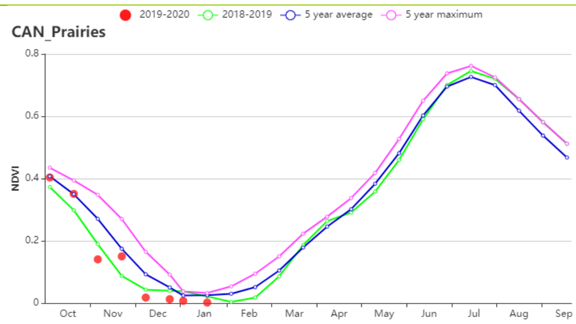
(b) Crop condition development graph based on NDVI (c) Maximum VCI

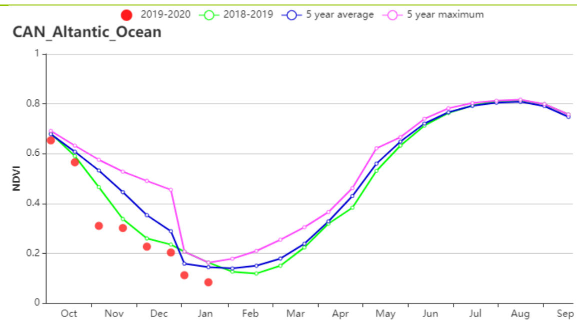




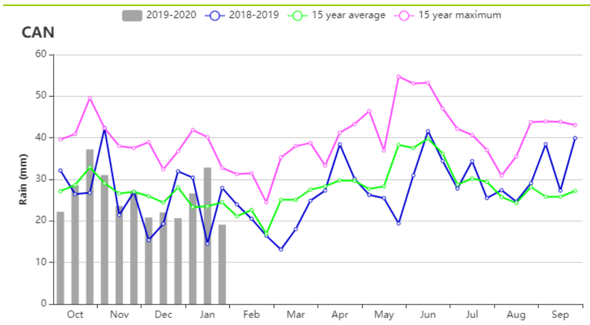
(d) Spatial NDVI patterns compared to 5YA

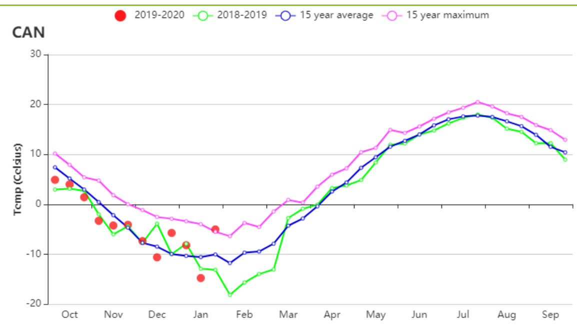
(e) NDVI profiles





(f) Crop condition development graph based on NDVI (Canadian Prairies region (left) and Saint Lawrence basin region (right))





(f)Time series profile of rainfall

(g)Time series profile of temperature

Table 3.17 Canada's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Saint Lawrence basin	480	0	-1.4	-0.2	318	0
Prairies	155	-7	-5.5	-0.8	276	-4

Table 3.18 Canada agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current (%)	Departure from 5YA (%)	Current
Saint Lawrence basin	52	0	99	1	0.92
Prairies	36	-11	49	30	0.93

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[DEU] Germany

This reporting period for Germany covers the late stages of sugar beets (October harvest) and early vegetative stages of winter wheat and winter barley.

At the national level, total precipitation was 5% below average, temperature was significantly above average (TEMP, +1.2°C), and radiation was average. Above average precipitation occurred in most of Germany from early-October to mid-October, early-November and mid-December. This was favorable for winter crop planting and establishment. Negative rainfall departures occurred during short periods in late October, late November and after late December. Most parts of Germany experienced warmer-than-usual conditions during this reporting period, except early-October and in mid-November, when a cold spell swept through most European countries. Due to favorable rainfall early in the monitoring period and overall warmer-than-usual conditions, the biomass production potential (BIOMSS) is expected to increase by 1% nationwide compared to the five-year average.

According to the national crop condition development graph, the reporting period experienced crop condition that was better than in 2019. As compared to the 5-year average, it was worse until November, but increased to above average in December and exceeded the 5-year maximum in January 2020. These observations are confirmed by the spatial NDVI profiles. Crop condition was above average in October on only 41.4% of the cropland, and improved to 55.1% in December and 92% in January, because of warmer-than-usual temperatures. The large negative outliers are probably due to fog, snow, clouds or other factors. Overall, the above-mentioned pattern of crop growth is also reflected by VCIx. Its value reached 0.95 countries wide. CALF during the reporting period was the same as the recent five-year average.

Generally, the values of agroclimatic and agronomic indicators mentioned above show favorable conditions for most winter crops and the outlook of winter crops is above average.

Regional analysis

Based on cropping systems, climatic zones, and topographic conditions, six sub-national regions can be distinguished for Germany. The ones which are most relevant for crop cultivation are the Northern wheat zone, North-west mixed wheat and sugar beets zone, and the Central wheat zone.

Schleswig-Holstein and the Baltic coast is the major winter wheat zone of Germany. The CropWatch agroclimatic indicators RAIN (+5%) and temperature (TEMP, +1.3°C) were above average, whereas radiation (RADPAR, -4%) was below. Due to unfavorable sunshine, biomass (BIOMSS) in this zone was decreased by 1% as compared to the five-year average. As shown in the crop condition development graph based on NDVI, the values were below or close to average in October and below average from November to December, then above average in January 2020. The area had a high CALF (100%) as well as a favorable VCIx (0.94), indicating a larger cropped area.

Wheat and sugar-beets are major crops in the **Mixed wheat and sugar-beets zone of the north-west**. The CropWatch agroclimatic indicator RAIN was average with warm weather (TEMP +1.0°C) and radiation below average (RADPAR, -2%), which led to a small decrease (-2%) of BIOMSS. As shown in the crop condition development graph based on NDVI, the NDVI values and crop condition was above the situation in 2019 until late-October, then below average in November, while after early-December, it was average, and even above the 5-year maximum in January 2020. The area had a high CALF (100%) and a high VCIx (0.96), indicating favorable crop prospects.

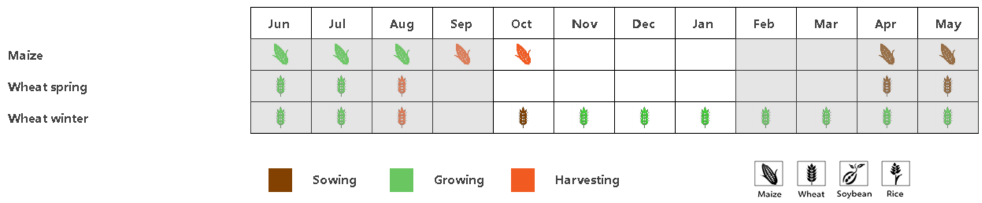
The Central wheat zone of Saxony and Thuringia is another major winter wheat zone; The CropWatch agroclimatic indicator show that this region experienced a precipitation deficit (-13%) with warm weather (TEMP, +1.5°C) and radiation above average (RADPAR, +6%). With suitable temperature, biomass (BIOMSS) in this zone is expected to increase by 7% compared to the five-year average. As shown in the crop condition development graph based on NDVI, the values were higher than in 2019 from October to November, and above the 5-year maximum after December. The area has a high CALF (100%) as well as a favorable VCIx (0.95), indicating favorable crop prospects.

The East-German lake and Heathland sparse crop area experienced rainfall deficit (RAIN, -6%) but with above average temperature (TEMP, +1.6°C), average radiation (RADPAR, +4%) and above average BIOMSS (+8%). NDVI values were average until late-November, and then increased to above 5-year maximum by late December. The area had a high CALF (100%) and a high VCIx (0.96).

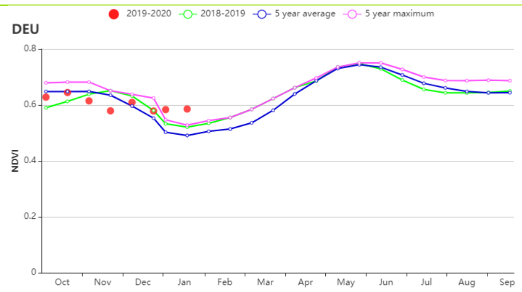
The cropland in the **Western sparse crop area of the Rhenish massif** was more marginal. It recorded about 4% above average rainfall, with warm weather (TEMP +1.0°C) and radiation below average (RADPAR, -7%), which led to a decrease of BIOMSS (-9%). As shown in the crop condition development graph based on NDVI, the NDVI values and crop condition were similar to the other regions, and showed above the situation in 2019 until late-October, then below average in November, while after early-December, it was average, and even above the 5-year maximum in January 2020. The area had high CALF (100%) and a high VCIx (0.91).

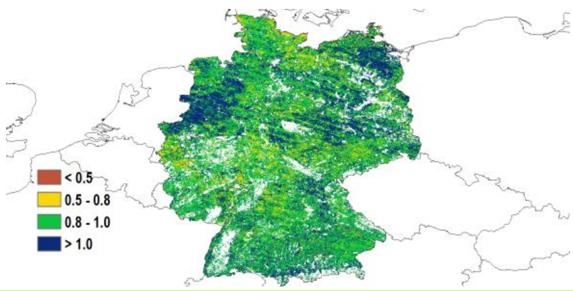
Dry weather was recorded in the **Bavarian Plateau** (RAIN -9%), with above average temperatures (+1.1°C) and radiation (RADPAR +1%). Compared to the five-year average, BIOMSS increased 2%. The area had a high CALF (100%) as well as a favorable VCIx (0.95). As shown in the crop condition development graph based on NDVI, the values were all above the situation in 2019 and average during the whole reporting period, except November, showing favorable crop prospects for the regions.

Figure 3.13 Germany's crop condition, October 2019 - January 2020

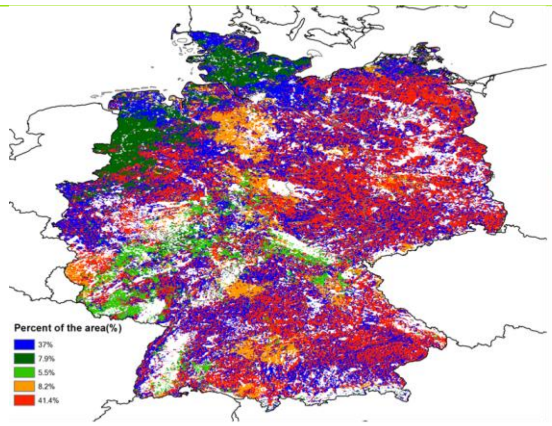


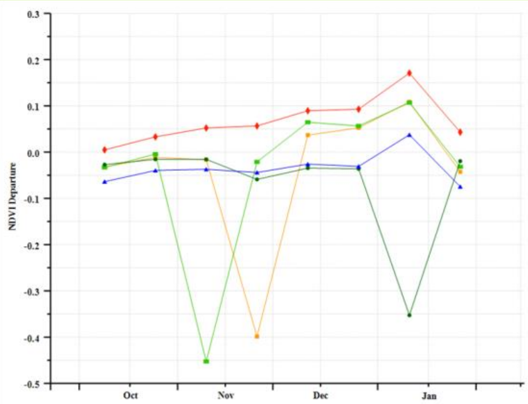
(a). Phenology of major crops



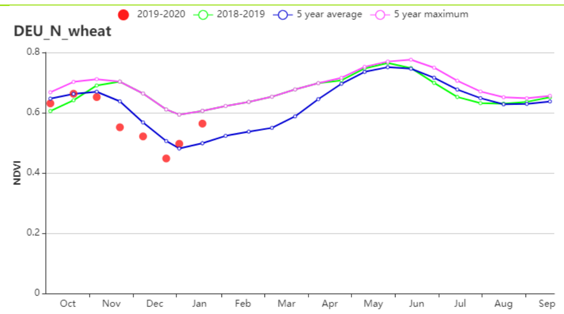


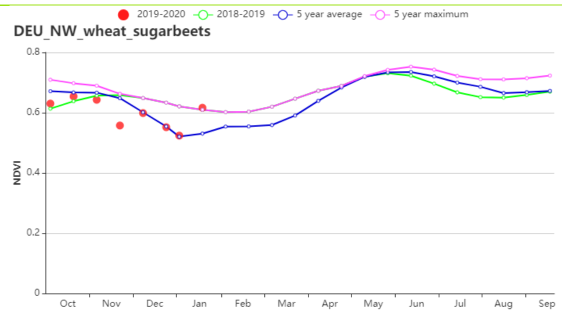
(b) Crop condition development graph based on NDVI (c) Maximum VCI



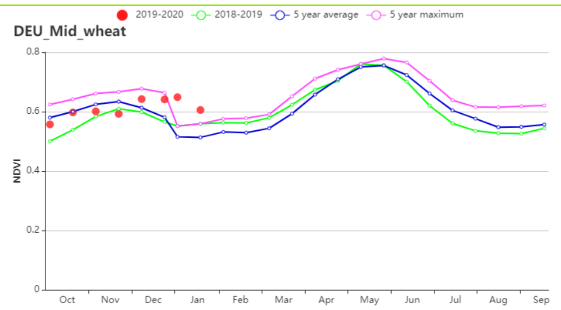


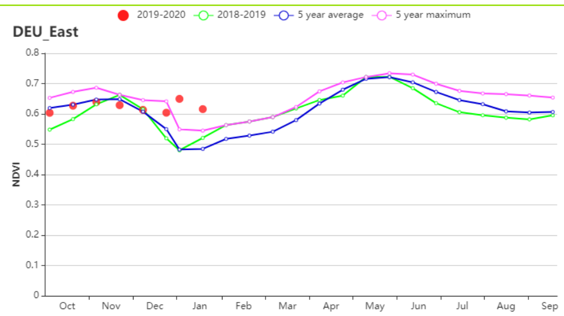
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



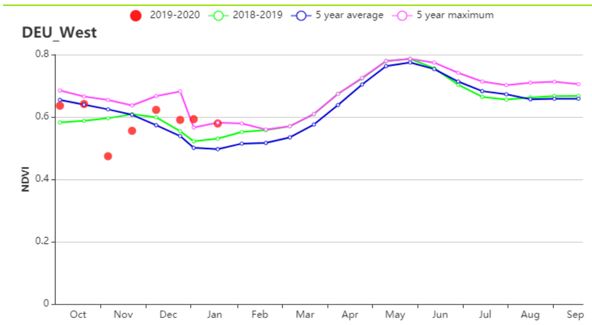


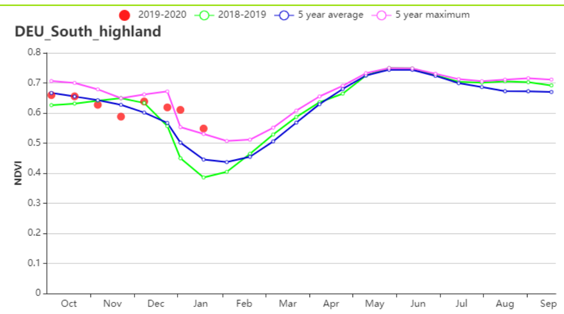
(f) Crop condition development graph based on NDVI (Wheat zone of Schleswig-Holstein and the Baltic coast (left) and Mixed wheat and sugar beets zone of the north-west(right))



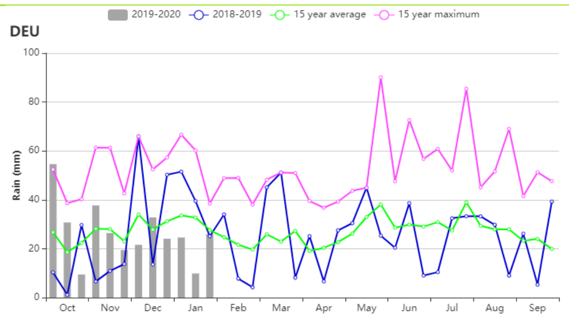


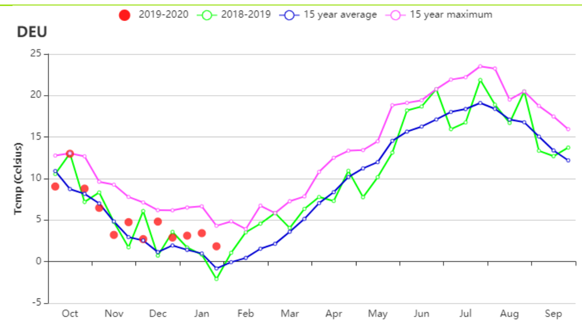
(g) Crop condition development graph based on NDVI (Central wheat zone of Saxony and Thuringia(left) and Sparse crop area of the east-German lake and Heathland (right))





(h) Crop condition development graph based on NDVI (Western sparse crop area of the Rhenish massif (left) and Bavarian Plateau (right))





(f)Time series profile of rainfall

(g)Time series profile of temperature

Table 3.19 Germany agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, July-October 2019

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)
Wheat zone of Schleswig-Holstein and the Baltic coast	349	5	6.4	1.3	169	-4
Mixed wheat and sugarbeets zone of the north-west	340	0	6.2	1.0	196	-2
Central wheat zone of Saxony and Thuringia	243	-13	5.3	1.5	232	6
East-German lake and Heathland sparse crop area	228	-20	5.6	1.6	222	4
Western sparse crop area of the Rhenish massif	314	4	5.1	1.0	213	-7
Bavarian Plateau	345	-9	4.2	1.1	291	1

Table 3.20 Germany's agronomic indicators by sub-national regions, current season's value and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m²)	Departure from 15YA (%)	Current (%)	Departure from 5YA (%)	Current
Wheat zone of Schleswig-Holstein and the Baltic coast	43	-1	100	0	0.94
Mixed wheat and sugarbeets zone of the north-west	49	-2	100	0	0.96
Central wheat zone of Saxony and Thuringia	56	7	100	0	0.95
East-German lake and Heathland sparse crop area	54	8	100	0	0.96
Western sparse crop area of the Rhenish massif	50	-9	100	1	0.91
Bavarian Plateau	64	2	100	0	0.95

AFG AGO ARG AUS BGD BLR BRA CAN DEU **EGY** ETH FRA GBR HUN IDN IND IRN ITA KAZ KEN KGZ KHM LKA MAR MEX MMR MNG MOZ NGA PAK PHL POL ROU RUS THA TUR UKR USA UZB VNM ZAF ZMB

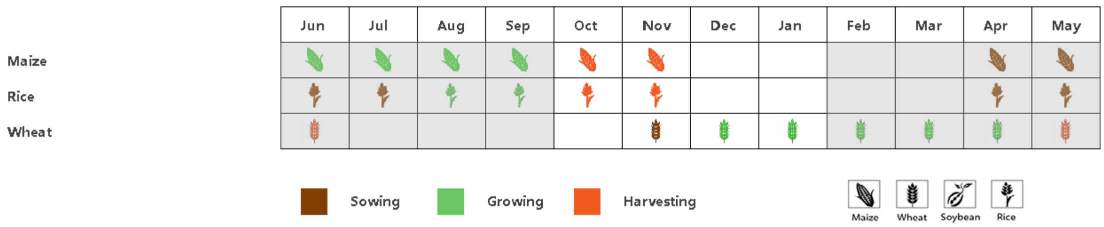
[EGY] Egypt

During the reporting period, the summer crops such as maize and rice were harvested, followed by the sowing of winter wheat in November. The CropWatch agro-climatic indicators show that rain and temperature were 99% and 0.5°C above the average, respectively. High rainfall occurred in late October and January. RADPAR, which is the main limiting factor for crop growth in Egypt since almost all crops are irrigated, was 0.4% below the average. The estimated BIOMSS was 14% below the average and VCIx was 0.85. The nationwide NDVI profile shows below-average crop conditions during October and November. Starting in December, conditions improved to average. The NDVI spatial pattern shows that 6.8% of the cultivated area was above the 5YA, 60.3% was below the 5YA, and 32.8% was below the average until the end of December then increased in January. The whole country VCIx value was 0.85 and the CALF exceeded the 5YA by 8%, indicating favorable crop conditions.

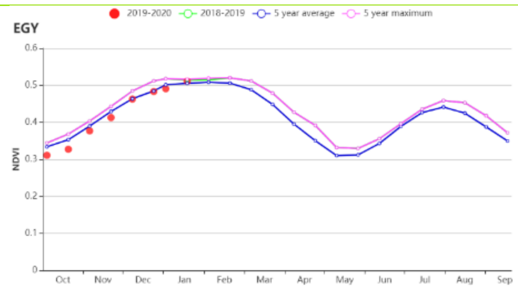
Regional Analysis

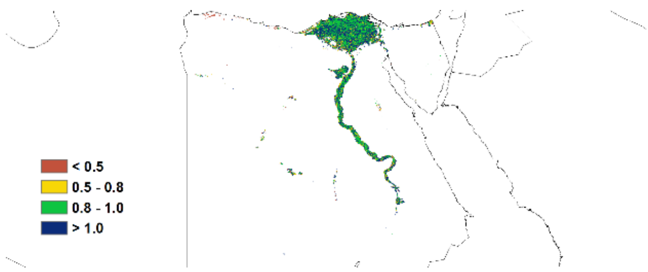
Egypt can be subdivided into three agro-ecological zones (AEZs) based on cropping systems, climatic zones, and topographic conditions. Only two of them are relevant for crops: 1) the Nile Delta and the Mediterranean coastal strip and 2) the Nile Valley. Rainfall was 121% above the average in the first AEZ and 39% below average in the Nile Valley. Temperatures in both zones were slightly above average and on the contrary, the RADPAR was slightly below average. The estimated BIOMSS was 27% below the average in the Nile Delta and Mediterranean coastal strip and 16% above the average in the Nile Valley. For the Nile Delta and Mediterranean coastal strip, CALF was up by 6% and VCIx at 0.84. In the Nile Valley, CALF was up by 10% and VCIx at 0.95. The NDVI-based crop condition development graphs indicate below-average conditions during October and November, and average starting in December. Since most of the agricultural lands in Egypt are irrigated, the rainfall makes little change in the outcome of the season. However, additional water usually has a beneficial effect. It should be noted that unusually high amounts of rainfall registered during a short period (late of October) may have slightly delayed the sowing of winter wheat. This could explain the reduction of BIOMSS over the Nile Delta and the Mediterranean coastal strip. However, the crops seem to be well on track by the end of January.

Figure 3.14 Egypt's crop condition, October 2019 - January 2020



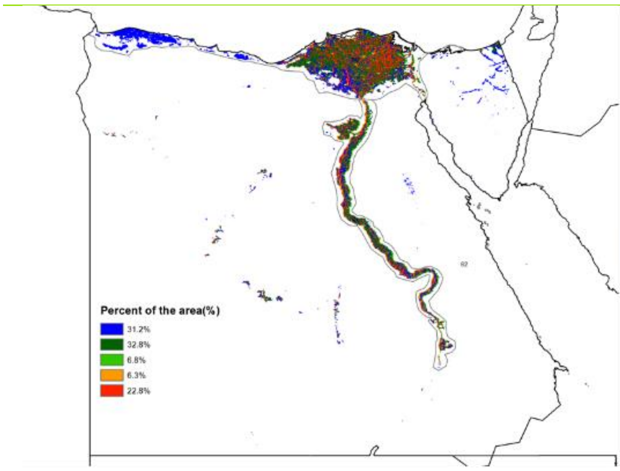
(a). Phenology of major crops

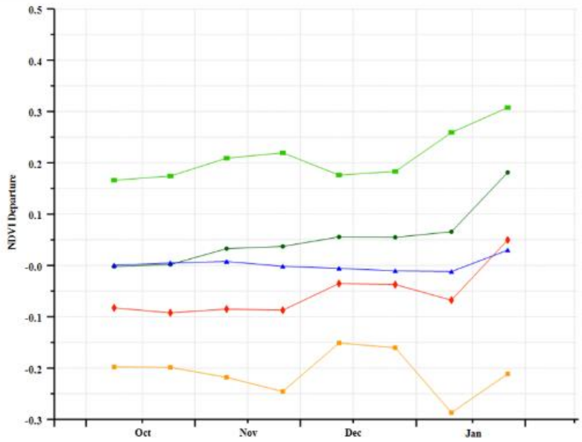




(b) Crop condition development graph based on NDVI

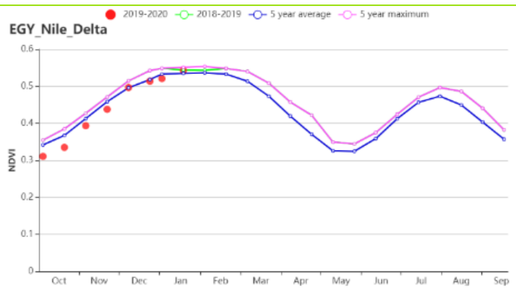
(c) Maximum VCI

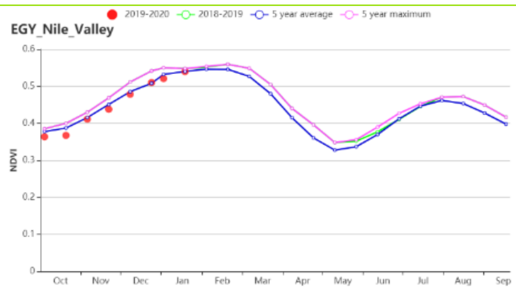




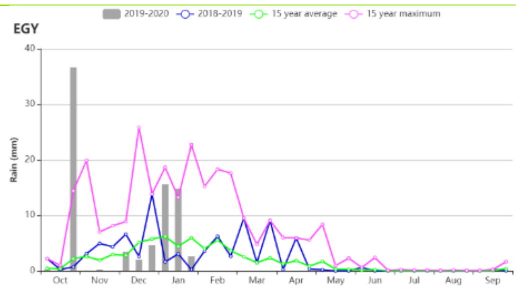
(d) Spatial NDVI patterns compared to 5YA

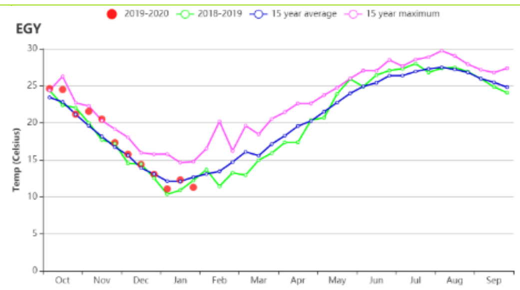
(e) NDVI profiles





(f) Crop condition development graph based on NDVI (Nile Delta (left) and Nile Valley (right))





(g) Time series profile of rainfall

(h) Time series profile of temperature

Table 3.21 Egypt's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)
Nile Delta and Mediterranean coastal strip	108	121	17.6	0.5	756	-0.5
Nile Valley	6	-39	17.4	0.6	881	-0.4

Table 3.22 Egypt's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m²)	Departure from 15YA (%)	Current (%)	Departure from 5YA (%)	Current
Nile Delta and Mediterranean coastal strip	203	-27	72	6	0.84
Nile Valley	128	16	82	10	0.95

[ETH] Ethiopia

This monitoring period covers the grain filling and harvest time for cereal crops grown during the main rainy season (meher). The major crops are wheat, teff and barley. At the national level, as compared to the average, CropWatch agroclimatic indicators show that the conditions were favorable, because rainfall was 72% above average during the October to January period. This may also benefit the production of maize during the belg (February to May) rainfall season in the central and southeastern parts of the country. Nationwide, there was a drop (-3%) in RADPAR. Total biomass production potential was above average (BIOMASS +12%), which is a positive indicator for livestock producers. CALF was above average (+3%) and maximum VCI was 0.97. The spatial NDVI patterns compared to the five-year average and corresponding NDVI departure cluster profiles indicate that NDVI was above average for 62.5% of arable land. In general, all the CropWatch indicators show favorable crop conditions. We expected a good production from the Meher season and good moisture availability for the upcoming belg season.

Regional Analysis

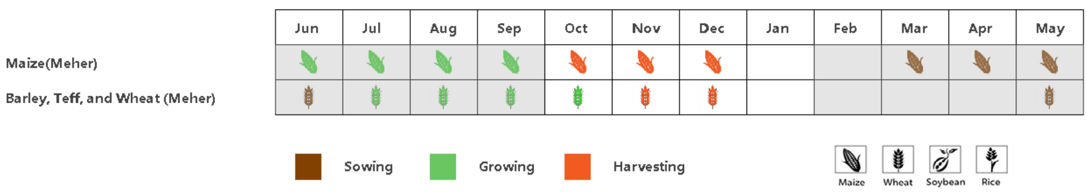
The main rain-fed cereal producing areas include the Southeastern mixed-maize zone, Western mixed maize zone, and the Central-northern maize-teff highlands zone.

In the **Southeastern mixed-maize zone** the total recorded rainfall reached 241 mm, which is 112% above average. In this zone, both TEMP and RADPAR were below average (0.3 °C and 10%, respectively). Because of the higher rainfall, the total biomass production was increased by 13% and CALF was above average by 9%. NDVI trends were also above average and VCI was at 1.06. All the indicators were favorable and we expect a good crop production.

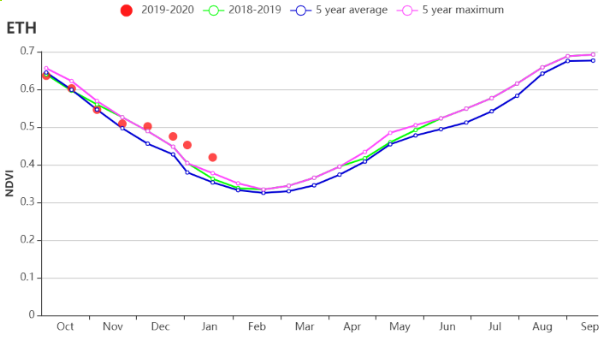
The **Western mixed maize zone** recorded a high rainfall total of 624 mm (+96%). In this zone, all CropWatch indicators except the temperature (TEMP -1.1°C) were above average. The RADPAR remained constant while CALF showed a slight increase of 1%. The total biomass production was above average by 4%, which is good for livestock production in this zone. According to the NDVI development graph crop conditions were close to average during October and subsequently increased to above average. A maximum VCI value of 1.01 was recorded. All CropWatch indicators concur in assessing crop and livestock feed conditions as favorable.

Finally, like the other zones, favorable weather conditions were observed in the **Central-northern maize-teff highlands** (RAIN +73%). in this zone, except for TEMP (-0.1°C) and the RADPAR (-3%), all CropWatch indicators were above average. The total biomass production was 16% above its five-year average. According to the NDVI profiles, crop conditions from October to the end of November were close to the average. In December and January, they were above average. The VCIx value was 0.96 in this zone. Overall, the conditions were favorable for crop and livestock production.

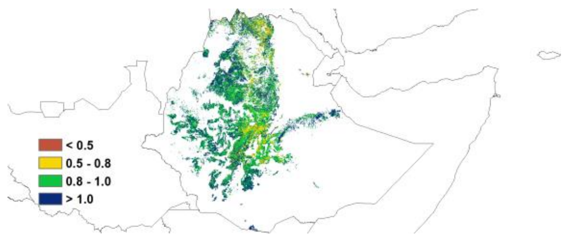
Figure 3.15 Ethiopia's crop condition, October 2019 - January 2020



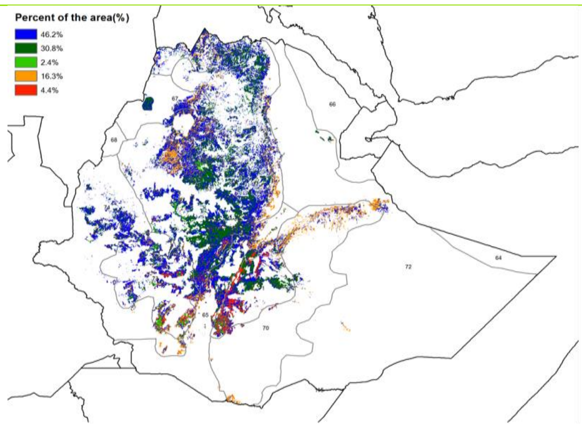
(a). Phenology of major crops



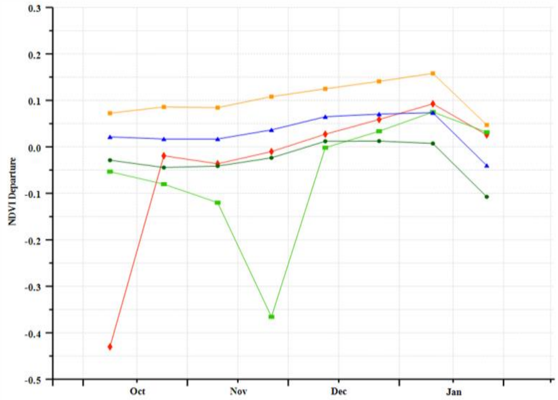
(b) Crop condition development graph based on NDVI



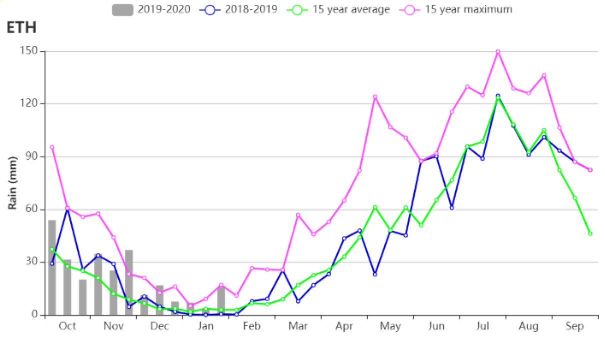
(c) Maximum VCI



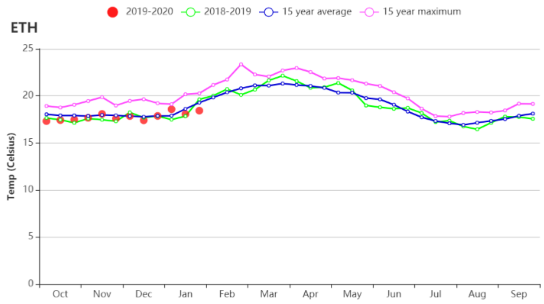
(d) Spatial NDVI patterns compared to 5YA



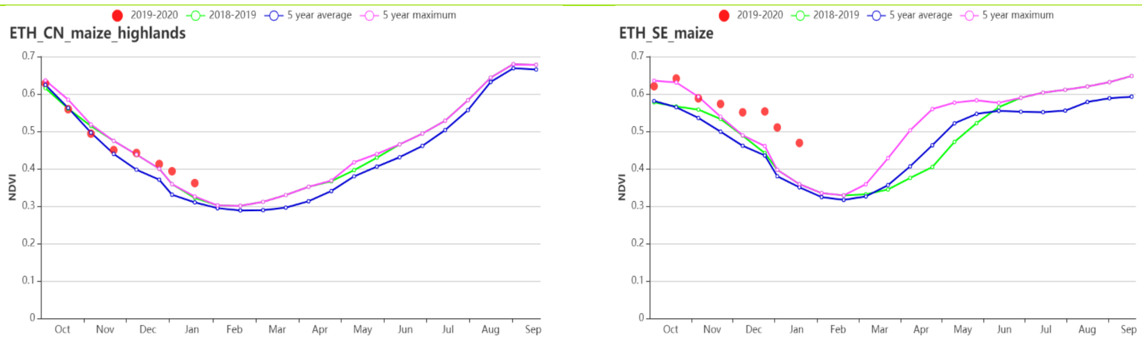
(e) NDVI profiles



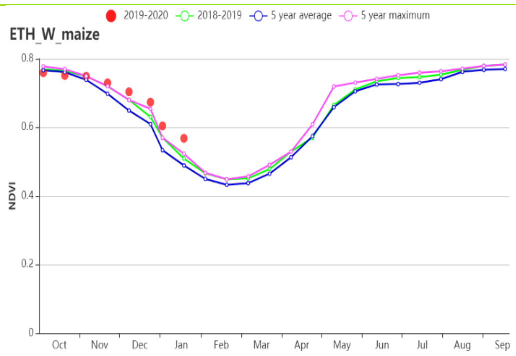
(f) Rainfall Index



(g) tempratrure index



(h) Crop condition development graph based on NDVI (central-northern maize-teff highlands (left) and south-eastern mixed maize zone (right))



(i) Crop condition development graph based on NDVI Western mixed maize zone

Table 3.23 Ethiopia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
South-eastern mixed maize zone	242	112	18.2	-0.3	1127	-10
Western mixed maize zone	624	96	20.5	-1.1	1247	0
Central-northern maize-teff highlands	141	73	17.0	-0.1	1327	-3

Table 3.24 Ethiopia's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current (%)	Departure from 5YA (%)	Current
South-eastern mixed maize zone	490	13	100	9	1.06
Western mixed maize zone	565	4	100	1	1.01
Central-northern maize-Teff highlands	372	16	92	2	0.96

[FRA] France

The monitoring period covers winter wheat sowing and early growth as well as the harvest of spring wheat and maize.

CropWatch agro-climatic indicators show that the temperature was 0.8°C higher as compared to the long-term average. RAIN was 39% above average, while sunshine (RADPAR) was 10% below. Due to unfavorable sunshine conditions, the biomass production potential (BIOMSS) is estimated to have decreased by 9% nationwide compared to the 15-year average.

The national-scale NDVI development graph shows that the NDVI values were higher than in the 2018-2019 season and the crop conditions were close to the 5-year average. The spatial patterns of NDVI departures compared to the five-year average indicate above-average NDVI values on 54.5% of the arable lands. This spatial pattern is also partly reflected with the spatial distribution of maximum VCI (VCIx) across the country, which reached an average of 0.95. Generally, the outlook for winter crops is above average.

Regional analysis

Taking into account cropping systems, climatic zones and topographic conditions, additional sub-national details are provided for eight agro-ecological zones. They are identified on the maps by the following numbers: (78) **Northern barley region**, (82) **Mixed maize/barley and rapeseed zone from the Center to the Atlantic Ocean**, (79) **Maize-barley and livestock zone along the English Channel**, (80) **Rapeseed zone of eastern France**, (75) **Massif Central dry zone**, (81) **Southwestern maize zone**, (76) **Eastern Alpes region**, and (77) the **Mediterranean zone**.

In the Northern barley region, both RAIN (+25%) and TEMP (+0.6 °C) were above the long-term average, while RADPAR (-7%) was below. Higher than normal rainfalls decreased sunshine that in turn reduced BIOMSS (-10%). The NDVI profile was similar to the previous season's levels, but below the five-year average.

In the Mixed maize/barley and rapeseed zone from the Center to the Atlantic Ocean, environmental conditions were favorable as the VCIx reached 0.92. Compared to the 15-year average, a significant drop in BIOMSS (-12%) was estimated. RAIN and TEMP were increased by 40% and 0.8 °C, respectively, whereas RADPAR dropped by 14%.

In the Maize-barley and livestock zone along the English Channel, substantial variability was observed in the region's NDVI profile. It was generally below average for this period and indicated a similar crop growth level as in last year. RAIN in the region increased by 33% while the RADPAR decreased by 8%. A relative high VCIx (0.96) but a drop in BIOMSS (-11%) indicated slightly below-average crop conditions.

In the Rapeseed zone of eastern France, below-average to average crop conditions was observed in Oct and Nov 2019 evidenced by the NDVI profile. From Dec 2019 and onward the profile was showing an above average trend indicating favorable conditions. Overall, RAIN and TEMP were increased by 23% and 1.1°C, while RADPAR dropped by 12%. BIOMSS dropped by 12% as well when compared to the five-year average.

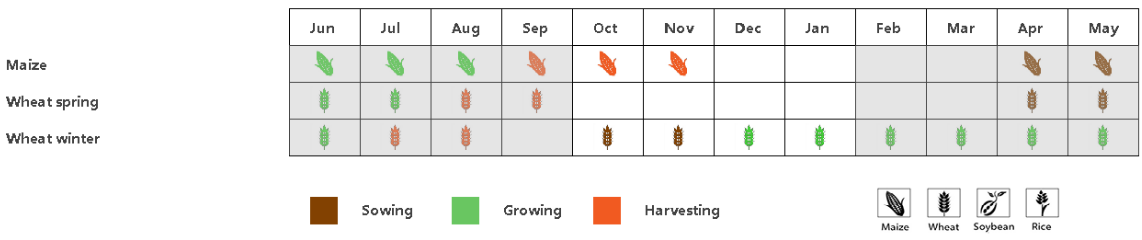
In the Massif Central dry zone, the VCIx was recorded at a relative high level (0.98) and the NDVI profile was showing an average to above average level, indicating normal or above normal crop conditions. The RAIN and TEMP in the region increased by 37% and 1.1°C, while RADPAR decreased by 14%. BIOMSS decreased by 14% as well when compared to the five-year average.

In the southwestern maize zone, RAIN (+49%) and TEMP (+0.9 °C) were also higher, whereas RADPAR (-11%) and BIOMSS (-12%) were lower. The NDVI profile was below the previous season level but close to the five-year average, indicating a close to average crop condition for the region.

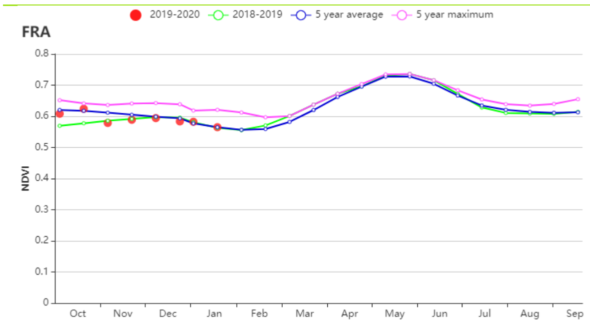
In the Eastern Alpes region, the NDVI profile showed close to average crop conditions since the end of Dec, 2019. Before that, the NDVI profile was below the average level. The region showed the largest increase in RAIN (+56%) and a 1.0°C rise in TEMP. It also showed a relative low decrease in RADPAR (-8%) and BIOMSS (-4%). Such environmental condition tends to favor crop growth, which also indicated with the relative high VCIx (0.95).

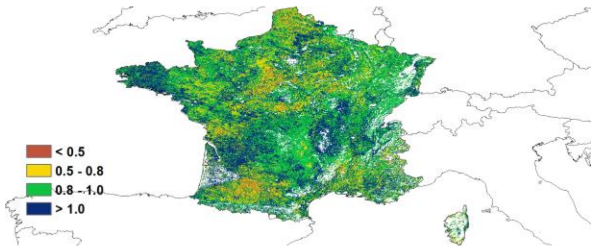
The Mediterranean zone is the only region showing an increased BIOMSS (2%). The NDVI profile also confirms slightly above average crop conditions. RAIN in the region increased by 55%, and also the TEMP increased by 0.7 °C. It is also the region that showed the lowest drop in RADPAR (-5%).

Figure 3.16 France's crop condition, October 2019 - January 2020



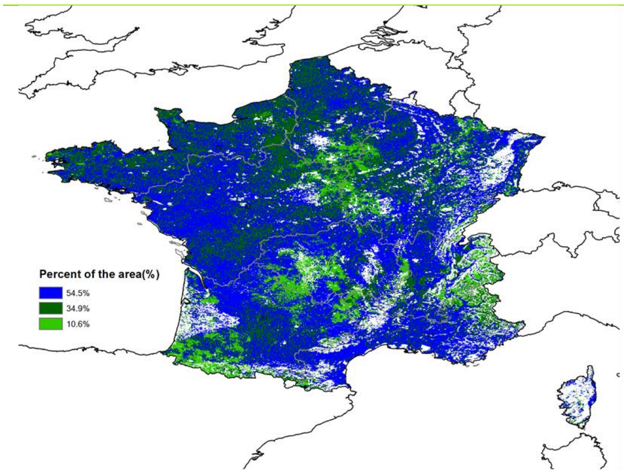
(a). Phenology of major crops

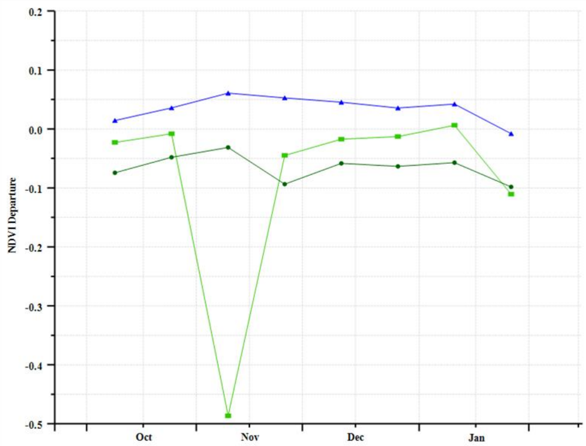




(b) Crop condition development graph based on NDVI

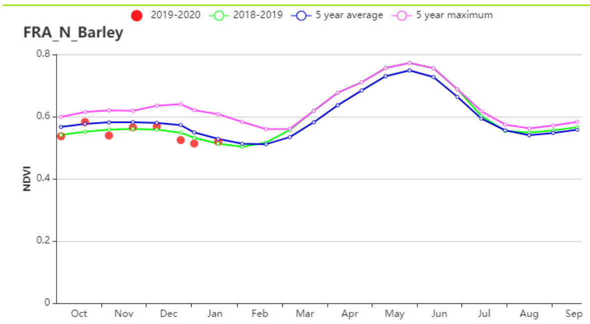
(c) Maximum VCI

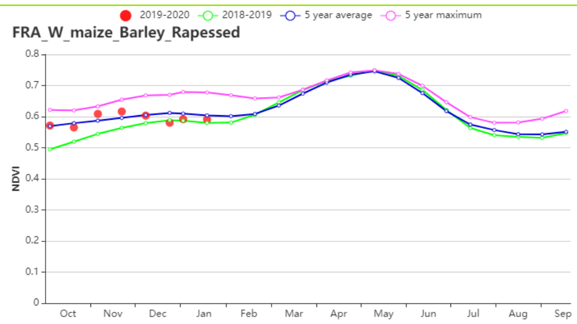




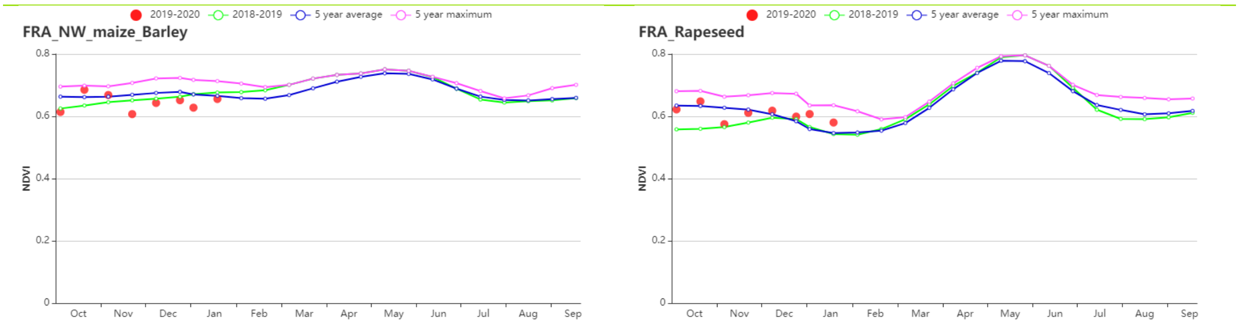
(d) Spatial NDVI patterns compared to 5YA

(e) NDVI profiles

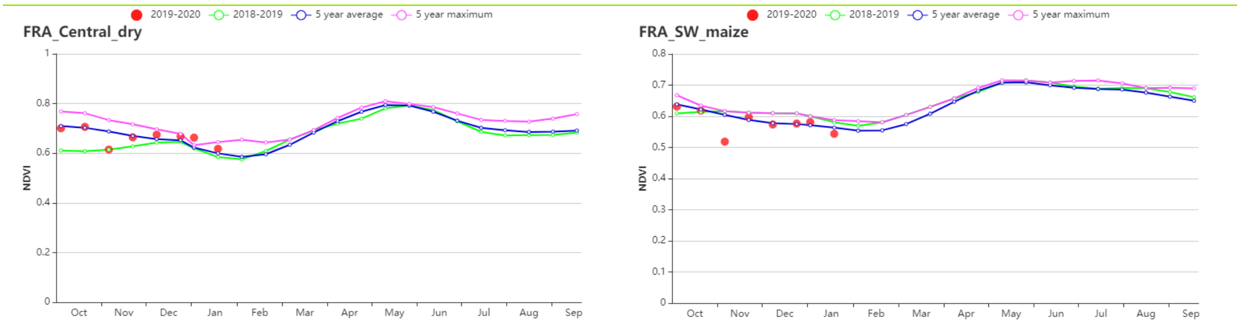




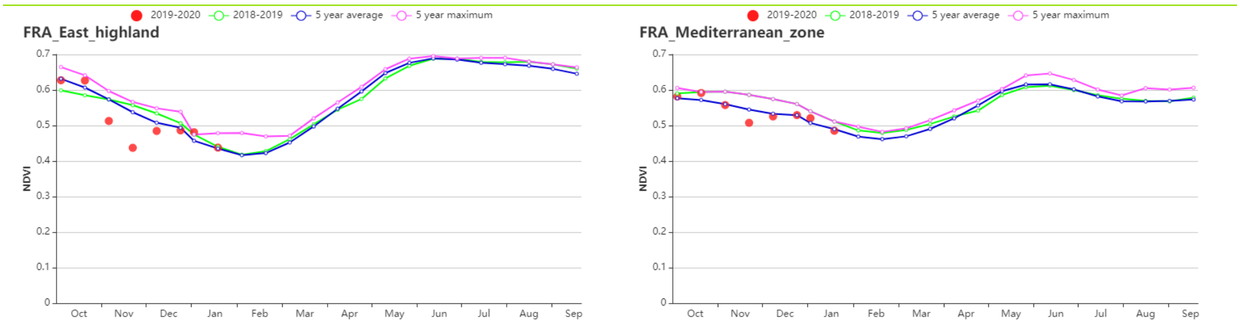
(f) Crop condition development graph based on NDVI (Northern barley region (left) and Mixed maize, Barley and Rapeseed zone (right))



(g) Crop condition development graph based on NDVI (Maize, barley and livestock zone (left) and Rapeseed zone (right))



(h) Crop condition development graph based on NDVI (Dry Massif Central zone (left) and Southwest maize zone (right))



(i) Crop condition development graph based on NDVI (Eastern Alpes region (left) and Mediterranean zone (right))

Table 3.25 France's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Northern Barley zone	420	25	7.4	0.6	227	-7
Mixed maize/barley and rapessed zone from the Centre to the Atlantic Ocean	491	40	8.8	0.8	270	-14
Maize barley and livestock zone along the English Channel	520	33	8.5	0.2	241	-8
Rapeseed zone of eastern France	491	23	6.3	1.1	253	-11
Massif Central Dry zone	515	37	6.4	1.1	303	-14
Southwest maize zone	619	49	8.4	0.9	356	-11
Alpes region	733	56	4.8	1.0	361	-8
Mediterranean zone	615	55	7.6	0.7	435	-5

Table 3.26 France's agronomic indicators by sub-national regions, current season's value and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current (%)	Departure from 5YA (%)	Current
Northern Barley zone	59	-10	99.5	1.4	0.91
Mixed maize /barley and rapessed zone from the Centre to the Atlantic Ocean	76	-12	98	1.4	0.92
Maize barley and livestock zone along the English Channel	66	-11	99.9	0.1	0.96
Rapeseed zone of eastern France	62	-12	99.5	0.5	0.93
Massif Central Dry zone	74	-15	99.8	0.6	0.98
Southwest maize zone	99	-13	96	0.5	0.96
Alpes region	80	-4	95.3	1.2	0.95
Mediterranean zone	121	2	95.4	4.6	0.95

[GBR] United Kingdom

Summer crops have been harvested and winter crops (winter wheat, winter barley, and rapeseed) have been planted during the current reporting period. According to crop condition development graph, NDVI values were below average from October to January. Rainfall for the country were above average (RAIN, +9%), radiation were slightly below average (RADPAR, -3%) and temperatures were close to average (TEMP, -0.2°C). The below average radiation and unfavorable growing conditions resulted in the below average biomass (BIOMSS, -7%). The seasonal RAIN profile presents overall above average rainfall except mid-October, November and late January, while the seasonal TEMP profile shows that temperature was below average before mid-November, then above average or average from late November to January.

The national average VCIx was 0.90. CALF (99%) is unchanged compared to its five-year average. The NDVI departure cluster profiles indicate that: (1) 23.4% of arable land experienced slightly above average crop conditions, mainly including Southwest England and Scotland (East of Aberdeenshire); (2) 45.4% of arable land experienced below or slightly below average crop conditions, mainly including Southeast England (Hampshire and Kent)and Scotland (Aberdeenshire, Angus, Fife, East Lothian, Scottish Borders), Northeast England (Northumberland, County Durham), Yorkshire and the Humber, East Midlands (Lincoinshire), East of England (Norfolk); (3) 31.1% of arable land experienced slightly below average from October to Noveber, then fluctuating conditions from December to January, including Southeast England (West Sussex, East Sussex), East of England (Sufolk, Essex) and West Midland (Staffordshire, Warwickshire, Worcestershire). Altogether, the outputs for wheat in the country are expected to be below average.

Regional analysis

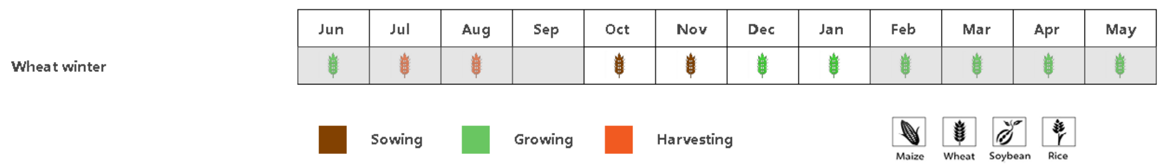
Based on cropping systems, climatic zones, and topographic conditions, three sub-national regions can be distinguished: 1) **Central sparse crop region**, 2) **Northern barley region**, and 3) **Southern mixed wheat and barley region**. The fractions of arable land (CALF) in all subregions are average compared to 5 years average.

The **Central sparse crop region** is one of major agricultural regions in terms of crop production. Rainfall was above average (RAIN +3%), radiation and temperature were below average (RADPAR, -2%; TEMP, -0.4°C), which resulted in the biomass estimates that were below average (BIOMSS, -6%). NDVI values were below or near the five-year maximum according to the region's crop condition development graph in October to January. The VCIx was at 0.94. Altogether, the conditions for wheat are expected to be below average.

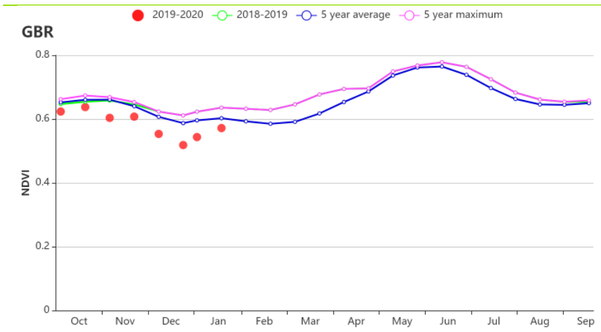
Northern barley region suffered the largest rain deficit (RAIN, -9%) in all the regions. Temperature were average (TEMP, -0.3°C) and radiation were above average (RADPAR, +2%). Biomass was slightly below average (BIOMSS, -1%). NDVI was below average according to the crop condition graphs in this reporting period. The VCIx was 0.92. Altogether, the output of wheat is expected to be on average.

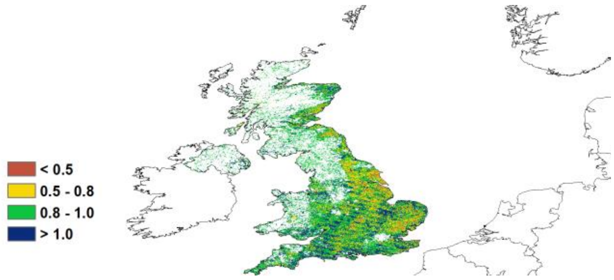
The largest rainfall excess (RAIN, +35%) was recorded in **Southern mixed wheat and barley zone**, while temperature was on average (TEMP,-0.2°C) and radiation was below average (RADPAR, -6%). The low radiation and excessive rainfall resulted in below average biomass (BIOMSS, -9%). NDVI was below average according to the crop condition graph in this period. The VCIx was 0.89, slightly less than the other regions. Altogether, the output of wheat is expected to be below average.

Figure 3.17 United Kingdom crop condition, October 2019 - January 2020



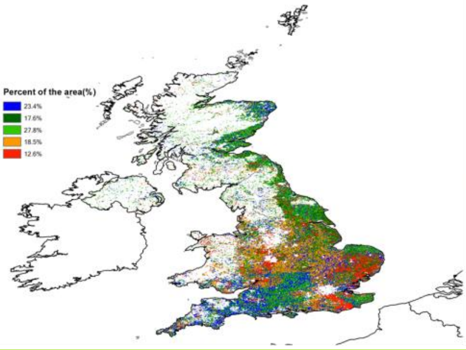
(a). Phenology of major crops

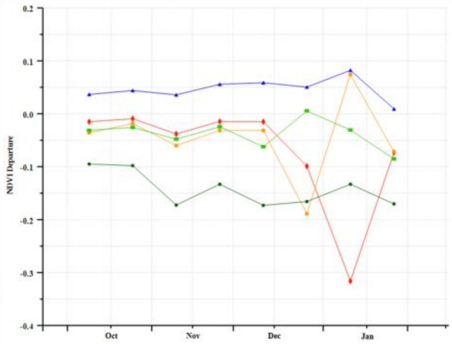




(b) Crop condition development graph based on NDVI

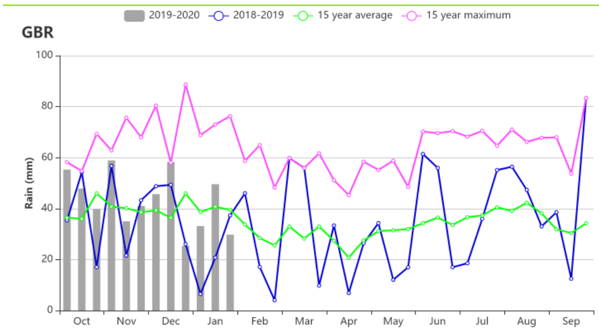
(c) Maximum VCI

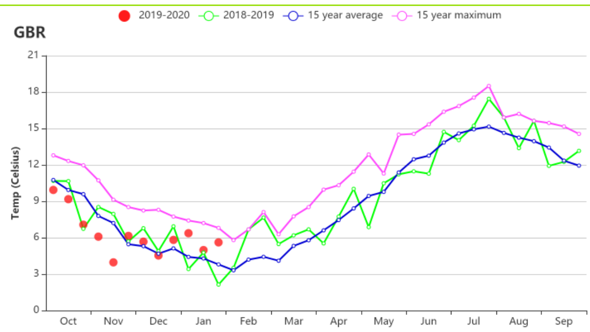




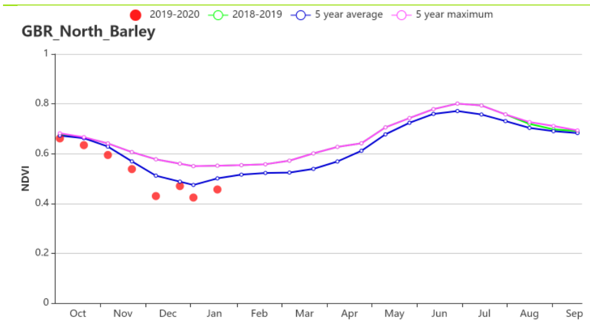
(d) Spatial NDVI patterns compared to 5YA

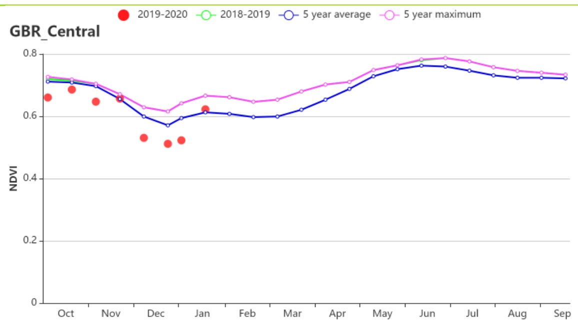
(e) NDVI profiles



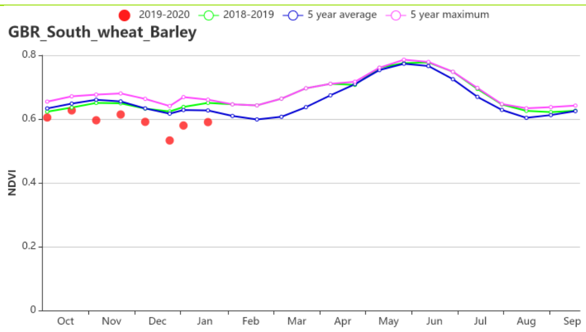


(f) Crop condition development graph based on NDVI (Sparse crop area of N England, Wales and N. Ireland (left) and Northern Barley region (right))





(g) Crop condition development graph based on NDVI (Northern Barley region (left) and Central sparse crop region (right))



(g) Crop condition development graph based on NDVI (Southern mixed wheat and Barley zone)

Table 3.27 United Kingdom's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Northern Barley area (UK)	558	-9	5.1	-0.3	131	2
Southern mixed wheat and Barley zone (UK)	539	3	6.2	-0.4	161	-2
Central sparse crop area (UK)	483	35	7.2	-0.2	186	-6

Table 3.28 United Kingdom's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current (%)	Departure from 5YA (%)	Current
Northern Barley area (UK)	29	-1	99	0	0.92
Southern mixed wheat and Barley zone (UK)	38	-6	100	0	0.94
Central sparse crop area (UK)	47	-9	99	0	0.89

AFG AGO ARG AUS BGD BLR BRA CAN DEU EGY ETH FRA GBR **HUN** IDN IND IRN ITA KAZ KEN KGZ KHM LKA MAR MEX MMR MNG MOZ NGA PAK PHL POL ROU RUS THA TUR UKR USA UZB VNM ZAF ZMB

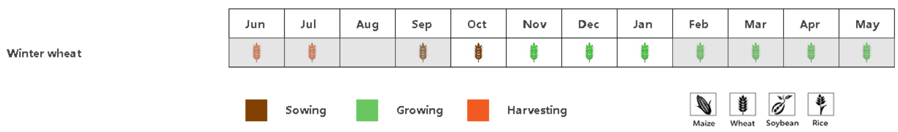
[HUN] Hungary

Winter crops (wheat and barley) were growing during this monitoring period.
The agro-climatic indicators of RADPAR and TEMP were above average: RADPAR +3.8%, and TEMP +1.6°C, which led to a 0.9% increase in BIOMSS compared with the fifteen-year average, while RAIN was below average by 15.5%. According to the national NDVI development graphs, crop condition was below average from October to late November but above average from December to January. Some spatial and temporal detail is provided by NDVI clusters: NDVI was above average throughout the monitoring period for 31.4% of arable land, below average for 45.0% of arable land in the Northern Great Plain such as Helves, Jasz-Nagykun-Szolnok, Bekes, and Szabolcs-Szatmar-Bereg. For the rest 23.6%, the NDVI was below average from October to November but above average from December to January in the Puszta region such as Jaz-Nagykum-Szolnok and Bekes.
With the maximum VCI value at the national level reaching 0.93 and the cropped arable land fraction (CALF) at 97% (above average 7% compared to the recent five-year average), crop condition is assessed as slightly above average.

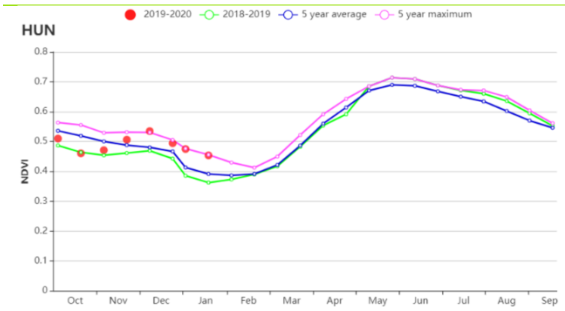
Regional analysis

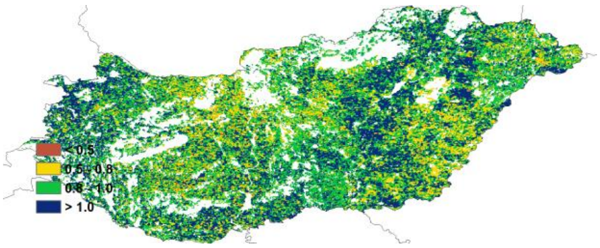
CropWatch has adopted four agro-ecological zones (AEZ) to provide a more detailed spatial analysis for the country. They include North Hungary, Central Hungary, the Puszta and Southern Transdanubia. Specific observations for the reporting period are included for each region.
Cultivated arable land (CALF) increased in all sub-regions: 5% in North Hungary region, 1% in Southern Transdanubia, and by 1% and 15% in Central Hungary and Puszta sub-regions, respectively.
Central Hungary is one of the major agricultural regions in terms of crop production. A sizeable share of winter wheat, maize and sunflower is planted in this region. The NDVI was below average from October to late November and above average from December to January. Agro-climatic conditions were above average for temperature and radiation (TEMP +1.4%; RADPAR +6%), and rainfall was below average (RAIN, -10%). Compared to the 15YA, the biomass production potential was below average (BIOMSS, -1%) while VCIx reached 0.9. The crop production in this region is expected to be close to average.
Northern Hungary is another important winter wheat region where 5 to 8% of the national winter wheat, and 1 to 4% of maize are grown.The NDVI was below average from October to late November and above average from December to January. The temperature (TEMP +1.4°C), and radiation (RADPAR +3%) were little above average while the accumulated rainfall (RAIN -10%) was below average, resulting in a biomass production potential decrease in this region (BIOMSS -10%). The VCIx was favorable at 0.96. The crop production in this region is expected to be below but close to average.
The Puszta region grows mostly winter wheat, maize and sunflower especially in the counties of Jaz-Nagykum-Szolnok and Bekes. According to the crop condition graph, NDVI values were below average from October to late November and above average from December to January. The biomass potential decreased by 5% due to low rainfall and little increase radiation (RAIN -28% and RADPAR +5%); temperature was close to average (TEMP +1.7°C). The maximum VCIx reached 0.95, indicating a good crop.
Southern Transdanubia cultivates winter wheat, maize and sunflower, mostly in Somogy and Tolna counties while smaller areas are planted in northern Transdanubia. All agro-climatic indicators were as follows: RAIN -11%, TEMP +1.5°C and RADPAR +2%, while BIOMSS increased by 11%. The maximum VCI (0.93) stands for good crops in the Transdanubia region.

Figure 3.18 Hungary's crop condition, October 2019 - January 2020.

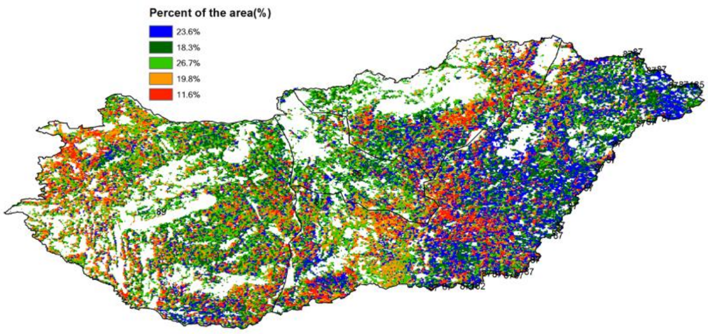


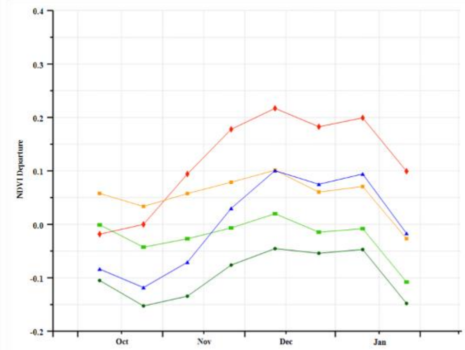
(a). Phenology of major crops



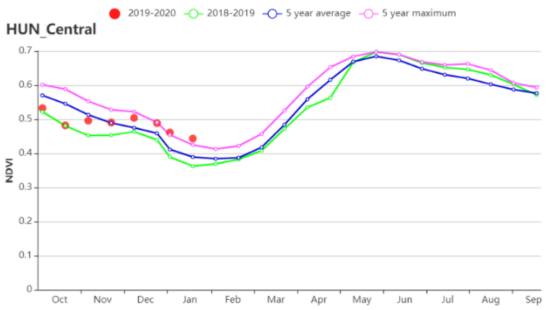


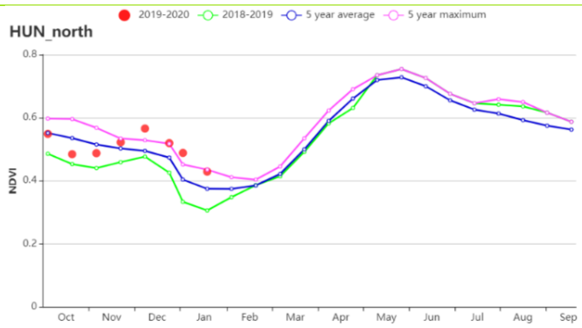
(b) Crop condition development graph based on NDVI (c) Maximum VCI



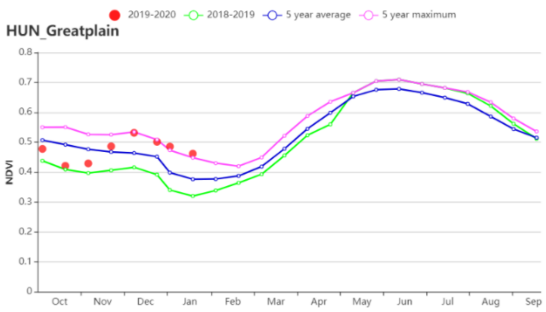


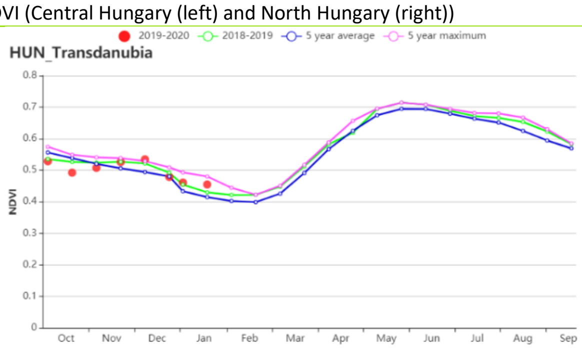
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles





(f) Crop condition development graph based on NDVI (Central Hungary (left) and North Hungary (right))





(g) Crop condition development graph based on NDVI (Great Plain (left) and Western Transdanubia (right))

Table 3.29 Hungary's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Central Hungary	196	-10	5.9	1.4	359	6
North Hungary	220	-1	5	1.4	324	3
Great Plain	169	-28	6.4	1.7	362	5
Transdanubia	212	-11	6	1.5	361	2

Table 3.30 Hungary's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current (%)	Departure from 5YA (%)	Current
Central Hungary	78	-1	98	1	0.9
North Hungary	65	-10	98	5	0.96
Great Plain	76	-5	97	15	0.95
Transdanubia	90	11	96	1	0.93

[IDN] Indonesia

From October 2019 to January 2020, the harvest of the secondary maize was completed and the main season maize was sown in Java and Sumatra; Correspondingly, main season rice was planted while the second rice in Java reached maturity and was harvested. Rainfall (RAIN, -11%) was below average while temperature (TEMP, +0.2℃) and radiation (RADPAR +9%) were slightly above, which led to an increase of biomass production potential (BIOMSS, 6%). Crop condition was slightly below average as shown in the NDVI development graph. Spatially, crop condition in 39.6% of the cropped area was close to average. In 11.7% of cultivated area, mostly located in Sumatera Barat, Sumatera Selatan, Jambi, Sumatera Barat and Riau, crop conditions were slightly below average at be beginning of this period but continued to deteriorate to significantly below average. Crop condition on 18.9% cropland, the condition was significantly below average. However, they recovered to slightly below average afterward. Considering that the area of cropped arable land (CALF) in the country was average compared with the five-year average and the VCIx value of 0.95, the crop condition is nevertheless anticipated to be slightly below average.

Regional analysis

The analysis below focuses on four agro-ecological zones, namely **Sumatra** (92), **Java** (90, the main agricultural region in the country), **Kalimantan and Sulawesi** (91) and **West Papua** (93), among which former three are relevant for crops cultivation. The numbers correspond to the labels on the VCIx and NDVI profile maps.

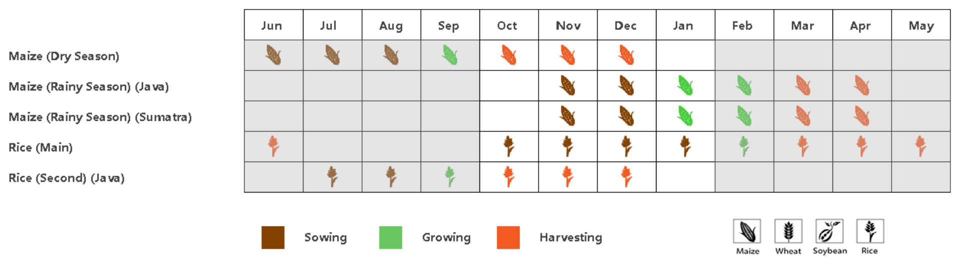
The weather over **Java** was relatively dry. RAIN was below average (-38%), whereas radiation (RADPAR +10%) and temperature (TEMP,+0.6℃) were above average, resulting in close to average (+3%) biomass production potential. According to the NDVI development graph, crop condition was below the 5-year average. Overall, the crop conditions in Java are assessed as fair.

Kalimantan and Sulawesi experienced the same patterns as the rest of the country: Rainfall (RAIN, -8%) was below average while temperature (TEMP, +0.1℃) and radiation (RADPAR +9%) were slightly above, which led to an increase of biomass production potential (BIOMSS, 7%). According to the NDVI development graph, crop conditions were slightly below the 5-year average except for the end of October and January. Overall, the crop conditions were close to average.

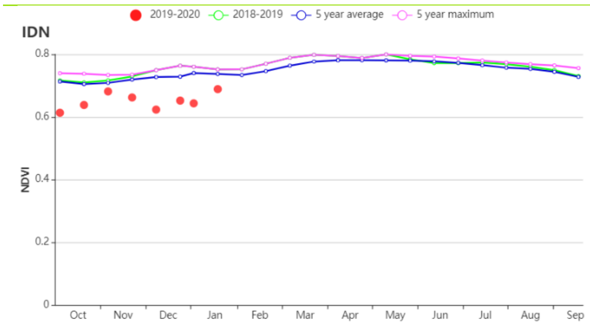
The slightly below average rainfall (RAIN -7%) in **Sumatra** was accompanied by above average radiation (+9% departure) and temperature (+0.3℃ departure) , which resulted in slightly above average biomass production potential (BIOMSS +8%). According to NDVI development graphs, crop condition was slightly below the 5-year average except for the end of October. The crop condition in Sumatra was close to average.

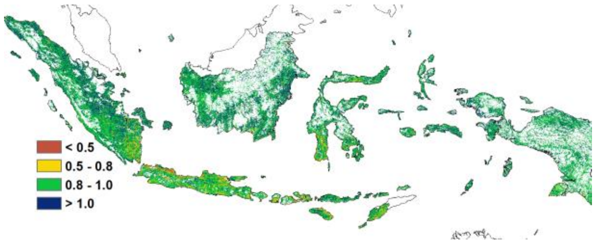
Considering that all the arable land was cultivated and enough water (RAIN, 1250 mm), though slightly less than the five-year average, was available for the crops, CropWatch assesses the conditions of crops slightly below average.

Figure 3.19 Indonesia's crop condition, October 2019 - January 2020



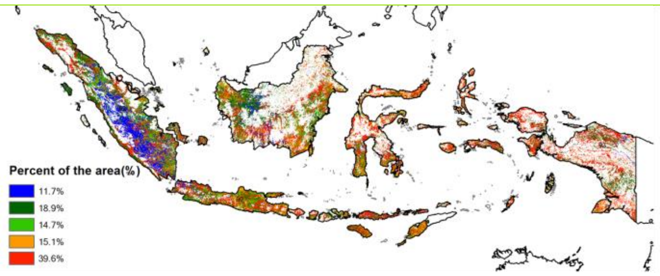
(a). Phenology of major crops

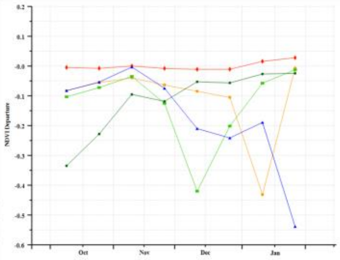




(b) Crop condition development graph based on NDVI

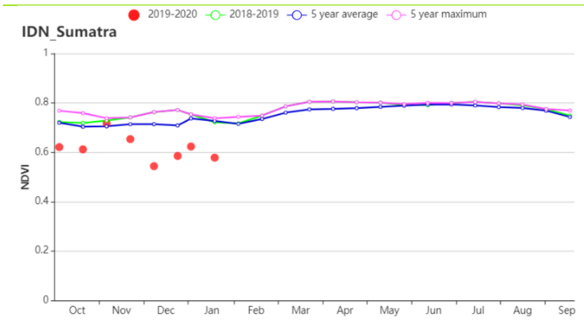
(c) Maximum VCI

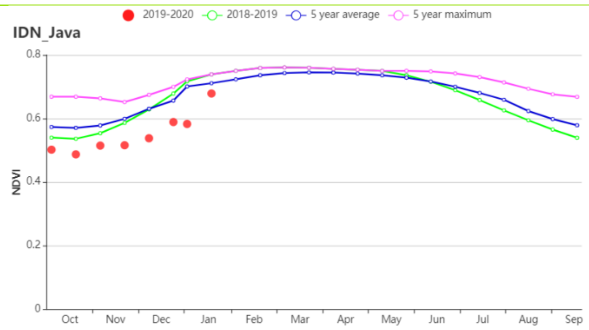




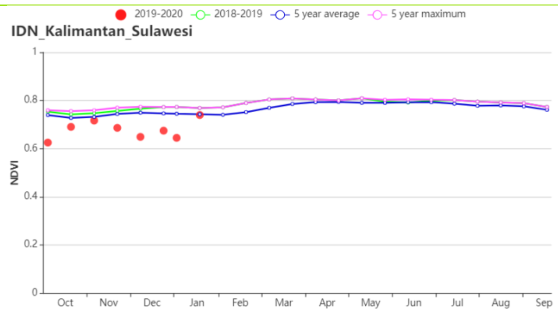
(d) Spatial NDVI patterns compared to 5YA

(e) NDVI profiles





(f) Crop condition development graph based on NDVI (Sumatra (left) and Java (right))



(g) Crop condition development graph based on NDVI (Kalimantan-Sulawesi)

Table 3.31 Indonesia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA(%)	Current (°C)	Departure from 15YA(%)	Current (MJ/m^2)	Departure from 15YA(%)
Java	750	-38	25.8	0.6	1323	10
Kalimantan and Sulawesi	1180	-8	24.6	0.1	1229	9
Sumatra	1371	-7	24.3	0.3	1140	9
West Papua	1436	-13	23.5	0.2	1116	9

Table 3.32 Indonesia's agronomic indicators by sub-national regions, current season's value and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA(%)	Current (%)	Departure from 5YA(%)	Current
Java	817	3	96	-1	0.87
Kalimantan and Sulawesi	799	7	100	0	0.97
Sumatra	739	8	100	0	0.96
West Papua	710	6	100	0	0.97

AFG AGO ARG AUS BGD BLR BRA CAN DEU EGY ETH FRA GBR HUN IDN **IND** IRN ITA KAZ KEN KGZ KHM LKA MAR MEX MMR MNG MOZ NGA PAK PHL POL ROU RUS THA TUR UKR USA UZB VNM ZAF ZMB

[IND] India

This monitoring period (October 2019-January 2020) covers the late growth and harvest of Kharif (summer) maize, rice and soybean and the planting and early growth of Rabi (winter) rice and wheat. The graph of NDVI development shows that crop growth during this monitoring period was higher than the average level in previous years; especially from December 2019 to January 2020, the difference between the NDVI value and the average level continued to increase.

At the national scale, affected by the monsoon rainy season, India continued to have rainfall in October and November. The rainfall during this monitoring period was much higher than the 15YA average (+76%). RAIN in 26 states of India exceeded the 15-year average, in 8 agro-ecological regions it increased significantly, with large spatial differences: Deccan Plateau (+148%), Eastern coastal region (+35%), Gangetic plain (+81%), Assam and north-eastern region (+25%), Agriculture areas in Rajasthan and Gujarat (+357%), Western coastal region (+1139%), and the North-western dry region (+159%). Cumulative rainfall was much higher than the 15-year average, especially between October and November 2019. TEMP in India decreased by 0.3°C compared with the same period of the previous 15 years. Only Eastern coastal region remained unchanged, and the rest of the agro-ecological regions decreased. Compared with the 15-year average level, RADPAR for the whole of India also decreased by 7%.

At the country level, BIOMSS during this period was 37% above average of the past 15 years. Only in Assam and north-eastern region BIOMSS was lower than the 15-year average (-3%), where the increase in rainfall could not compensate the effect of decreasing temperature and sunshine. But the BIOMSS of remaining seven agro-ecological regions had increased significantly. This may be related to the heavy rainfall in the early part of the period. Although it caused the reduction of TEMP and RADPAR, the continuous rainfall in October and November 2019 increased the soil moisture required for planting and promoted the growth of crops. In addition, CALF increased by 7%, and the cultivated area expanded. However, the CALF in North-western dry region was lower than the 5-year average (- 40%). Heavy rain (+ 1139% relative to average) might have caused flooding and affected the sowing of cultivated land in the earlier period from Fig (L).

Overall, due to the abundant rainfall in the previous period, India's crop growth in this period is better than the average level in the previous year. The wheat production for the whole of India in this period may increase even if the North-western dry region might be lower than the average.

Regional analysis

India is divided into eight agro-ecological zones: the **Deccan Plateau** (94), the **Eastern coastal region** (95), the **Gangatic plain** (96), **Assam and north-eastern region** (97), **Agriculture areas in Rajasthan and Gujarat** (98), the **Western coastal region** (99), the **North-western dry region** (100) and the **Western Himalayan region** (101).

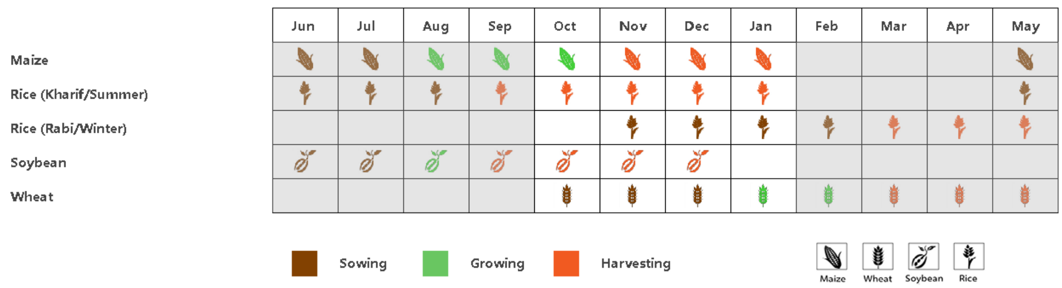
The five agro-ecological zones of the **Deccan Plateau**, the **Eastern coastal region**, the **Gangetic plain**, **Agriculture areas in Rajasthan and Gujarat**, and the **Western coastal region** have similar trends in agricultural indices. Compared to the same period of previous years, RAIN had increased significantly. Although TEMP and RADPAR were lower, abundant rainfall compensated for their effects and caused BIOMSS to be much higher than the 15-year average. At the same time, CALF also increased and the VCIx was higher than 1.04. The graph of NDVI development shows that the crop growth of the five agro-ecological regions during this monitoring period exceeded the 5-year maximum. Generally, the crop production is expected to be above average.

The **Assam and Northeastern region** recorded 395mm of RAIN (+25%), with slightly lower average TEMP at 16.4°C (-0.2°C) and RADPAR of 846 MJ/m² (-6%). BIOMSS was lower than the average (-3%). Increased rainfall was not enough to compensate for reduced temperature and sunshine. CALF reached 96% which was above average (+1%), and VCIx was 0.99. The outlook of crop production in this region is not promising.

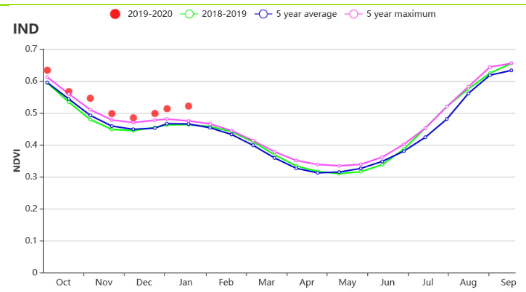
The **North-western dry region** recorded 129 mm of RAIN (+1139% much higher the average), with slightly below average TEMP at 20.9°C (-0.1°C) and RADPAR of 977 MJ/m² (-3%). BIOMSS was much higher than the average (+318%), and CALF reached 37% which is lower than average (-40%). Heavy rainfall might have caused flooding conditions and affected the sowing of cultivated land in the earlier period from Fig (L). The VCIx was 1.09. Therefore, although crops are growing better in the region, a large reduction in CALF will reduce crop production to below average.

The **Western Himalayan region** recorded 272 mm of RAIN (+159% higher the average), with much lower average TEMP at 10.4°C (-1.3°C) and RADPAR of 818 MJ/m² (-9%). The BIOMSS was higher than the average (+50%) due to the sufficient rainfall. CALF reached 97% which was above the 5-year average (+4%) and VCIx was 1.00. But crop condition as assessed by NDVI was close to the average. Generally, the crop production may be favorable.

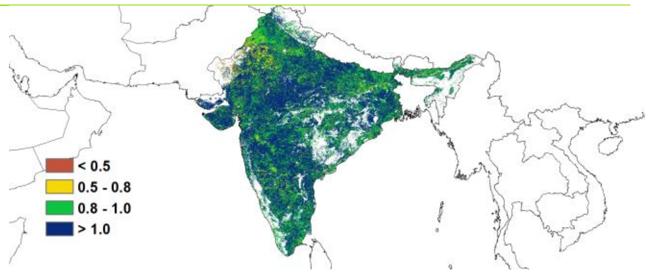
Figure 3.20 India's crop condition, October 2019 - January 2020



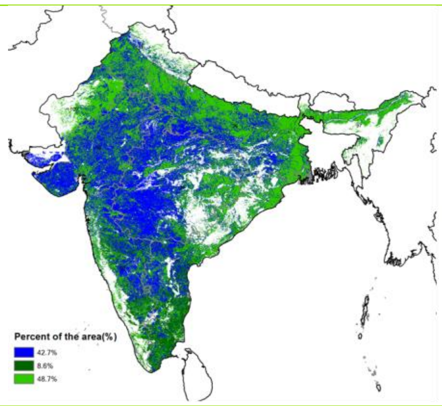
(a). Phenology of major crops



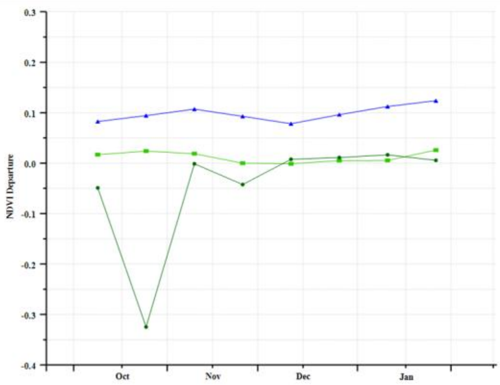
(b) Crop condition development graph based on NDVI



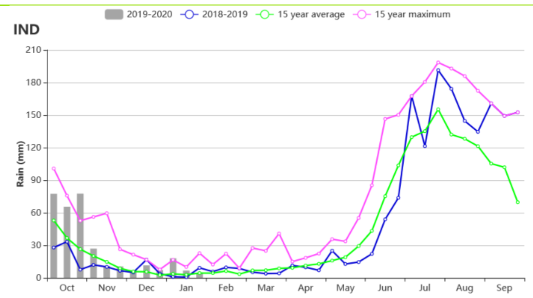
(c) Maximum VCI

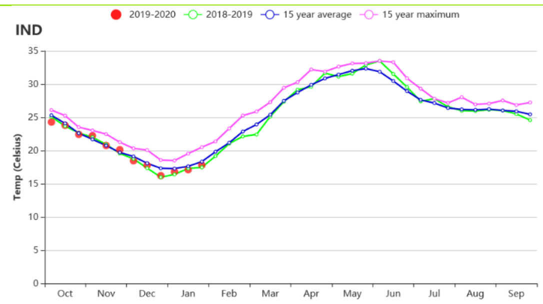


(d) Spatial NDVI patterns compared to 5YA

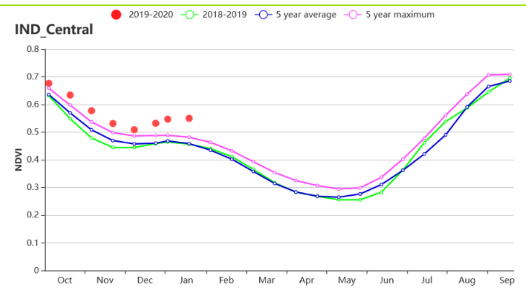


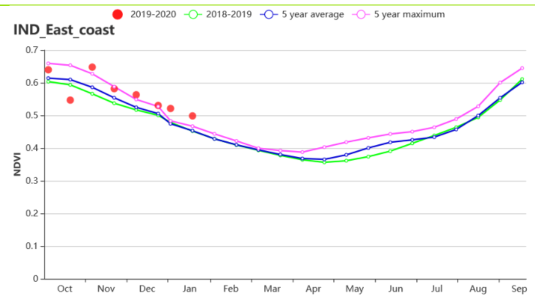
(e) NDVI profiles



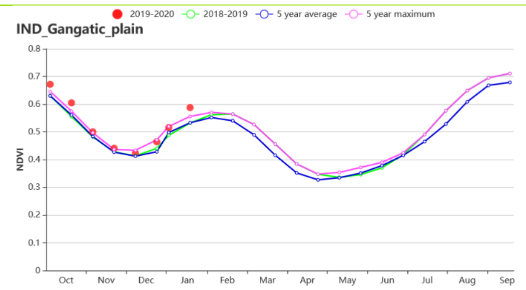


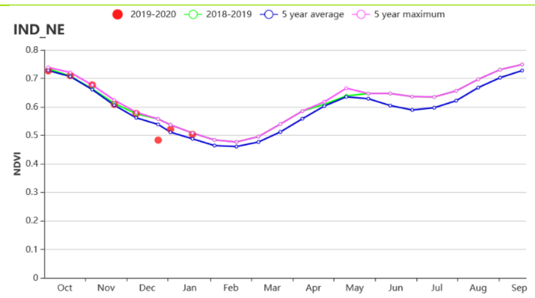
(f) Rainfall profiles (g) Temperature profiles



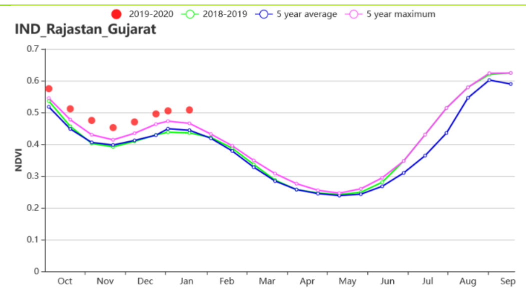


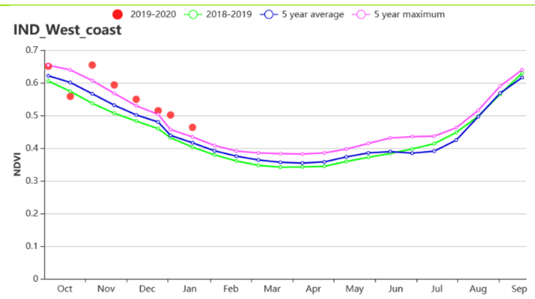
(h) Crop condition development graph based on NDVI (Deccan Plateau (left) and Eastern Coastal Region (right))



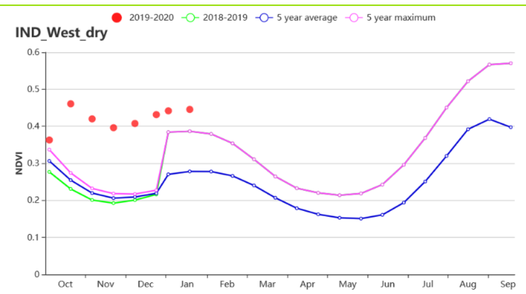


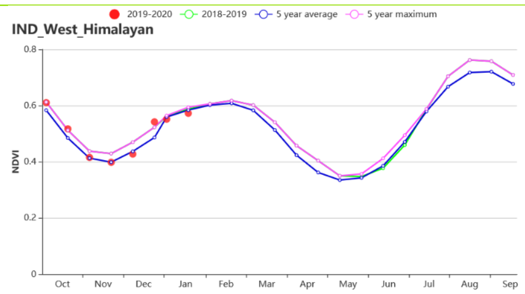
(i) Crop condition development graph based on NDVI (Gangatic Plains (left) and Assam and north-eastern regions (right))



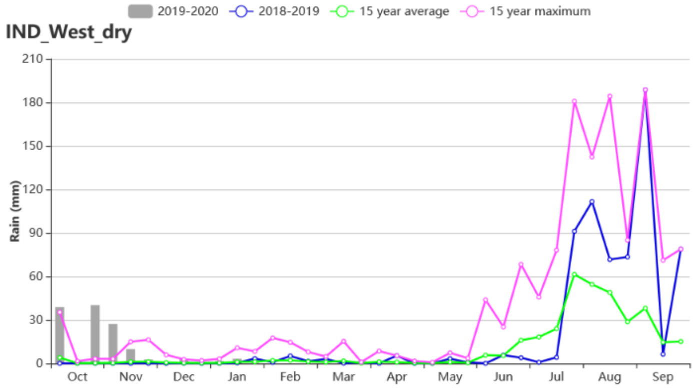


(j) Crop condition development graph based on NDVI (Agriculture areas in Rajastan and Gujarat (left) and Western Coastal Region (right))





(k) Crop condition development graph based on NDVI (North-western dry region (left) and Western Himalayan Region (right))



(L) Rainfall profiles of the North-western dry region

Table 3.33 India's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Deccan Plateau	231	148	20.0	-0.2	989	-8
Eastern coastal region	507	35	22.5	0.0	1063	-2
Gangatic plain	176	81	18.3	-0.6	907	-8
Assam and north-eastern regions	395	25	16.4	-0.2	846	-6
Agriculture areas in Rajastan and Gujarat	142	357	21.0	-0.7	986	-7
Western coastal region	630	93	23.2	-0.1	1067	-7
North-western dry region	129	1139	20.9	-0.1	977	-3
Western Himalayan region	272	159	10.4	-1.3	818	-9

Table 3.34 India's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current (%)	Departure from 5YA (%)	Current
Deccan Plateau	376	43	100	2	1.09
Eastern coastal region	560	7	99	5	1.06
Gangatic plain	303	29	99	3	1.04
Assam and north-eastern regions	330	-3	96	1	0.99
Agriculture areas in Rajastan and Gujarat	418	182	95	19	1.09
Western coastal region	543	17	99	8	1.06
North-western dry region	394	318	37	-40	1.09
Western Himalayan region	205	50	97	4	1.00

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[IRN] Iran

During the monitoring period, crop condition was generally above average except for January according to the NDVI profile. The planting of winter wheat was completed in November. Radiation and temperature were both slightly below average (RADPAR -3%, TEMP, -0.1°C), while abundant rainfall nourished the vegetation (RAIN, +22%). The favorable agro-climatic conditions resulted in an increase in the BIOMSS index by 22% comparing to the five-year average. The national average of maximum VCI index reached 0.92, and the Cropped Arable Land Fraction (CALF) increased by 32% compared to the recent five-year average.

According to the spatial distribution of NDVI profiles, approximately 44.4% of the cropland had very good crop condition during the whole monitoring period, mainly located in northwestern, northeastern, and western parts of Iran. The crop condition of roughly 25% of the croplands, marked in deep green, was quite favorable in October and November, and then glided until the end of the monitoring period. It is worth noticing that 8.1% of the croplands suffered from unfavorable crop condition, mainly distributed in northern region and some parts in western region, including the provinces of Ardabil, Gilan, Mazandaran, Luristan, and Isfahan.

Overall, the early crop condition for winter crops is favorable for the current season. The final outcome of the season will be determined by soil moisture in March when vegetative growth will resume.

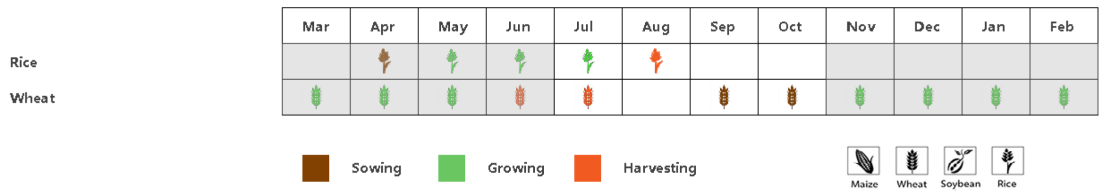
Regional analysis

Based on cropping systems, climatic zones and topographic conditions, three sub-national agro-ecological regions can be distinguished for Iran, among which two are relevant for crop cultivation. The two regions are referred to as **the Semi-arid to sub-tropical hills of the west and north** (75), and **the Arid Red Sea coastal low hills and plains** (74).

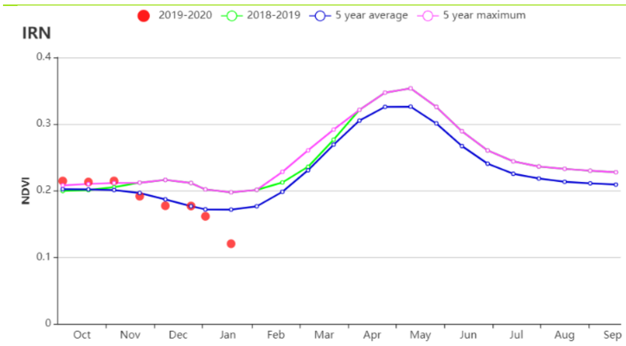
In **the Semi-arid to sub-tropical hills of the west and north region**, crop condition was very good at the beginning of the monitoring period, and the below average NDVI values might be related to the cloudy weather conditions. The accumulated rainfall was 227 mm (13% above average), temperature was slightly below average (TEMP -0.1°C) and radiation was also slightly below average (RADPAR -2%). The favorable weather conditions resulted in an increase of BIOMSS by 5% compared to the recent five-year average. The CALF increased by 17%, and the average VCIx (0.91) was high. The output will be quite favorable.

Crop condition in **the Arid Red Sea coastal low hills and plains region** was above average throughout the whole monitoring period, and crop condition in October even exceeded the five-year maximum. The region received 246 mm rainfall during this report period. The far above average rainfall (RAIN, +72%) and average temperature resulted in a significant 72% increase of BIOMSS. The CALF increased by 121% comparing to five-year average, reflecting that more land was cultivated. The average VCIx (1.05) of this region reached the five-year maximum. Therefore, the crop conditions for this season are expected to be very favorable.

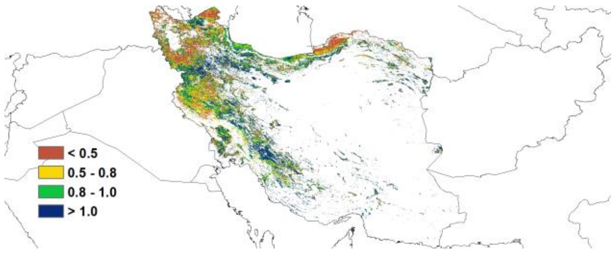
Figure 3.21 Iran's crop condition, October 2019 - January 2020



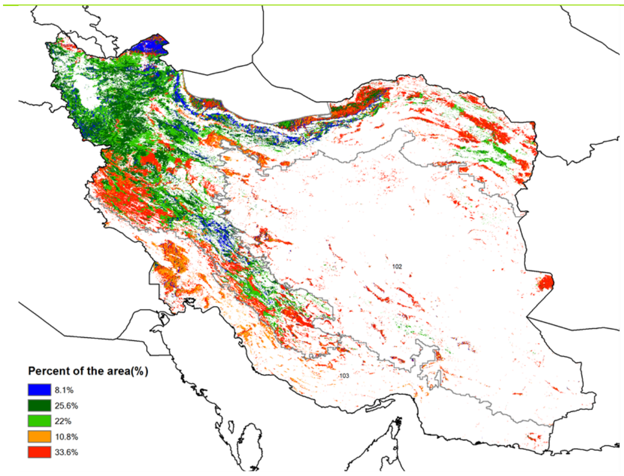
(a) Phenology of major crops



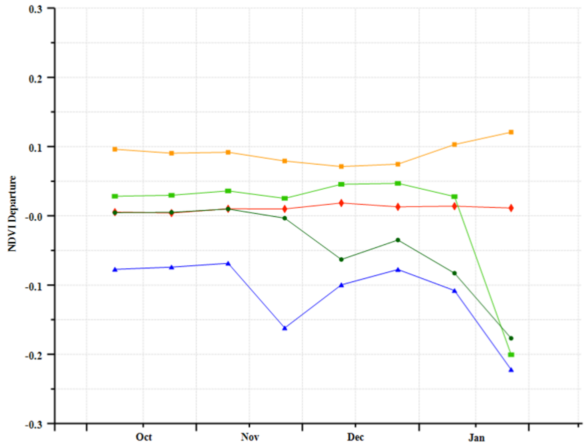
(b) Crop condition development graph based on NDVI



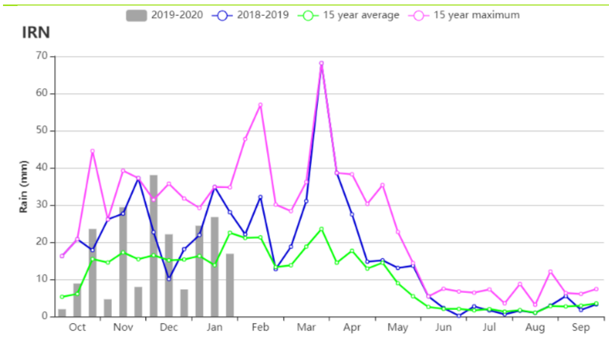
(c) Maximum VCI



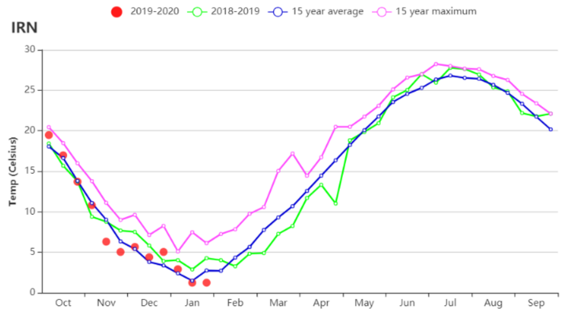
(d) Spatial NDVI patterns compared to 5YA



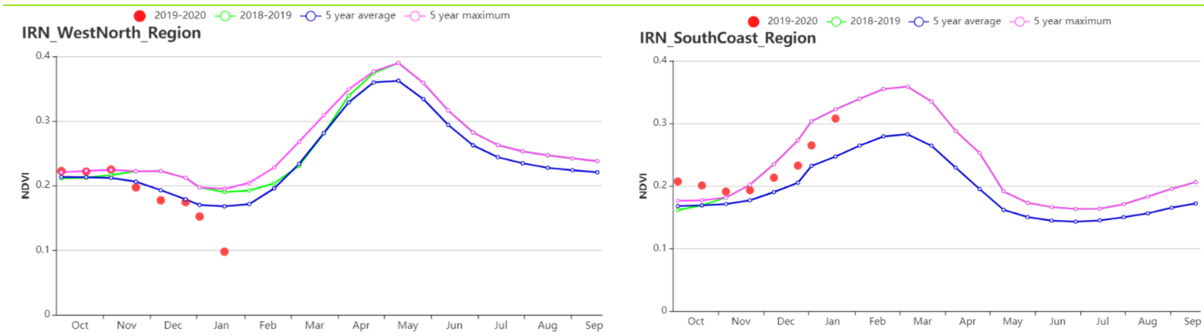
(e) NDVI profiles



(f) Rainfall profiles



(g) Temperature profiles



(h) Crop condition development graph based on NDVI (Semi −arid to sub −tropical hills of the west and north region (left) and Arid Red Sea coastal low hills and plains region (right))

Table 3.35 Iran's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Semi-arid to sub-tropical hills of the west and north	227	13	5.6	-0.1	718	-2
Arid Red Sea coastal low hills and plains	246	72	18.5	0	833	-3

Table 3.36 Iran's agronomic indicators by sub-national regions, current season's value and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current (%)	Departure from 5YA (%)	Current
Semi-arid to sub-tropical hills of the west and north	153	5	10	17	0.91
Arid Red Sea coastal low hills and plains	330	72	24	121	1.05

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[ITA] Italy

The 2019-20 winter wheat crop was sown in October. Generally, according to the NDVI development graph, crop conditions were below the values of the previous year, but very close to the average of the past five years from October to January. CropWatch agro-climatic indicators show above average Rainfall (+20%), TEMP (+0.8°C) and RADPAR (+1%). With CALF up by 5%, BIOMSS increased by 0.7% and VCIx was 0.95. Some spatial and temporal detail is provided by the NDVI clusters: NDVI was above average throughout the monitoring period on 23.6% of arable land in Northern Italy, and below average on 18.6% in Eastern Italy. In Southern Italy (about 19.5% of arable land) crop condition was below average from October to November and above average from December to January. About 36.6% of arable land was above average from October to November and below average from December to January. A small fraction, about 1.7% of arable land, was below average in November, but then improved to close to average conditions. The overall crop condition in the country is assessed as favorable.

Regional analysis

Based on cropping systems, climatic zones and topographic conditions, four sub-national regions can be distinguished for Italy; they include Eastern Italy, Northern Italy, Southern Italy (Sicily) and Western Italy (including Sardinia).The index of cultivated arable land (CALF) compared to previous years in all sub-regions was as follows: decreased by 3% in Eastern Italy region, increased by 12% in Northern Italy, increased by 1% in Western Italy and increased by 8% in Southern Italy sub-regions.

Eastern Italy experienced above average rain (RAIN +36%), below average TEMP (-1.5°C) and RADPAR (-13%). As a consequence, BIOMSS decreased by 27% compared with the averages (5YA). VCIx was 0.81. The crop condition development graph indicates that NDVI exceeded the values of last year from October to late November, but was below the 5 years average. After November NDVI was consistent with the values of the previous year. Average production is expected.

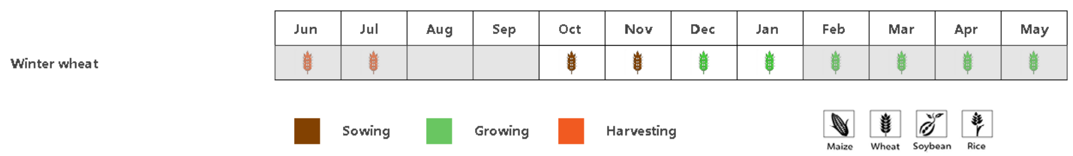
Crop production in **Northern Italy** was affected by high rainfall, with RAIN up by 57% compared to average, slightly below average TEMP (-0.1°C) and average RADPAR. BIOMSS was below the 5YA by 12% and VCIx reached 0.98. The crop condition development graph indicates higher values than during last year, reaching the average of 5 years from November to January. According to the agro-climatic indicators, above average output is expected.

Southern Italy recorded above average precipitation (RAIN +7%), TEMP (+0.9°C) and RADPAR (+8%). BIOMSS increased by 8% compared with the average (5YA). VCIx was 0.87. NDVI was below average throughout the monitoring period. The crop production in this region is expected to be close to average.

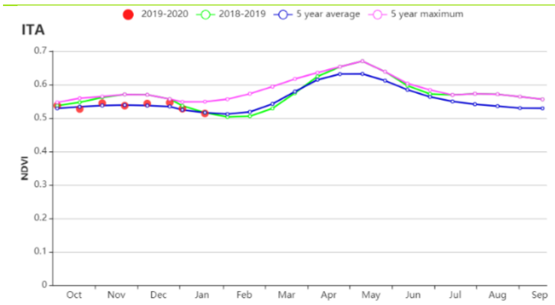
In **Western Italy**, precipitation was 3 % above average (RAIN +3%). RADPAR (+7%) and TEMP (+1.4°C) were also above average, which resulted in a biomass production potential increase in this region (BIOMSS +13%). The NDVI was below average from October to late November and above average from December to January. VCIx reached 0.97. CropWatch expects above average production.

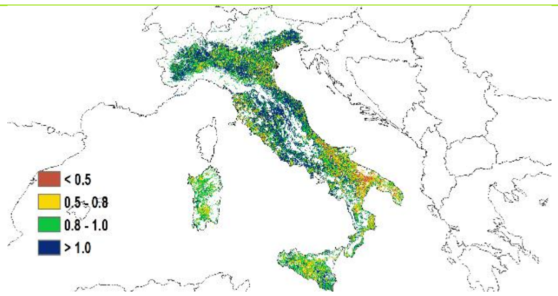
Overall, prospects for winter crops are promising.

Figure 3.22 Italy's crop condition, October 2019 - January 2020.



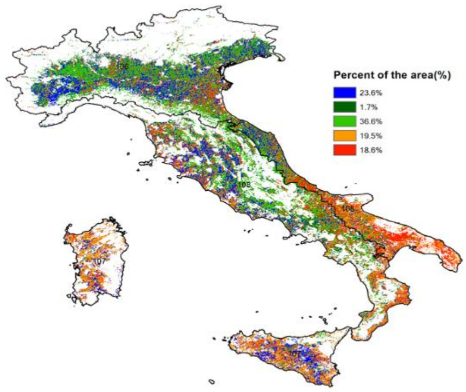
(a). Phenology of major crops

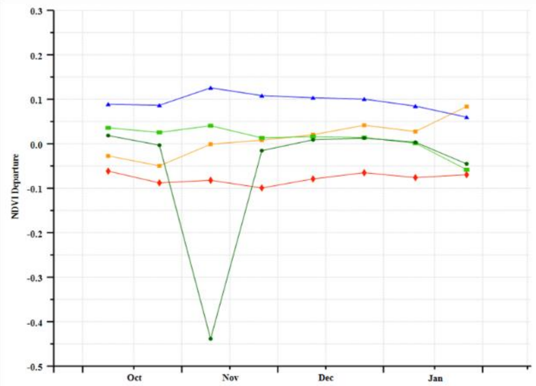




(b) Crop condition development graph based on NDVI

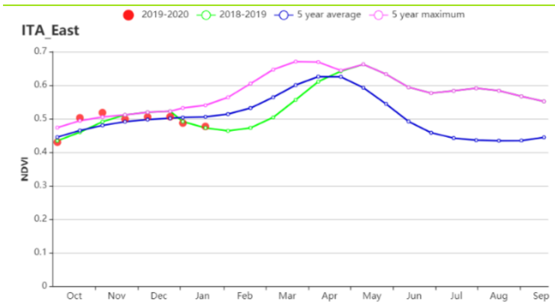
(c) Maximum VCI

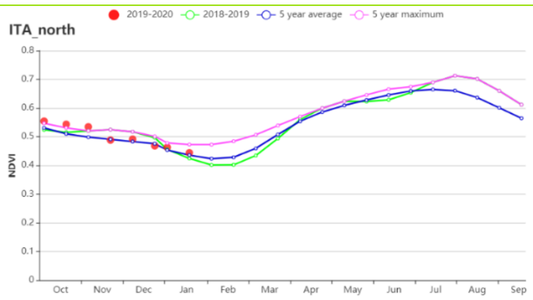




(d) Spatial NDVI patterns compared to 5YA

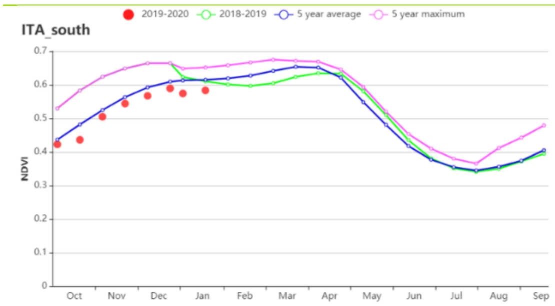
(e) NDVI profiles

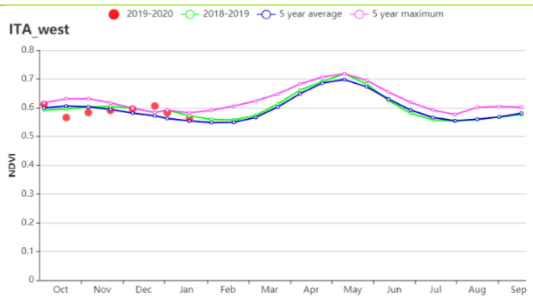




(f) East coast (Italy) crop condition development graph based on NDVI

(g) Po Valley (Italy) crop condition development graph based on NDVI





(h)Islands (Italy) crop condition development graph based on NDVI

(i). Western Italy (Italy) crop condition development graph based on NDVI

Table 3.37 Italy's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Eastern Italy	443	36	8.5	-1.5	429	-13
Northern Italy	665	57	5.2	-0.1	381	-4
Southern Italy	343	7	12.7	0.9	622	8
Western Italy	472	3	10.3	1.4	504	7

Table 3.38 Italy's agronomic indicators by sub-national regions, current season's value and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current (%)	Departure from 5YA (%)	Current
Eastern Italy	127	-27	84	-3	0.81
Northern Italy	87	-12	94	12	0.99
Southern Italy	231	8	97	8	0.87
Western Italy	164	13	98	1	0.97

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[KAZ] Kazakhstan

No crops were cultivated in most of the country during the monitoring period, except that only the limited amounts of winter rye and wheat in southern areas are grown during this period. Compared to the fifteen-year average, accumulated rainfall and temperature were both above average (RAIN +15%, TEMP +1.8°C), while radiation was slightly below average (RADPAR -2%). Furthermore, rainfall of more than 20 mm above average in the middle of October, early November and the end of January improved soil moisture conditions. Favorable agro-climatic conditions resulted in an increase in the BIOMSS index by 8% above average. The abundant rainfall will benefit the planting of forthcoming spring crops.

Overall, the agro-climate conditions are favorable in the monitoring period.

Regional analysis

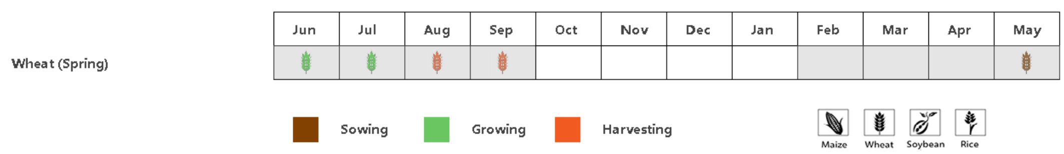
Based on cropping systems, climatic zones and topographic conditions, four sub-national agro-ecological regions can be distinguished for Kazakhstan, among which three are relevant for crop cultivation: the Northern region (112), the Eastern plateau and southeastern region (111) and the South region (110).

In the **Northern region**, the accumulated rainfall (RAIN +23%) and temperature (TEMP +2.5°C) were above average, but RADPAR was below average (-3%). The agro-climatic indicators resulted in an increase of the BIOMSS index by 11%.

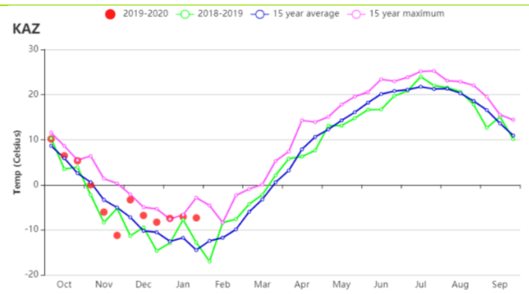
Agro-climatic conditions in the **Eastern plateau and southeastern region** were normal in the report period. RAIN and TEMP were above average (7% and 0.5°C, respectively), while RADPAR was close to average. BIOMSS (up 2%) was slightly above average.

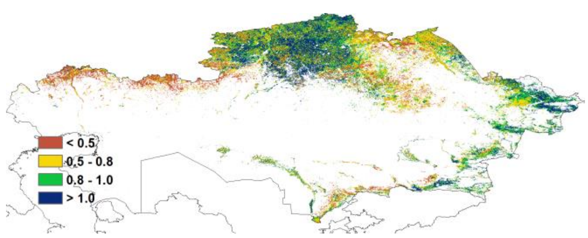
The **South region** received the less rainfall of (116 mm) than the other two regions, which was 12% below the fifteen-year average. TEMP and RADPAR were above average (0.8°C and 2%). The combination of agro-climatic indicators resulted in an increase of the BIOMSS index by 12%. The rainfall deficit in this region should not a have negative impact on winter crops due to the low water requirements in this period.

Figure 3.23 Kazakhstan's crop condition, October 2019 - January 2020



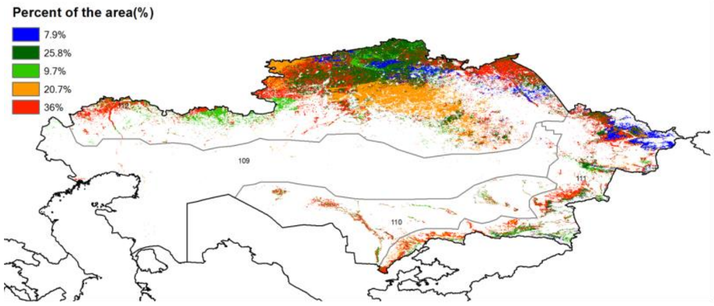
(a). Phenology of major crops

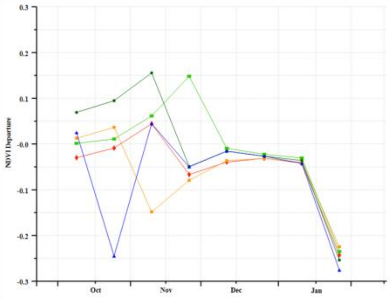




(b) Crop condition development graph based on NDVI

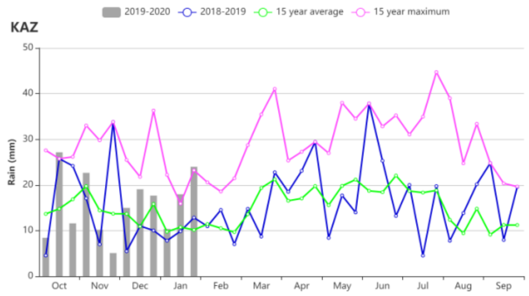
(c) Maximum VCI

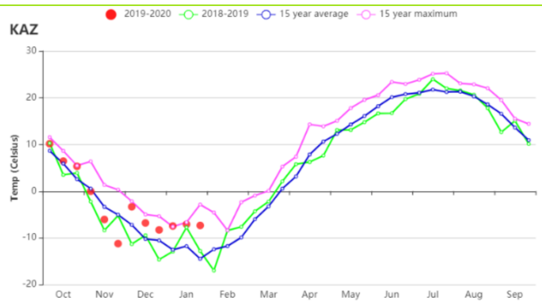




(d) Spatial NDVI patterns compared to 5YA

(e) NDVI profiles





(f) Rainfall

(g)Temperature Index

Table 3.39 Kazakhstan agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Northern region	180	23	-3.6	2.5	280	-3
Eastern plateau and southeastern region	229	7	-2.8	0.5	465	0
South region	116	-12	2.5	0.8	500	2

Table 3.40 Kazakhstan, agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current (%)	Departure from 5YA (%)	Current
Northern region	43	11	12	87	0.84
Eastern plateau and southeastern region	68	2	25	60	0.87
South region	99	12	10	70	0.83

[KEN] Kenya

The monitoring period covers mainly the harvest of the long rain maize crop and wheat, as well as the sowing period and early growth phases of short rain maize. Desert locusts had entered into Kenya from Somalia through Wajir and Mandera in late December. Since the harvest of maize and wheat was already concluded, the impact on early maize and wheat was limited. However, the locust already damaged the rangeland and might damage the maize in the south of the country which was cultivated during short rain season. At the national level, the CropWatch indicators had RAIN at 831 mm (+122%). Soil moisture is favorable for rangeland along the coast in the south-east and for the planting of long rain maize crops during March. While temperature (TEMP) (-1°C) and RADPAR (-6%) were below average, CALF (+5%) was above average. BIOMASS was estimated to be below average (-8%). As shown by the NDVI development graph, national crop condition values were above the five-year average. In addition, spatial NDVI patterns indicate that NDVI was above average in 78.4%of arable lands, mostly around North-west Kitui, Machakos and Kirinyaga and below average elsewhere. This spatial pattern is reflected by the maximum VCI in different areas, with high values of VCIx at 1.09. Country-wide, CALF was up by 5%. VCIx values were between 0.8 and 1.0. Generally, even though some CropWatch indicators were below average, crop conditions according to the national NDVI profile and rainfall were above average. This resulted in overall favorable conditions for crops.

Regional analysis

Considering the cropping system, climatic zones and topographic conditions we divided this country into four agro-ecological regions: The Eastern Coastal Area, the Highland agriculture zone, the Northern region with sparse vegetation and southwest Kenya.

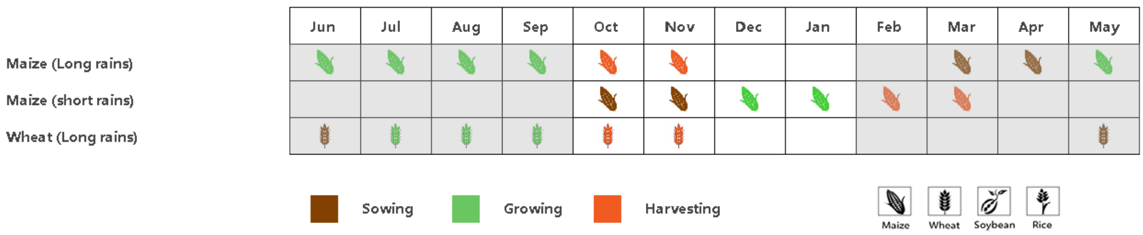
The **Coastal** area includes Mandera, Maralal, Marsabit, Wajir, and Isiolo. The total amount of rainfall in this area was recorded at 905 mm. The rainfall was more than 80% above average. TEMP was constant and radiation was slightly below average (RADPAR -1%). Even though the total amount of rainfall was above average, the total biomass production potential was below the five-year average (BIOMASS -2%). The NDVI profile was above-average for the entire reporting period. Throughout the reporting period, the maximum VCIx was 1.11 with CALF at 100%. Based on the above indicators and NDVI profile over time, crop conditions are assessed as above average.

Precipitation recorded over the **Highland agriculture zone** reached 802 mm, above-average by 124%. Temperature remained constant. RADPAR (-9%) and BIOMASS (-15%) were below average. CALF increased above average by 5% and the crop condition development graph based on NDVI was above the five-year average and maximum VCI values at 1.09. In general, the crop conditions were favorable.

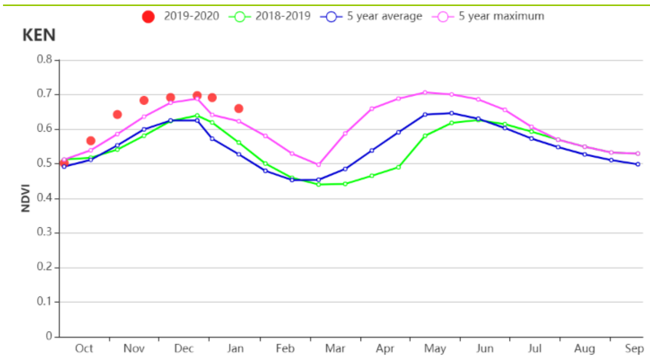
In the **northern region** the total rainfall was 554 mm (+47%). Rainfall was above average, but RADPAR slightly decreased by -6%, resulting in a lower estimate of biomass production. The NDVI development curve shows values above the five years average during the entire monitoring period. The maximum VCI was high at 1.18 with a significant increase in CALF (+46%). Overall, the CropWatch indicators point to favorable conditions.

South-west of Kenya includes the districts Narok, Kajiado, Kisumu, Nakuru and Embu which are major producers of long rain wheat and maize. Total rainfall (RAIN at 837 mm) was 127% above average. Like the northern region, in the south-west, all CropWatch agroclimatic indicators were recorded as below average, except for the significant positive departure in total rainfall. Temperature (-2.2 ºC), RADPAR (-8%) and BIOMASS (-16%) were below average. The NDVI profile stayed above the five-year average starting from mid November. VCIx reached 1.04 with CALF up by 4%. In general, the conditions were favorable for crops.

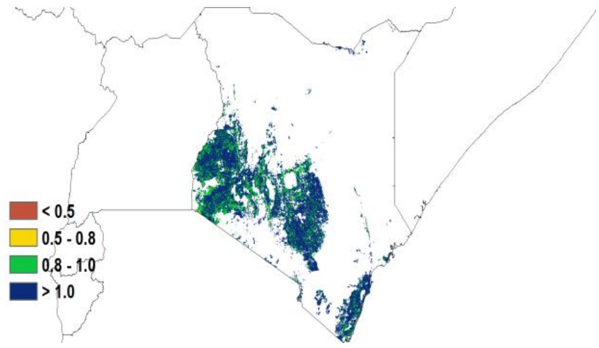
Figure 3.24 Kenya's crop condition, October 2019 - January 2020



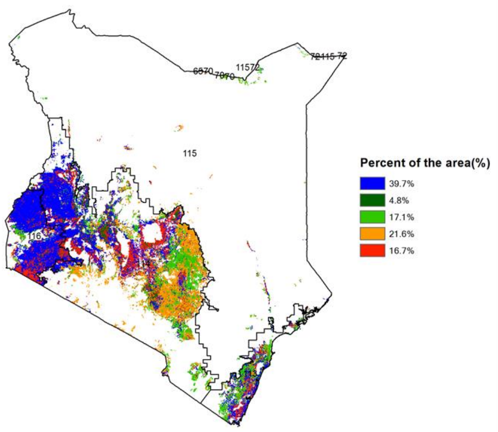
(a). Phenology of major crops



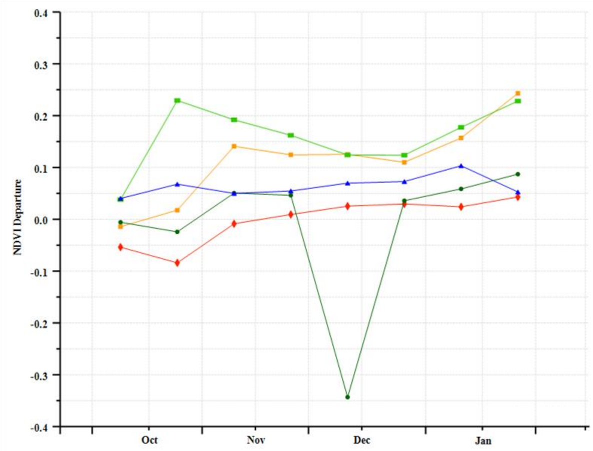
(b) Crop condition development graph based on NDVI



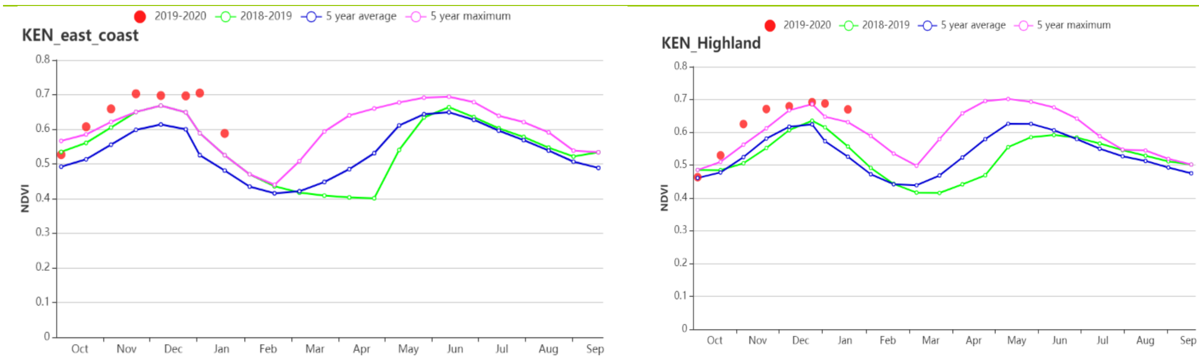
(c) Maximum VCI



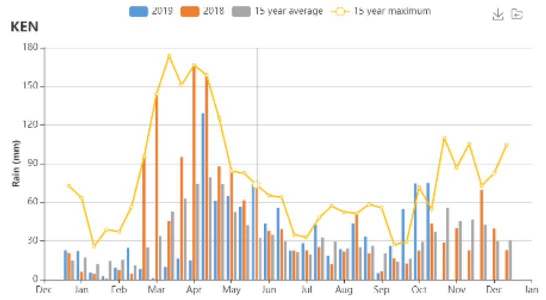
(d) Spatial NDVI patterns compared to 5YA



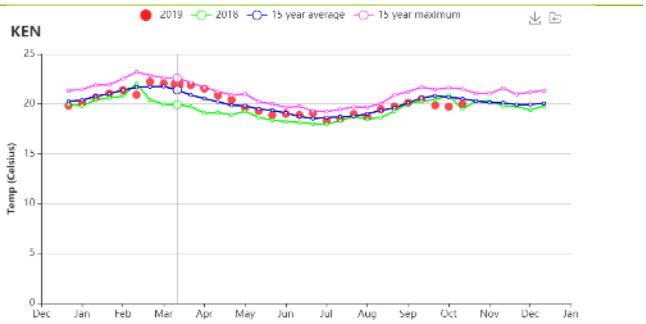
(e) NDVI profiles



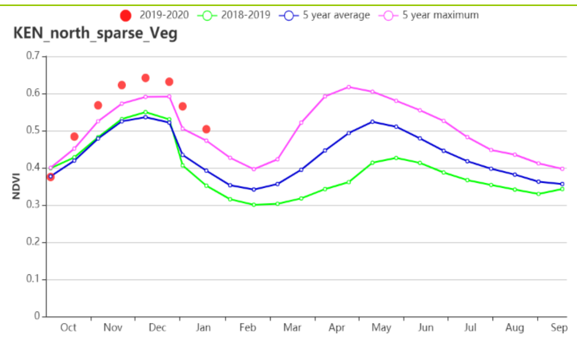
(f) Crop condition development graph based on NDVI (Coast(left) and Highland agriculture zone(right))

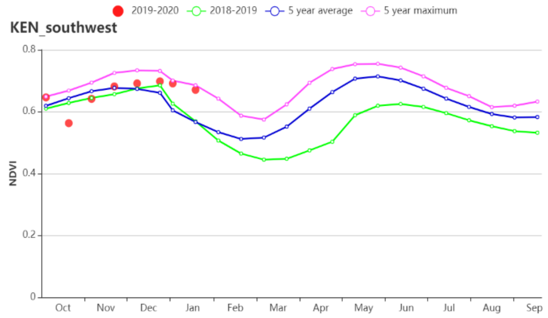


(d) Rainfall Index



(e) tempratrure index





(g) Crop condition development graph based on NDVI (Northern rangelands (left) and South-west (right))

Table 3.41 Kenya's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Coastal	905	80	26.8	0.0	1396	-1
Highland agriculture zone	802	124	18.3	-0.4	1154	-9
Northern rangelands	554	47	23.6	-1.8	1227	-6
South-west	839	127	19.5	-2.2	1178	-8

Table 3.42 Kenya's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current (%)	Departure from 5YA (%)	Current
Coastal	542	-15	100	8	1.11
Highland agriculture zone	704	-7	100	5	1.09
Northern rangelands	564	-16	99	46	1.18
South-west	941	-2	100	4	1.04

[KGZ] Kyrgyzstan

The reporting period covers the sowing period for winter wheat in Kyrgyzstan. Rainfall was 15% higher than average; TEMP was higher by 1.8 °C, RADPAR was lower by 2% and BIOMSS was higher by 8%, The nationwide NDVI profile shows that crop condition was around average during the reporting period. The temperature was higher than the average and close to the 15 years maximum. Rainfall was initially below average, but starting from December, it reached average levels.

The NDVI profile shows that NDVI was around average during the reporting period and the north region with vegetation coverage shows a high VCI maximum value (0.8-1.0) in most areas, indicating the agroclimatic indicators were favorable for vegetation.

Regional Analysis

More spatial detail is provided below for four main agro −ecological zones: the **Central non-agriculture region** (109), the **South zone** (110), the **Eastern plateau and southeastern zone** (111) and the N**orthern zone** (112).

The **Central non-agriculture region** has very little cropland and the agroclimatic indicators in this region don't influence crop growth in this country.

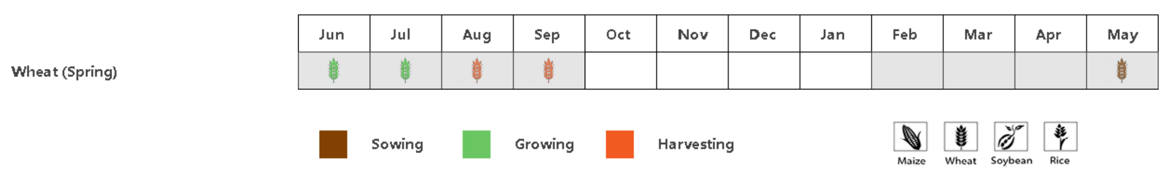
For the **Southern zone**, rain decreased by 12%, whereas increases for temperature (+0.8 ℃), radiation (+2%) and biomass (+12%) were observed. VCI max value of this region was 0.83. The NDVI profile shows that NDVI close to average until late December, when it started to fall below average.

For the **Eastern plateau and southeastern zone**, rainfall increased by 7%, temperature raised by 0.5℃, radiation remained near average and biomass increased by 2%. VCI max value of this region was 0.87. The increase of rainfall could provide favorable conditions for crop growth. The NDVI profile shows that it was close to average throughout the reporting period.

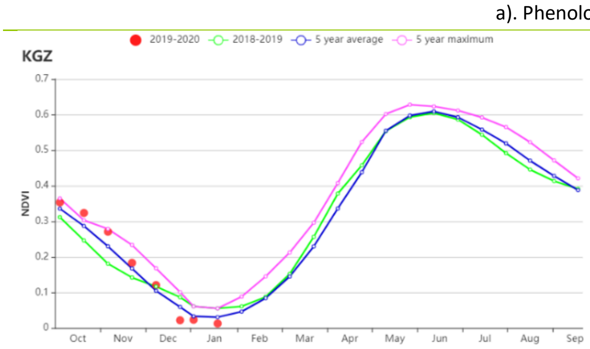
Most of Kyrgyzstan' s cropland is located in the **Northern zone**. During the reporting period, rainfall increased by 23% and temperature up by 2.5 ℃. Radiation slightly decreased by 3% and biomass increased 11%. The VCI value of this region was 0.84 and in most of the northern border region it was around 1.00. The increase of rainfall provided a favorable environment for crop growth. The crop condition is good in this region.

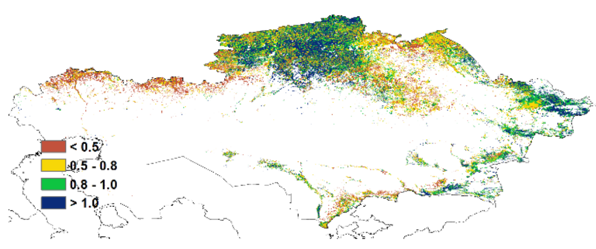
Overall, since the Northern zone experienced favorable meteorological conditions and the northern zone covers most of cropland in Kyrgyzstan, the crop conditions were favorable in this reporting period.

Figure 3.25 Kyrgyzstan's crop condition, October 2019 - January 2020



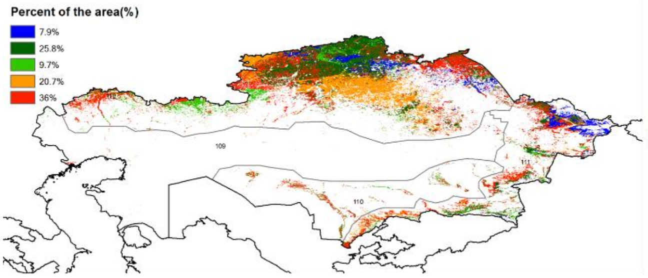
a). Phenology of major crops

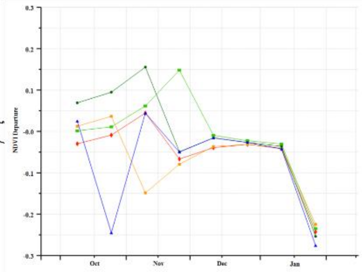




(b) Crop condition development graph based on NDVI

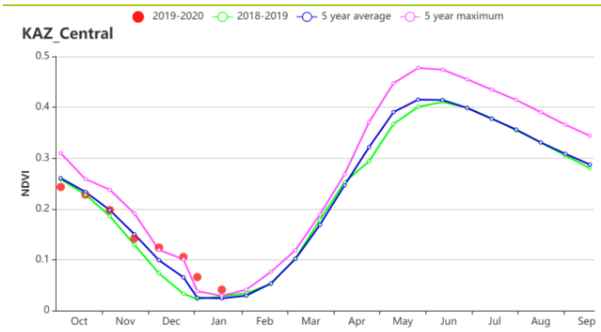
(c) Maximum VCI

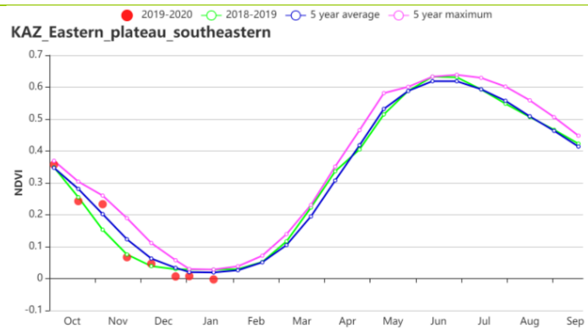




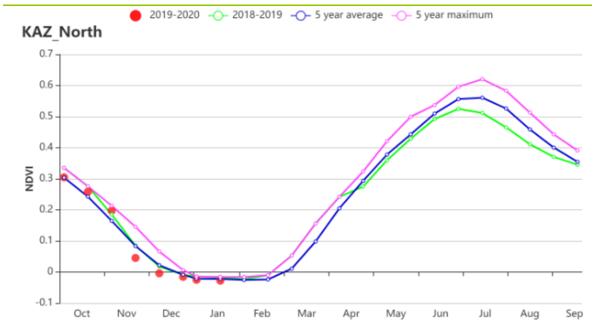
(d) Spatial NDVI patterns compared to 5YA

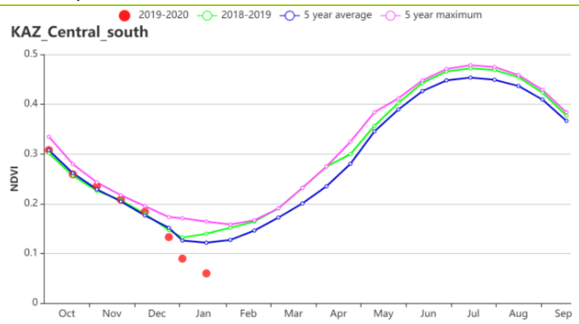
(e) NDVI profiles



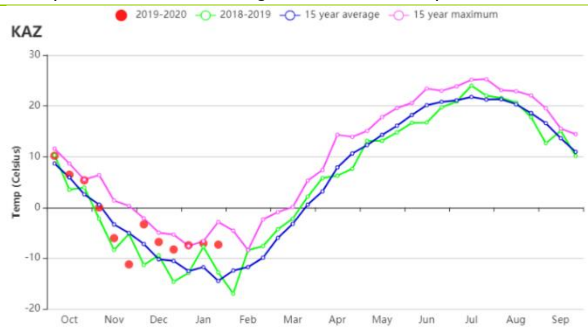


(f) Crop condition development graph based on NDVI (left: Central non-agriculture region, right: Eastern plateau and southeastern zone)





(f) Crop condition development graph based on NDVI (left: Northern zone, right: Southern zone)



(g) Rainfallprofiles

(h) Temperatureprofiles

Table 3.43 Kyrgyzstan's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 to January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Central non-agriculture region	116	-11	-1.1	1.8	370	0
South zone	116	-12	2.5	0.8	500	2
Eastern plateau and southeastern zone	229	7	-2.8	0.5	465	0
Northern zone	180	23	-3.6	2.5	280	-3

Table 3.44 Kyrgyzstan's agronomic indicators by sub-national regions, current season's values and departure, October 2019to January 2020

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current (%)	Departure from 5YA (%)	Current
Central non-agriculture region	65	10	2	-50	0.69
South zone	99	12	10	70	0.83
Eastern plateau and southeastern zone	68	2	25	60	0.87

[KHM] Cambodia

This monitoring period covers the harvest of main (wet season) rice, the planting of dry season rice, the growing and harvesting of medium, late and floating rice and the early stage of dry season maize and soybean in Cambodia. Compared to average, the CropWatch agro-climatic indicators describe a relative dry season with a 37% drop in rainfall. Air temperature (TEMP +0.3°C) and radiation (PADPAR +12%) were both higher than average. Environmental indicators mentioned above caused a 8% decrease in the potential biomass production (BIOMSS -8%). However, the maximum VCI value for the country is at 0.92, which means favorable crop conditions. The fraction of cropped arable land (CALF +2%) was slightly above the average of previous five years.

Water deficits harmed the crops and resulted in well below average crop condtions, especially after November 2019. This is clearly shown in the NDVI profile. According to the Spatial distribution of NDVI profiles, a small area (5.4% of cropland), mainly in Kandal and along the MeKong river, had an above-average NDVI before December. It subsequently dropped to average gradually in January. About 3.9% of the crop land, which mainly lies in the southeast of Banteay Meanchey, suffered a NDVI deficit in the early part of the season, but had recovered since December. About 81.2% of crop land shared the same trend of NDVI departure: it was close to the average before November and decreased gradually during reporting period.

High value of Maximum VCI index (VCIx >0.8) in most parts of the country indicate a limited negative impact from drought on crop growth from December to January. Generally, seasonal rainfall deficiency did not impact the overall crop development, and the wet-season rice production of Cambodia can be expected to be favorable.

Region analysis

Based on cropping systems, climatic zones, and topographic conditions, four sub-national regions are described below: the **Tonle-sap lake area** where the seasonally inundated freshwater lake and especially temperature are influenced by the lake itself, the **Mekong valley between Tonle-sap and Vietnam border**, **Northern plain and northeast**, the **Southwestern Hilly region** along the Gulg of Thailand coast.

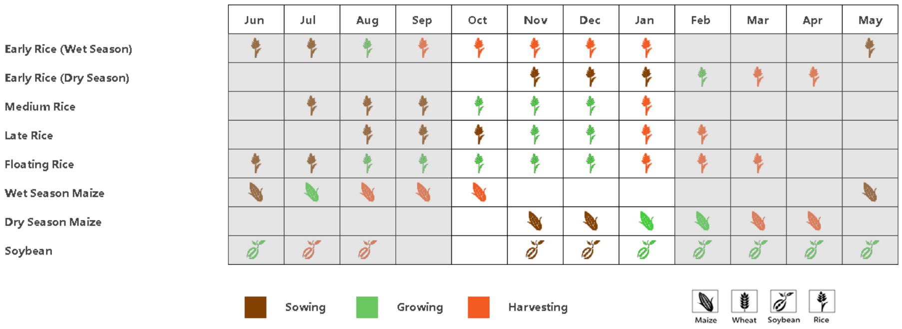
In the **Tonle Sap lake area**, NDVI was below average during reporting period. Compared to average, sunshine and temperature were relatively high (RADPAR +12%, TEMP +0.2°C) and fraction of arable land (CALF +1%) was above average as well. However, the rainfall (RAIN -34%) and the biomass production potential (BIOMASS -12%) were below average. The maximum VCI value for the region is at 0.89.

The **Mekong valley between Tonle-sap and Vietnam border**, the main rice growing area in Cambodia, was affected by low precipitation (RAIN, -44%) with above average RADPAR (+9%) and below average temperature (TEMP, -0.4°C). CALF was above the 5-year average (CALF, +2%) and the biomass potential was below average by 10%. The NDVI for the region was above average from October to December 2019 and below average after December, according to the NDVI profile. The maximum VCI for the region was 0.96. The overall crop outputs are expected to be good.

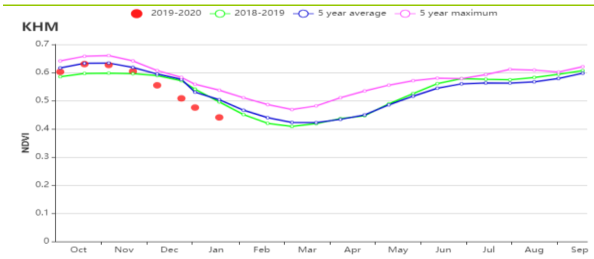
The **Northern plain and northeast** recorded a drop of rainfall below average by 47%. The temperature was slightly below average (TEMP, -0.1°C) and radiation significantly exceeded average (RADPAR, +12%). CALF was a little higher compared to the 5-year average (CALF, +1%). Crop condition was below average for the region, where the biomass potential was 13% below average while the maximum VCI reached 0.92. Altogether, this region had a below-average NDVI during reporting period.

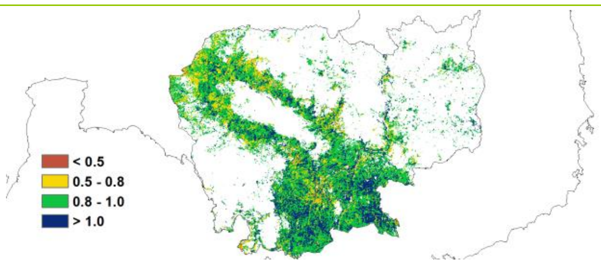
The **Southwest Hilly region** had favorable VCIx (0.92) accompanied by increased BIOMSS (+4%) resulting from the increase in radiation (RADPAR +12%) and above average temperature (TEMP +0.4°C), while the NDVI for the region was below average in the whole reporting period. The precipitation was below average (RAIN -29%).

Figure 3.26 Cambodia's crop condition, October 2019 - January 2020

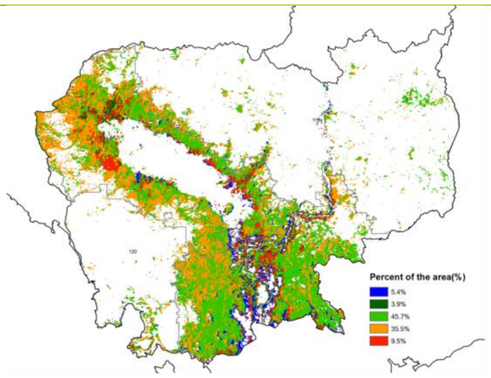


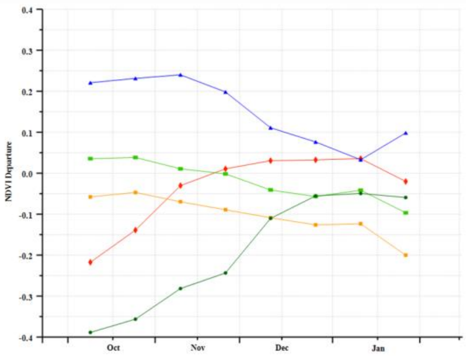
(a). Phenology of major crops



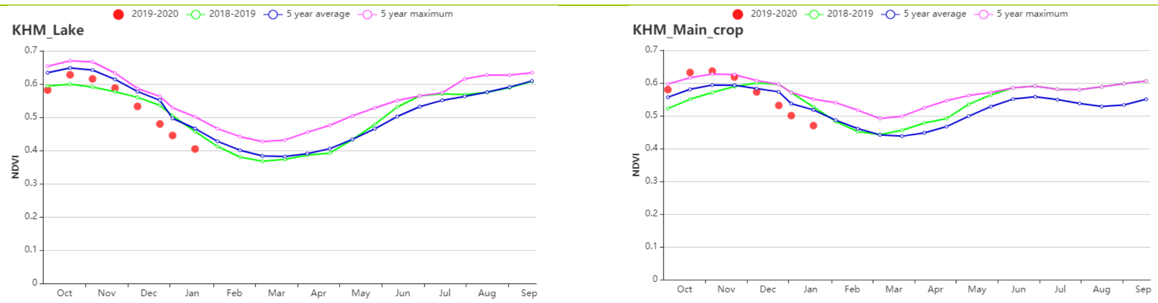


(b) Crop condition development graph based on NDVI (c) Maximum VCI

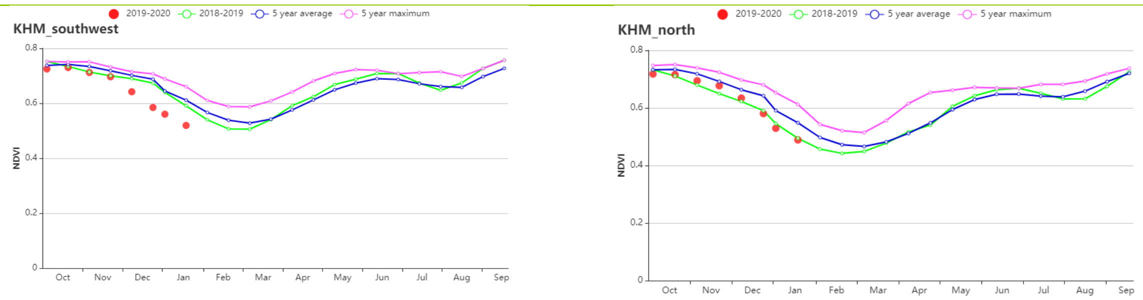




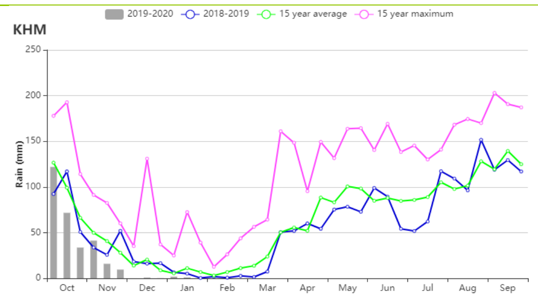
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles



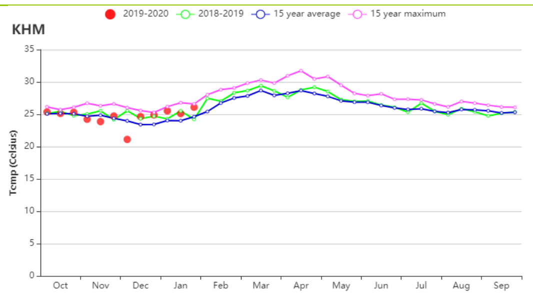
(f) Crop condition development graph based on NDVI_Central Tonle-Sap plain (left) and Mekong valley between Tonle-sap and Vietnam borders (right))



(g) Crop condition development graph based on NDVI_Southwest Hilly region (left) and Northern plain and northeast (right))



(h) Rainfall Index



(i) tempratrure index

Table 3.45 Cambodia agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Tonle Sap	276	-34	24.5	0.2	1203	12
Mekong valley between Tonle-sap and Vietnam border	314	-44	24.8	-0.4	1193	9
Northern plain and northeast	233	-47	24.3	-0.1	1179	12
Southwest Hilly region	400	-29	23.1	0.4	1204	12

Table 3.46 Cambodia, agronomic indicators bysub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current (%)	Departure from 5YA (%)	Current
Tonle Sap	585	-12	100	1	0.89
Mekong valley between Tonle-sap and Vietnam border	617	-10	98	2	0.96
Northern plain and northeast	541	-13	100	1	0.92
Southwest Hilly region	707	4	100	0	0.92

[LKA] Sri Lanka

The monsoon from the southwest and the mountains in central north and east delineate different climatic zones in Sri Lanka. Rice is the most important crop of the country and is mainly planted in the southwest and central highlands. Maize requires less water and is mainly grown in the north and west. This monitoring period covers the sowing and growing season within the main season (Maha), both for rice and maize. According to the CropWatch monitoring results, crop condition was average for the whole period in general.

Influenced by monsoon and topography, the country experienced typical rainy season conditions during October and November, followed by cold and dry conditions during December and January. Precipitation, temperature and radiation all increased compared to 15YA (RAIN +3%, TEMP +0.2℃, RADPAR +9%). The fraction of cropped arable land (CALF) remained comparable to 5YA. BIOMSS was up 7% as compared to 15YA. As shown on the NDVI development graph, NDVI values were apparently below average in mid-October and early December, while they were close to the 5YA for other periods. During the period of abnormal NDVI values, RAIN was much larger than 15YA and consequently affected the crop conditions. In spite of this, agroclimatic and agronomic indicators reflected the favorable environmental condition for crop growth during the monitoring period. NDVI trends revealed a good prospect for crop production. The maximum VCI for the whole country was 0.99.

As shown by NDVI clusters map and profiles, spatial heterogeneity of crop condition was significant throughout the country’s cropland. 28.8% of cropland showed consistent above-zero NDVI departure values, including parts of provinces of North Western, NorthCentral, Southern, Uva and Eastern Sri Lanka. 64.4% of cropland experienced large negative NDVI departure values in mid-October and early December. The regions were Kurunegala, Anuradhapura, the area between Colombo and Galle, and other scattered areas along the western coast. The area between Nuwara-Eliya and Badulla showed below-zero NDVI departure values for the whole period, which accounted for 6.8% of cropland. The VCIx map exhibited high values for almost the whole country.

Regional analysis

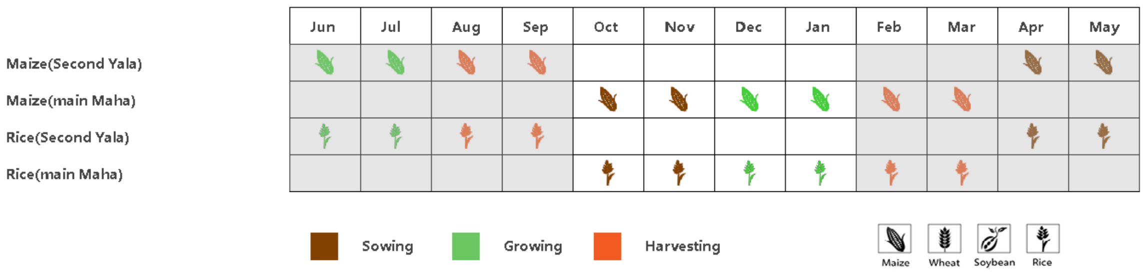
Based on the cropping system, climatic zones and topographic conditions, three sub-national agroecological regions can be distinguished for Sri Lanka. They are the Dry zone, the Wet zone, and the Intermediate zone.

In the **Dry zone**, the recorded RAIN (925mm) was 3% below average and amounted to over 7 mm per day, which was sufficient for the growth of maize. TEMP was 0.3°C above average with RADPAR up as well, by 10%; BIOMSS and CALF increased by 9% and 1% compared to average. NDVI followed a similar trend as the whole county. The VCIx for the zone was 0.99. Overall, crop condition was fair in general.

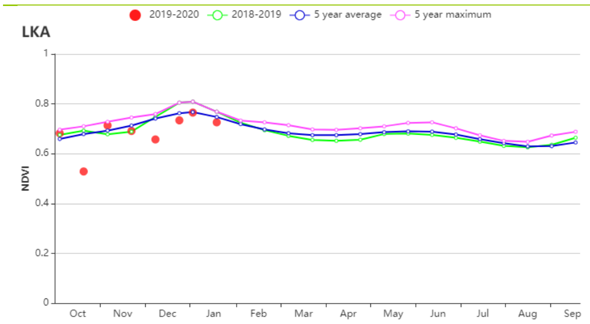
The **Intermediate zone** went through the end of the rainy season with RAIN at 1408 mm, 7% above 15YA. More than 11mm precipitation per day could meet the need of water for rice and maize in this zone. TEMP was comparable to average while RADPAR was up 8% above average. With full use of cropland, BIOMSS was close to the average (+1%). The variation of NDVI was analogous to the Dry zone. The VCIx value for the zone was 1. Condition of crop was assessed as average.

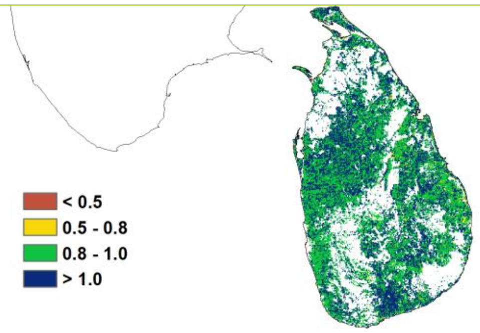
The **Wet zone** received the most RAIN (1783mm) that was 7% up compared to 15YA. TEMP (+0.3°C) and RADPAR (+5%) were higher too. Favorable agroclimatic indicators led to a 7% rise in BIOMSS and cropland was fully utilized. NDVI was average for the whole period except for mid-October. The VCIx value for the zone was 0.99. Crop conditions were normal for this zone, and thus similar to the other two sub-national regions.

Figure 3.27 Sri Lanka's crop condition, October 2019 - January 2020



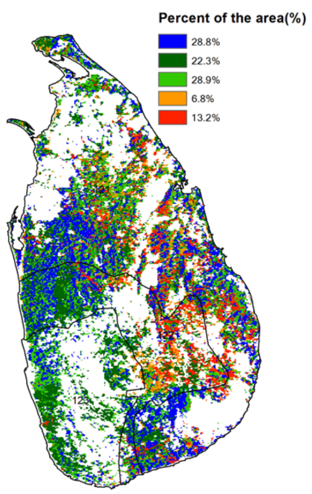
(a). Phenology of major crops

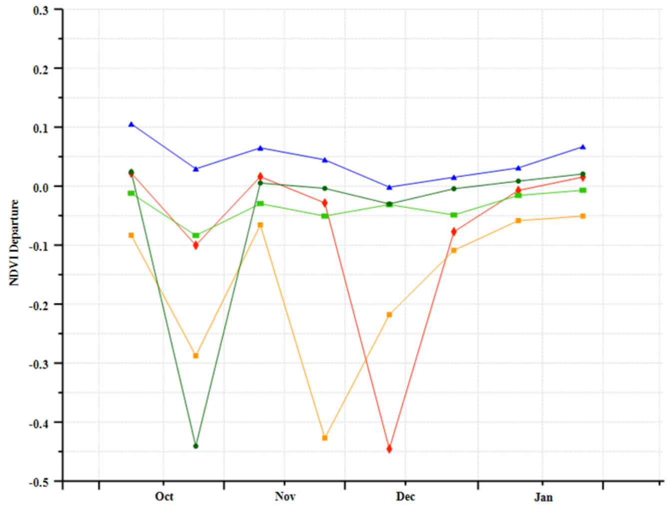




(b) Crop condition development graph based on NDVI

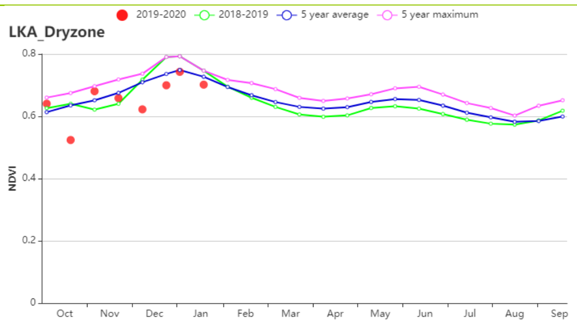
(c) Maximum VCI

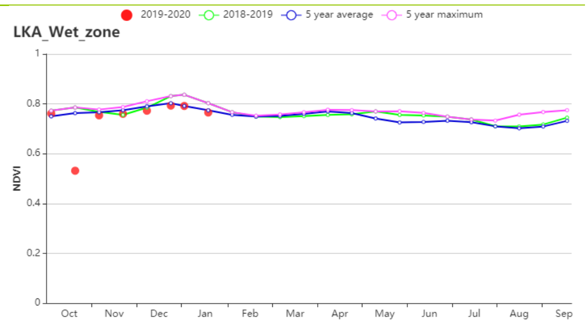




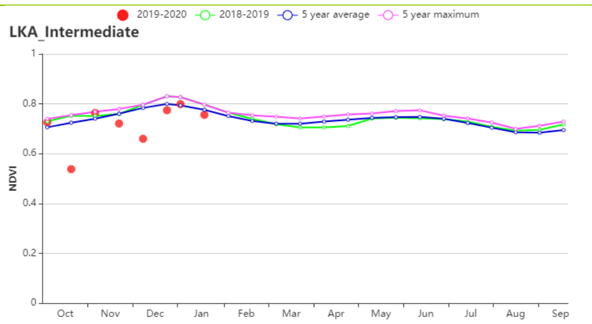
(d) Spatial NDVI patterns compared to 5YA

(e) NDVI profiles





(f) Crop condition development graph based on NDVI (Dry zone (left) and Wet zone (right))



(g) Crop condition development graph based on NDVI (Intermediate zone)

Table 3.47 Sri Lanka's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Dry zone	925	-3	25.4	0.3	1219	10
Wet zone	1783	7	23.9	0.3	1074	5
Intermediate zone	1408	6	23.3	0.0	1092	8

Table 3.48 Sri Lanka's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current (%)	Departure from 5YA (%)	Current
Dry zone	818	9	100	1	0.99
Wet zone	694	7	100	0	0.99
Intermediate zone	686	1	100	0	1.00

[MAR] Morocco

This reporting period covers the first half of the rainy season, which lasts from November to March. Winter wheat is sown in November. The cereal production in Morocco is heavily dependent on rainfall, since only 15 percent of the country's cropland is irrigated. Eighty percent of the arable land is located in arid or semi-arid areas.

For the current reporting period, the CropWatch agro-climatic indicators showed a large reduction (-33%) in rainfall as compared to the 15 year average. The weather was sunnier, RADPAR was 5% above the average, and colder. The average temperature was 0.2°C lower. The CropWatch estimated biomass (BIOMSS) was 17% below the average, due to limited rainfall.

The nationwide NDVI graph indicated that crops conditions were near average and the maximum VCI indicated moderate (0.72) crop conditions. However, the NDVI spatial clustering map showed that the conditions for half of the cropped area, mostly in the southern part of the country, were below the average.

As a general conclusion, all agro-climatic and agronomic indicators were consistent and more sensitive to the large deficit in rainfall than the NDVI-based graph of crop conditions. The current conditions for Morocco are unfavorable.

Regional analysis

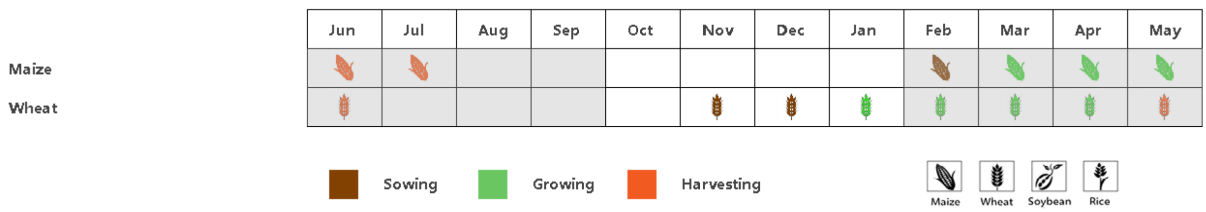
CropWatch adopts three agro-ecological zones (AEZs) relevant for crop production in Morocco: The **Sub-humid northern highlands**, the **Warm semiarid zone** and the **Warm sub-humid zone**.

All agro-climatic indicators measured for the three agro-ecological zones are consistent with the national trend. The reductions in the rainfall for the three zones were 24%, 44% and 32% below the average respectively. The drop in temperature was 0.2 °C below the average in **Sub-humid northern highlands** and by 0.3°C in the two other zones. Higher RADPAR data resulted from the sunnier conditions, particularly for the **Warm semiarid zone** (RADPAR=858 MJ/m2 with a 6% increase above the average). Due to the rainfall shortage, the estimated BIOMSS was below average for the three zones (by 16, 16 and 12% respectively).

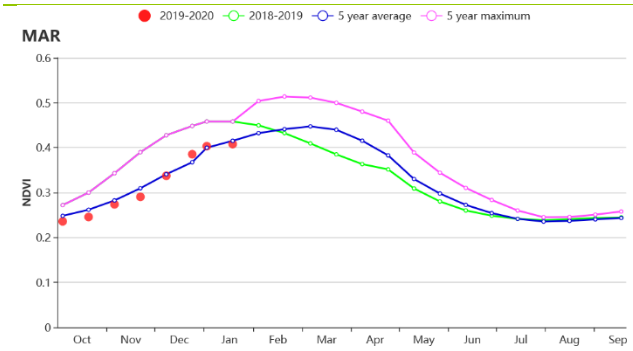
In the **Sub-humid northern highlands** and **Warm sub-humid zones**, the crop conditions based on the NDVI graph indicated that they were below average in October, near average in November and then turned to be above average in December and January. The impact of the rainfall deficit was more profound in the **Warm semiarid zones** where crop conditions were below average during the whole reporting period. This was also confirmed by the estimated maximum VCI since the **Warm semiarid zones** had the lowest VCI (0.61) as compared to the other two zones. The **Warm semiarid zones** include the provinces with major wheat production such as El Jadda and Settat.

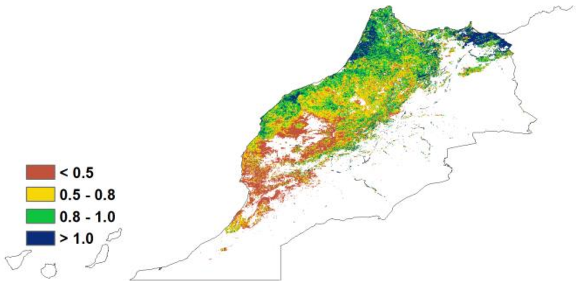
The maximum VCI was high (0.84) in the **Warm subhumid zones**, which indicated less impact of rainfall shortage on crop conditions than in the other two zones, while conditions in **Sub-humid northern highlands** were moderate with maximum VCI of 0.78.

Figure 3.28 Morocco's crop condition, October 2019 - January 2020



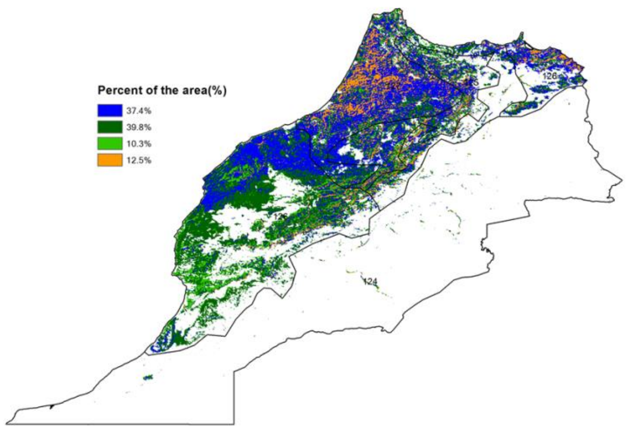
(a). Phenology of major crops

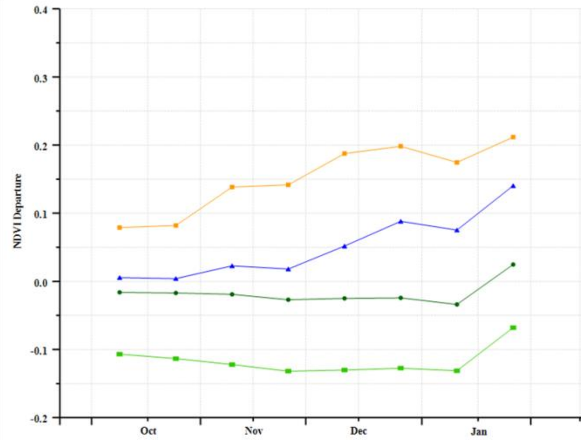




(b) Crop condition development graph based on NDVI

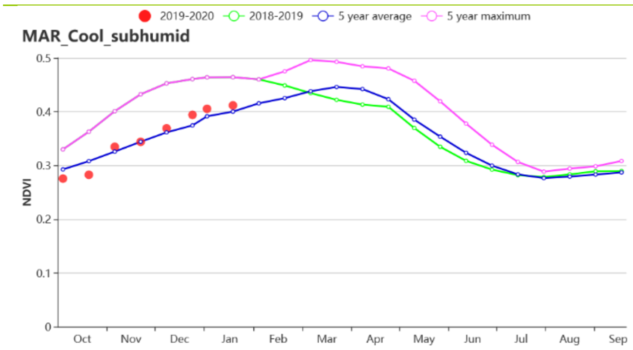
(c) Maximum VCI

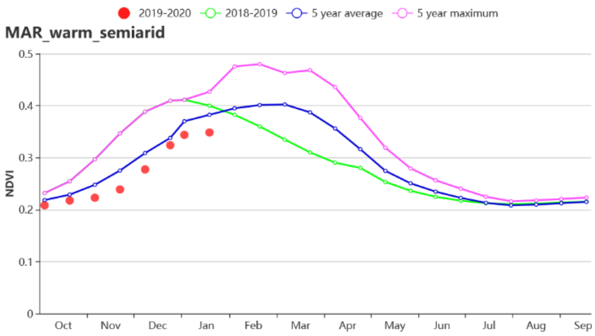




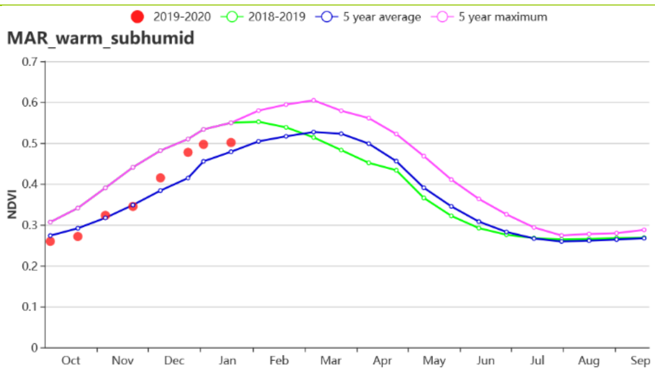
(d) Spatial NDVI patterns compared to 5YA

€ NDVI profiles

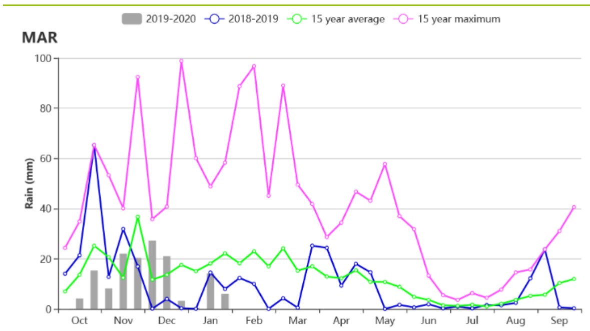




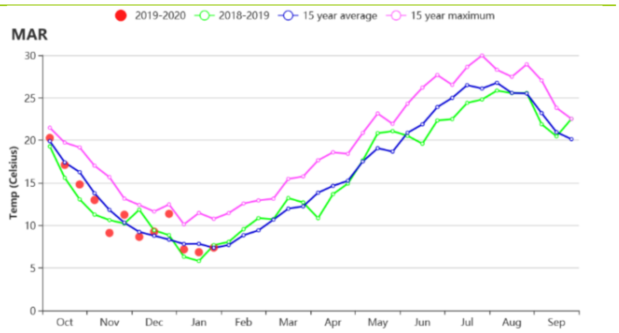
(f). Crop condition development graph based on NDVI (Sub-humid northern highlands).and (g). Warm semiarid zones)



(h) . crop condition development graph based on NDVI, Warm subhumid zones.



(i) Rainfall profiles



(j) Temperature profiles

Table 3.49 Morocco's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Sub-humid northern highlands	124	-34	10	0.1	990	3
Warm semi-arid zones	72	-40	12.3	0.1	1112	4
Warm sub-humid zones	116	-43	12.4	-0.1	1003	3

Table 3.50 Morocco's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current (%)	Departure from 5YA (%)	Current
Sub-humid northern highlands	452	-35	66	5	0.9
Warm semi-arid zones	270	-37	40	-11	0.7
Warm sub-humid zones	440	-39	83	6	0.9

[MEX] Mexico

As the most important crop of Mexico, winter wheat sowing began in October. Both soybean and rice were at harvesting stage over the reporting period. Maize was at growing stage in November and December and reached harvest in January in the northwest. In other areas of the country, maize was at the harvesting stage from October to December.

Crop condition was close to average between October to January according to the crop condition development graph based on NDVI. The CropWatch agroclimatic indicators show that TEMP (+0.4°C) and RADPAR (-3%) were close to average and RAIN was significantly increased (+62%), which was beneficial for crop growth, as indicated by a relatively high value of VCIx (0.89). CALF decreased by 2% compared with the previous 5-year average. BIOMSS increased by 2% compared to average.

Crop condition displayed obvious differences in spatial distribution. According to the spatial pattern of VCIx, VCIx in the south was higher than that in the North. Very high values (greater than 1.0) occurred mainly in southeastern Mexico (including Veracruz, Tabasco and western Campeche), whereas extremely low values (less than 0.5) occurred in the north-east and middle of the country (northwestern Coahuila, northern Nuevo León and northern Tamaulipas). The VCIx in other regions of Mexico was moderate, with the values between 0.5 and 1.0. As shown in the spatial NDVI profiles and distribution map, about 42.2% of the total cropped areas were below average during the entire monitoring period, mainly distributed in the northeast of Coahuila, north of Nuevo León and north of Tamaulipas while 54.7% of the total cropped areas, mainly in Sinaloa and Sonora provinces, were just slightly above average.

Regional analysis

Based on cropping systems, climatic zones and topographic conditions, Mexico is divided into four agro-ecological regions. These regions include Arid and semi-arid regions (128), Humid tropics with summer rainfall(129), Sub-humid temperate region with summer rains (130) and Sub-humid hot tropics with summer rains (131). Regional analyses of crop conditions can provide more detail for the production situation in Mexico.

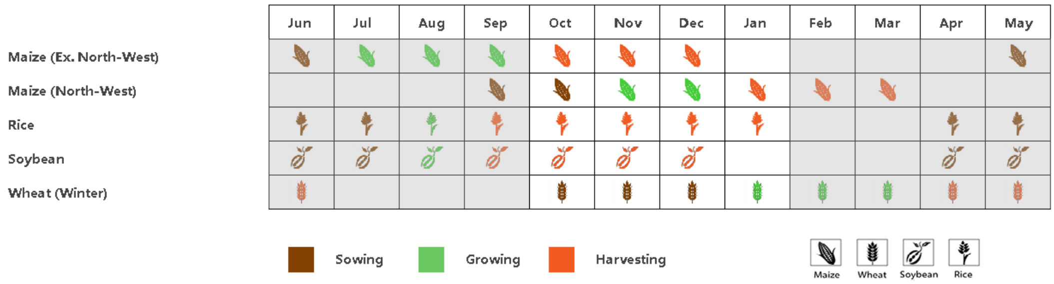
The Arid and semi-arid regions located in northern and central Mexico account for about half of planted areas in the country. According to the NDVI development graph, crop condition in this region was generally close to average during the reporting period. VCIx was relatively low with a value of 0.80 and CALF decreased by 5% compared with average, RAIN and TEMP increased by 84% and 0.1°C respectively and RADPAR decreased by 4%, which all resulted in an increasement of BIOMSS(+6%).

Sub-humid temperate region with summer rains is situated in central Mexico. According to the NDVI development graph, crop condition was continuously close to average in this region. The agro-climatic condition showed that RAIN and TEMP increased by 114% and 0.5°C respectively and RADPAR decreased by 6% compared to average. BIOMSS also increased by 1% and CALF was 93%. The VCIx(0.93) confirmed favorable crop condition in these regions.

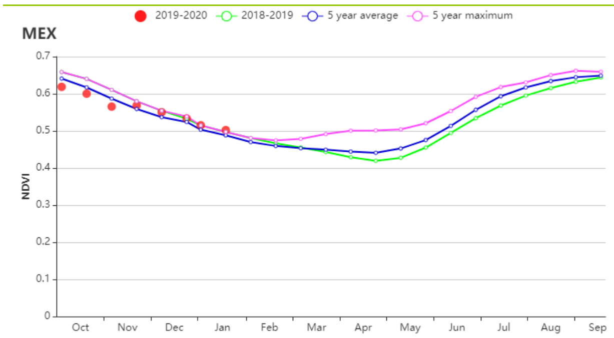
Sub-humid hot tropics with summer rains are located in southern Mexico. During the monitoring period, crop condition was above average since November, as shown by the NDVI time profiles. Agro-climatic conditions showed that RAIN was significantly above average (+64%) while TEMP and RADPAR were near average (+0.5°C and -3%). The VCIx in these areas was 0.95 and BIOMSS was on average, which meant crop grew well.

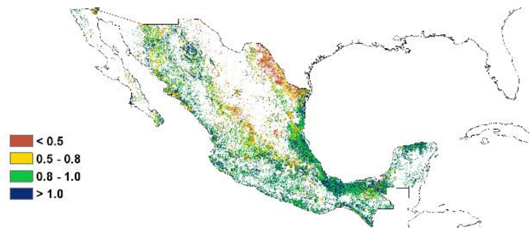
Humid tropics with summer rainfall are located in southeastern Mexico. RAIN was significantly above average (+30%), TEMP was 0.7℃ warmer and RADPAR up 4%. As shown in the NDVI development graph, crop condition was below average in October and improved to average from November to January. BIOMSS decreased (-3%) and the VCIx (0.97) confirmed favorable crop condition in these regions.

Figure 3.29 Mexico's crop condition, October 2019 - January 2020



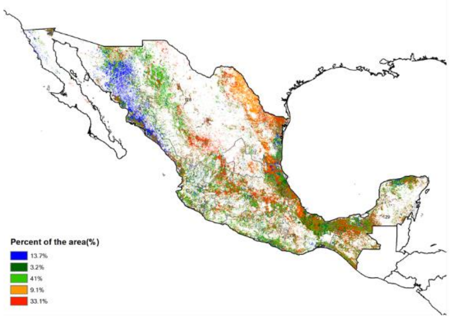
(a). Phenology of major crops

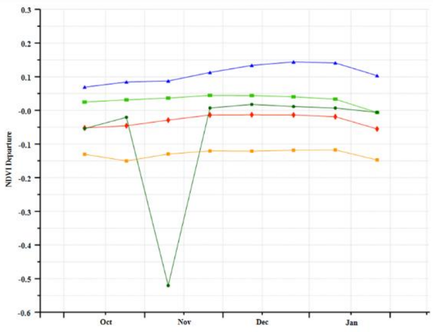




(b) Crop condition development graph based on NDVI

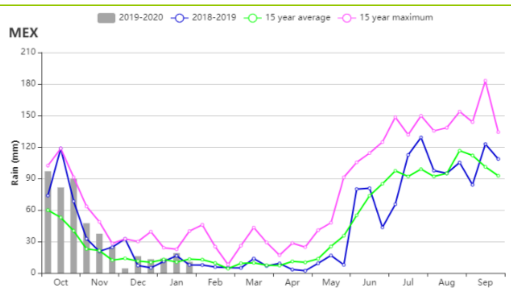
(c) Maximum VCI

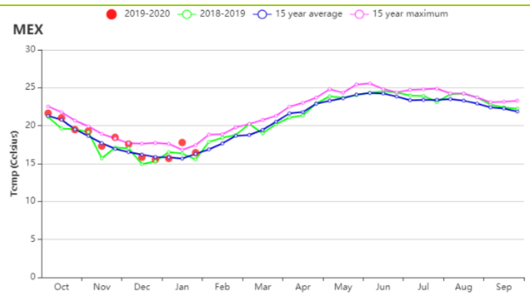




(d) Spatial NDVI patterns compared to 5YA

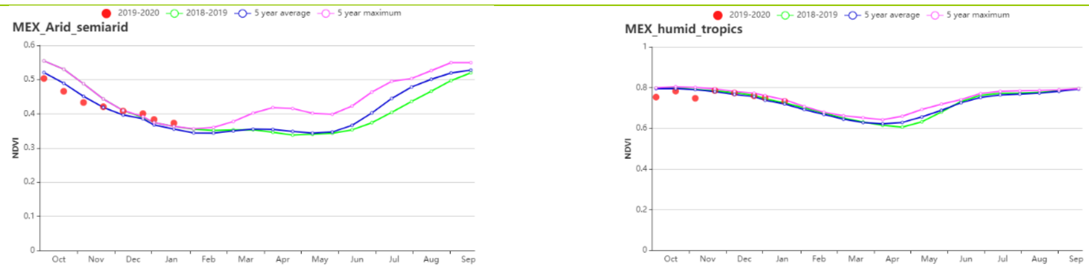
(e) NDVI profiles



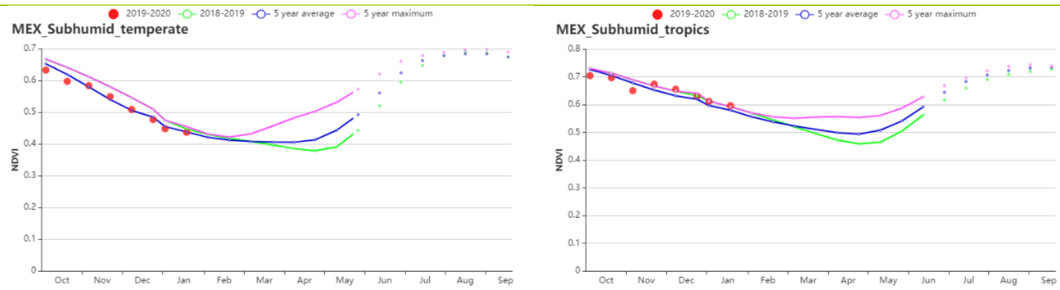


(f) Rainfall profiles

(g) Temperature profiles



(h) Crop condition development graph based on NDVI (Arid and semi-arid regions (left) and Humid tropics with summer rainfall (right))



(g) Crop condition development graph based on NDVI (Sub-humid temperate region with summer rains (left) and Sub-humid hot tropics with summer rains (right))

Table 3.51 Mexico's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Arid and semi-arid regions	240	84	14.8	0.1	929	-4
Sub-humid temperate region with summer rains	567	114	16.2	0.5	1022	-6
Sub-humid hot tropics with summer rains	527	64	19.7	0.5	985	-3
Humid tropics with summer rainfall	687	30	22.4	0.7	1006	4

Table 3.52 Mexico's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current (%)	Departure from 5YA (%)	Current
Arid and semi-arid regions	322	6	70	-5	0.8
Sub-humid temperate region with summer rains	386	1	93	-1	0.93
Sub-humid hot tropics with summer rains	426	0	97	0	0.95
Humid tropics with summer rainfall	567	-3	100	0	0.97

AFG AGO ARG AUS BGD BLR BRA CAN DEU EGY ETH FRA GBR HUN IDN IND IRN ITA KAZ KEN KGZ KHM LKA MAR MEX **MMR** MNG MOZ NGA PAK PHL POL ROU RUS THA TUR UKR USA UZB VNM ZAF ZMB

[MMR] Myanmar

As the most dominant cereal crop in Myanmar, rice is grown nationwide during the rainy season. Maize is another major crop that is growing in the dry season in highlands, accompanied by second rice. Wheat plays a little role in total crop production and is mainly grown in the central dry zone. The country went through the end of the rainy season in October and entered a cool dry season during November and January. This monitoring period covers the early harvesting season for maize and harvesting season for rice, as well as the sowing season and the growing season for second rice and wheat crops. CropWatch generally assesses the crop condition of Myanmar during this monitoring period as below-average in general.

Compared to the 15YA level, precipitation (RAIN) decreased by 19% while radiation (RADPAR) was 6% up. Temperature (TEMP) was average. Precipitation was below average mainly in October. As a result, potential cumulative biomass (BIOMSS) underwent a 17% reduction as compared to its 15YA level. The arable land was near full utilization according to the monitoring results in sub-national regions. The crop arable land fraction (CALF) increased by 1% nationally as compared to its 5YA. As shown in the NDVI development graph, NDVI values were about the 5YA at first and were slightly below the average since late December.

Crop condition underwent marked spatial variations according to the NDVI cluster and profile maps. 49.7% of cropland showed positive NDVI departure values throughout the monitoring period, including the regions of Sagaing, Mandalay, Magew, Bago Ayeyarwady and highlands in Shan State. 43.9% of cropland showed negative NDVI departure values during the whole period. 9% of cropland in Ayeyarwady and Bogo displayed negative NDVI departure values before December, reflecting the negative influence of insufficient precipitation during the sowing season. The VCIx map shows values between 0.5 and 0.8 over Mandalay Region and high values in the other regions.

Regional analysis

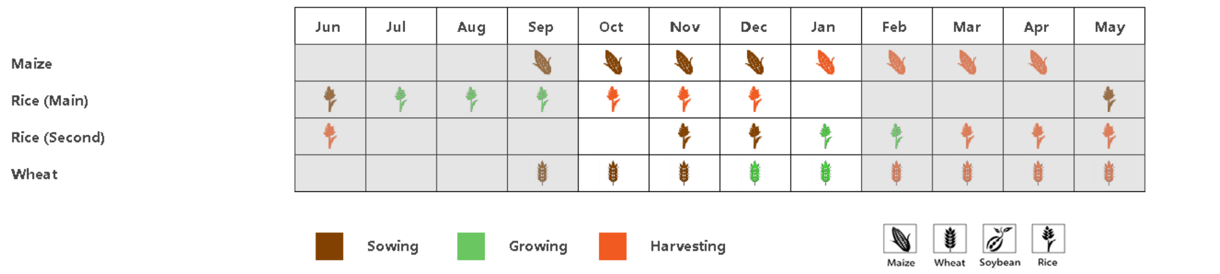
Based on the cropping system, climatic zones and topographic conditions, three sub-national agro-ecological zones (AEZ) can be distinguished for Myanmar. They are the Delta and southern-coast, the Central plain, and the Hills.

The **Delta and southern-coast region** experienced a dry season with a relatively low RAIN (199 mm), a 43% decrease compared to the 15YA. TEMP and RADPAR increased by 0.3℃ and 7%, respectively. BIOMSS decreased by 9% and CALF rose by 1%. NDVI was near average until January, when it dropped slightly to below average in January. The maximum VCIx was 0.96 for this region. The crop condition is below-average in general.

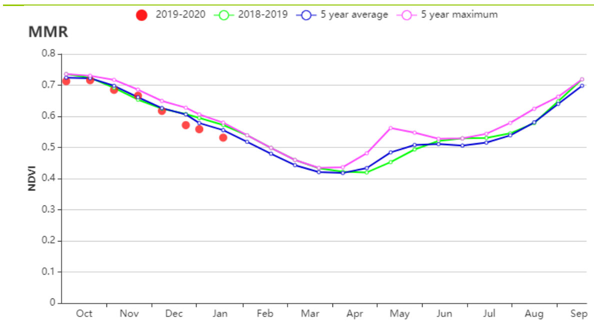
The **Central plain** was also short of RAIN (252 mm, 16% below the 15YA) while TEMP and RADPAR both increased, by 0.2℃ and 6% respectively. BIOMSS was 21% below the 15YA. This was the largest decrease among the three sub-national regions. CALF was up 1% above average. NDVI was near the level of the 5YA during the whole period and also experienced a slight decrease below average in January. The maximum VCIx was 0.94 for the region. The crop condition is assessed as moderately below the 5YA.

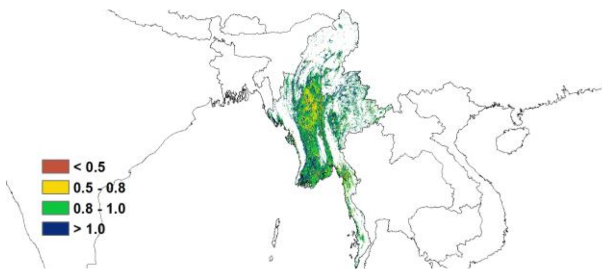
Analogous to the other two sub-national regions, the **Hills region** had less RAIN (286 mm), 12% below the 15YA. Temperature was slightly lower (TEMP -0.3℃) and radiation higher (RADPAR +6%). Even with the cropland fully used, BIOMSS was 18% down compared to the 15YA. The variation of NDVI was similar to the Central region. In spite of the high value of the maximum VCIx (0.99) for the region, the crop condition for this region is slightly below-average in general according to the agroclimatic indicators.

Figure 3.30 Myanmar's crop condition, October 2019 - January 2020



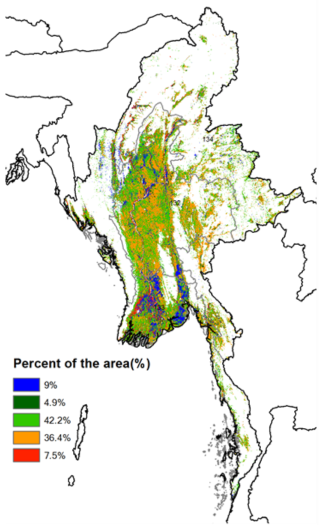
(a). Phenology of major crops

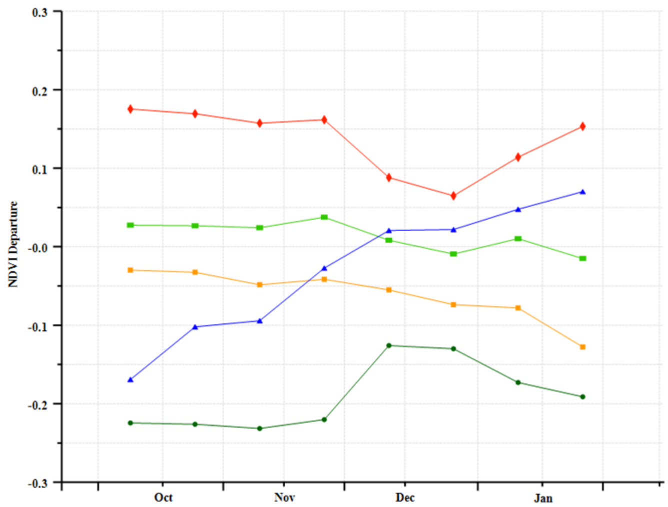




(b) Crop condition development graph based on NDVI

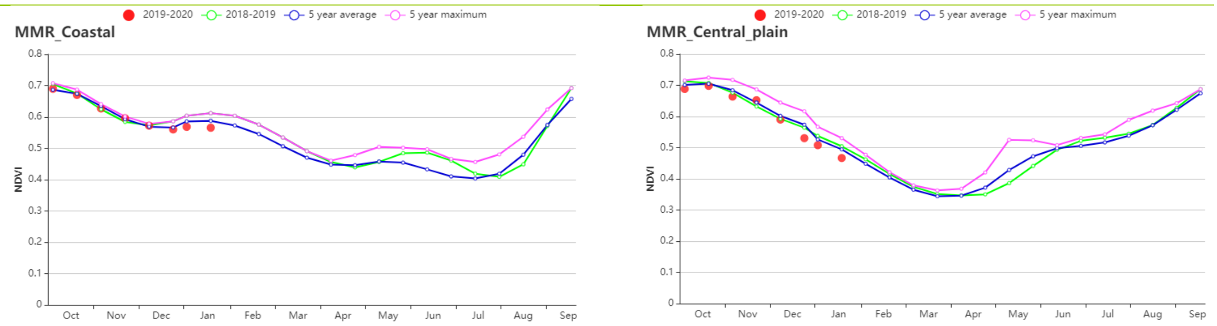
(c) Maximum VCI



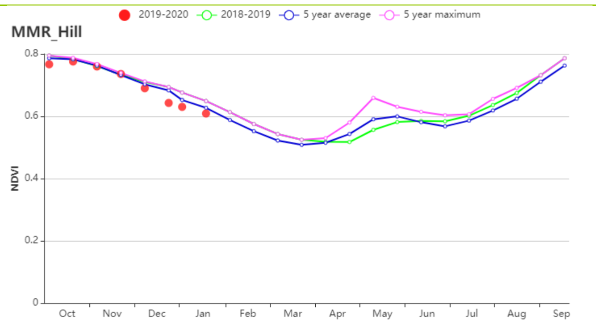


(d) Spatial NDVI patterns compared to 5YA

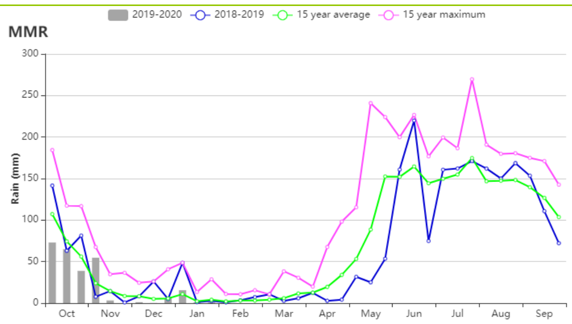
(e) NDVI profiles



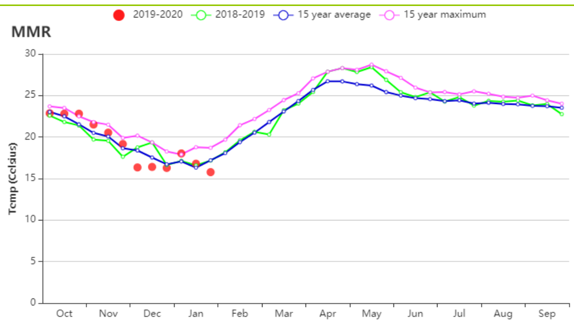
(f) Crop condition development graph based on NDVI (Coastal region (left) and Central plain (right))



(g) Crop condition development graph based on NDVI (Hill region)



(h)rainfall index



(i)temperature index

Table 3.53 Myanmar's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Coastal region	199	-43	24.8	0.3	1194	7
Central plain	252	-16	19.4	0.2	1074	6
Hill region	286	286	286	286	286	286

Table 3.54 Myanmar's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current (%)	Departure from 5YA (%)	Current
Coastal region	496	-9	99	1	0.96
Central plain	355	-21	99	1	0.94
Hill region	324	-18	99	0	0.99

AFG AGO ARG AUS BGD BLR BRA CAN DEU EGY ETH FRA GBR HUN IDN IND IRN ITA KAZ KEN KGZ KHM LKA MAR MEX MMR **MNG** MOZ NGA PAK PHL POL ROU RUS THA TUR UKR USA UZB VNM ZAF ZMB

[MNG] Mongolia

Mongolia only grows summer crops from May to September. The crops are normally harvested in September, but due to cold conditions (lower than 5.0°C) in May of last spring, the sowing and planting were delayed; therefore, harvest of last summer crops took place in October only. TEMP was near the fifteen-year average (+0.4°C) during this reporting season, and it was warmer (+3.0°C) than average at the beginning of November.

Nationwide, according to CropWatch agro-climatic indicators, the weather was humid and slightly cloudier (RAIN up +28% and RADPAR down -1%). The increased precipitation may benefit early sowing, in the primary agriculture regions of Selenge-Onon, Khangai-Khuvsgul, and Central and Eastern Steppe. The agro-climatic condition resulted in an increase in the BIOMSS index by 2% above the five-year average. The abundant rainfall will benefit the planting of spring crops.

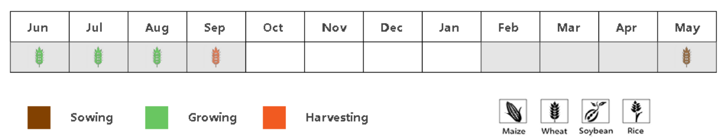
Regional analysis

The primary crop condition in the **Khangai Khuvsgul reegion** was higher than the five-year average in mid and late October and lower in November. Accumulated rainfall was above average (RAIN +33%). Compared to the average, TEMP was up by 0.6°C and RADPAR was down by 2%. The BIOMSS index increased by 1% compared to the fifteen-year average in this region.

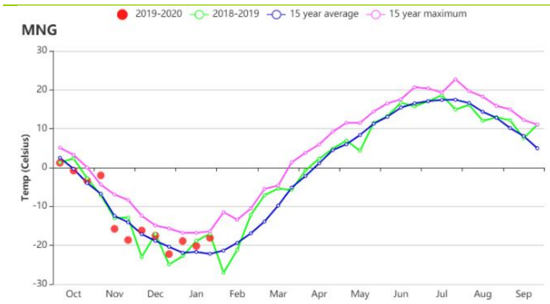
In the **Selenge-Onon region**, RAIN was up by 27%, while TEMP was average, and RADPAR was slightly lower (-2%). The BIOMSS index decreased by 2% of fifteen-year average. The agro-climate condition was almost average.

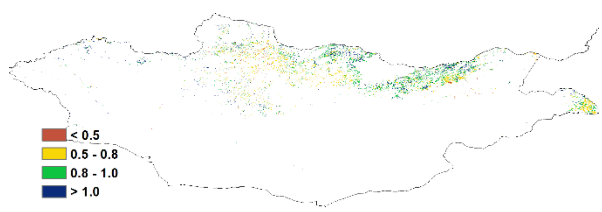
In the **Central and Eastern Steppe Region**, the meteorological variables were above average: RAIN +33% and TEMP +0.6°C. RADPAR increased slightly above average. BIOMSS (+7%) showed an above average potential biomass.

Figure 3.31 Mongolia's crop condition, October 2019 - January 2020



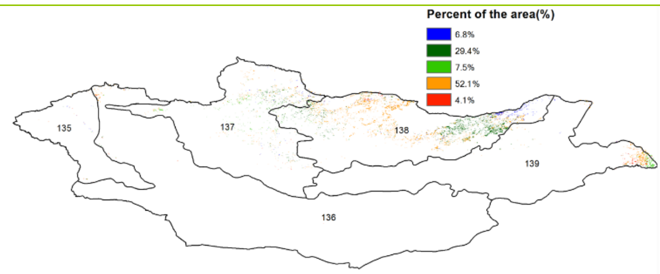
(a). Phenology of major crops

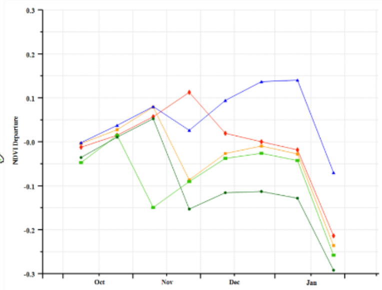




(b) Crop condition development graph based on NDVI

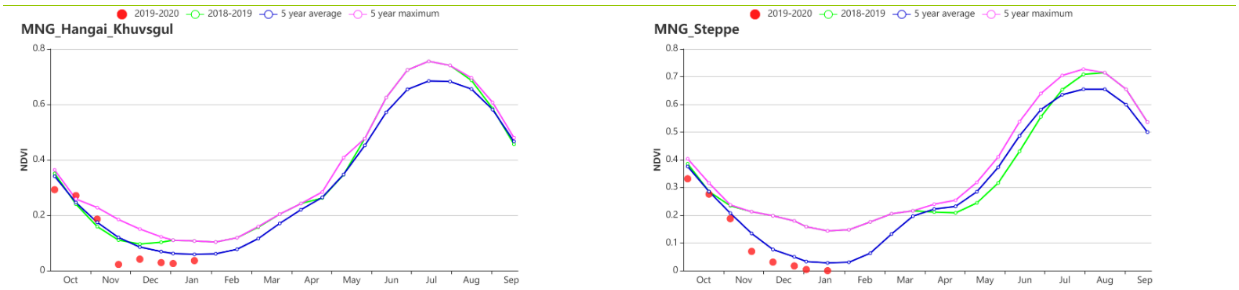
(c) Maximum VCI



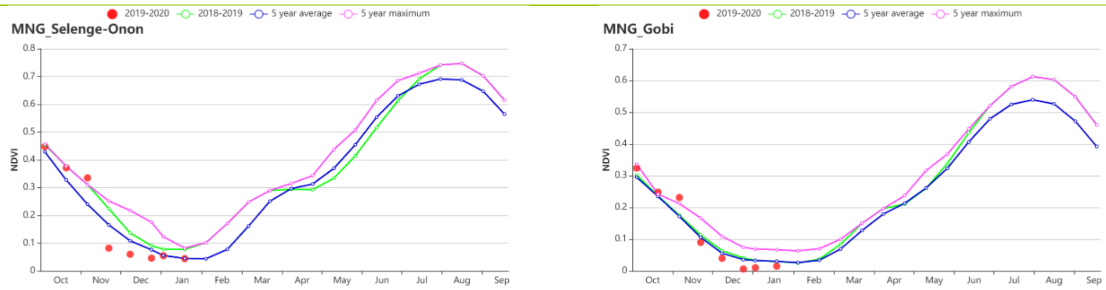


(d) Spatial NDVI patterns compared to 5YA

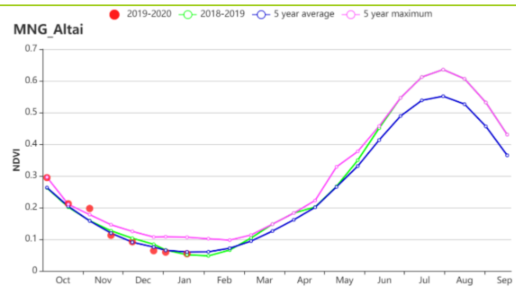
(e) NDVI profiles



(f) Crop condition development graph based on NDVI (Hangai Khuvsgul Region (left) andSteppe Region (right))



(g) Crop condition development graph based on NDVI (Selenge-Onon Region (left) and Gobi Region (right))



(h) Crop condition development graph based on NDVI (Altai Region)

Table 3.55 Mongolia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)
Hangai Khuvsgul Region	55	33	-13.9	0.6	454	-2
Selenge-Onon Region	61	27	-12.3	0.2	448	-2
Central and Eastern Steppe Region	80	33	-12.0	0.6	460	0
Altai Region	53	-16	-11.3	0.2	433	0
Gobi Desert Region	55	33	-13.9	0.6	454	-2

Table 3.56 Mongolia's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m²)	Departure from 15YA (%)	Current (%)	Departure from 5YA (%)	Current
Hangai Khuvsgul Region	38	1	6	49	0.87
Selenge-Onon Region	42	2	38	107	0.87
Central and Eastern Steppe Region	48	7	13	52	0.78
Altai Region	40	-10	3	950	1.25
Gobi Desert Region	32	-19	24	620	1.24

[MOZ] Mozambique

During the period between October 2019 and December 2019, farmers in Mozambique planted their maize, rice and wheat crops. This monitoring period, which lasts until the end of January, also covers the establishment and early growth phases of these crops. Low rainfall recorded in the southern region (in the provinces of Maputo, Gaza and Inhambane) has negatively impacted the crop conditions. However, in January, heavy rainfall was recorded in that region. Unlike the southern region, the central and northern regions of the country recorded favourable rainfall for crop establishment and development.

The CropWatch agroclimatic indicators reveal that during this period, rainfall, temperature and radiation were all above average (RAIN +12%, TEMP +0.3º and RADPAR +1%, respectively). Even so, the potential biomass was just close to average. CALF is 10% above 5YA, reaching 98%, indicating an increase in the total cropped area.

Nationwide, about average crop conditions were observed as indicated by the NDVI based crop development graph. The maximum VCIx recorded was 0.91 which also confirmed the favourable crop condition. Positive NDVI anomalies were verified in more than 30% of the cropped area, mostly concentrated in the provinces of Zambézia, Sofala, Nampula, Manica and northern Tete. About 19.1% of the cropped area recorded continuous unfavorable NDVI anomalies, mostly in southern Mozambique mainly due to the water shortage. The remaining areas showed mixed behaviors.

Overall, CropWatch assesses production potential at an above-average level in the 2019-2020 seasons.

Regional analysis

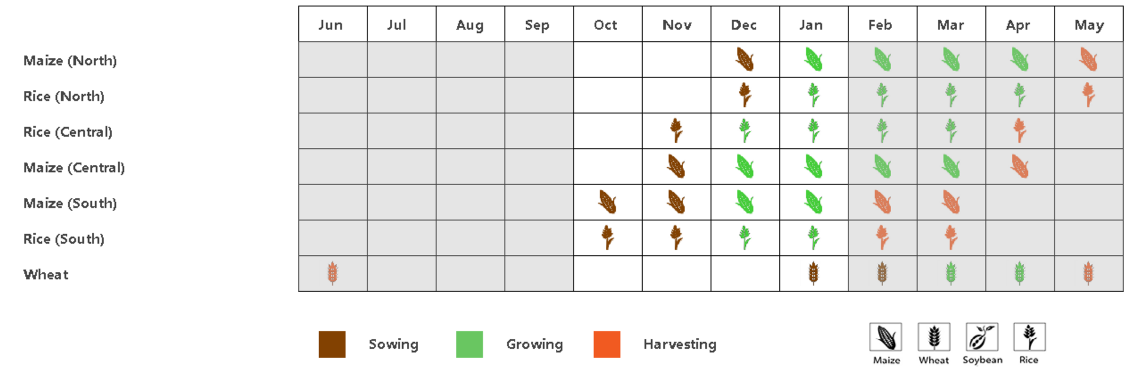
According to the cropping system, topography and climate, Mozambique is subdivided into five agro-ecological zones (AEZ): (1) Buzi Basin, (2) Northern High-altitude Areas, (3) Low Zambezi River Basin, (4) Northern Coast and (5) Southern Region.

The subregions development graphs based on the NDVI show that during the October 2019-January 2020 monitoring period, crop conditions were favourable in the Buzi Basin, Northern High-altitude Areas, Low Zambezi River Basin, and Northern Coast areas, while the Southern region experienced the unfavorable crop conditions throughout entire period compared to the five years average as a result of water shortage.

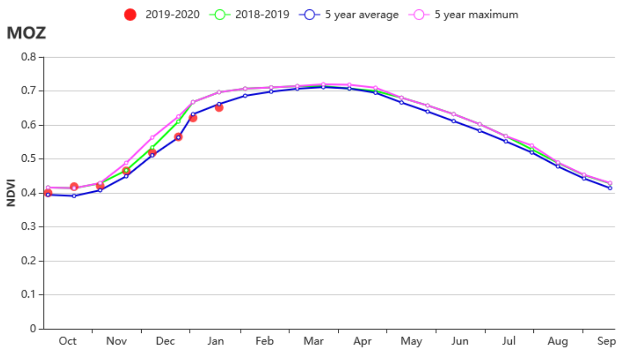
Except for the Southern region (rainfall at 331mm, 29% below average) and the Buzi Basin (near average), all other agro-ecological zones recorded positive rainfall departures of up to 42%. Significant deviations from average temperatures were observed in the Northern high-altitude areas (TEMP -1.5°C) and in the northern Coast (TEMP +1.2°C). Radiation was also lower in the Northern high-altitude areas (RADPAR -4%) and higher in the northern Coast (RADPAR +5%).

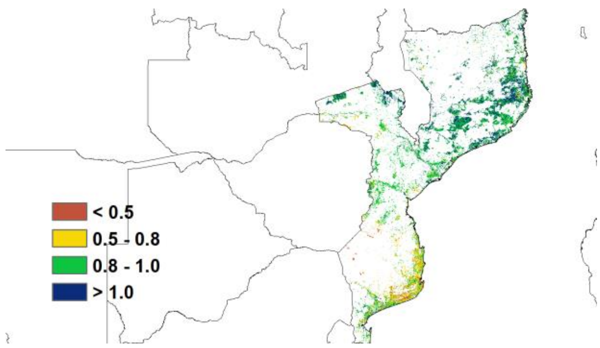
Despite the unfavorable crop conditions observed for the Southern region, an increase in Biomass by 3% was calculated. All other regions recorded a decrease in the biomass, especially in the Northern high-altitude areas, where the indicator decreased by 16%. CALF increased in all agroecological zones, having reached 100% in the Buzi Basin. The maximum VCIx was low in the Southern region, followed by the Buzi Basin, having respectively 0.75 and 0.89. Low VCIx in Southern region confirms the adverse weather conditions and their negative impacts on crops.

Figure 3.32 Mozambique's crop condition, October 2019 - January 2020



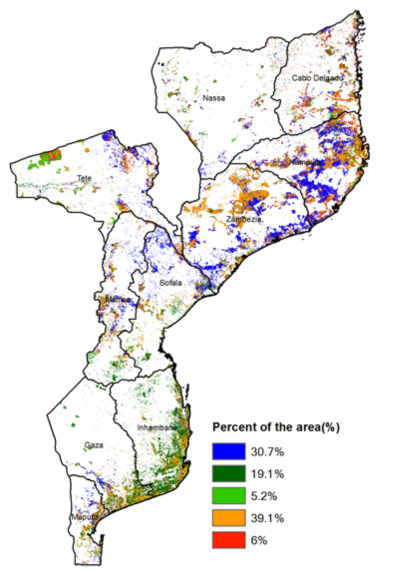
(a). Phenology of major crops

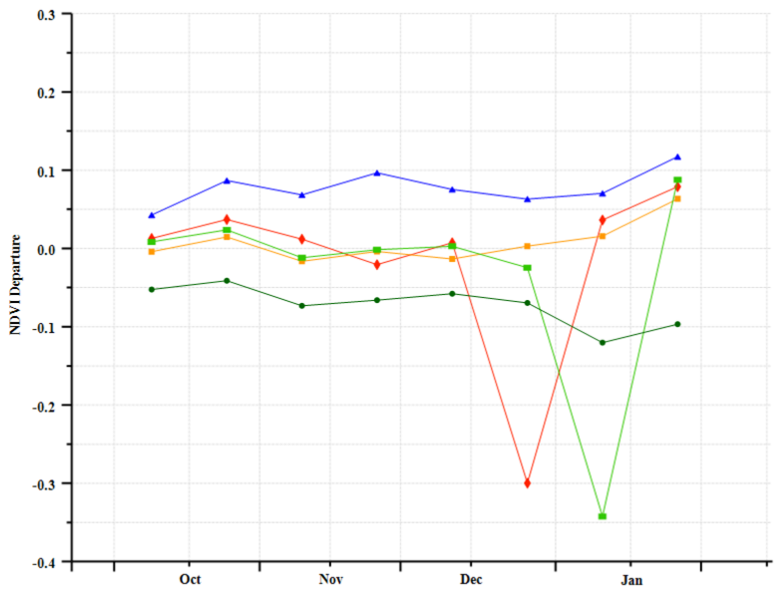




(b) Crop condition development graph based on NDVI

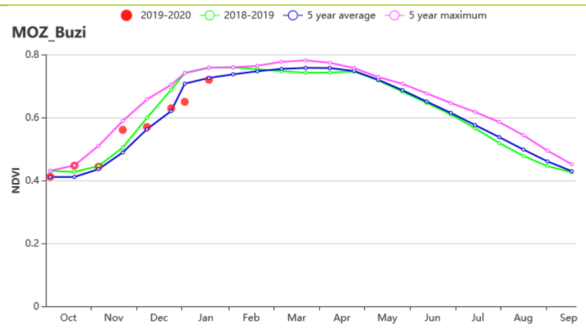
(c) Maximum VCI

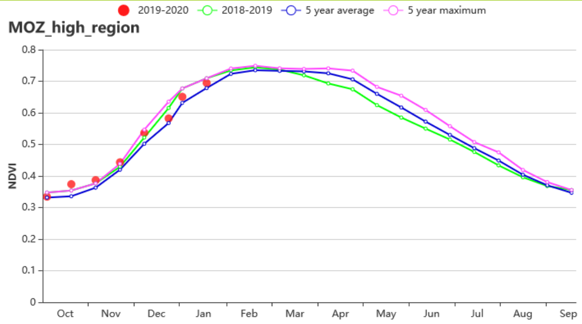




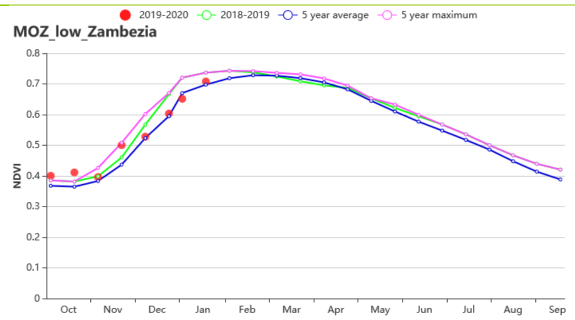
(d) Spatial NDVI patterns compared to 5YA

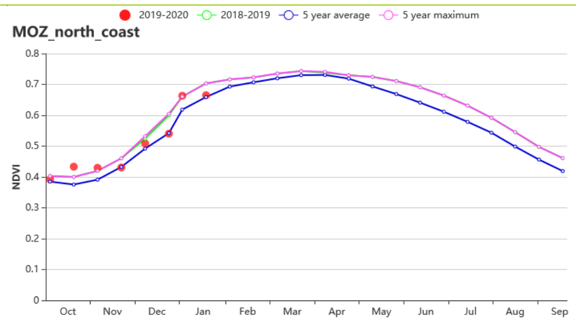
(e) NDVI profiles



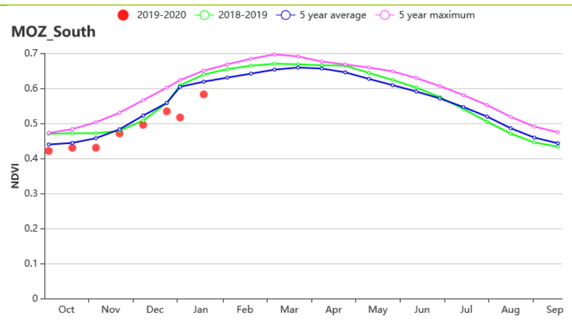


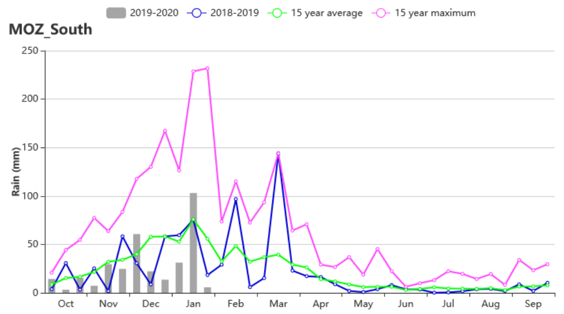
(f) Crop condition development graph based on NDVI- Buzi basin (g) Crop condition development graph based on NDVI- Northern high altitude areas



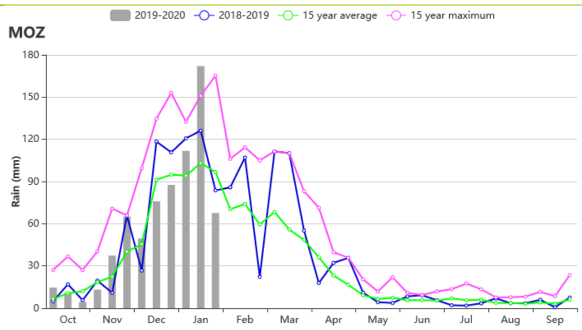


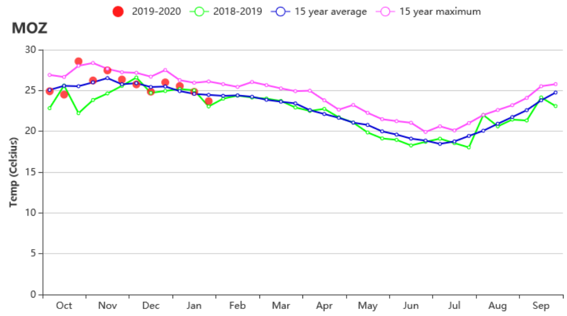
(h) Crop condition development graph based on NDVI- Lower Zambezi River basin (i) Crop condition development graph based on NDVI- Northern coast region





(j) Crop condition development graph based on NDVI- Southern region; (k) Southen region time-series rainfall profiles





(j) Rainfall index (k) Temperature index

Table 3.57 Mozambique's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Buzi basin	730	0	23.9	0.4	1442	4
Northern high altitude areas	1148	42	22.5	-1.5	1210	-4
Low Zambezi River basin	740	8	26.0	0.1	1366	2

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Northern coast	736	18	27.1	1.2	1362	5
Southern region	331	-29	26.3	0.7	1340	2

Table 3.58 Mozambique's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current (%)	Departure from 5YA (%)	Current
Buzi basin	909	-1	100	5	0.89
Northern high altitude areas	680	-16	99	8	0.95
Low Zambezia River basin	842	-3	99	11	0.94
Northern coast	844	-1	99	19	0.98
Southern region	899	3	94	3	0.75

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[NGA] Nigeria

The previous bulletin covered the period from July to October 2019, which was the harvesting period for main cereals, such as maize, wheat and rice, as well as the sowing period for second season maize. Cropping conditions were generally favorable in the different parts of the country.

Second season maize was the main crop in the fields during this reporting period (October to January). Harvest of the other crops, such as cassava in the south, groundnuts, soybean, sorghum and millet in the North was concluded by November. The conflict remains a big concern and continues to negatively impact food production and security in northern Sahel. Regarding agro-climatic indicators, the region received 282 mm of rainfall. This is an increase of 57% from the 15YA. Temperature (TEMP) was 24.6ºC (-0.4ºC) and radiation was 1216 MJ/m2. The observed maximum vegetation condition index (VCIx) was 0.98 and the Biomass production potential was 313 gDM/m2 (+10% of departure from 5YA).

From mid-October 2019, NDVI development graph and VCIx revealed above average crop conditions during the monitoring period across the country. Relatively better conditions, as compared to the average, were observed for the northern part. The NDVI spatial cluster indicates that only 10.9% of cropped land was below average. Generally, the crop conditions were favorable.

Regional analysis

Based on its cropping systems, topographic conditions and climatic zones, Nigeria is divided into four agro-ecological zones (AEZ): 1) Sudano-Sahelian zone in the north with the driest climate, 2) Guinean Savanna, 3) Derived Savanna in the center and 4) Humid forest zone in the south.

The **Sudano-Sahelian zone**, with its closeness to the Sahara desert, this is the driest AEZ. During this recent period, the average rainfall was 48 mm with a +276 % departure from the 15YA. The average temperature was 24.3ºC (-0.2ºC). 1211 (MJ/m2) of radiation was observed (-4%). The total estimated biomass production was 178 gDM/m2 with increase of 37%, and the CALF was 71% (+26 %). NDVI stayed above the average for the whole period.

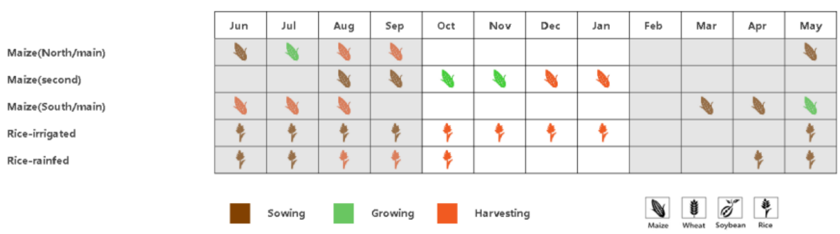
In the **Guinean Savanna**, the average precipitation was 148 mm with a 163 % of departure above the 15YA. The current temperature was 23.7 ºC (-4ºC) and the recorded radiation was 1250 MJ/m2 (-3.2%). The estimated biomass was 224 gDM/m2, a 9% decrease and CALF was 98%. The NDVI values were just above average in last four months and the maximum VCI for this region reached 0.96.

Derived Savanna, the transition zone between Guinean savanna and Humid forest zones, received 363 mm of rainfall, a +101% of departure compared to the 15YA. Average temperature was 24.8ºC (-0.5ºC), while the total radiation was 1213 (MJ/m2) (-2%).

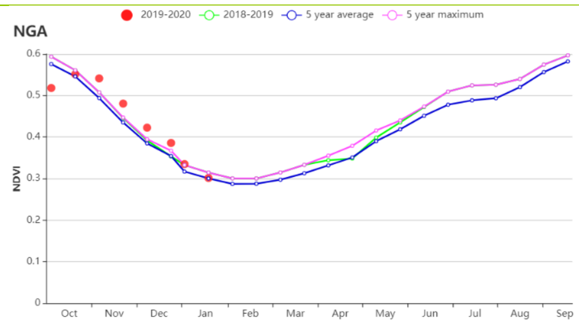
Due to decline of rainfall, the total biomass production was 410 gDM/m2 with a reduction by 22 % compared to the 5YA. The CALF was 99 % which is the same as the 5YA and maximum VCIx was 0.97. The NDVI values continued to be close to the 5YA until January.

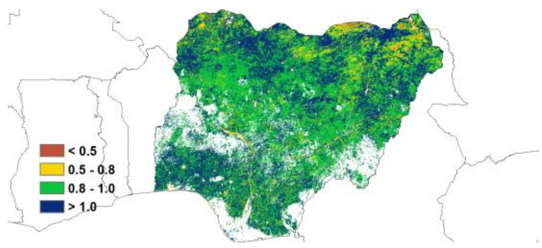
Humid forest AEZ, known for its high precipitation, recorded 623 mm (+7%). The temperature was 25.7 ºC (-0. 2ºC) and radiation (1166 MJ/m2) decreased (-0.2%). This might have caused a reduced estimate of biomass production (646 gDM/m2) (-10%). CALF and VCI continued to be high at 98% and 0.98 respectively. Trend in NDVI was below average during October but later in mid November went closer to the average.

Figure 3.33 Nigeria's crop condition, October 2019 - January 2020



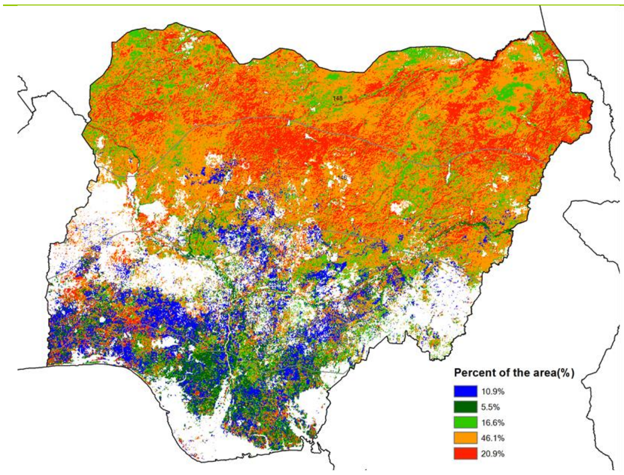
(a) Phenology of major crops

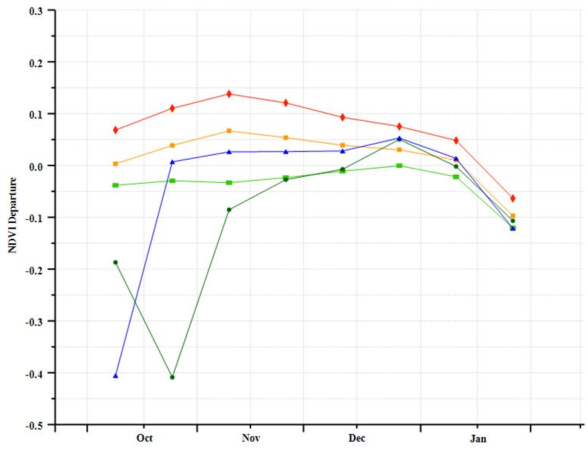




(b) Crop condition development graph based on NDVI

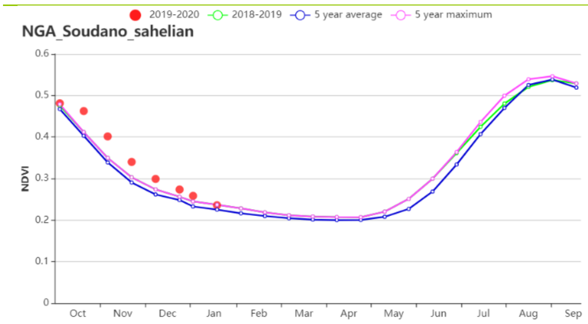
(c) Maximum VCI

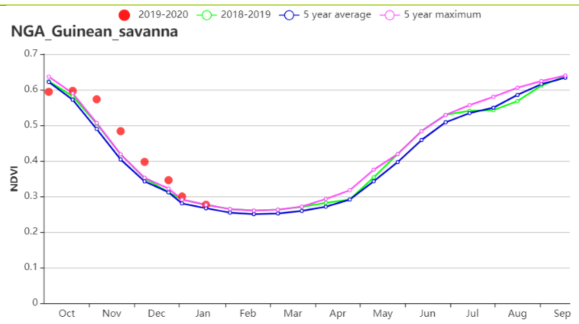




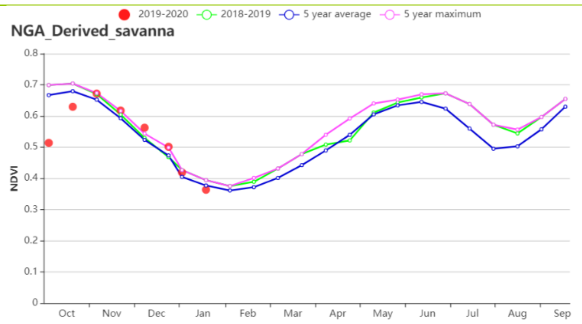
(d) Spatial NDVI patterns compared to 5YA

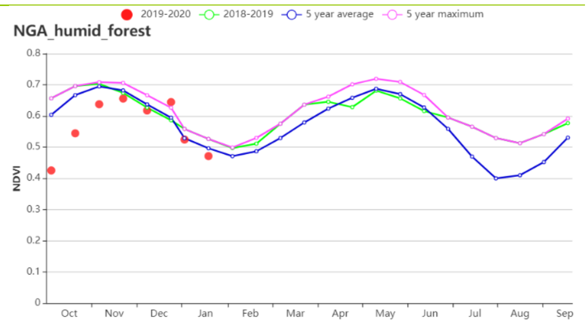
(e) NDVI profiles





(f) Crop condition development graph based on NDVI (Soudano-sahelian region (left) and Derived savanna zone region (right))





(g) Crop condition development graph based on NDVI (Humid forest zone region (left) and Guinean savanna region (right))

Table 3.59 Nigeria's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Soudano-Sahelian zone	48	276	24.3	-0.2	1211	-4
Derived savanna zone	363	101	24.8	-0.5	1213	-2
Humid forest zone	623	7	25.7	-0.2	1166	-0.2
Guinean savanna	148	163	23.7	-0.4	1250	-3

Table 3.60 Nigeria's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMASS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current	Departure from 5YA (%)	Current
Soudano-sahelian zone	178	37	71	26	0.98
Derived savanna zone	410	-22	99	0	0.97
Humid forest zone	646	-10	98	0	0.98
Guinean savanna	224	-9	98	0	0.96

[PAK] Pakistan

This period covers the harvest of maize and rice in October, as well as the subsequent planting and vegetative growth of wheat. Crop conditions were generally favorable from October to January.

Nationwide, RAIN (+149%) sharply increased, while TEMP (-1.3°C) and RADPAR (-8%) were lower as compared to the 15YA. Three agro-ecological regions had consistently excessive rainfall during this reporting period: The Lower Indus river basin in south Punjab and Sind (+518%), Northern Punjab (+318%) and Northern highlands (+78%) were above average. Correspondingly, less sunshine and lower temperature were observed in these zones. The combination of all the agro-climatic indicators resulted in BIOMSS exceeding the recent five-year average by 113%. These favorable agroclimatic conditions benefited the germination and early growth of winter wheat.

Crop conditions were above the maximum of the last five years starting in October, as shown by the NDVI development graph at the national level. Only 10% of the cropped areas were below average, mainly in north of Peshawar, west of Kohat and Bannu in Northern highlands zone, and some sporadically in Lower Indus river basin in south Punjab and Sind zone. According to the spatial NDVI patterns and profiles, most of the Punjab and the Indus river basin, the two major wheat producing areas, had above average NDVI throughout the period. The national average of VCIx (1.02) is above the maximum of the last five years. Winter wheat prospects are promising.

Regional analysis

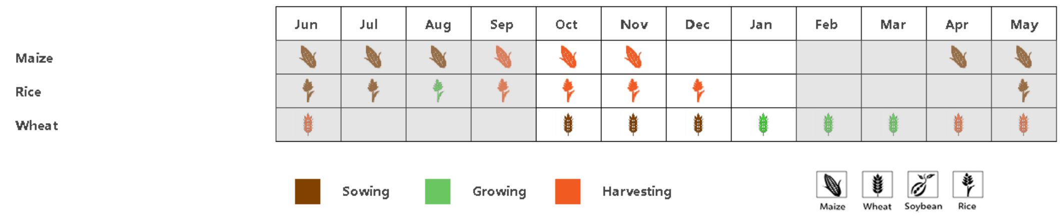
For a more detailed spatial analysis, CropWatch subdivides Pakistan into three agro-ecological regions based essentially on geography and agroclimatic conditions: the Lower Indus basin, the Northern highlands, and the Northern Punjab region.

RAIN in the **Northern highland** region was 78% above average. RADPAR (-4%) was lower and TEMP (+0.5°C) was higher. As a result, BIOMSS was 35% above average. The NDVI development graph showed above average crop conditions in this reporting period. VCIx with 1.02 indicated better conditions than in the previous five years. Planted area (CALF, 60%) was also high.

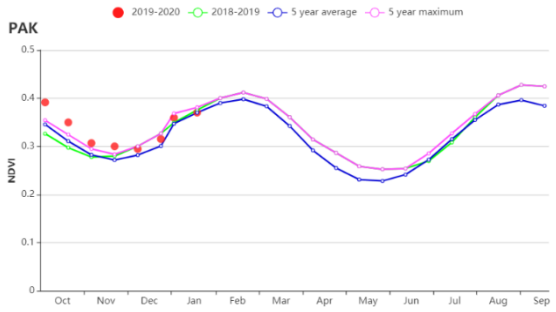
Northern Punjab, the main agricultural region in Pakistan recorded the above average RAIN (+318%). TEMP was below average by 1.8°C, and the RADPAR departure was -10%. The resulting BIOMSS exceeded the recent five-year average by 54%. Crop condition assessed through NDVI based crop development profiles showed high values in October. NDVI subsequently dropped to average in December and below average in January. The area had a good CALF of 87% (18% above last five years' average) and a VCIx of 0.96. Overall, the crop production potential for the region is deemed to be favorable.

In the **Lower Indus river basin in south Punjab and Sind**, RAIN was the highest among all regions, sharply above average (+518%), while TEMP was below average by 0.9°C and RADPAR was lower than average. BIOMSS was up by 212% as compared to the five-year average. In January, crop condition based on NDVI development profiles was close to average. The high CALF (75%) represented a large increase over the recent 5YA (+29%); VCIx at 1.03 indicated favorable crop condition. Overall, prospects are favorable.

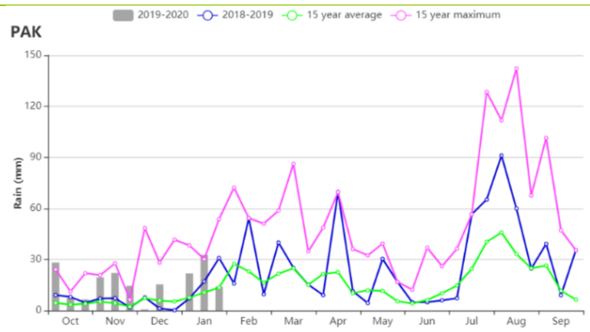
Figure 3.34 Pakistan's crop condition, October 2019 - January 2020



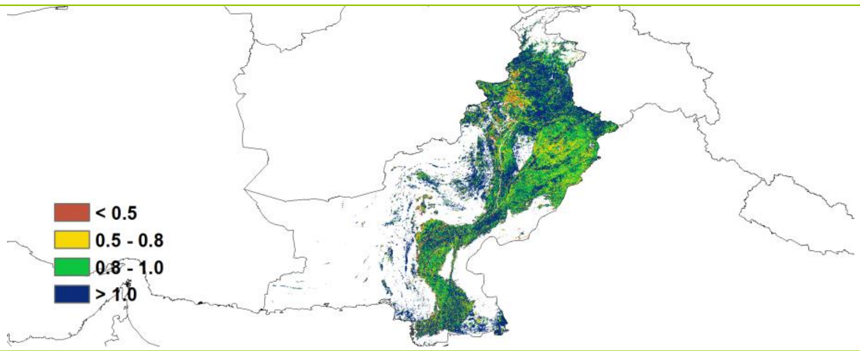
(a). Phenology of major crops



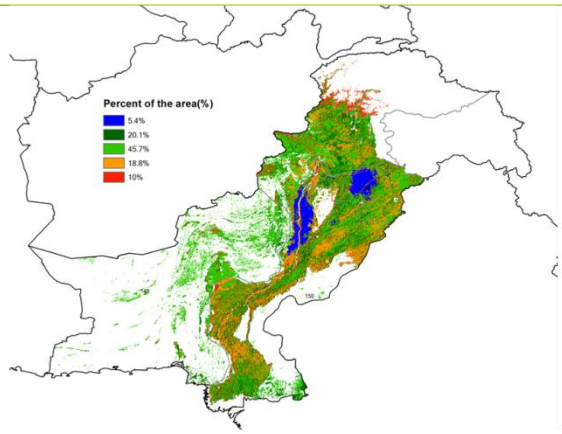
(b) Crop condition development graph based on NDVI



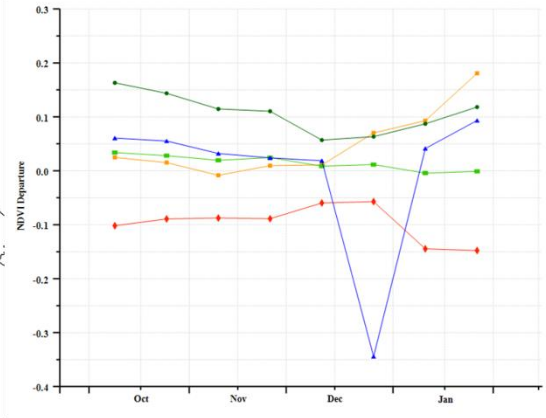
(c) Time series rainfall profile



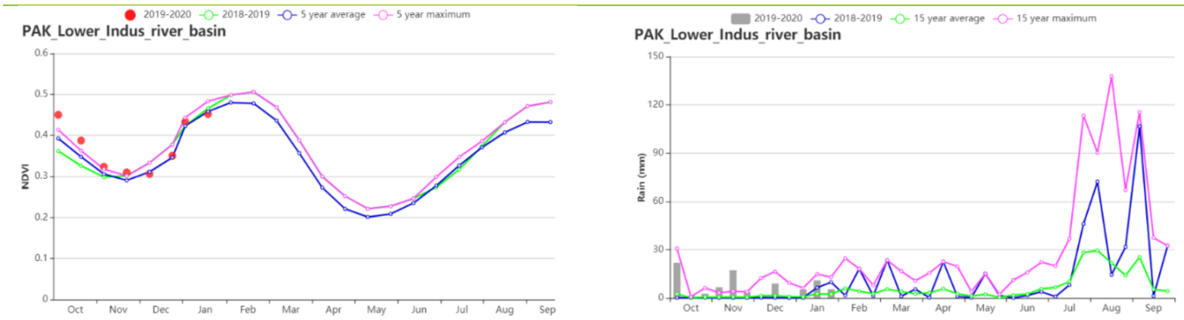
(d) Maximum VCI



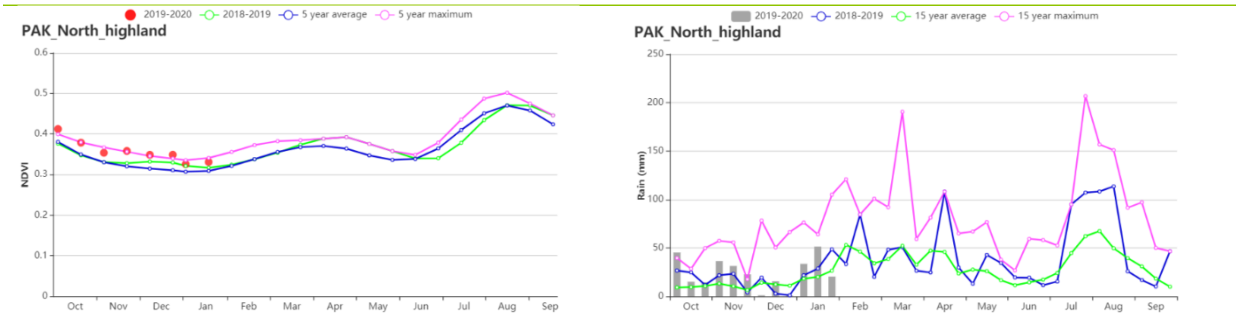
(e) Spatial NDVI patterns compared to 5YA



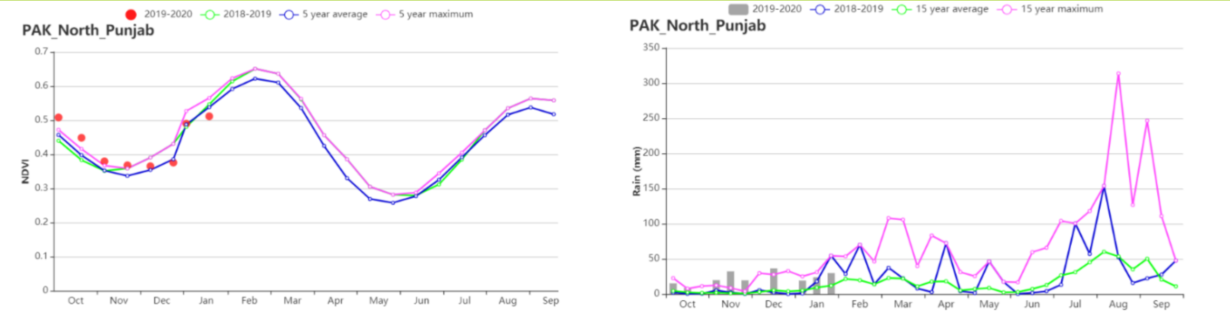
(f) NDVI profiles



(g) Crop condition development graph based on NDVI and time series rainfall profile (Lower Indus river basin in south Punjab and Sind)



(h) Crop condition development graph based on NDVI and time series rainfall profile (Northern highlands)



(i) Crop condition development graph based on NDVI and time series rainfall profile (Northern Punjab)

Table 3.61 Pakistan's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Balochistan	103	171	13.5	-0.5	918	-6
Lower Indus river basin in south Punjab and Sind	84	518	19.6	-0.9	904	-6
Northern highlands	288	78	8.3	0.5	716	-11
Northern Punjab	204	318	15.4	-1.8	754	-10

Table 3.62 Pakistan's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		CALF		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current (%)	Departure from 5YA (%)	Current
Balochistan	278	131	2	489	0.93
Lower Indus river basin in south Punjab and Sind	332	212	75	29	1.03
Northern highlands	209	35	57	60	1.12
Northern Punjab	299	54	87	18	0.96

[PHL] Philippines

In the Philippines, the monitoring period covers the harvesting stage of last year's main rice, as well as the sowing stage of secondary rice and maize crops. According to the NDVI profiles for the country, the NDVI was slightly below average until early December, when it started to approach close to average values. Nationwide, precipitation (RAIN) presented a negative departure of 16% compared with average, accompained by above-average radiation (PADPAR +8%) and average temperature (TEMP +0°C). Altogether, the potential cumulative biomass was above average (BIOMASS +6%). According to the VCIx indicator (0.98), favorable crop condition prevailed. The cropped arable land fraction (CLAF) for the country was almost 100%.

Considering the spatial patterns of NDVI profiles, about 52.5% of the crop land, which mainly lies in the western coast of Luzon island, the west of Visayas island and the west of Mindanao island, presented an above-average NDVI during reporting period. A couple of negative outliers for NDVI were observed for November and January. These might be due to cloud cover or aftereffects of typhoons.

In spite of the below average rainfall, the other indicators are close to average and we therefore conclude that overall, crop conditions are favorable.

Regional analysis

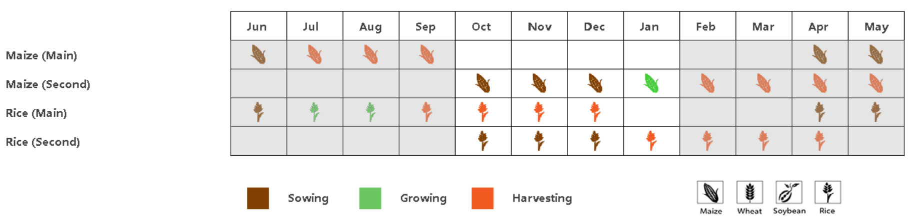
Based on cropping systems, climatic zones and topographic conditions, three main agro-ecological regions can be distinguished for the Philippines. They are the **Lowlands region** (northern islands), the **Hilly region** (Island of Bohol, Sebu and Negros), and the **Forest region** (mostly southern and western islands). All the regions have a stable (unchanged) cropped arable land fraction.

The **Lowlands region** experienced a rainfall deficit (RAIN -12%), average temperature (TEMP +0.0°C) and above average radiation (RADPAR +8%). According to the NDVI profiles for the region, crop condition was below the five-year average, especially in the early Novermber. However, BIOMSS was up 4% above average, with a VCIx of 0.98, which means a good crop condition.

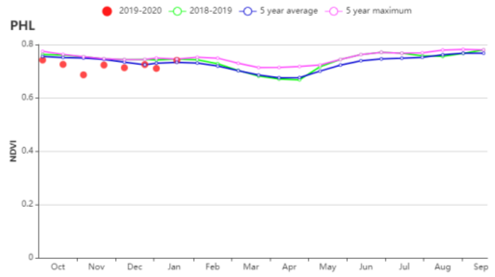
The **Negros and central Visayas Islands region** had a rainfall deficit (RAIN -7%), slightly above average temperatures (TEMP +0.2°C) and a departure of radiation (RADPAR +9%). As is shown by NDVI profile of this region, the NDVI was slightly below average before December 2019 and was above average after that time. Compared with the average, BIOMSS was up 10% above average with a VCIx of 1.00, showing a favorable crop condition.

The **Forest region** experienced the largest rainfall deficit (RAIN -20%), slightly above average temperature (TEMP +0.1°C) and above average radiation (RADPAR +8%). According to the NDVI profiles, crop condition was near the five-year average, while BIOMSS was up 6% from average. Altogether, the VCIx for the region was 0.98, displaying a good crop condition.

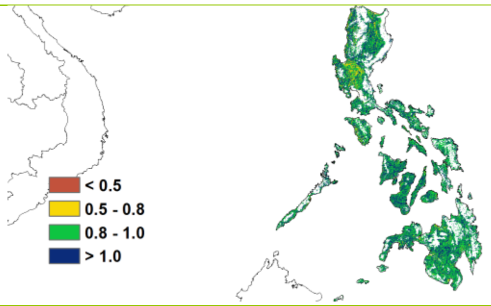
Figure 3.35 Philippines's crop condition, October 2019 - January 2020



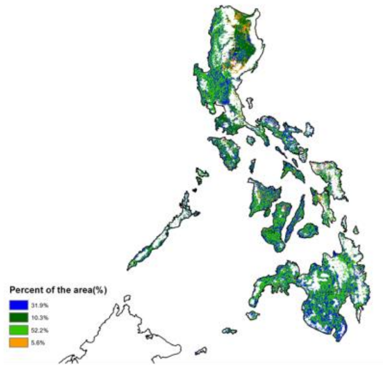
(a). Phenology of major crops



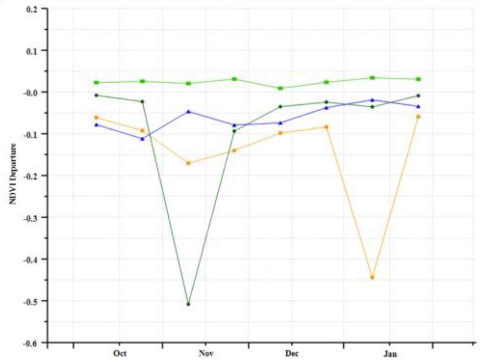
(b) Crop condition development graph based on NDVI



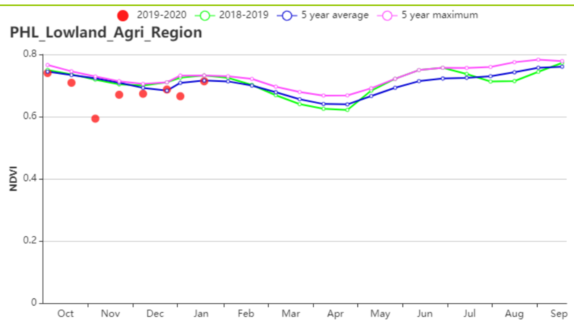
(c) Maximum VCI

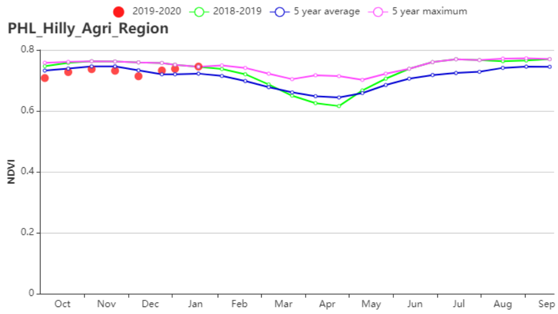


(d) Spatial NDVI patterns compared to 5YA

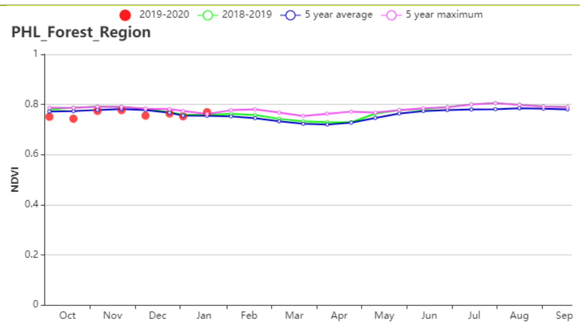


(e) NDVI profiles

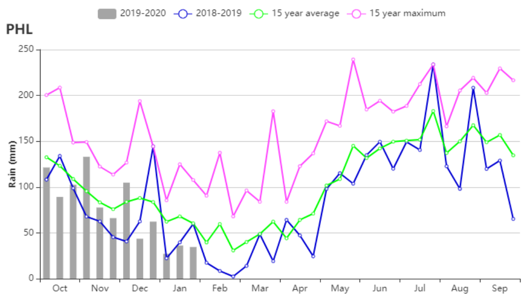


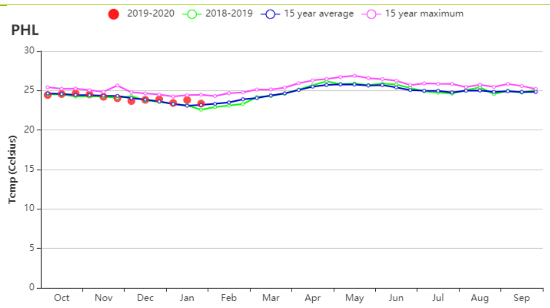


(f) Crop condition development graph based on NDVI (Northern lowlands of Mindanao to western Visayas region (left)， Negros and central Visayas Islands region (right))



(g) Crop condition development graph based on NDVI(Forest islands region)





(h)Rainfall index

(i)Temperature index

Table 3.63 Philippines's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Lowland region	769	-12	23.6	0.0	1000	8
Hilly region	1123	-7	26.0	0.2	1199	9
Forest region	1004	-20	24.2	0.1	1155	8

Table 3.64 Philippines's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current	Departure from 5YA (%)	Current
Lowlands region	622	4	100	0	0.98
Hilly region	811	10	98	0	1.00
Forest region	755	6	100	0	0.98

[POL] Poland

In Poland, the period covers the harvest of maize and the sowing of winter wheat in October 2019, and the early growth stages of winter wheat. Due to significant higher temperature (+2.2°C), national NDVI was above the maximum of the last 5 years from late November 2019 to January 2020, despite of a low rainfall (-20%). In this monitoring period, the Cropped Arable Land Fraction (CALF) was close to average (100%) and VCIx was 1.02.

As shown by the crop condition development graph, sowing was concluded in October, mainly under favorable conditions. Temperatures and soil moisture conditions were favorable for early development of plants. However, temperature was close to the maximum of the last 15 years in December and significantly higher than average. This means that in Poland, crops are particularly vulnerable to frost damage in the event of a cold air intrusion. Furthermore, pest and disease pressure can be expected to be higher than usual following a mild winter. In addition, the drier than average weather mainly affected soil moisture and ground water replenishment, rather than having a direct impact on crops. The situation needs further monitoring.

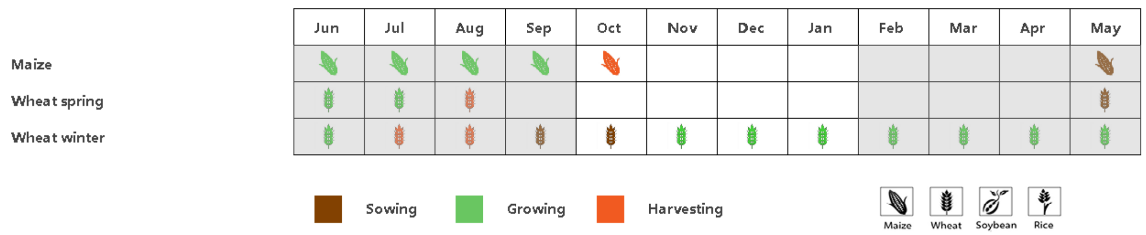
Regional analysis

Four agro-ecological zones (AEZ) are examined more closely below. They include the **Northern oats and potatoes area** (the northern half of: west Pomerania, eastern Pomerania and Warmia-Masuria), the **Northern-central wheat and sugar-beet area** (Kuyavia-Pomerania to the Baltic sea), the **Central rye and potatoes area** (Lubusz to South Podlaskie and northern Lublin), and the **Southern wheat and sugar-beet area** from southern Lower Silesia to southern Lublin and Subcarpathia along the Czech and Slovak borders. The listed administrative units correspond to voivodeships.

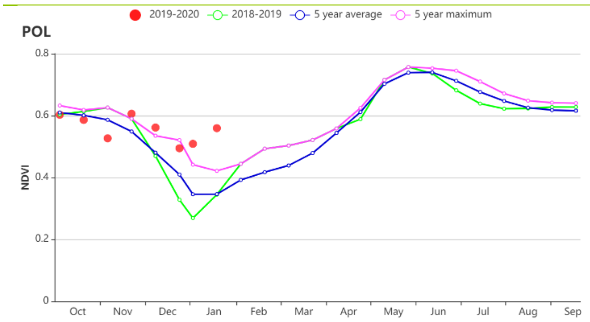
The **Northern oats and potatoes area** and the **Northern-central wheat and sugar-beet area** recorded both drier and warmer conditions compared to the average (RAIN -13% and -17%, TEMP +2.3°C and +2.2°C, respectively). RADPAR was below average in the two areas (-9% and -7%, respectively). The areas also had high CALF (100%) and VCIx (1.01 and 1.07). Crop conditions are satisfactory but need further monitoring.

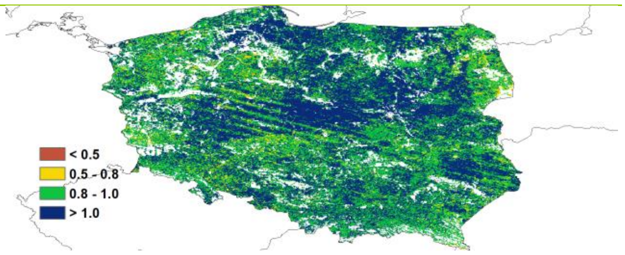
Different from above two regions, RADPAR in **Central rye and potatoes area** and the **Southern wheat and sugar-beet area** was above average (+3% and +10%, respectively). Meanwhile, weather in the two regions was both drier and warmer than average (RAIN -25% and -15%, TEMP +2.2°C and +2.1°C, respectively). High CALF and VCIx were observed for both. The crop conditions are assessed as good for this period.

Figure 3.36 Poland's crop condition, October 2019 - January 2020



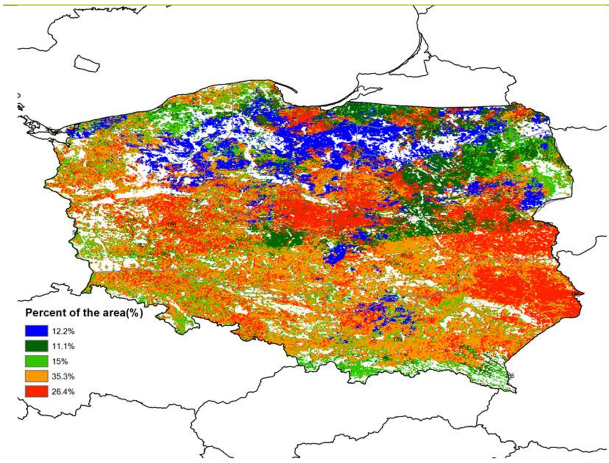
(a). Phenology of major crops

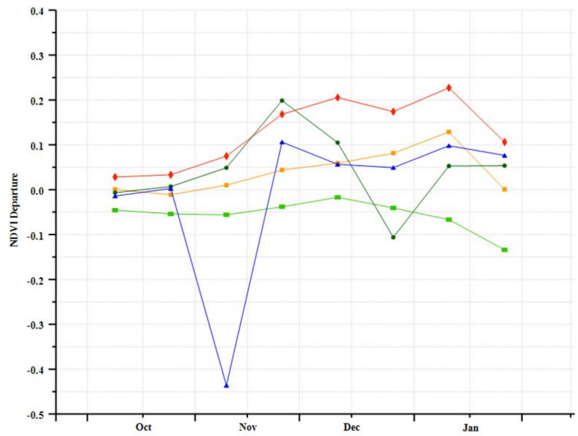




(b) Crop condition development graph based on NDVI

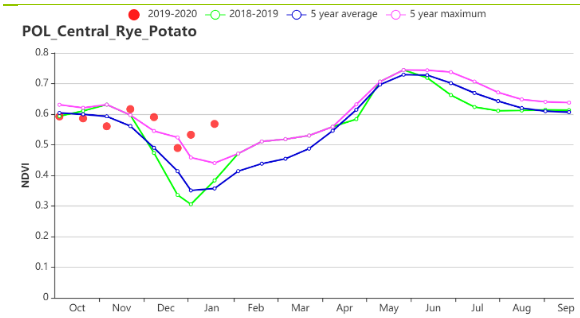
(c) Maximum VCI

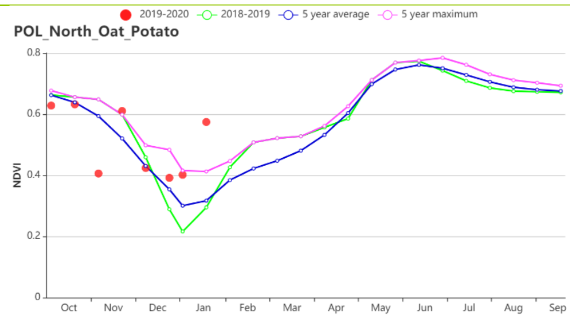




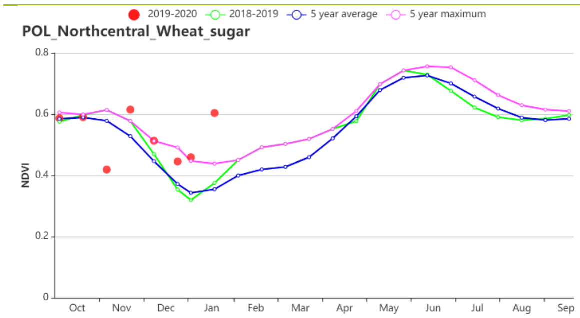
(d) Spatial NDVI patterns compared to 5YA

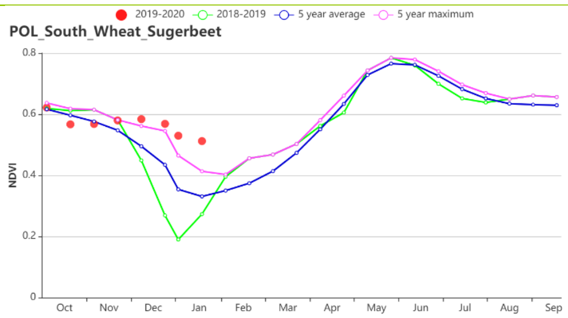
(e) NDVI profiles



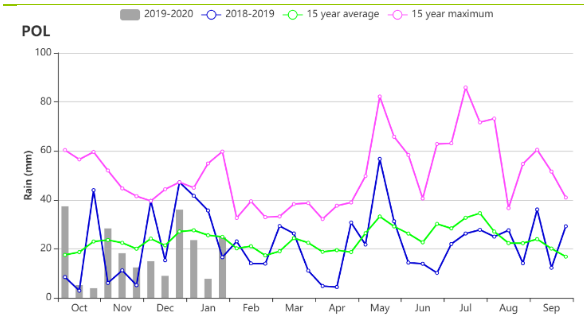


(f) Crop condition development graph based on NDVI, Central rye and potatoes area (left) and Northern oats and potatoes area (right).

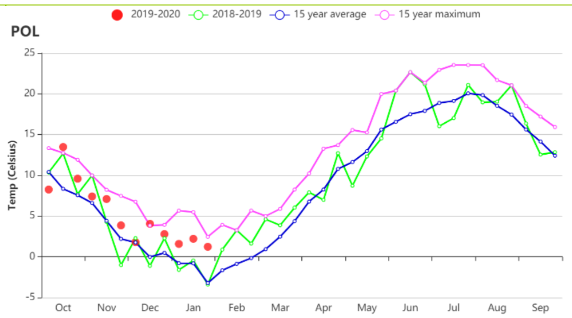




(g) Crop condition development graph based on NDVI, Northern-central wheat and sugar beet area (left) and Southern wheat and sugar beet area (right).



(h) Rainfall index



(i) Temperature Index

Table 3.65 Poland's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m2)	Departure from 15YA (%)
Central rye and potatoes area	276	-13	5.3	2.3	152	-9
Northern oats and potatoes areas	232	-17	5.6	2.2	169	-7
Northern-central wheat and sugarbeet area	205	-25	5.6	2.2	205	3
Southern wheat and sugarbeet area	222	-15	4.6	2.1	278	10

Table 3.66 Poland's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current	Departure from 5YA (%)	Current
Central rye and potatoes area	37	4	100	0	1.01
Northern oats and potatoes areas	43	6	100	1	1.07
Northern-central wheat and sugarbeet area	52	19	100	1	1.03
Southern wheat and sugarbeet area	58	6	100	1	1.00

[ROU] Romania

The reporting period includes the harvest of the 2019 maize crop and the planting of the 2019-2020 winter wheat, which started in September. Overall, crop conditions were favorable, yet the agroclimatic indicators fluctuated. Rainfall was 35% lower than average; TEMP, RADPAR and BIOMSS were higher by 2.1°C, 9% and 10%, respectively. The nationwide NDVI profile shows that crop conditions were below average in October, but then improved to above average. The temperature was higher than average and close to the 15 year maximum. Rainfall was lower than average during the reporting period. Higher temperatures provided a favorable environment for winter wheat while the decrease of rainfall could limit crop growth.

The NDVI profiles show that most of the eastern and southern areas experienced an increase in December. The increase of biomass shows that the crop condition was favorable for winter wheat.

Regional analysis

More spatial detail is provided below for three main agro-ecological zones: the **Central mixed farming and pasture Carpathian hills** (160), the **Eastern and southern maize, wheat and sugar beet plains** (161) and the **Western and central maize, wheat and sugar beet plateau** (162).

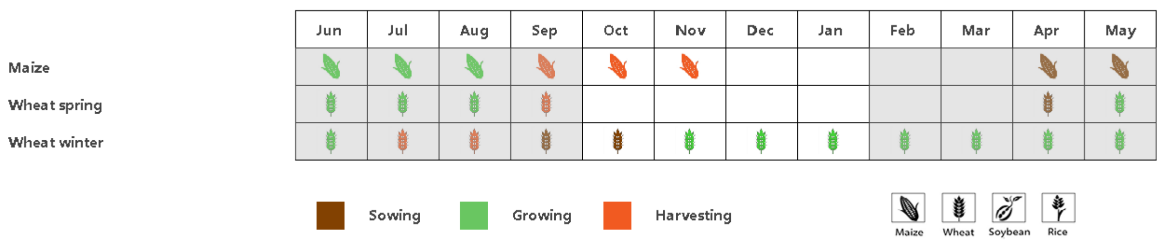
For the **Central mixed farming and pasture Carpathian hills**, compared to the 15YA, rainfall decreased by as much as 29%, while temperature and radiation were both up (TEMP +2.0℃ , RADPAR +9%) and BIOMSS increased by 9%. According to NDVI development, crop condition was better than average in December and January. The regional average VCI maximum was at 0.83. The NDVI spatial distribution shows that NDVI was fair throughout the reporting period. As the central mixed farming and pasture Carpathian hills occupies only a small fraction of cropland in Romania, this region's fair NDVI cannot represent much of Romania crop production.

For the E**astern and Southern maize, wheat and sugar beet plains**, rain decreased 40%, temperature increased 2.3℃, radiation increased 8% and biomass increased 10%. The NDVI development graph shows that crop condition was better than average after November. VCI max value of this region was 0.87 and according to the distribution map, VCI values were increasing in December in most of the central and middle region, especially in the southeast area of this sub-region (counties of Tulcea and Constanta), representing about 14.3% of the national cropland.

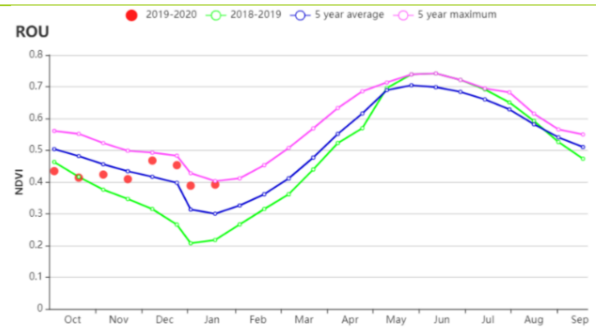
For the **Western and central maize, wheat and sugar beet plateau**, rainfall was lower than average by 34%, temperature and radiation were somewhat higher (TEMP +1.8℃, RADPAR +10%) and biomass increased 11%. Spatial NDVI profiles show that crop condition was higher than average in December and January and this could be due to the increase of temperature. Maximum VCI of this region was 0.80, a bit low and the spatial distribution was between 0.5 and 0.8. The spatial NDVI distribution shows that NDVI in most of this sub region has a small rising trend during October to December (green line).

Overall, crop condition was fair in Romania during this reporting period due to the good temperature condition.

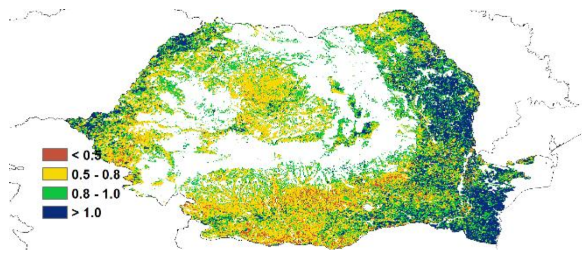
Figure 3.37 Romania's crop condition, October 2019 - January 2020



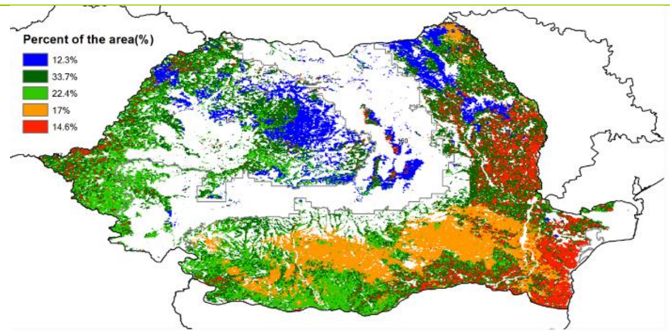
(a). Phenology of major crops



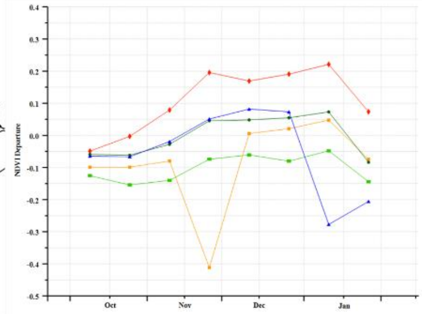
(b) Crop condition development graph based on NDVI



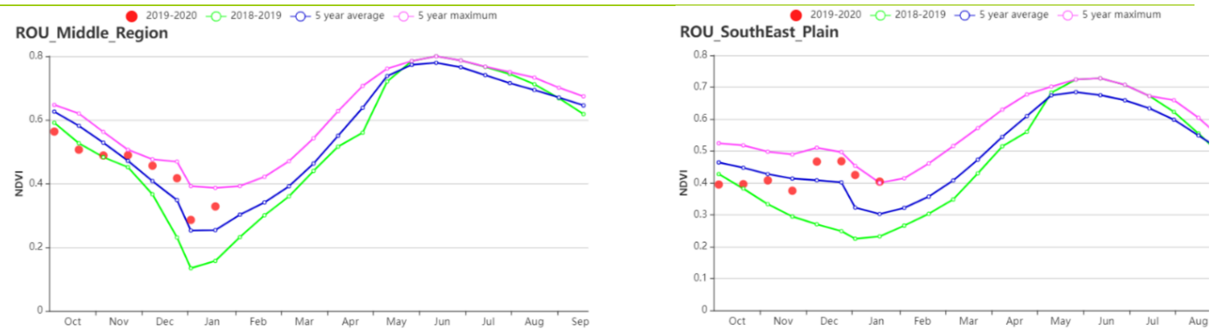
(c) Maximum VCI



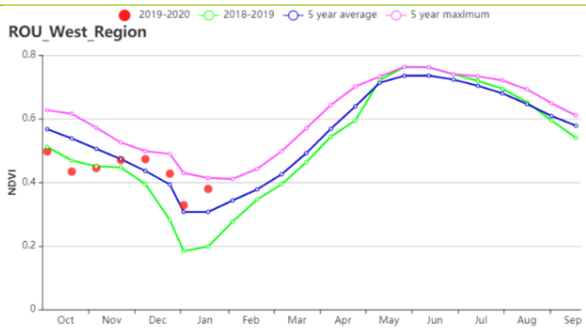
(d) Spatial NDVI patterns compared to 5YA



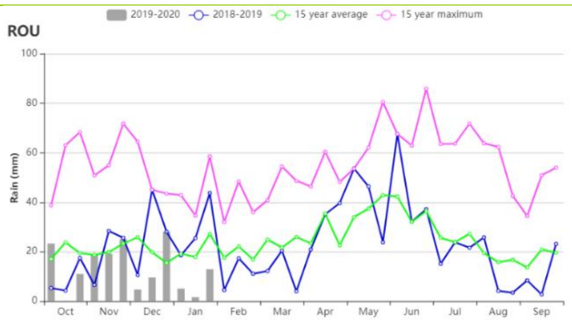
(e) NDVI profiles



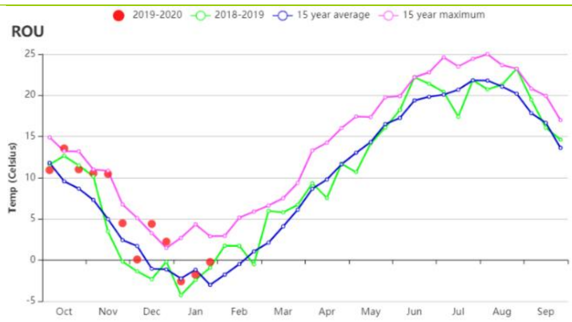
(f) Crop condition development graph based on NDVI (Central mixed farming and pasture Carpathian hills (left) and Eastern and southern maize, wheat and sugarbeet plains (right))



(g) Crop condition development graph based on NDVI (Western and central maize, wheat and sugar beet plateau)



(h) Rainfall index



(i) Temperature index

Table 3.67 Romania's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Central mixed farming and pasture Carpathian hills	196	-29	3.4	2	408	9
Eastern and southern maize, wheat and sugar beet plains	142	-40	6.3	2.3	417	8
Western and central maize, wheat and sugar beet plateau	165	-34	4.8	1.8	406	10

Table 3.68 Romania's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current	Departure from 5YA (%)	Current
Central mixed farming and pasture Carpathian hills	76	9	95	-1	0.83
Eastern and southern maize, wheat and sugar beet plains	98	10	80	7	0.87
Western and central maize, wheat and sugar beet plateau	86	11	91	0	0.8

[RUS] Russia

This monitoring period covers the sowing of winter crops (mainly winter wheat and barley) in October, followed by early vegetative growth and the subsequent dormant period.

At the national level, the data show that in October NDVI was below the 5-year average. But from the beginning of November to the end of January it was equal to the 5-year maximum.

Precipitation in October was higher than in previous year and just above the 15-year average. In November, it dropped below average, but recovered to similar levels as the 15YA starting from December.

The temperature in October was close to the 15-year maximum. Then in November it dropped below the 15-year average, but starting from December, it reached close to maximum levels observed over the last 15 years.

Main regions of winter crop production (Central and Central black soil regions, Northern and Southern Caucasus, Middle Volga) showed positive NDVI departure with VCI above 0.8.

Due to a very warm winter, NDVI values were reaching the 5-year maximum. However, the lack of snow cover caused some concern, since it increased the risk of frost damage. Overall, the crop conditions in Russia were favorable during the monitoring period.

Regional analysis

In South Caucasus the amount of precipitation was below the 15-year average by 37%. The temperature was 1.2°C higher than the 15-year average. RADPAR was 12% above 15-year average. As a result of warm weather, the biomass increased by 16% relative to the 5-year average. Cropped area was 36% above the 5-year average. The VCI was 0.93.

NDVI at the beginning of the period was equal to the 5-year average. In November it reached 5-year maximum and stayed at that level in December and January.

In **Northern Caucasus** precipitation decreased significantly (by 38% relative to the 15-year average). The temperature increased by 2.4°C compared to the 15-year average. RADPAR value was 13 % above to the 15-year average. Due to the increase in RADPAR and in temperature, biomass value increased by 32%. Cropped area was 59% above the 5-year average. The VCI was 0.95.

NDVI value in October exceeded the 5-year average, but did not reach a 5-year maximum. In early November, the NDVI reached a 5-year maximum, but before mid-December, it decreased and stayed between the 5-year average and the 5-year maximum. From mid-December to the end of the analyzed period, NDVI was significantly higher than the 5-year maximum.

In **Central Russia** the temperature increased by 3.6°C relative to the 15-year average, and the amount of precipitation decreased by 2%. RADPAR decreased by 19%. Decrease in RADPAR combined with lower precipitation resulted in biomass decrease by 4% as compared to the 5-year average.Cropped area was down by 3% compared the 5-year average. VCI index was 0.83.

At the beginning of the period, NDVI was below the 5-year average. But in mid-November, the NDVI exceeded the 5-year maximum. During December it was equal to the 5-year average and reached a 5-year maximum in January.

In **Central black soils region** the temperature in this period increased by 3.1°C compared to the 15-year average. Rainfall was 20% below 15-year average and RADPAR decreased by 4%. But the amount of biomass increased by 16%. Cropped area increased by 13% relative to the 5-year average. VCI was 0.90.

Throughout October, NDVI was below the 5-year average, but in November, it reached a 5-year maximum and by the middle of the month was well above that value. At the beginning of December, there was a sharp decline in NDVI value. It dropped below the 5-year average. But from mid-December to the end of this monitoring period, NDVI value was equal to the 5-year average.

In **Middle Volga region** temperature and rainfall increased by 2.8°C and 4% as compared to the 15YA. But RADPAR value decreased by 8%. Biomass increased by 9% compared to 5-year average. Cropped area was 23% above the 5-year average. VCI was 0.87.

For most of the period from October to November, NDVI was equal to the 5-year maximum. Then it dropped and became equal to the 5-year average.

In **Ural and western Volga region** the amount of precipitation increased by 7% and the temperature was up by 2.3°C relative to the 15-year average. RADPAR was above the15-year average by 3%. Biomass increased by 26% compared to the 5-year average. Cropped area was 34% above the 5-year average. VCI was 0.83.

Between mid-November and January NDVI was at the 5-year average. In October and early February, it exceeded the 5-year average, but did not reach the 5-year maximum.

In **Western Siberia** rainfall increased by 21% and temperature increased by 2.6° C relative to the 15-year average. RADPAR decreased by 1%. Biomass increased by 17% relative to the 5-year average. Cropped area was 49% above the 5-year average. The VCI was 0.85.

Between October and December NDVI was equal to the 5-year average. An exception occurred in early November when the NDVI exceeded the 5-year maximum.

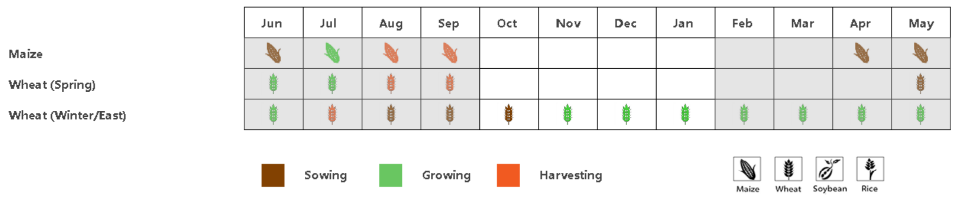
In **Middle Siberia** the amount of precipitation decreased by 5% relative to the 15-year average, while the temperature increased by 0.7°C. RADPAR increased by 2%. Biomass was by 9% above the 5-year average. Cropped area increased by 102% compared the 5-year average. VCI was 0.98.

In October NDVI exceeded the 5-year average and reached the 5-year maximum by the end of the month. From mid-November to mid-December, NDVI was below the 5-year average. But since mid-December, NDVI was equal to the 5-year average.

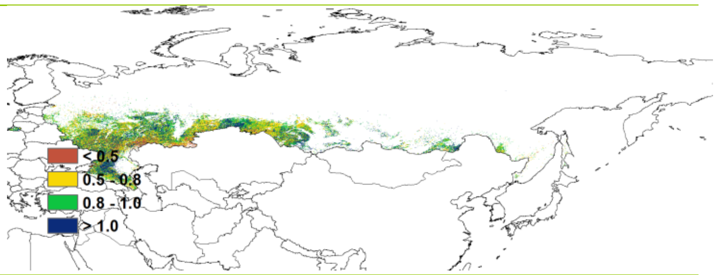
In **Eastern Siberia** the temperature increased by 0.5°C relative to the 15-year average, and the amount of precipitation decreased by 12 %. RADPAR increased by 4%. Biomass increased by 10% relative to the 5-year average. Cropped area was down by 9% as compared to the 5-year average. VCI was 0.78.

In the period from October to early November and from mid-November to the end of January, the NDVI was below the 5-year average and below last year's level. It touched the 5-year average only in early November.

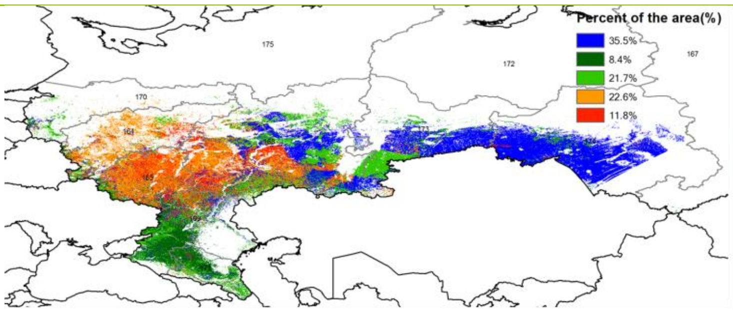
Figure 3.38 Russia's crop condition, October 2019 - January 2020

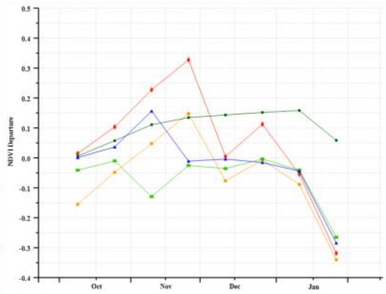


(a). Phenology of major crops



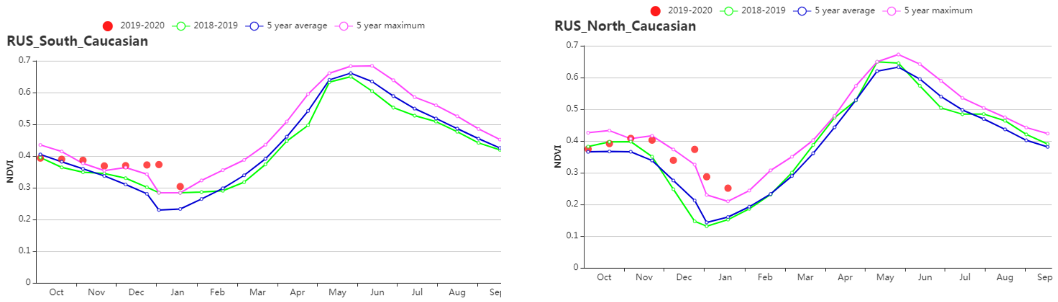
(b) Crop condition development graph based on NDVI (c) Maximum VCI



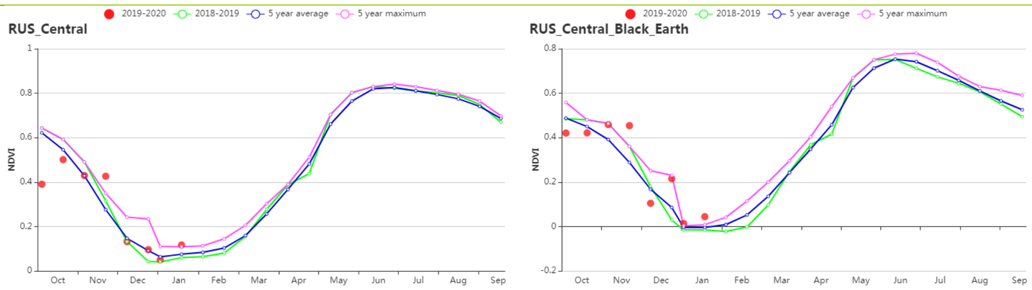


(d) Spatial NDVI patterns compared to 5YA

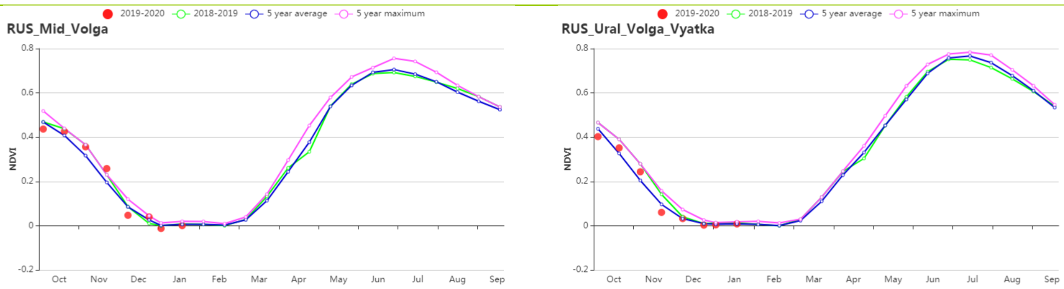
(e) NDVI profiles



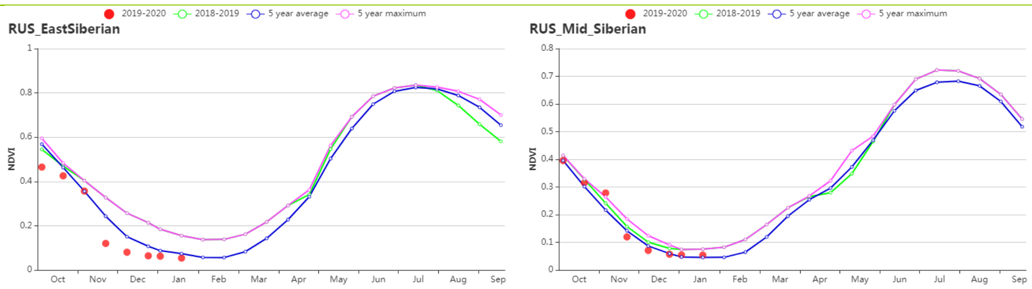
(f) Crop condition development graph based on NDVI (Southern Caucasus (left) and Northern Caucasus (right))



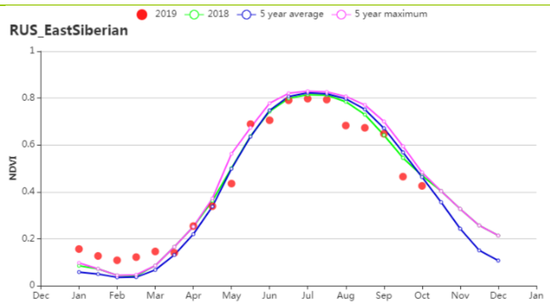
(g) Crop condition development graph based on NDVI (Central Russia (left) and Central black soils area (right))



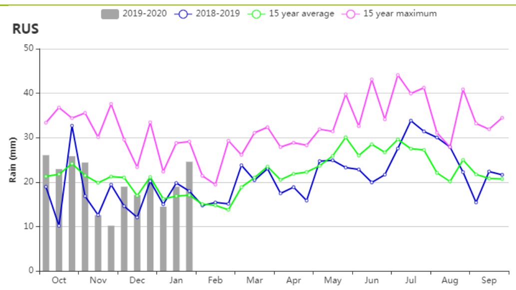
(h) Crop condition development graph based on NDVI (Middle Volga (left) and Ural and western Volga region (right))



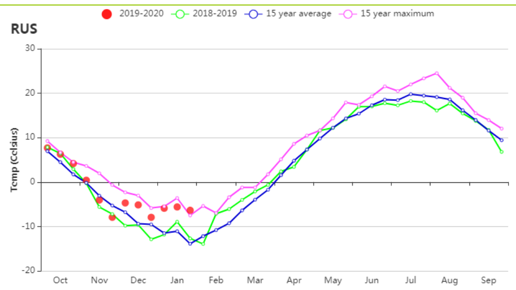
(i) Crop condition development graph based on NDVI in the Eastern Siberia (left) and the Middle Siberia (right)



(j) Crop condition development graph based on NDVI (Eastern Siberia



(k) Rainfall index



(l) Temperature index

Table 3.69 Russia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)
Central Russia	297	-2	1.6	3.6	107	-19
Central black soils area	217	-20	2	3.1	188	-3
Eastern Siberia	191	-12	-9.7	0.5	363	4
Middle Siberia	119	-5	-11.7	0.7	319	2
Middle Volga	274	4	-1.4	2.8	161	-8
Northern Caucasus	160	-38	4.7	2.4	366	13
South Caucasian	157	-37	3.5	1.2	471	12
Ural and western Volga region	200	7	-4.8	2.3	177	3
Western Siberia	268	21	-5.7	2.6	206	-1

Table 3.70 Russia's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m²)	Departure from 15YA (%)	Current	Departure from 5YA (%)	Current
Central Russia	21	-4	96	-3	0.83
Central black soils area	39	16	79	13	0.9
Eastern Siberia	43	10	85	-9	0.78
Middle Siberia	31	8	53	102	0.98
Middle Volga	29	9	73	23	0.87
Northern Caucasus	90	32	63	59	0.95
South Caucasian	103	16	69	36	0.93
Ural and western Volga region	28	25	65	34	0.83
Western Siberia	30	17	49	24	0.85

AFG AGO ARG AUS BGD BLR BRA CAN DEU EGY ETH FRA GBR HUN IDN IND IRN ITA KAZ KEN KGZ KHM LKA MAR MEX MMR MNG MOZ NGA PAK PHL POL ROU RUS **THA** TUR UKR USA UZB VNM ZAF ZMB

[THA] Thailand

This monitoring period covers the harvest of the main rice and the start of the second rice season. Temperature (TEMP +0.6℃) and radiation (RADPAR +10%) were above average, while the BIOMSS decreased 4%, due to low rainfall (RAIN, -43%). At the country level, crop conditions were slightly below the five-year average at the beginning of the monitoring period and kept gradually declining. NDVI departure profiles clustering shows that in 21.9% of the country crop condition was above average before mid-January. These patches mostly appear in the Central double and triple-cropped rice lowlands and Western and southern hill areas. In almost half of the cropped area, the situation was close to average before the end of October, but dropped to below average for the rest of the monitoring period. In 11.3% of cultivated area, the crop condition was below average at the start of the monitoring period but recovered to close to average by the end of January. Altogether, considering the favorable VCIx value of 0.90, the crop conditions are assessed as slightly below average.

Regional analysis

The regional analysis below focuses on some of the above mentioned agro-ecological zones. They include **Central double and triple-cropped rice lowlands** (176), **South-eastern horticulture area** (177), **Western and southern hill areas** (178), **Single-cropped rice north-eastern region** (179). The numbers correspond to the labels in the VCIx and NDVI profile maps.

Compared to average, **Central double and triple-cropped rice lowlands** experienced sunnier and drier conditions. Temperature (TEMP +0.8℃) and radiation (RADPAR +8%) were above average accompanied by lower rainfall (RAIN -45%). All of these led to an average estimate for BIOMSS (BIOMSS +1%). The NDVI development graph shows that crop condition was slightly below the five-year average. This is confirmed by a fair VCIx value of 0.86. Overall, the situation was close to average.

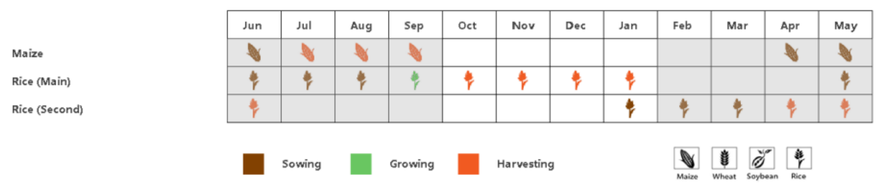
Indicators for the **South-eastern horticulture area** follow the same patterns as those for the **Central double and triple-cropped rice lowlands**: temperature (TEMP +0.5℃) and radiation (RADPAR 9%) were above average but accompanied with significantly lower rainfall (RAIN -46%), leading to an increase of biomass production potential (BIOMSS +8%). According to the NDVI development graph, however, the crop conditions were slightly below average during this monitoring period.

Crop conditions in the **Western and southern hills** were similar to other regions in the country: temperature (TEMP +0.3℃), and radiation (RADPAR +11%) were above average, while the BIOMSS decreased by 2% mainly due to the significantly lower rainfall (RAIN -35%). According to the NDVI development graph, crop conditions were below average. Overall, the situation was slightly below but close to average.

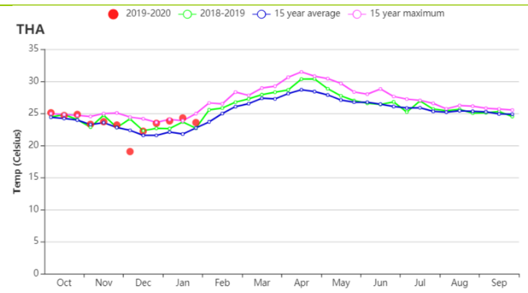
The rainfall in the **Single-cropped rice north-eastern region** suffered the highest decline (-62%) among all regions, while the temperature (TEMP +0.8°C) and radiation (RADPAR +11%) were above. BIOMSS (-12%) was estimated to be below average values, which was in agreement with below average NDVI values.

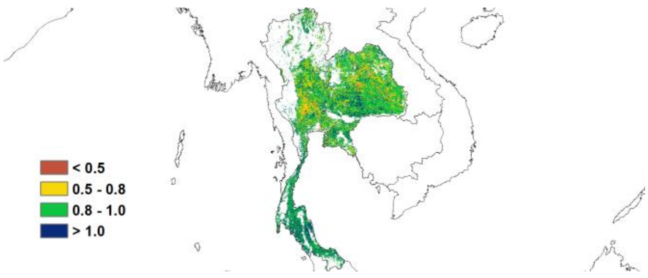
At the national level, most arable lands were cropped during the season and had favorable VCIx values around 0.90. CropWatch projections are that the crop conditions during this monitoring period were slightly below average.

Figure 3.39 Thailand's crop condition, October 2019 - January 2020



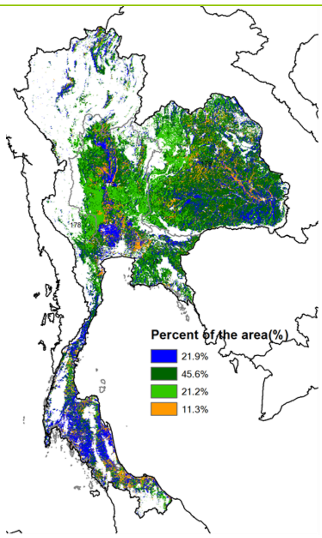
(a). Phenology of major crops

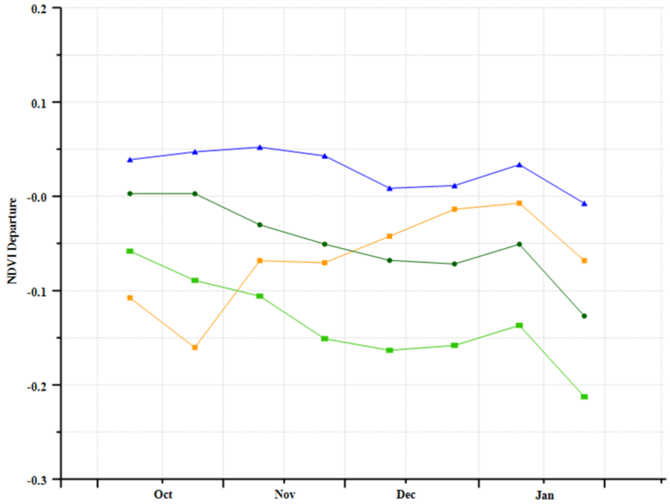




(b) Crop condition development graph based on NDVI

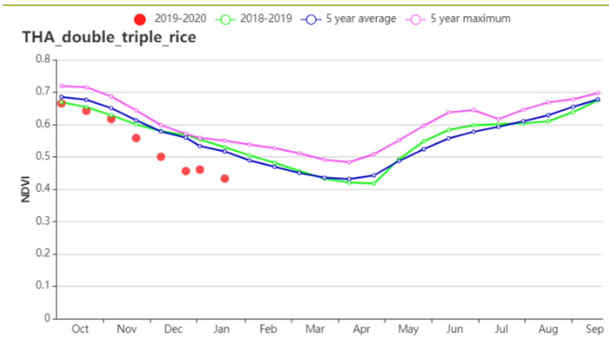
(c) Maximum VCI

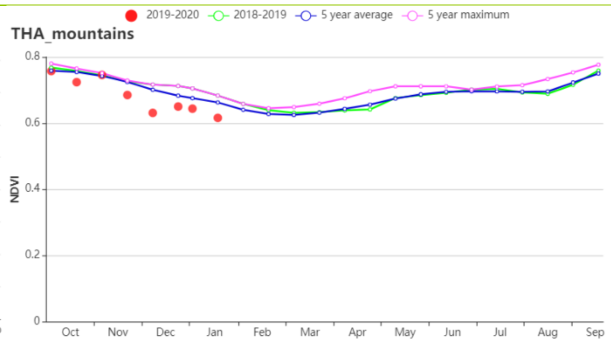




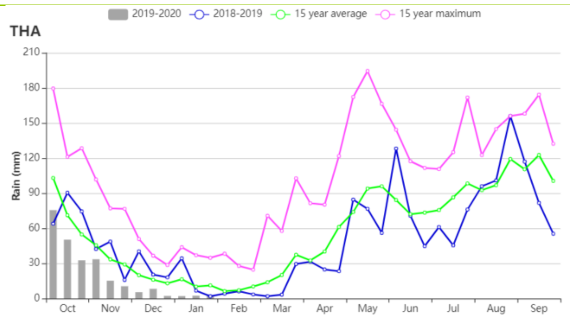
(d) Spatial NDVI patterns compared to 5YA

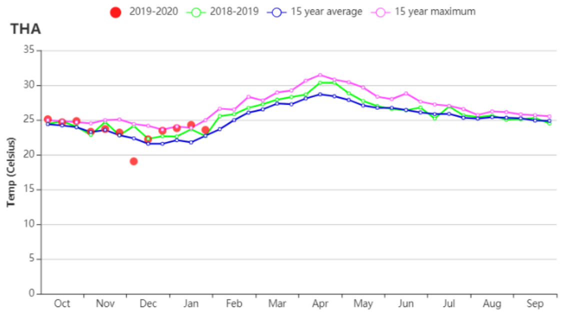
(e) NDVI profiles





(f) Crop condition development graph based on NDVI (Central double and triple-cropped rice lowlands (left) and Western and southern hill areas (right))





(h) Rainfal profiles

(i) Temperature profiles

Table 3.71 Thailand's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Central double and triple-cropped rice lowlands	203	-45	24.4	0.8	1150	8
South-eastern horticulture area	201	-46	25.4	0.5	1182	9
Western and southern hill areas	373	-35	22.7	0.3	1189	11
Single-cropped rice north-eastern region	106	-62	23.4	0.8	1155	11

Table 3.72 Thailand's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current	Departure from 5YA (%)	Current
Central double and triple-cropped rice lowlands	554	1	99	0	0.86
South-eastern horticulture area	674	8	99	0	0.90
Western and southern hill areas	589	-2	100	0	0.95
Single-cropped rice north-eastern region	513	-12	100	0	0.88

AFG AGO ARG AUS BGD BLR BRA CAN DEU EGY ETH FRA GBR HUN IDN IND IRN ITA KAZ KEN KGZ KHM LKA MAR MEX MMR MNG MOZ NGA PAK PHL POL ROU RUS THA **TUR** UKR USA UZB VNM ZAF ZMB

[TUR] Turkey

At the beginning of this reporting period, maize and rice harvests were reaching the completion, while winter wheat planting was in progress. NDVI was slightly lower than the five-year average during the monitoring period, execpt in late December and early January. Both temperature and radiation were above average (TEMP +1.2℃, RADPAR +4%), but rainfall was below average (RAIN, -14%). The resulting potential biomass was above average (BIOMSS, +9%). The cropped arable land fraction (CALF) increased by 3% and the maximum VCI (VCIx) was 0.74.

The spatial NDVI patterns almost exactly correspond with the spatial distribution of VCIx. NDVI was close to or slightly above average in 16.2% of the croplands, mostly in the lowlands along the Syrian border and the Mediterranean, and the western parts including the provinces of Edirne, Kirklareli, Takirdag, Balikesir, Manisa, Izmir, Aydin, and Mugla. On the contrary, NDVI was below the average during the whole monitoring period in 62.9% of the croplands marked in light green and orange. These areas are mainly located in the midwestern and mideastern parts including the provinces of Eskiselir, Afyon, Isparta, Erzurum, Mus, ingol, Konya, Ankara, Kirikkale, Kisrsehir, Nevsehir, Aksaray, K.Maras, Diyarbakir, Malatya, Elazig, and Bingol, indicating below optimal crop conditions. Crop conditions of winter crops largely depend on the timely water supply after winter period.

Regional analysis

The regional analysis covers four agro-ecological zones (AEZs): the Black Sea area, Central Anatolia, Eastern Anatolia and Marmara Aegean Mediterranean lowland zone.

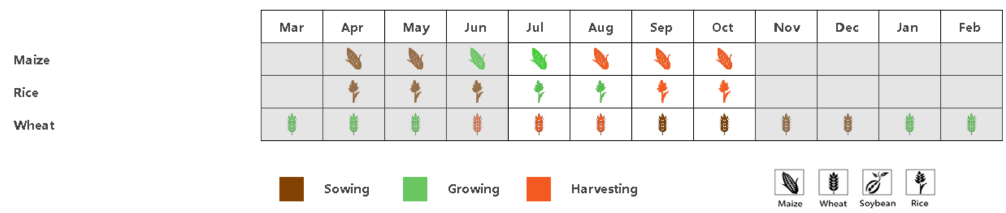
In the **Black Sea zone**, the NDVI was close to or slightly below average in October, early November, early December and late January, while the NDVI was above average in late November, late December, and early January. Radiation and temperature were well above average (RADPAR +6%, TEMP+ 1.4℃), and rainfall was below average (RAIN -15%), resulting in an average biomass. VCIx reached 0.94 and CALF was up 2%.

The **Central Anatolian region** had below average NDVI during the monitoring period except late December. Both radiation and temperature were above average (RADPAR +4%, TEMP+ 1.4℃), while rainfall was below average (RAIN, -16%). The potential biomass production was above average (BIOMSS +4%), and CALF decreased by 9%.

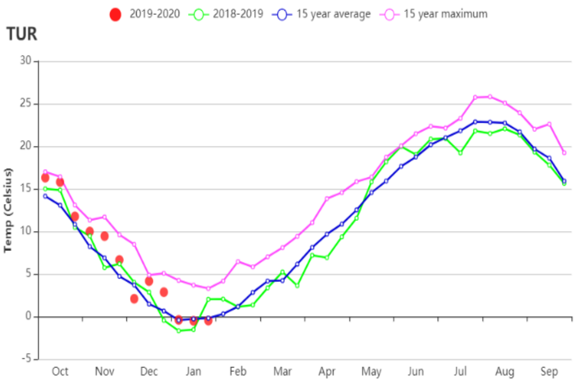
In the **Eastern Anatolian plateau**, the NDVI was below average from October to November, and then dropped to below 0.2 starting in December. This zone experienced the highest precipitation shortage among the four AEZs (RAIN -23%). Weather was relatively warm (TEMP +1.0℃) while sunshine was good (RADPAR +5%). Biomass was up slightly (BIOMSS +5%) mainly because of favorable temperatures. The cropped arable land fraction (CALF) was below average by 23%, indicating that the utilization rate of cultivated land is quite low.

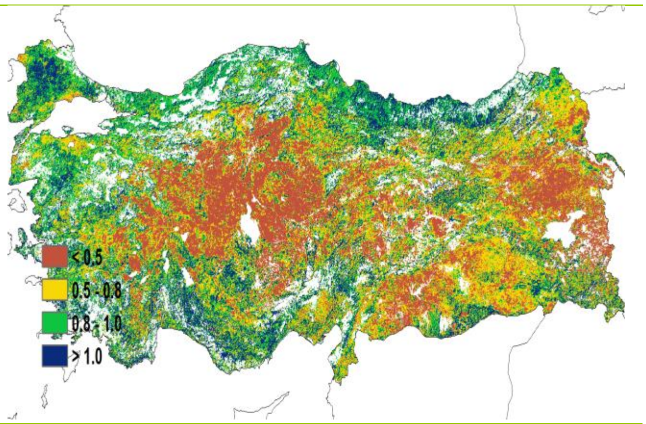
As shown by the NDVI profile in the **Marmara Aegean Mediterranean lowland zone**, the NDVI was very close to average during the whole monitoring period. The rainfall was below average (RAIN -7%) with the smallest decline relative to the average among the four AEZs, while the radiation and temperature were above the average (RADPAR +3%, TEMP+ 1.2℃). Both BIOMSS and the CALF were up compared with its respective average, by 14% and 13%. The VCIx was 0.86. Crop production prospects are estimated to be favorable.

Figure 3.40 Turkey's crop condition, October 2019 - January 2020

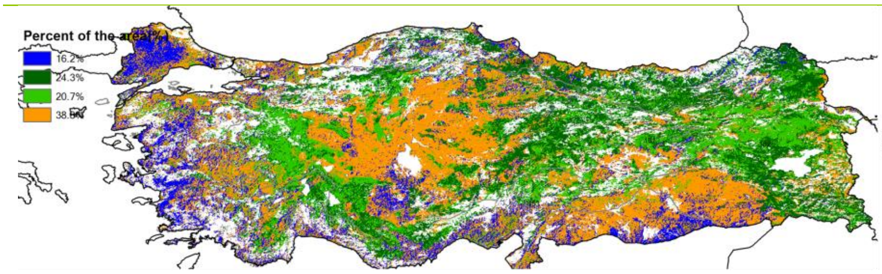


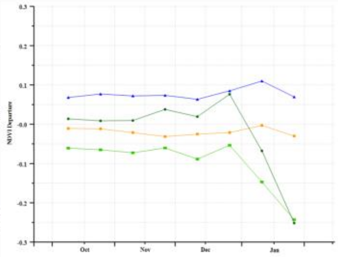
(a). Phenology of major crops



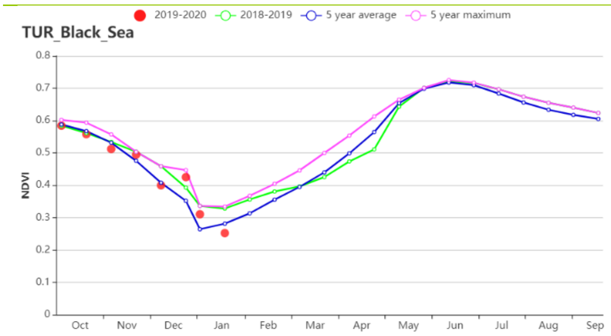


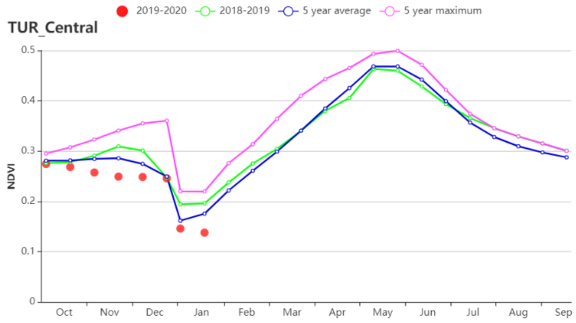
(b) Crop condition development graph based on NDVI (c) Maximum VCI



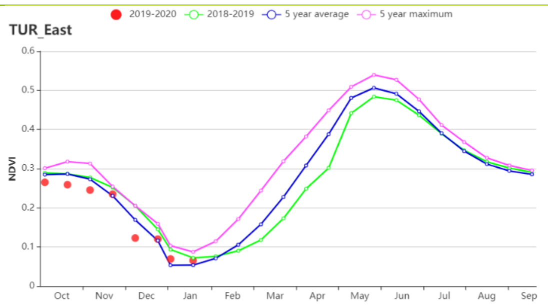


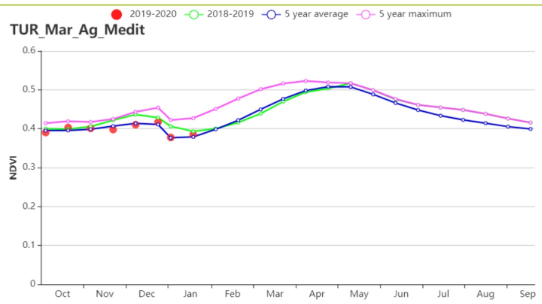
(d) Spatial NDVI patterns compared to 5YA (e) NDVI profiles





(f) Crop condition development graph based on NDVI (Black Sea region (left) and Central Anatolia region (right))





(f) Crop condition development graph based on NDVI (Eastern Anatolia region (left) and Marmara_Agean_Mediterranean lowland region (right))

Table 3.73 Turkey's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Black Sea region	378	-15	5	1.4	504	6
Central Anatolia region	217	-16	5.5	1.4	604	4
Eastern Anatolia region	259	-23	2.8	1	637	5

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Marmara Agean Mediterranean lowland region	382	-7	10	1.2	605	3

Table 3.74 Turkey's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current	Departure from 5YA (%)	Current
Black Sea region	115	0	79	2	0.94
Central Anatolia region	143	12	17	-9	0.65
Eastern Anatolia region	111	-3	12	-23	0.67
Marmara Agean Mediterranean lowland region	185	14	64`	13	0.86

AFG AGO ARG AUS BGD BLR BRA CAN DEU EGY ETH FRA GBR HUN IDN IND IRN ITA KAZ KEN KGZ KHM LKA MAR MEX MMR MNG MOZ NGA PAK PHL POL ROU RUS THA TUR **UKR** USA UZB VNM ZAF ZMB

[UKR] Ukraine

The main Ukrainian grain crops are spring barley, winter wheat and maize. This monitoring period covers the harvest of maize in October and November, as well as the vegetative growth stages of winter wheat, which is planted in September and October.

The whole country experienced a much dryer and warmer fall-winter period than normal. Amount of rainfall was 34% below average and average temperature reached 4.6 °C, which was 2.6 °C higher as compared to the 15-year average. These conditions were favorable for maize harvest and sowing of winter wheat. The agronomic indicators correspondingly showed that potential biomass significantly increased by 26%, cropped arable land fraction (CALF) increased by 24% and maximum vegetation condition index (VCIx) reached 0.96. Noteworthy is a region with low VCIx concentrated around Cremea and Nykolayiv. The nation wide NDVI profile showed that the crop development surpassed the 5-year maximum starting in late December. In general, good prospects for winter wheat can be expected.

Regional analysis

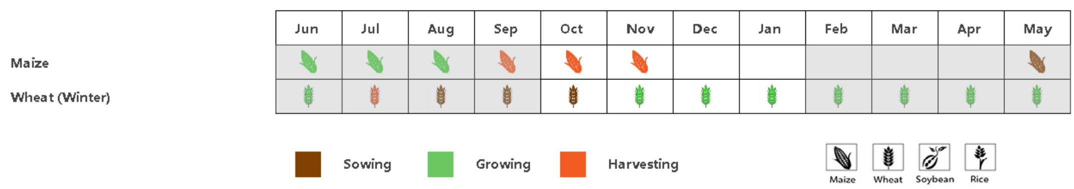
Based on cropping system, climatic zones and topographic conditions, regional analyses are provided below for four agro-ecological zones (AEZ), including the **Central wheat area**, **Northern wheat area**, **Eastern Carpathian hills**, and **Southern wheat and maize area**. The four AEZs shared generally similar patterns of crop development conditions in this period.

In agroclimatic aspects, all of the four AEZs recorded deficient rainfall ranging from -23% in **Eastern Carpathian hills** (Lviv, Zakarpattia and Ivano-Frankivsk oblasts) to -35 % in **Northern wheat area** (Rivne, Zhytomyr and Kiev oblasts), higher temperature ranging from + 2.3 to + 2.8°C and higher radiation from +7% to +9%, respectively.

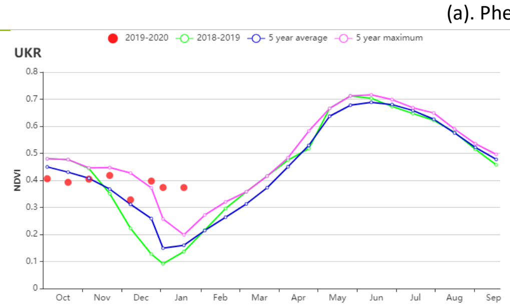
Agronomic indicators showed that the potential BIOMSS in the AEZs was up by 9 to 28% compared with the 5-year average; CALF in **Central wheat area** (Poltava, Cherkasy, Dnipropetrovsk and Kirovohrad Oblasts) and **Southern wheat and maize area** (Mykolaiv, Kherson and Zaporizhia oblasts) substantially increased by 33% and 73% respectively, with both regions reaching 71%. Maximum VCI in four AEZs were stable at high values above or around 0.9, except for the Cremea (0.8) and Nykolayiv (0.5).

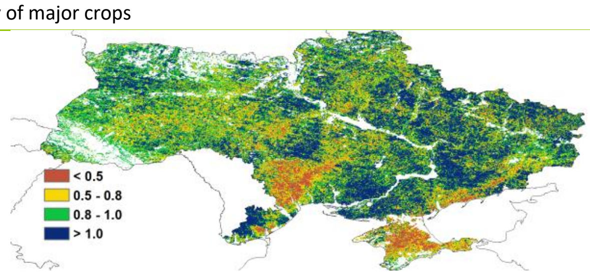
The NDVI development graph indicated that the crop condition in all AEZs experienced a below average situation in October, closed to average in November and then gradually improved to above average starting in December and surpassed the 5 year maximum in January.

Figure 3.41 Ukraine's crop condition, October 2019 - January 2020



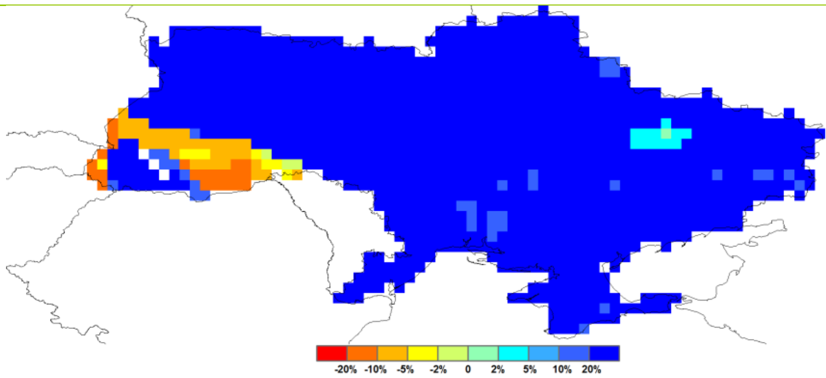
(a). Phenology of major crops



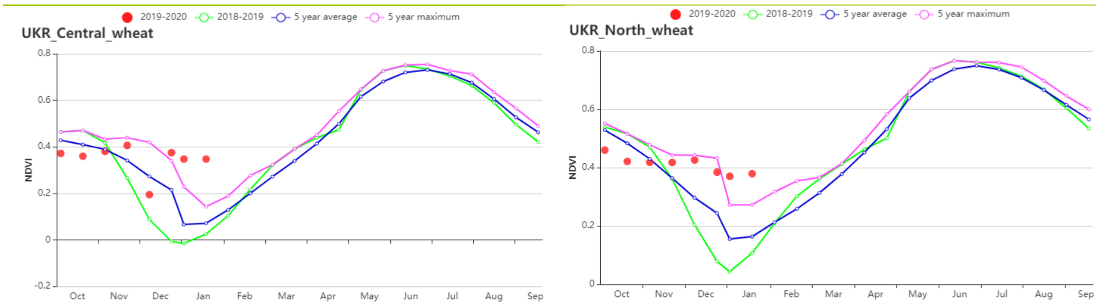


(b) Crop condition development graph based on NDVI

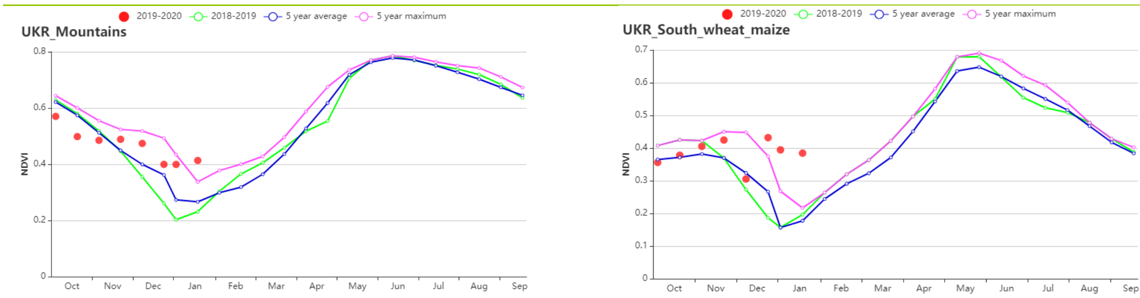
(c) Maximum VCI



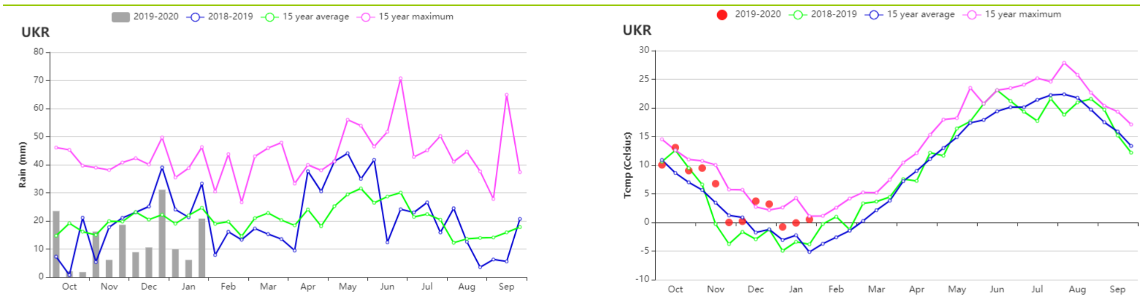
(d) Potential biomass departure from 5YA



(e) Crop condition development graph based on NDVI (Central wheat area(left) Northern wheat area(right))



(f) Crop condition development graph based on NDVI (Eastern Carpathian hills(left) Southern wheat and maize area(right))



(g) Rainfall profile (left) and temperature profile (right)

Table 3.75 Ukraine's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Central wheat area	151	-34	4.2	2.8	284	7
Northern wheat area	199	-23	3.9	2.3	318	8
Eastern Carpathian hills	159	-35	4.2	2.8	246	7
Southern wheat and maize area	140	-37	5.2	2.4	338	9

Table 3.76 Ukraine's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current	Departure from 5YA (%)	Current
Central wheat area	68	27	71	33	1.00
Northern wheat area	64	9	96	0	0.89
Eastern Carpathian hills	58	28	85	3	0.94
Southern wheat and maize area	87	28	71	73	0.99

[USA] United States

This monitoring period lasts from October, 2019 to January, 2020. It covers the late harvesting season of summer crops in 2019 and the sowing period of winter crops in 2020. In the last bulletin, growing situation of the 2019 summer crops had been reported. This analysis will focus on agroclimatic conditions and their potential impact on the 2020 winter crops. In general, the crop condition of winter wheat was mixed.

In this monitoring period, cloudy-rainy weather was sweeping through most parts of the United States. The precipitation was 18% above average, temperature was 0.1 ℃ below average, and RADPAR was 4% below average. In the key winter wheat production zones, significantly above average precipitation occurred in the southern Plains covering Kansas, Oklahoma, and Texas, and the precipitation was 19%, 66% and 9% above average respectively at state level. Abundant rainfall replenished soil moisture for growth of winter crops. In contrast, the other important winter crop zones of the United States, the Pacific Northwest and California received below average precipitation, including Washington (-4%), Oregon (-19%), Montana (-10%), Idaho (-13%) and California (-22%). Due to limited water demand in the early-growth stage and dormancy period, the shortage of precipitation has limited impact on growth of winter wheat in this reporting period.

The positive influence of agro-climatic condition on winter crops in the southern Plains was captured by the map of potential biomass departure, compared to the 15-year average. The potential biomass of the southern Plains was 10% to 20% above the average. Due to the deficit of precipitation, a negative potential biomass departure was widely observed in the northwest of United States and in California where the potential biomass was 20% below the average. The spatial pattern of NDVI departure clusters represented variations of crop condition. It is interesting to note that slightly below average crop conditions occurred in the southern Plains with better agro-climatic condition. This could be attributed to the uncropped land fraction during the current stage as shown on the cropped and uncropped arable land map. Due to the rainfall deficit, NDVI departures indicated that crop condtions in eastern Washington state deteriorated greatly. Although suffering precipitation shortage, the crop condition in California fluctuated up and down but was generally close to average due to irrigation.

In short, CropWatch estimated that the growth situation of winter wheat was acceptable in the southern Plains, while the situation of winter crops in the northwest and California should be watched in the next bulletin.

Regional Analysis

In this section, only the three agro-ecological zones (AEZs) dominated by winter crops were analyzed, they are the Southern Plains, Northwest, and California.

1. Southern Plains

As the top winter crop producing zone of United States, precipitation of the southern Plains was 25% above average, the temperature was 0.2 ℃ below, and RADPAR was 3% below average. The significant above average precipitation can replenish soil moisture and stimulate the growth of winter wheat after wintering period. Compared to the 5-year average, the fraction of cropped arable land was 4% below the average.

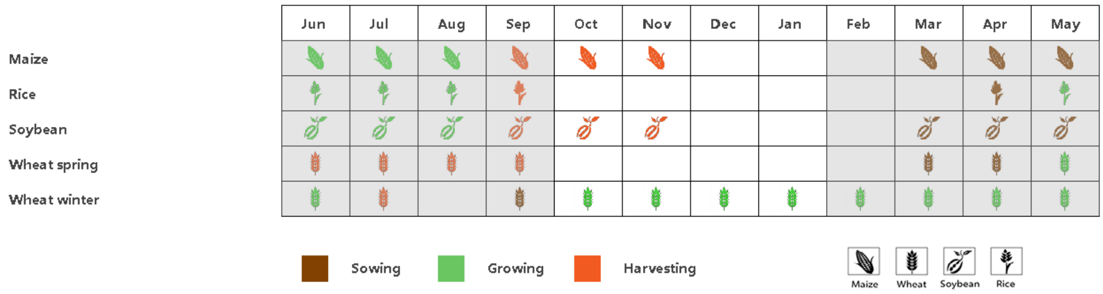
2. Northwest

In this monitoring period, the Northwest was short of precipitation. It was 13% below average compared to the 15-year average. Other agro-climatic indices were close to average, such as temperature (-0.4℃) and RADPAR (1%). Due to the shortage of precipitation the crop condition converted from above average to below average. Crop condition in this region should be watched closely considering the increase of water demand in next reporting period.

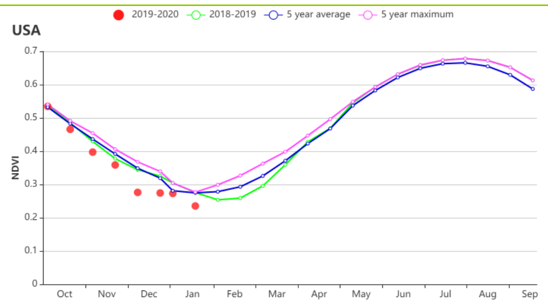
3. California

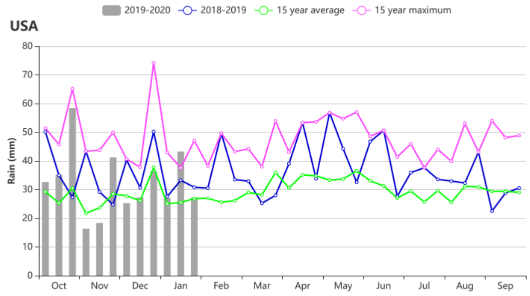
In this reporting period, California suffered severe shortage of precipitation. Compared to the 15-year average, precipitation was significantly 22% below the average. In this Mediterranean climate, this period is critical because of the predominantly cool and rainy weather. Due to a shortage of water, the crop condition was below average at the early growing stage before wintering, while it recovered to the 5-year average at the end of January. This could be attributed to the positive effects of irrigation. In summary, CropWatch estimated that the crop growth would be near average.

Figure 3.42 United States's crop condition, October 2019 - January 2020

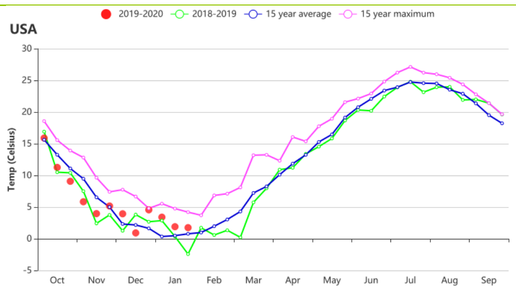


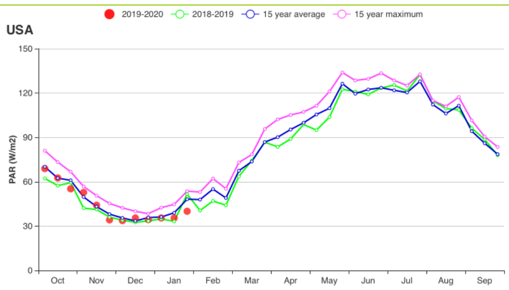
(a). Phenology of major crops



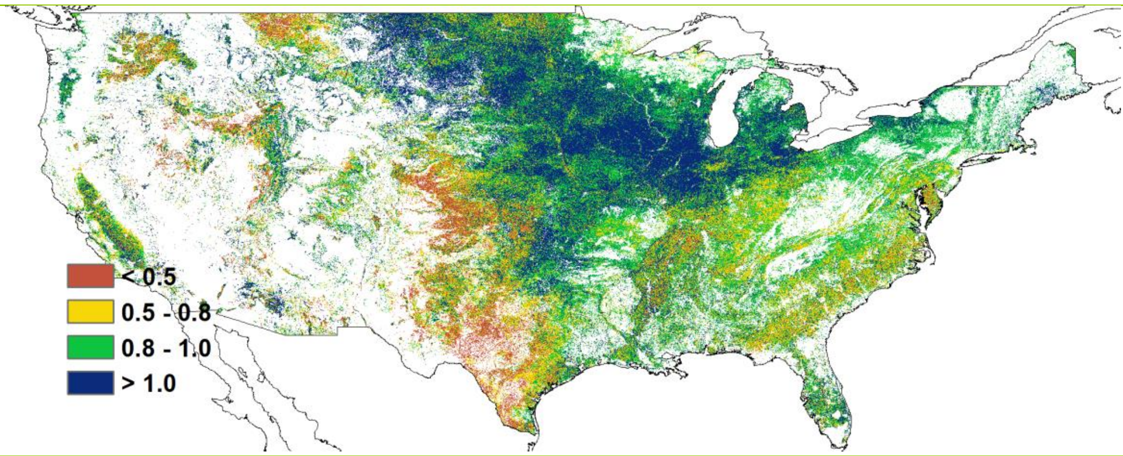


(b) Crop condition development graph based on NDVI (c) Rainfall profiles

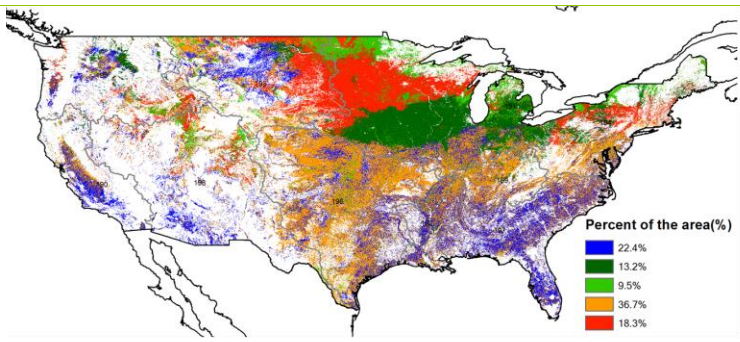


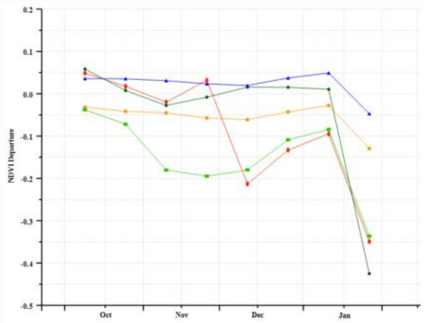


(e) Temperature profiles (f) Profiles of photosynthetic active radiation

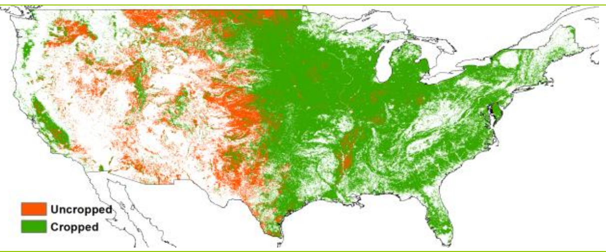


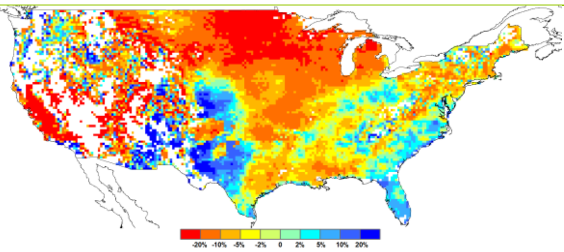
(g) Maximum VCI



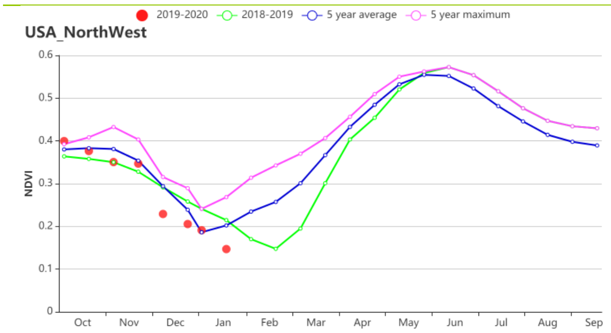


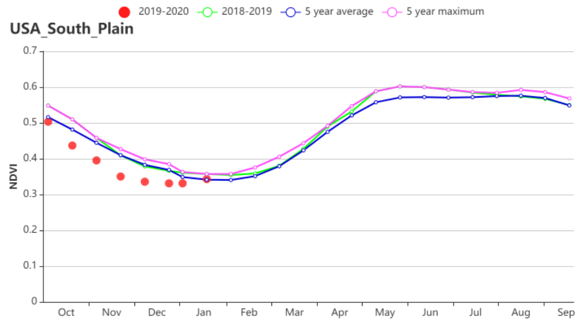
(h) Spatial NDVI patterns compared to 5YA (i) NDVI profiles



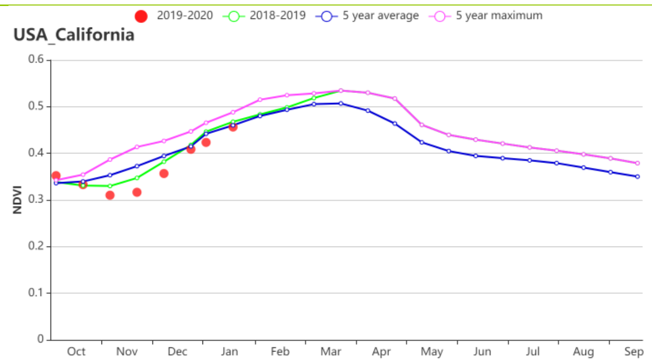


(j) Cropped and uncropped arable land (k) Potential biomass departure from 5YA





(l) Crop condition development graph based on NDVI (North West (left) and South Plain (right))



(m) Crop condition development graph based on NDVI for California

Table 3.77 United States's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m²)	Departure from 15YA (%)
Southern Plains	329	25	9.3	-0.2	648	-3
Northwest	400	-13	1.2	-0.4	408	1
California	275	-22	9.7	-0.1	663	3

Table 3.78 United States's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020.

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current	Departure from 5YA (%)	Current
Southern Plains	195	-2	66	-4	0.78
Northwest	72	-3	45	11	0.86
California	116	-22	74	20	0.90

[UZB] Uzbekistan

The report covers the sowing stage and early growth of winter wheat to the end of January in Uzbekistan. Among the Crop Watch agro-climatic indicators, RAIN and TEMP were below average (by 14% and 0.1 °C) with RADPAR close to average. BIOMSS fell 1% compared to the five-year average. As shown by the NDVI development graph, crop condition was close to the five-year average in October and slightly below the five-year average from November to January. According to the NDVI profile maps, 48.1% of the agriculture land had above five-year average conditions from November to late December in most parts of Namangan, Qarshi, Qunghirot, Chimbay, Takhtakupyr, Urganch, Beuni, Turtkul and some parts of Samarqand, Termez, Bukhoro, Denau provinces. In other regions, crop conditions were slightly below average. The precipitation above the 5-year maximum in early October was beneficial for germination of winter wheat. The following rainfall deficit did not have much negative effects on winter wheat in that period. Winter wheat will require more water in the next months when the rapid growth phase starts. Overall, the conditions for winter wheat were normal to slightly unfavorable.

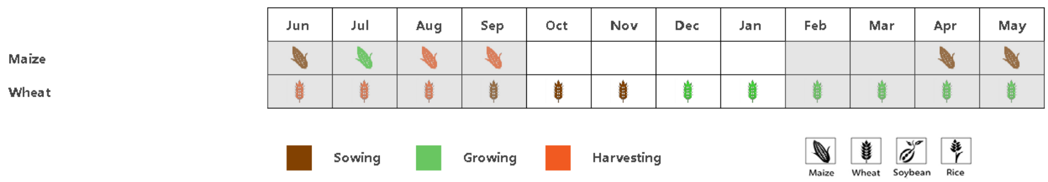
Regional analysis

Additional information is provided below for two agro-ecological zones: The Eastern hilly cereals zone and the Aral Sea cotton zone.

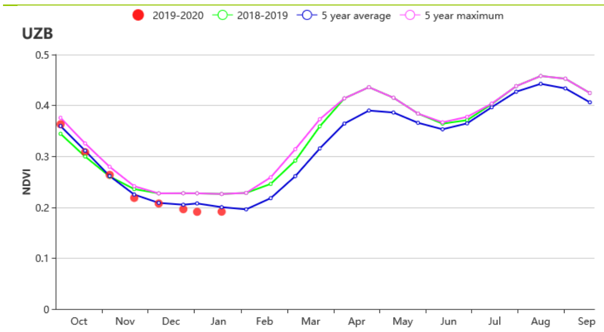
In the Eastern hilly cereals zone, NDVI was close to the five-year average in October, and below average from November to January. RAIN and TEMP were below average (by -13% and -0.2°C, respectively) while RADPAR was close to average.

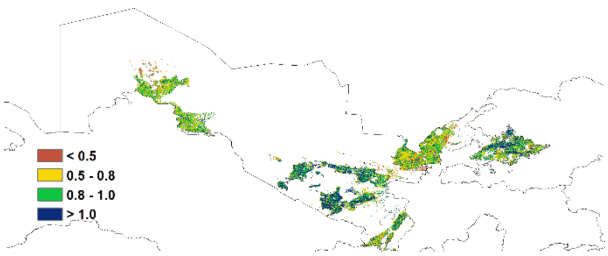
In the Aral Sea cotton zone, crop condition was below average in October and close to the average in early November and early December. Precipitation was well below average during the monitoring period (RAIN -47%) but temperature and radiation were above (TEMP 0.7°C and RADPAR 5%). The BIOMSS index decreased by 30%.

Figure 3.43 Uzbekistan's crop condition, October 2019 - January 2020



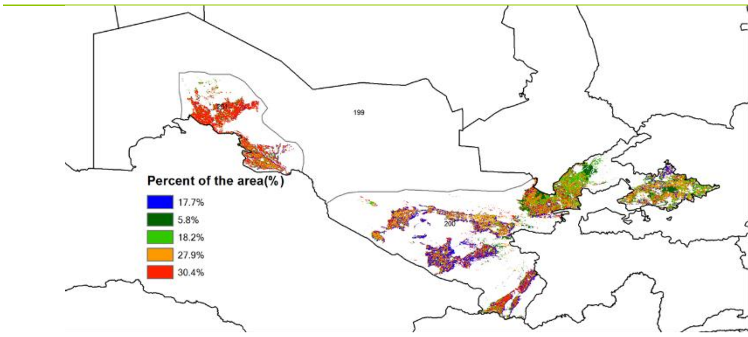
(a). Phenology of major crops



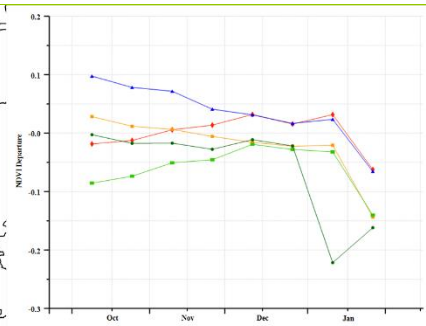


(b) Crop condition development graph based on NDVI

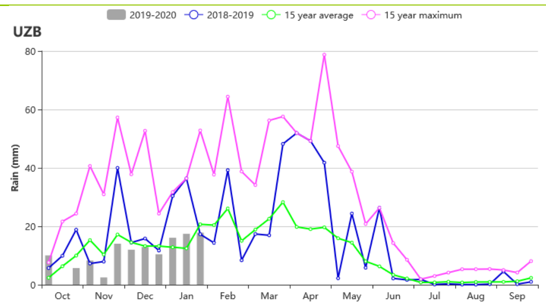
(c) Maximum VCI



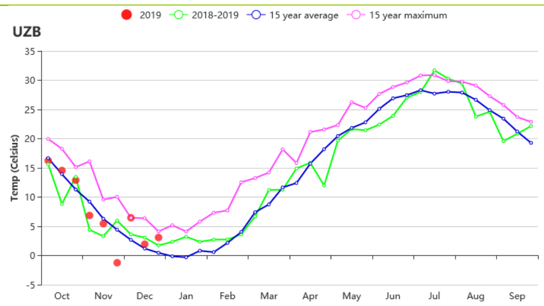
(d) Spatial NDVI patterns compared to 5YA



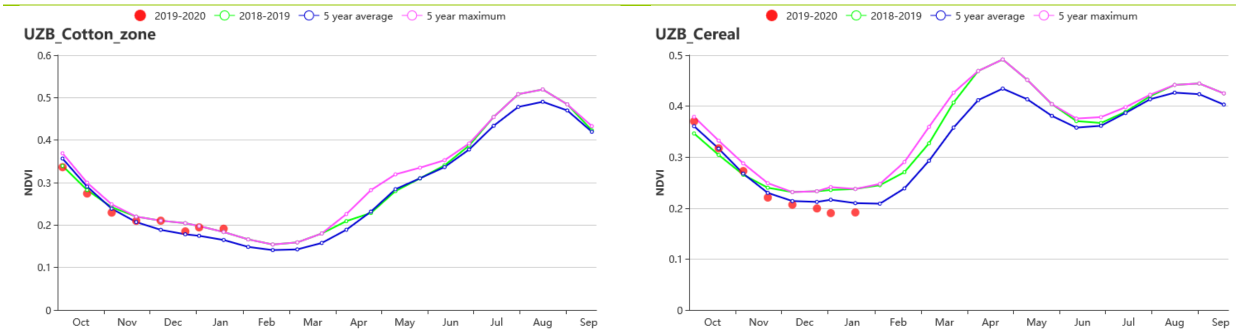
(e) NDVI profiles



(f) Rainfall profiles



(g) Temperature profiles



(f) Crop condition development graph based on NDVI Aral Sea cotton region (left) Central region with sparse crops (right)

Table 3.79 Uzbekistan's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Eastern hilly cereals zone	139	-13	5.6	-0.2	624	1
Aral Sea cotton zone	31	-47	4.5	0.7	566	5

Table 3.80 Uzbekistan's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current	Departure from 5YA (%)	Current
Eastern hilly cereals zone	130	5	31	51	0.91
Aral Sea cotton zone	69	-30	8	61	0.80

[VNM] Vietnam

Vietnam is the world's second largest exporter of rice. The monitoring period covered the growth of the 10th month rice, as well as the sowing of winter and spring rice. Most of the rice cultivation regions are distributed over the northern Red River delta and the Mekong Delta in the south. Crop condition development graph based on NDVI were mostly below average, especially from November 2019 to January 2020. The spatial NDVI patterns compared to the five-year average indicated that 29.1% regions were above average, with below average values in the other region. CropWatch indicators showed that RADPAR (+11%), CALF (1.0), temperature(+0.4°C), BIOMSS (+1%) and VCIx (0.97), but total rainfall (416mm) was below average by 28%.Overall crop condition in the country is unsatisfactory.

Regional analysis

Based on cropping systems, climatic zones, and topographic conditions, several agro-ecological zones (AEZ) can be distinguished for Vietnam: North Central Coast(202), North East(203), Red River Delta(204), South East(205), South Central Coast(206), North West(207), Central highlands(208), Mekong River Delta(209).

In the **Central Highlands** both RAIN and TEMP were below average (-43% and -0.4°C, respectively), while RADPAR was above 16%.Although rainfall is below normal, high VCIx(0.99)values and cropped arable land fraction(1.0) marked BIOMSS increased 2% compared to average.

The situation in the **Mekong River Delta** was conditioned by low precipitation (RAIN -34%) and average temperature (TEMP +0.2°C) and abundant sunshine (RADPAR +12%). BIOMSS was above average (+8%). VCIx (0.95) and CALF (+0.3%) described fair to good condition. The crop condition development graph based on NDVI showed that crop condition was closed to the 5 years average. Output is likely to be about the average.

Mostly unfavorable climatic conditions dominated the **North Central Coast** over the reporting period. Rainfall was 30% below average by a wide margin. Temperature (+0.7°C), CALF (+3%) and RADPAR (+14%) were increased, but BIOMSS was unchanged compared to be average.

North East recorded 450 mm of rainfall over four months (RAIN +22%). Temperature (+0.9°C) and RADPAR was average. The decrease in BIOMSS was 5% compared to the 5 years average. The NDVI profile confirmed the condition of crop was closed to average. Crop condition development graph based on NDVI showed condition above average in this region,.

North West recorded low RAIN (-13%), above average RADPAR (+11%) and temperature (+0.8°C). As a result BIOMSS increased by 4% compared with average (15YA). VCIx (0.98) and CALF (1.0) were high. The crop condition development graph of NDVI indicated below average crop condition from October 2019 to January 2020 and maximum occurred in November.

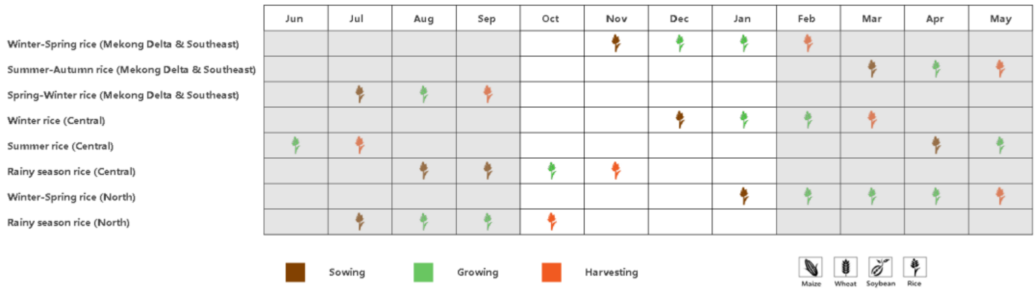
In the **Red River Delta**, rainfall was 22% above the average and the temperature was up by 0.8°C. Both RADPAR and BIOMSS were all up by 2%. This region is known for the wide cultivation of rice. The crop condition development graph of NDVI was closed to average and crop conditions turned to be below average in December. The VCIx (0.94) and CALF (+4%) also confirmed the favorable crop conditions.

In the **South Central Coast**, the average rainfall was 44% below average and TEMP (-0.4°C) was closed to average. RADPAR was above average (+21%, respectively).Despite the high reduction in rainfall, BIOMSS was below average (-1%) and the crop condition was below the average in November. Overall, VCIx (0.99) indicated moderate conditions in this region.

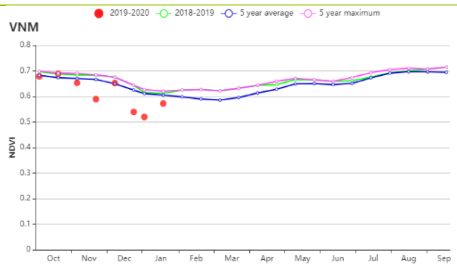
In the **South East of Vietnam**, crop condition was closed to average from October to December in 2019, but was below average since January 2020. The agro-climatic condition showed that rainfall (-47%, respectively), TEMP (+0.2°C), RADPAR (+10%), VCIx (0.97), and CALF (+1%) compared to be the average.

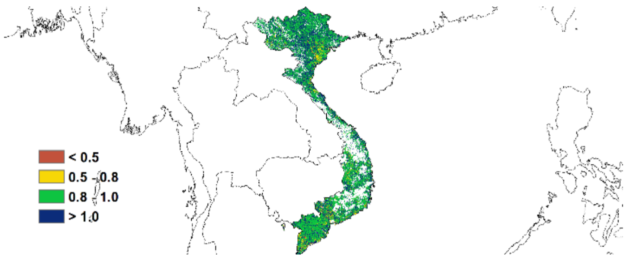
Due to the decrease of rainfall and dry weather, BIOMSS decreased by 3%, which indicated unsatisfactory crop conditions.

Figure 3.44 Vietnam's crop condition, October 2019 - January 2020



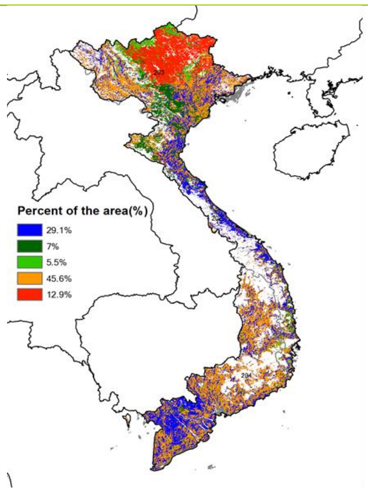
(a). Phenology of major crops

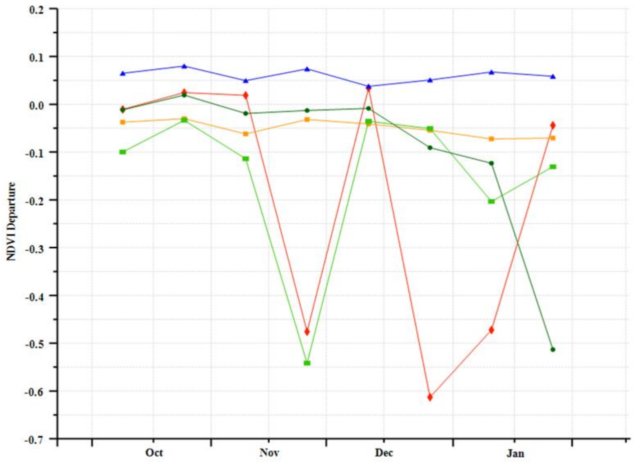




(b) Crop condition development graph based on NDVI

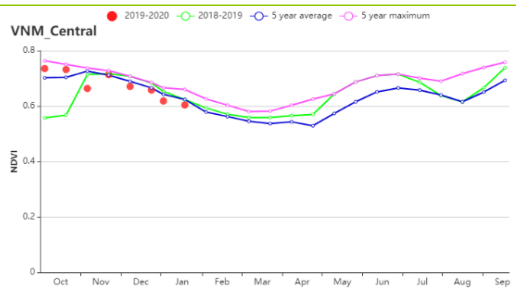
(c) Maximum VCI

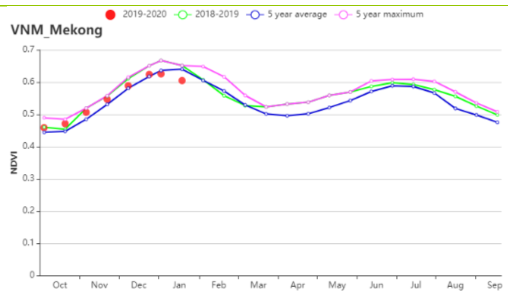




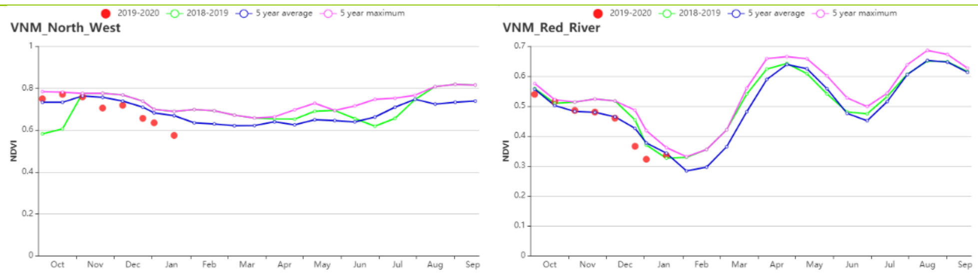
(d) Spatial NDVI patterns compared to 5YA

(e) NDVI profiles

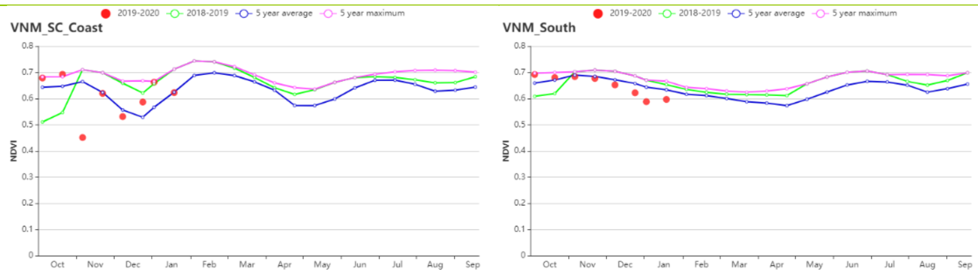




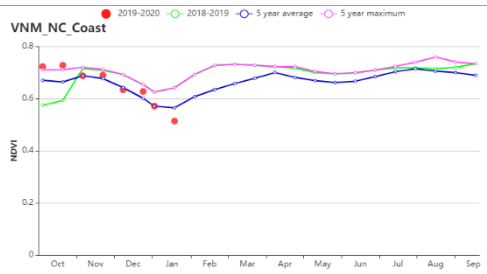
(f) Crop condition development graph based on NDVI Central Highlands Vietnam (left), and Mekong River Delta (right).



(g) Crop condition development graph based on NDVI North West Vietnam (left), and Red River Delta (right).



(h) Crop condition development graph based on NDVI South Central Coast Vietnam (left), and South East Vietnam (right).



(i) Crop condition development graph based on NDVI North Central Coast Vietnam

Table 3.81 Vietnam's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019-January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Central Highlands	288	-43	20.5	-0.4	1083	16
Mekong River Delta	496	-34	26.1	0.2	1226	12
North Central Coast	472	-30	18.9	0.7	767	14
North East	450	22	16.8	0.9	673	0
North West	228	-13	16.5	0.8	865	11
Red River Delta	538	22	20.0	0.8	671	2
South Central Coast	636	-44	19.8	-0.4	848	21
South East	328	-47	25.1	0.2	1202	10

Table 3.82 Vietnam's agronomic indicators by sub-national regions, current season's values and departure from 5YA/15YA, J October 2019-January 2020

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current	Departure from 5YA (%)	Current
Central Highlands	552	2	100	0	0.95
Mekong River Delta	781	8	93	3	0.95

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current	Departure from 5YA (%)	Current
North Central Coast	389	0	97	3	0.99
North East	309	-5	100	0	0.99
North West	379	4	100	0	0.98
Red River Delta	378	2	94	3	0.94
South Central Coast	450	-1	98	3	0.99
South East	678	-3	96	1	0.96

[ZAF] South Africa

The current reporting period corresponds to the sowing and early growth stages of maize and soybean, while wheat was harvested by the end of November. Rainfall was close to the average of the last 15 years with 268 mm. It was warmer (+0.2°C) and sunnier with RADPAR at + 3%. These weather conditions led to an increase in the estimated BIOMSS by 2%, and 79% of the cropland area was cultivated, with a 29% increase in cropped area as compared to the last 5 years average.

Generally, the crop conditions based on the NDVI graph were below average until the end of December and then improved to above average in January. This was not the case for all cropped areas since the NDVI clustering map indicated that the conditions of 36.7% of the cropped area remained below the average during the whole period. These areas are mostly located in coastal regions in the Eastern and Western Cape provinces and showed a low value of VCIx (< 0.5) based on the VCIx map; however, the nationwide maximum VCI was high (0.91).

All these CropWatch parameters indicated high variability, but overall favorable conditions. The best conditions were observed for the northeastern provinces, which are known for the predominant maize cultivation. The recent above average rainfalls were beneficial for the summer crops and the sowing progress was 31% in advance compared to the same period last year. CropWatch forecasts a good maize production prospect for this season. The coastal regions in Eastern and Western Cape presented below average NDVI indicating low wheat output which was harvested by the end of 2019.

Regional analysis

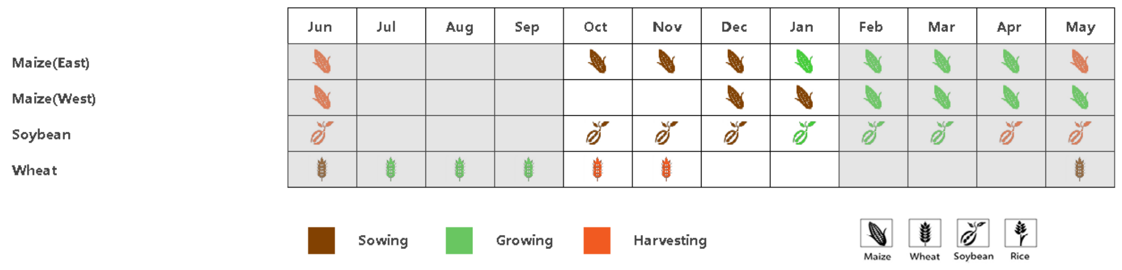
CropWatch adopts three agro −ecological zones (AEZs) relevant for crop production in South −Africa. The first zone is **the Humid Cape Fold Mountains**; the second zone is **the Mediterranean zone**, while the third zone is **the Dry Highveld and Bushveld maize areas**, by far the most relevant zone in terms of food production.

In **the Humid Cape Fold Mountain zone**, a drop in rainfall by 12% below the average has occurred with an increase of the average temperature by 0.4 °C and 4% above average RADPAR. The reduction in rainfall with this hot and sunny weather was leading to below-average crop conditions during October and November and then turned to be close to average in December and above-average crop conditions in January. The impact of rainfall reduction was not significant since the CropWatch agronomic measures indicated that the BIOMSS was 1% above the average and the maximum VCI value was high (0.86).

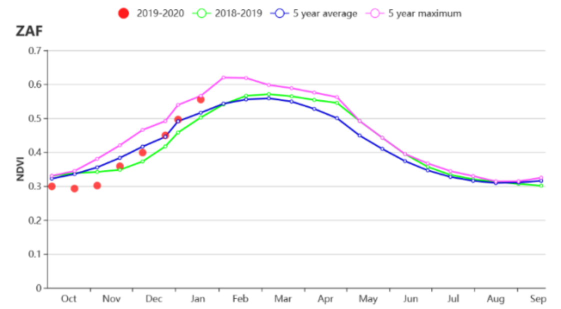
In **the Mediterranean zone**, the average rainfall was 28% above the average, and the temperature was colder by 0.4°C. The RADPAR was also 1% below the average. However, the nationwide NDVI shows that the zone well known for wide cultivation of wheat was at the end of growing season and by the end of November, all wheat had already been harvested. The conditions based on the NDVI graph were above the average, except in October. The CALF indicated that only 36% of the cropland area in the zone was cultivated with a reduction in the cropped area by 40% compared to the last 5 years average. Hence, the estimated BIOMSS was 2% below the average and the VCIx value was low (0.32).

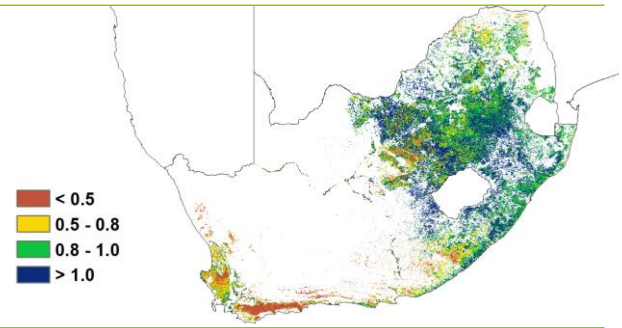
In **Dry Highveld and Bushveld maize areas**, the average rainfall was higher by 4% compared to the average, and the temperature rose by 0.3 °C with sunny weather (RADPAR, 4% above average). This zone is the main zone for maize cultivation and these favorable weather conditions led to an increase in estimated BIOMSS by 3% and high VCIx value (0.99). These conditions were not so great at the beginning of the reporting period since the NDVI graph that describes crop conditions indicated below-average conditions in October and November but subsequently the conditions improved by December and reached maximum values by the end of January.

Figure 3.45 South Africa's crop condition, October 2019 - January 2020



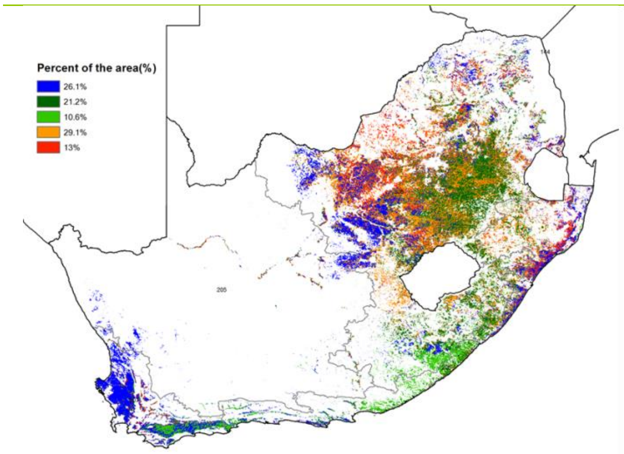
(a). Phenology of major crops

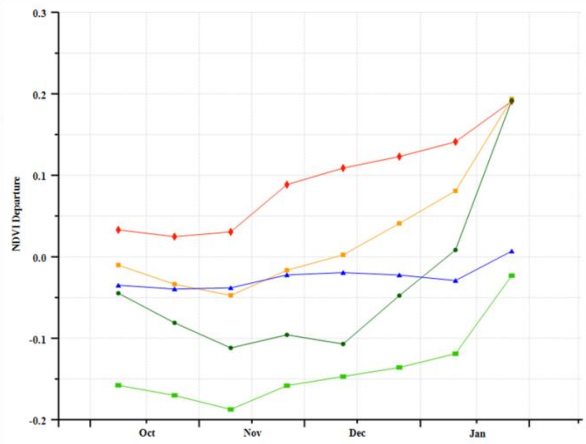




(b) Crop condition development graph based on NDVI

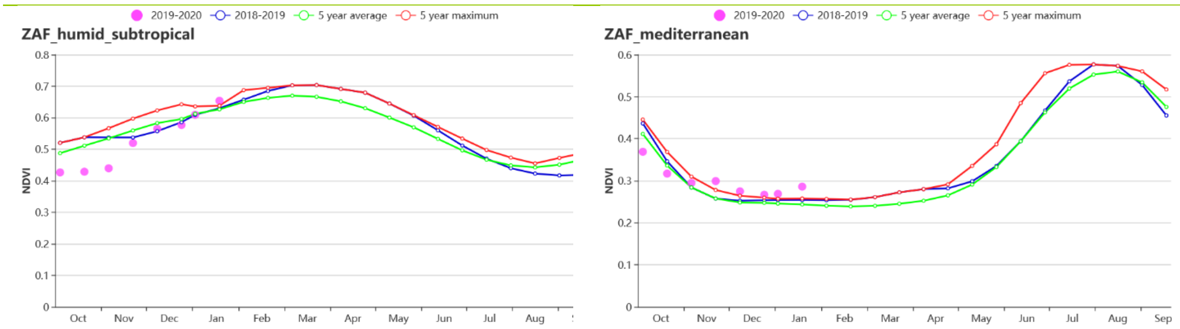
(c) Maximum VCI



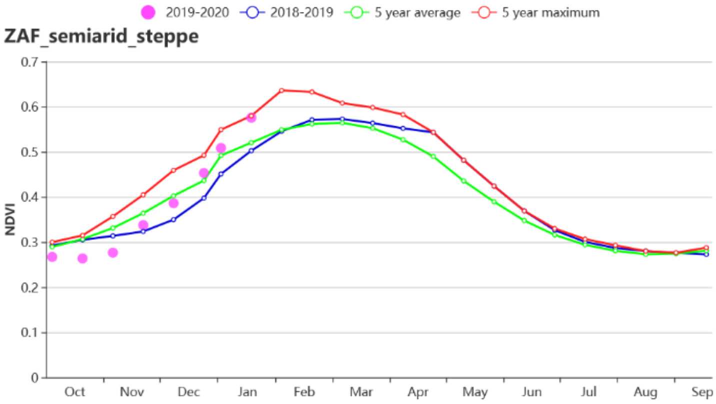


(d) Spatial NDVI patterns compared to 5YA

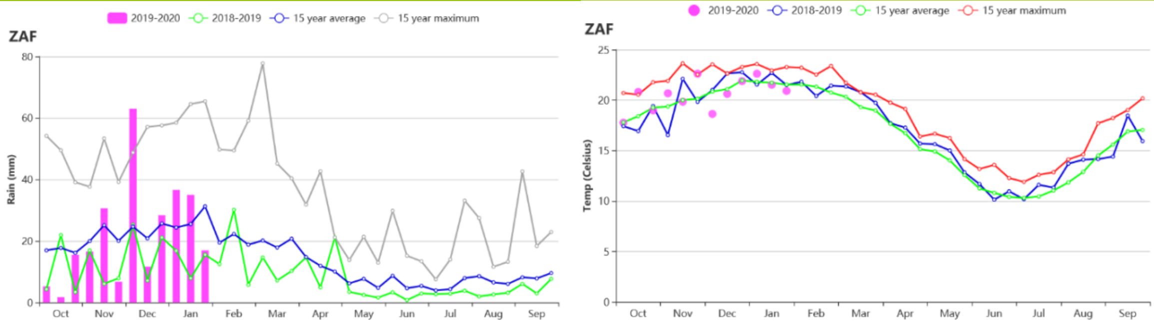
(e) NDVI profiles



(f) Crop condition development graph based on NDVI (Humid Cape Fold Mountains (left) and Mediterranean wheat zone (right))



(f) Crop condition development graph based on NDVI (Dry Highveld and Bushveld maize zone)



(g) Time series profiles of precipitation (left) and temperature (right)

Table 3.83 South Africa's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Humid Cape Fold Mountains	345	-12	20	0.4	1308	4
Mediterranean Zone	147	28	18.1	-0.4	1569	-1
Dry Highveld and Bushveld	271	4	20.9	0.3	1533	4

Table 3.84 South Africa's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current	Departure from 5YA (%)	Current
Humid Cape Fold Mountains	694	1	94	4	0.86
Mediterranean Zone	733	-2	36	-40	0.32
Dry Highveld and Bushveld	829	3	83	45	0.99

AFG AGO ARG AUS BGD BLR BRA CAN DEU EGY ETH FRA GBR HUN IDN IND IRN ITA KAZ KEN KGZ KHM LKA MAR MEX MMR MNG MOZ NGA PAK PHL POL ROU RUS THA TUR UKR USA UZB VNM ZAF **ZMB**

[ZMB] Zambia

During this reporting period, irrigated wheat was harvested with an estimated national production of 150,000 MT while main field crops were planted following the onset of the rainy season in October/November. The previous seasons resulted in a decline of rainfed cereal production in two consecutive years to below-average levels, mainly driven by rainfall deficits.

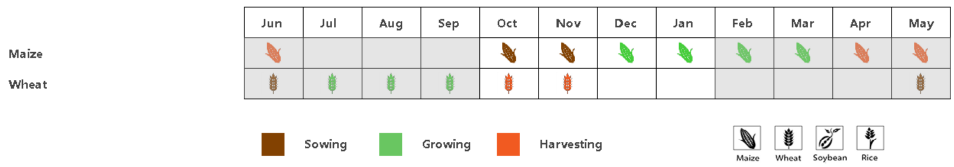
Countrywide the average rainfall was at 962 mm, 12% above the 15 year average, average temperatures at 23.7 °C (+0.1) and solar radiation of 1315 MJ/m2. These conditions resulted in potential biomass production of 786 g DM/m2 (+2%), total cropped land at 98% (+9%) and maximum VCI of 0.89. Delayed onset of the rainfall in October and early November affected crop establishment in some parts of the country. However rainfall returned to average levels thereafter.

Regional Analysis

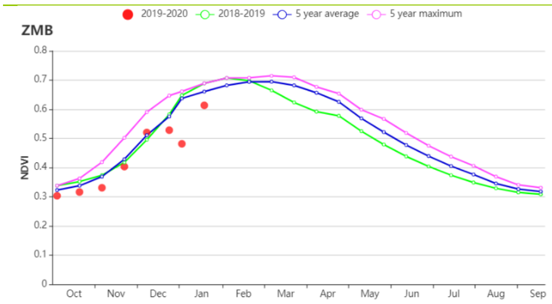
The three agro-ecological zones (AEZs) indicated that the cumulative rainfall received in all the agro-ecological zones was above the 15 year average (>3%), except for the **Luangwa-Zambezi Rift Valleys** where the deviation was negative (-1%). Based on the temperature profiles, average temperature for the regions varied from 21.9°C to 25.3°C with negligible departure from 15 year average. Similarly the sunshine radiation for the three agro-ecological zones was above 1200 MJ/m2. These indicators are reflected in positive BIOMSS departures in the **Luangwa-Zambezi Rift Valley** (+11%) and **West-Semiarid zone** (+4%) while **Northern high rainfall zone** (-7%) and Central, eastern and southern plateau (-1%) recorded negative departures.

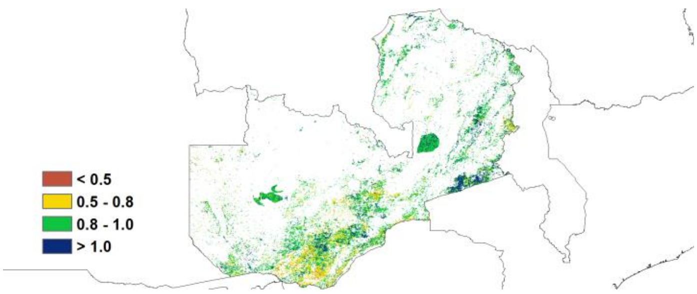
The Cropped Arable Land Fraction (CALF) was above 98% across all the AEZs except for Luangwa-Zambezi Rift Valley (95%). Similar positive trends were observed for the maximum VCI. The NDVI showed a large negative outlier in January, presumably due to cloud cover. Values for all regions were above average by the end of January. Overall, these agronomic indicators showed more favorable crop conditions as compared to the previous year and hence an expected potential increase for the 2020 cereal harvest.

Figure 3.46 Zambia's crop condition, October 2019 - January 2020



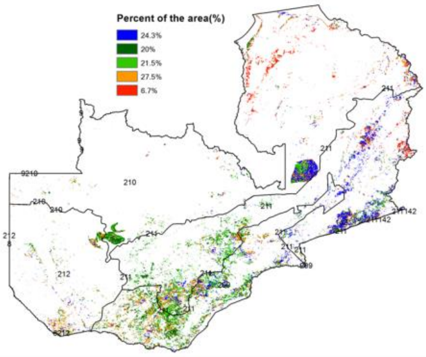
a). Phenology of major crops



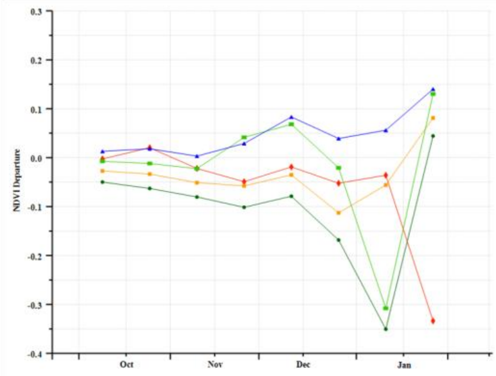


(b) Crop condition development graph based on NDVI

(c) Maximum VCI



(d) Spatial NDVI patterns compared to 5YA



(e) NDVI profiles

Table 3.85 Zambia's agroclimatic indicators by sub-national regions, current season's values and departure from 15YA, October 2019 - January 2020

Region	RAIN		TEMP		RADPAR	
	Current (mm)	Departure from 15YA (%)	Current (°C)	Departure from 15YA (°C)	Current (MJ/m^2)	Departure from 15YA (%)
Luanguwa Zambezi rift valley	780	-1	25.3	+0.5	1409	0
Northen high rainfall zone	1193	+20	21.9	-0.2	1211	-2
Central-eastern and southern plateau	914	+14	24.0	+0.1	1337	+1
Western semi-arid plain	811	+3	24.7	-0.2	1310	-1

Table 3.86 Zambia's agronomic indicators by sub-national regions, current season's values and departure from 15YA/5YA, October 2019 - January 2020

Region	BIOMSS		Cropped arable land fraction		Maximum VCI
	Current (gDM/m^2)	Departure from 15YA (%)	Current	Departure from 5YA (%)	Current
Luanguwa Zambezi rift valley	895	+11	95	+6	0.83
Northen high rainfall zone	683	-7	99	+1	0.93
Central-eastern and southern plateau	760	-1	98	+17	0.91
Western semi-arid plain	852	+4	99	+2	0.90

Chapter 4. China

After a brief overview of the agro-climatic and agronomic conditions in China over the reporting period (section 4.1), Chapter 4 describes the situation by region, focusing on the seven most productive agroecological zones (AEZs) of the east and south (4.2): North-east China, Inner Mongolia, Huanghuaihai, Loess region, Lower Yangtze, Southwest China and Southern China. Additional information on the agro-climatic indicators for agriculturally important Chinese provinces is listed in table A.11 in Annex A.

4.1 Overview

Agro-climatic conditions were slightly below average in China from October 2019 to January 2020, with rainfall and radiation deficits by 4% and 1%, respectively. Temperature was 0.8℃ above the average. Low rainfall but relative high temperatures and close to average radiation resulted in the average potential biomass. Due to the complexity and variability of climatic conditions in China, weather conditions vary over different agroecological zones. Temperatures in seven agroecological zones of China were all above average, ranging from 0.6℃ to 1.2℃. Lower Yangtze and Southern China suffered from water shortage, with 17% and 31% lower rainfall compared to average. Drier conditions may potentially hamper the sowing and early growth of crops after winter. Since potential biomass is a synthetic indicator taking rainfall, radiation, and temperature into consideration, potential biomass in Lower Yangtze was still above average due to the agreeable conditions of radiation and temperature, while potential biomass in Northeast China was still above average due to the relatively high temperatures.

Rainfall departure clustering and temperature departure clustering show detailed spatial and temporal patterns. Rainfall in 58% of the total agricultural area was generally average, and mainly located in Northern China, Northeast China, and western parts of Southwest China. Other regions in China went through some fluctuation in rainfall. Excessive rainfall occurred mainly in early October, early January, and late January mainly in Central China, Southern China, southern parts of Northern China and eastern of Southwest China. Interestingly, the variations of temperature were quite consistent in the three clustered regions, with temperatures above the average in most of the time during the monitoring period.

More than ten provinces had large rainfall anomalies such as Henan (+54%), Guangdong (-53%), and Chongqing (+52%). The largest positive temperature anomalies (in excess of 1.0°C) were recorded in eleven provinces such as Jiangsu (+1.6℃), Jiangxi (+1.5℃) and Anhui (+1.4℃). If the situation of above average temperature still continues into the next monitoring period (January to April), snow may melt early and facilitate early sowing of spring crops.

Winter wheat cultivated across northern China is going through the hibernation period, while there was nearly no crop in Northeast China and Inner Mongolia. The significantly above average CALF in Huanghuaihai and Loess Region could be a result of advanced development of winter crops thanks to the higher than average temperature. CropWatch will keep watching at the agro-climatic and agronomic conditions in the following bulletins.

Table 4.1 CropWatch agroclimatic and agronomic indicators for China, October 2019 - January 2020, departure from 5YA and 15YA

Region	Agroclimatic indicators				Agronomic indicators		
	Departure from 15YA (2004-2018)				Departure from 5YA (2014-2018)		Current period
	RAIN (%)	TEMP (°C)	RADPAR (%)	BIOMSS (%)	CALF (%)	Cropping intensity (%)	Maximum VCI
Huanghuaihai	37	1.2	-7	7	10	-	0.91
Inner Mongolia	21	0.7	-2	7	-	-	0.91
Loess region	37	0.8	-7	-5	21	-	0.99

Lower Yangtze	-17	1.2	2	7	-1	-	0.89
Northeast China	-3	0.7	0	7	-	-	0.76
Southern China	-31	0.8	11	-3	0	-	0.96
Southwest China	25	0.6	-7	-12	1	-	0.97

Figure 4.1 China spatial distribution of rainfall profiles, October 2019 - January 2020

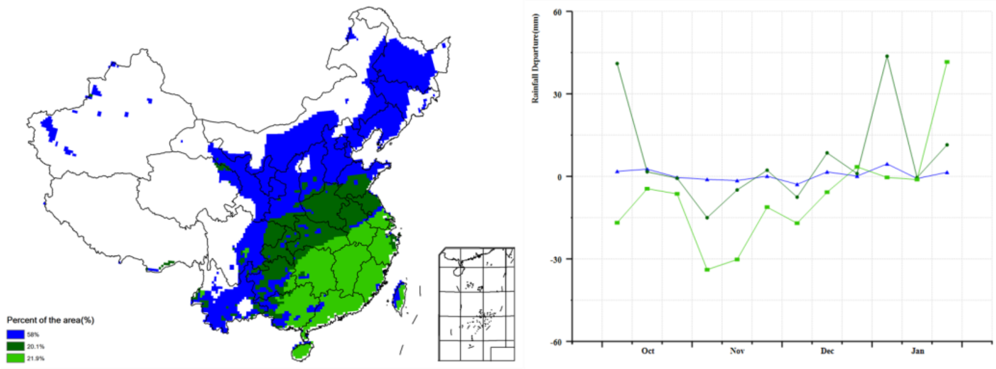


Figure 4.2 China spatial distribution of temperature profiles, October 2019 - January 2020

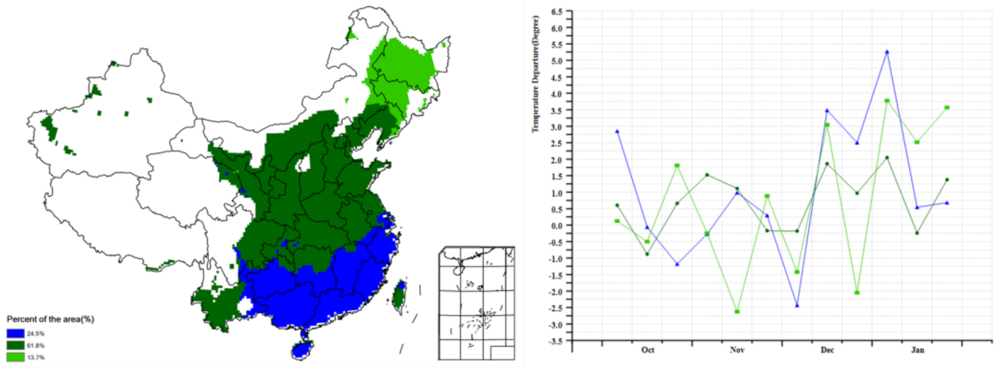


Figure 4.3 China cropped and uncropped arable land, by pixel, October 2019 - January 2020

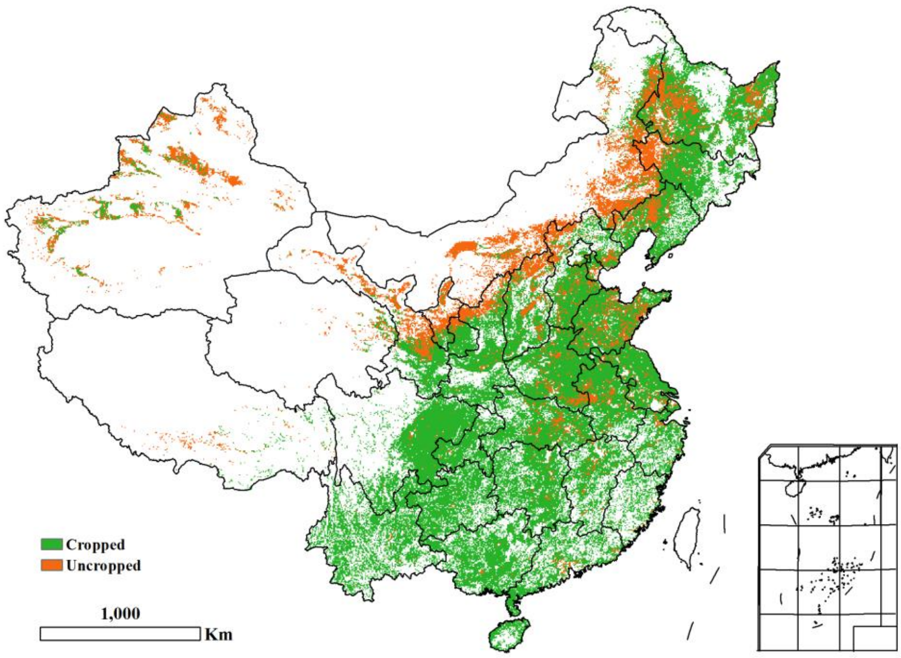
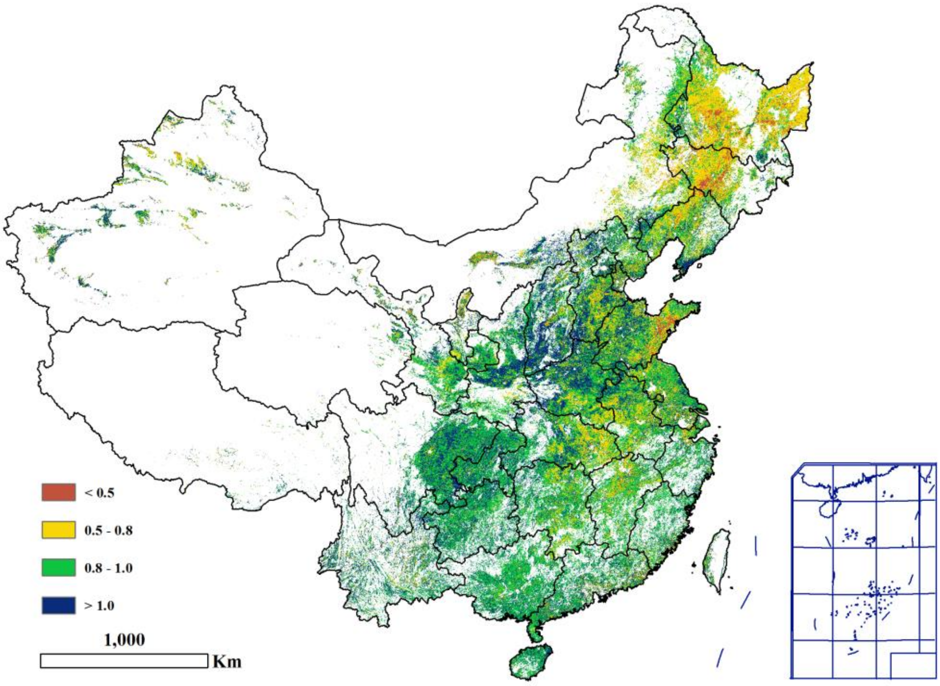


Figure 4.4 China maximum Vegetation Condition Index (VCIx), by pixel, October 2019 - January 2020



4.2 Regional analysis

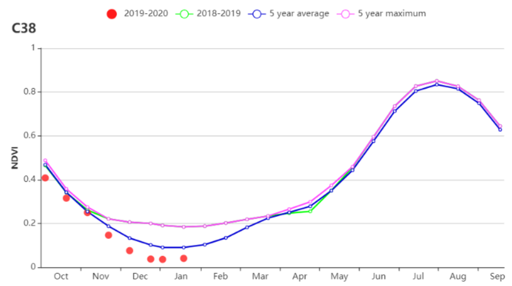
Figures 4.5 through 4.11 present crop condition information for each of China's seven agricultural regions. The provided information is as follows: (a) Phenology of major crops; (b) Crop condition development graph based on NDVI, comparing the current season to the previous season, to the five-year average (5YA), and to the five-year maximum; (c) Spatial NDVI patterns (compared to the (5YA)); (d) NDVI profiles associated with the spatial patterns under (c); (e) maximum VCI (over arable land mask); and (f) biomass for October 2019 - January 2020. Additional information about agro-climatic indicators and BIOMSS for China is provided in Annex A.

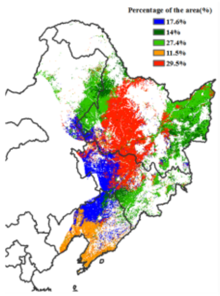
Northeast region

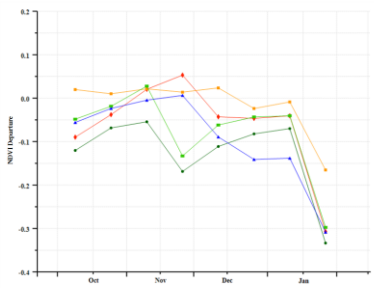
Due to the cold weather, no crops were growing in the northeast of China during this monitoring season (October 2019 to January 2020). CropWatch Agroclimatic Indicators (CWAIs) showed that all agricultural meteorological indicators were close to average level. Overall precipitation decreased by 3%, but was significantly above average in late October, mid-November and mid-December. The photosynthetically active radiation decreased by 1%, and temperature decreased by about 0.7°C. The temperature was close to average level in October and November, and increased to above average level in January 2020.

For the potential biomass, most areas are above average in the northeast China. Since the potential biomass is the result of the synthesis of agricultural meteorological conditions, the higher potential biomass indicates favorable agricultural meteorological conditions during this monitoring season in northeast China. If the rainfall and temperature remain appropriate until the sowing period, it will also be conducive to the emergence and early growth of crops.

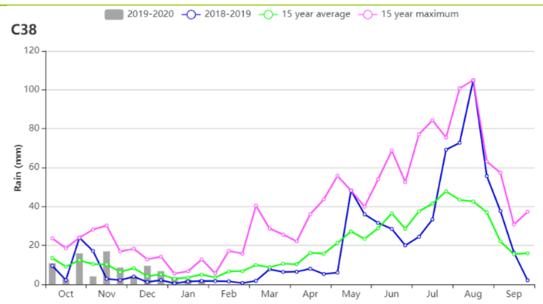
Figure 4.5 Crop condition China Northeast region, October 2019 - January 2020

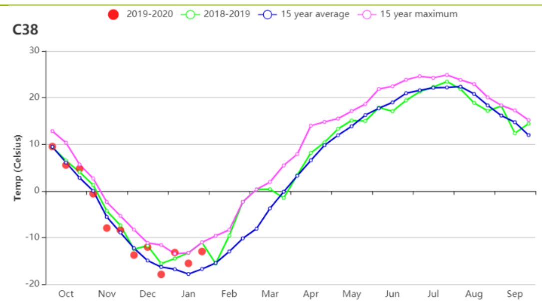




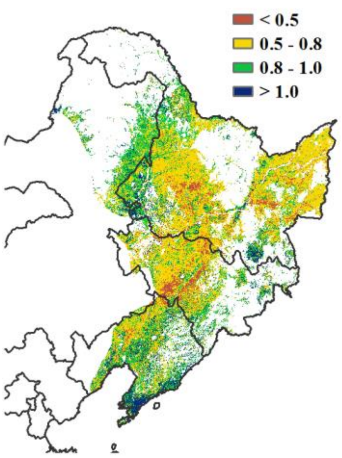


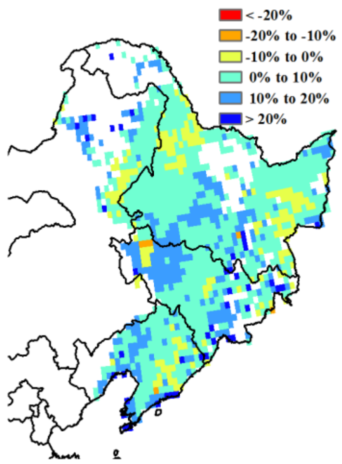
(a) Crop condition development graph based on NDVI (b) Spatial NDVI patterns compared to 5YA (c) NDVI profiles





(d)Time series rainfall profile (e)Time series temperature profile





(f) Maximum VCI (g) Biomass departure

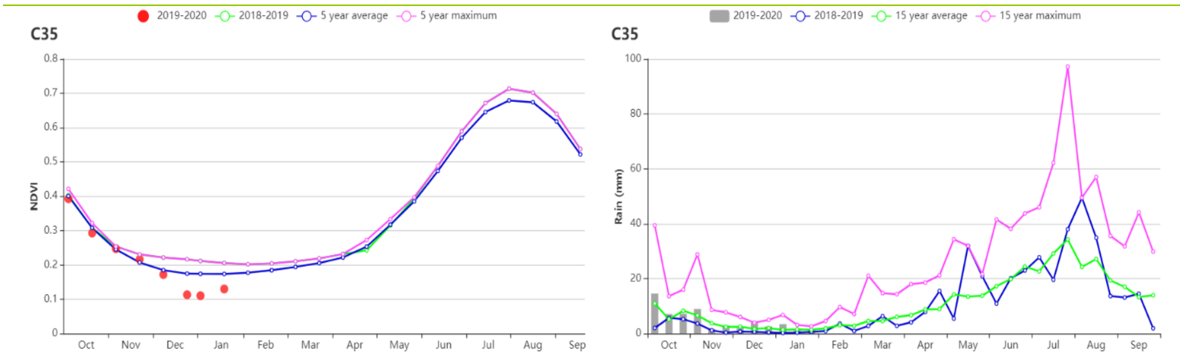
Inner Mongolia

From late October 2019 to January 2020 in Inner Mongolia, there were no crops in the field due to low temperatures. However, weather conditions in this period were relevant, particularly rainfall, as it controlled soil moisture availability for spring sown crops. In October, slightly below average conditions had almost no effect since the crops had reached maturity or were harvested already.

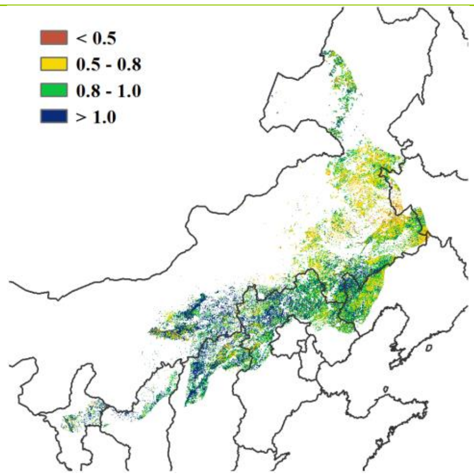
The reporting period recorded 57 mm of precipitation, which was 21% above the average. The rainfall profile showed that rainfall was above average in each month during this reporting period. Together with above temperature average (TEMP, +0.7°C) and close to average radiation (2% below average), potential biomass accumulation was simulated at 7% above average level.

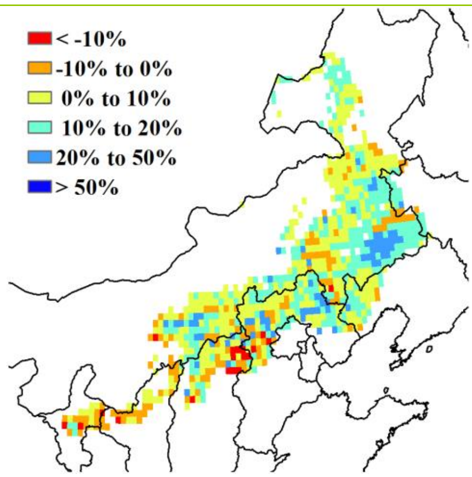
Though the average of VCIx was above 0.9 and below 0.5 in the southeast, as well as lower BIOMASS in central Ningxia, north of Shanxi, Shaanxi and Hebei, it was not vital as no crop existed in the field. In general, above average snow and rainfall may be able to provide adequate soil moisture for the land preparation and early growth of 2020 spring crops.

Figure 4.6 Crop condition China Inner Mongolia, October 2019 - January 2020



(a) Crop condition development graph based on NDVI (left) and rainfall profiles (right)





(b) Maximum VCI

(c) Biomass departure

Huanghuaihai

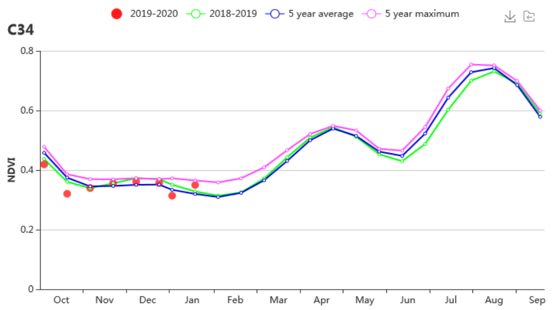
This monitoring period (October 2019 to January 2020) covers the planting and early growth stages of winter wheat in Huanghuaihai.

Precipitation in this area increased by 37% from the average, temperature increased by 1.2℃, and photosynthetically active radiation decreased by 7%. Good climatic conditions caused a 7% increase in biomass over the average level and were beneficial to the growth of winter wheat. Favorable climatic conditions also advanced the development of winter crops before wintering as reflected by 10% above 5YA CALF.

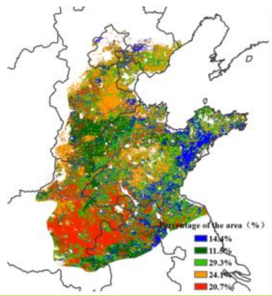
The NDVI profiles showed that crop growth in the Huanghuaihai region was slightly above average level for most of the monitoring period. There is some spatial variation of the crop growth conditions within this region. From mid to late October to January, NDVI anomalies in central and eastern Henan and northwestern Anhui were positive, whereas in the central and southern Jiaozhou Peninsula and northeastern Anhui Province they were negative, indicating that the crops in this area were in poorer condition.

The maps of maximum VCI showed a similar trend to the spatial NDVI patterns. Overall, crop conditions in the Huanghuaihai region during the monitoring period were generally favorable, with an average VCIx of 0.91.

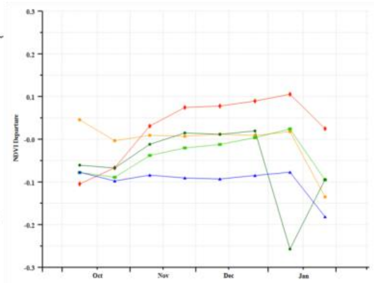
Figure 4.7 Crop condition China Huanghuaihai, October 2019 - January 2020



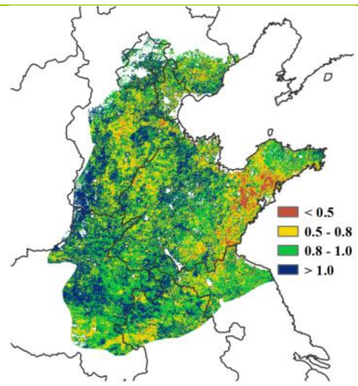
(a) Crop condition development graph based on NDVI



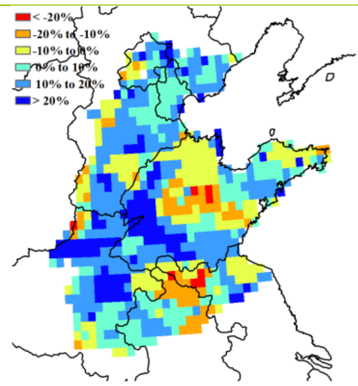
(b) Spatial NDVI patterns compared to 5YA



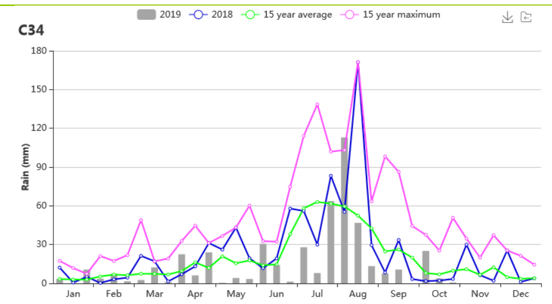
(c) NDVI profiles



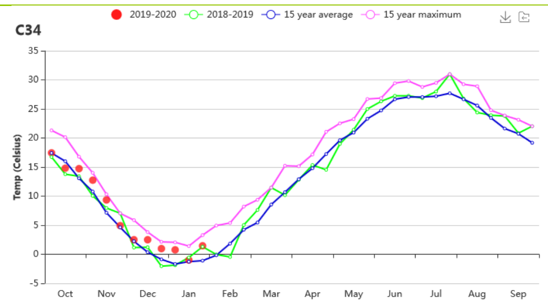
(d) Maximum VCI



(e) Biomass departure



(f) Time series rainfall profile

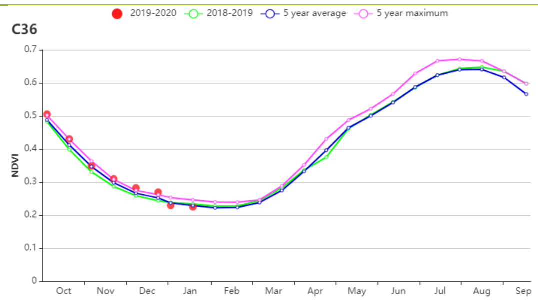


(g) Time series temperature profile

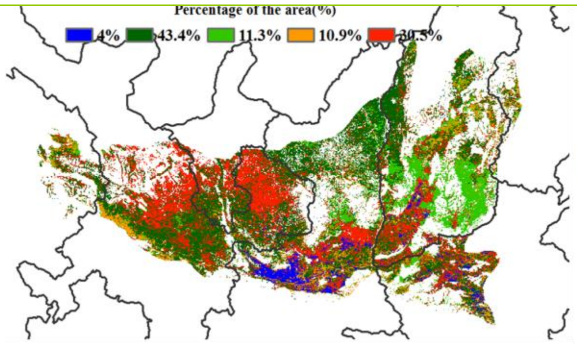
Loess region

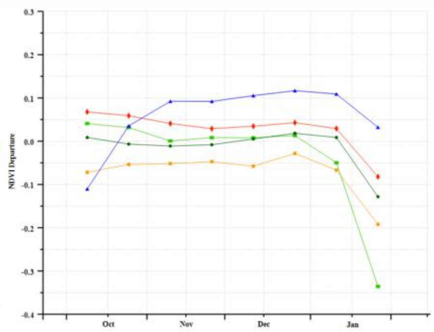
In this region, the most important crop in the field is winter wheat, which is currently hibernating. Crop condition was generally superior to last year's and the five year average from October to December, but dropped to below average in January. Precipitation (RAIN +37%) was above average, and so was temperature (TEMP +0.8°C); radiation (RADPAR -7%) was below average. Although significant above average rainfall was received in the region, low radiation resulted in 5% below average BIOMSS compared with the 15-year average. In most of the region, spatial patterns of NDVI departure clustering and the profiles are consistent with VCIx: the most favorable conditions prevail in the center of Gansu province and south-central Ningxia, and some parts in south-central Shaanxi, due to the relatively abundant rainfall. The cropped arable land fraction (CALF) increased by 21% compared with recent years and VCIx averaged at 0.99 in the region, showing a favorable crop prospect in the region.

Figure 4.8 Crop condition China Loess region, October 2019 - January 2020



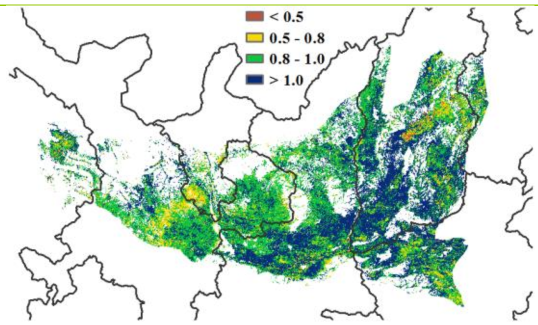
(a) Crop condition development graph based on NDVI

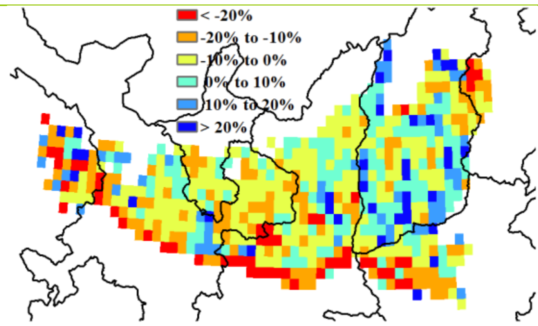




(b) Spatial NDVI patterns compared to 5YA

(c) NDVI profiles





(d) Maximum VCI

(e) Biomass departure

Lower Yangtze region

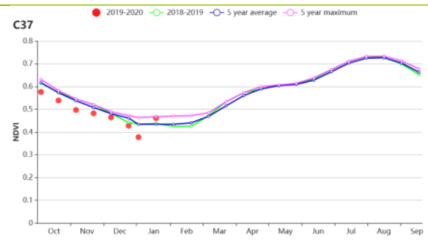
During this monitoring period, only winter crops like wheat and rapeseed were in the field, mostly in the north of the region, including parts in Hubei, Henan, Anhui and Jiangsu provinces. There were basically no crops in Fujian and the southern Jiangxi and Hunan provinces. The overall crop condition is estimated to be unfavorable.

According to the CropWatch agro-climatic indicators, Lower Yangtze region experienced a warmer and drier winter compared to the 15YA with temperature at 1.2 ℃ above average and photosynthetically active radiation at 2% above average. The accumulated precipitation, however, was significantly below average (RAIN,-17%). Even so, the warmer weather and above average radiation still led to a 7% increase in potential biomass compared to the 15YA. Potential Biomass departure map shows the spatial variation of the weather impact on crops. Most parts of Jiangxi, Fujian and Southern Hunan had large positive anomalies up to 20% above average. This was due to the above average radiation in Jiangxi and Fujian and slightly above average rainfall in Hunan.

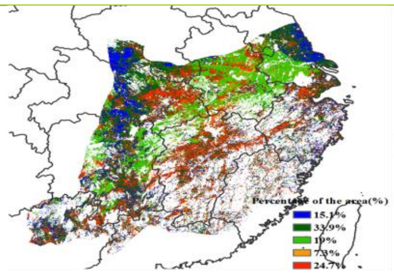
As shown in the NDVI development graph, crop conditions were below the 5-year average. Only 15.1% of the area, mostly distributed in the northwest and northeast of this region including Jiangsu, Hubei and Henan provinces, had slighthly better crop conditions as compared to the five-year average. NDVI in the remaining areas presented below average patterns, presumably due to below average rainfall. The red and orange areas concentrated in Jiangxi, Zhejiang and western Hubei, which account for 32% of the total area, were significantly below average.

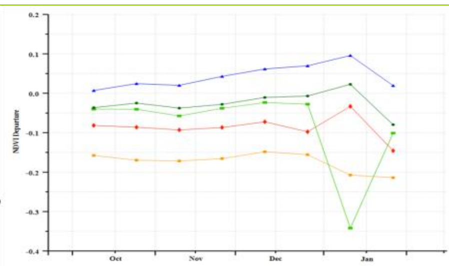
The crop condition in the lower Yangtze region is currently assessed as close to but below average.

Figure 4.9 Crop condition Lower Yangtze region, October 2019 - January 2020



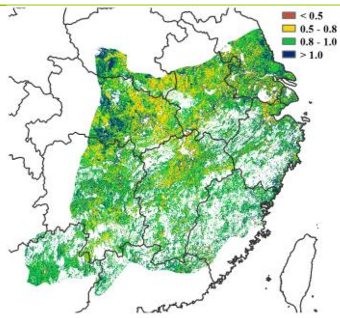
(a) Crop condition development graph based on NDVI

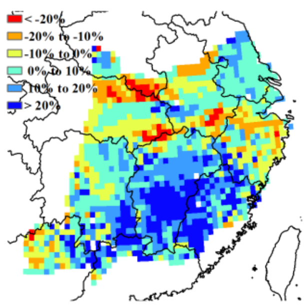




(b) Spatial NDVI patterns compared to 5YA

(c) NDVI profiles





(d) Maximum VCI

(e) Biomass departure

Southwest China

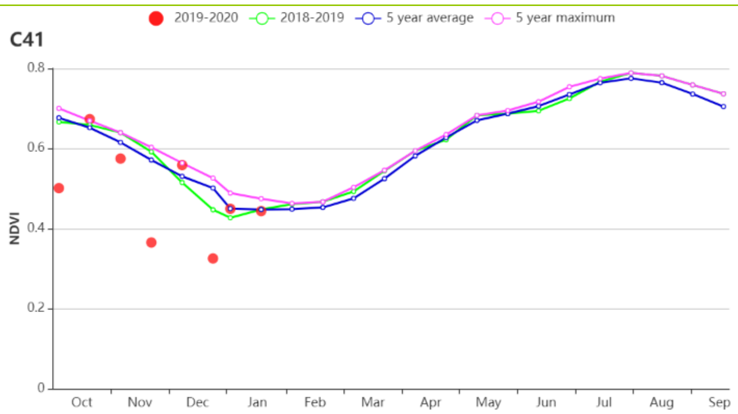
The reporting period covers the wintering period of winter crops. According to the regional NDVI profile, crop conditions were generally below the 5-year average, but above the average in October and mid-December 2019.

On average, rainfall was above the fifteen-year average (Rain +25%), whereas radiation was below average (RADPAR -7%). Temperature was close to average as well (TEMP + 0.6 °C). The resulting BIOMSS was 12% below average mainly due to the less radiation.

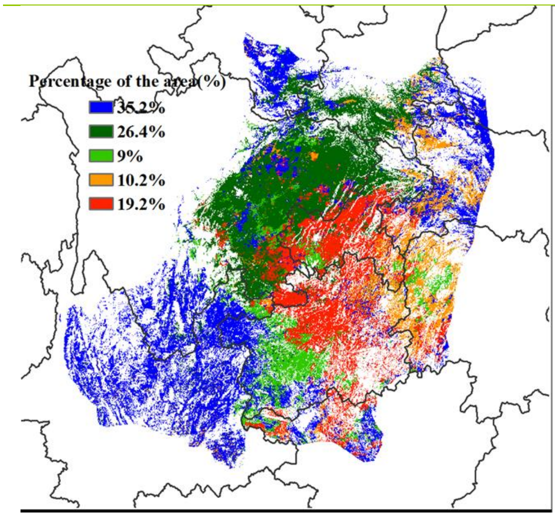
According to the NDVI departure clustering map and the profiles, values were fluctuating throughout the monitoring period. In general, they were below average. Average NDVI throughout the monitoring period was observed in Yunnan, in spite of both precipitation and radiation being significantly above average (See Annex A.11). The cropped arable land fraction for the whole region remained at the same level as in the previous five years. The maximum VCI reached 0.97 at the peak of the growing season. The value was comparable with those of the previous five years.

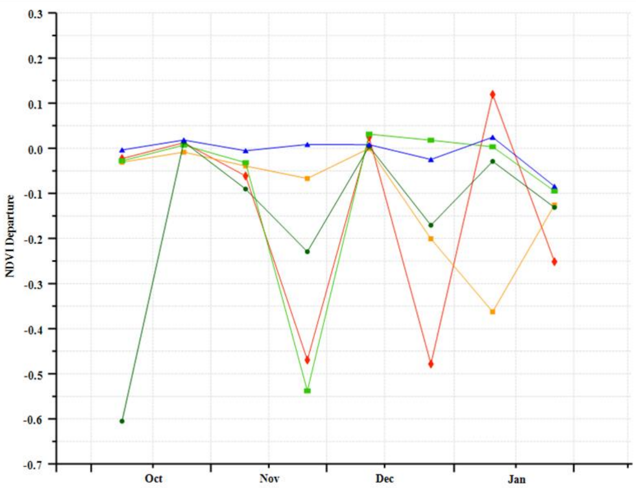
Overall, the mixture of agroclimatic and agronomic indicators show generally average crop condition.

Figure 4.10 Crop condition Southwest China region, October 2019 - January 2020



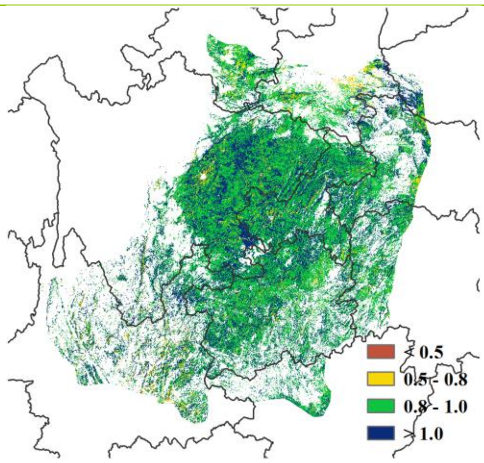
(a) Crop condition development graph based on NDVI



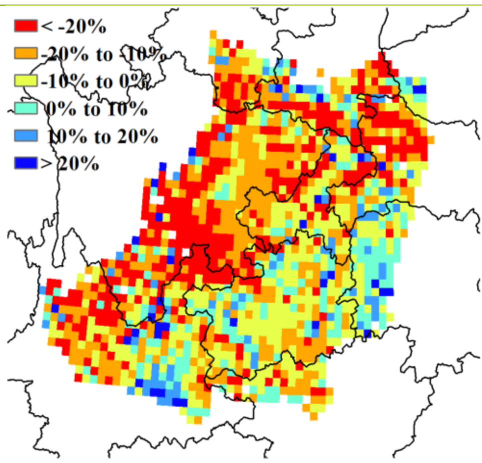


(b) Spatial NDVI patterns compared to 5YA

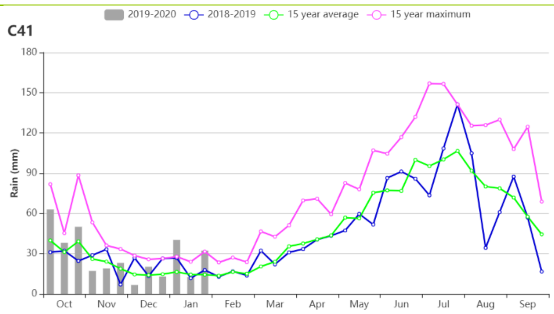
(c) NDVI profiles



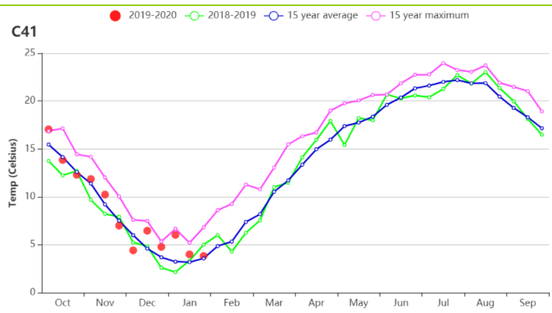
(d) Maximum VCI



(e) Biomass departure



(f) Time series rainfall profile



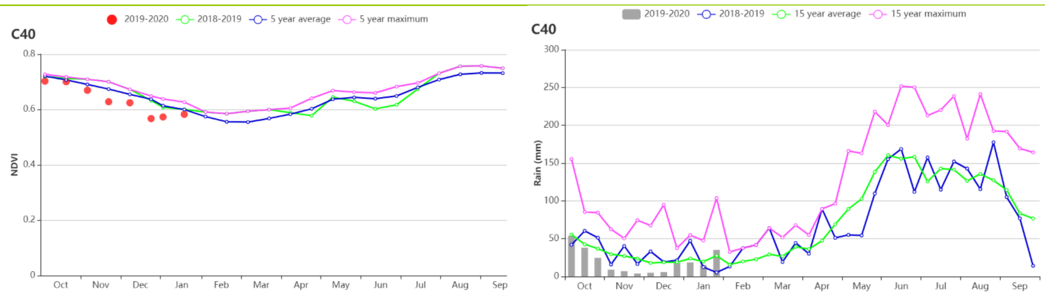
(g) Time series temperature profile

Southern China

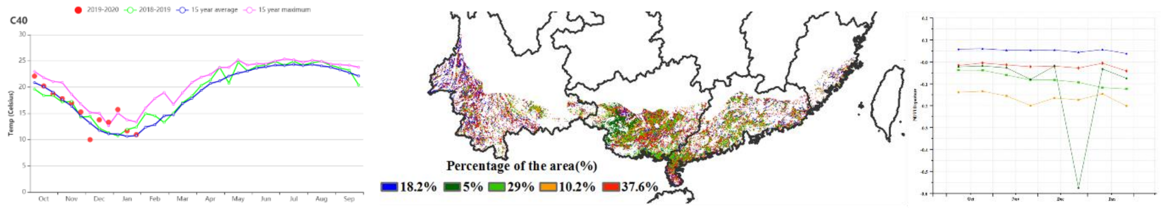
During the reporting period, the main crop in Southern China was late rice, which was harvested in November. Regionally, rainfall reached 234 mm, 31% lower than the average. The temperature and the radiation rose by 0.8℃ and 11% compared to the 15YA, respectively. The resulting BIOMSS was close to average (-3%). Since rainfall, temperature and radiation are non-linearly integrated into the BIOMSS model, the departures are not always consistent with sunlight (RADPAR), RAIN and TEMP departures at provincial level. Among those indicators, precipitation changes the most. In Guangdong and Fujian, precipitation dropped by 53% and 47% respectively compared to the 15YA.

The cropped arable land fraction (CALF) in this region was 97%, which was close to average. The average VCIx of the Southern China region during the monitoring period was 0.96, and almost all regions presented above 0.80 VCIx. According to the spatial clusters of NDVI departure from average, most areas in southern China were slightly below average except for scattered areas in Yunnan province accounting for 18.2% of the total cropland area in the region. The spatial distribution of biomass departures displayed a drop in this region, more significant reductions were noted in Guangxi. The conditions were mixed in the Yunnan province. Increases occurred in Guangdong, Fujian and some scattered areas in Yunnan and Guangxi. Overall, the mixture of positive and negative departures of indicators discussed above show generally unfavorable crop condition.

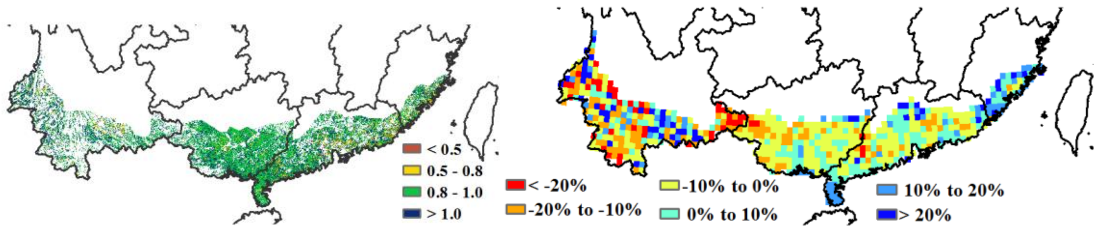
Figure 4.11 Crop condition Southern China region, October 2019 - January 2020



(a) Crop condition development graph based on NDVI (b) Rainfall profiles



(c) Temperature profiles (d) Clustering analysis of NDVI departure from 5 years average



(d) Maximum VCI (e) Biomass departure

Chapter 5. Focus and perspectives

Building on the CropWatch analyses presented in chapters 1 through 4, this chapter presents first early outlook of crop production for 2020(section 5.1), as well as sections on recent disaster events (section 5.2), and an update on El Niño (5.3).

5.1 CropWatch food production estimates

Methodological introduction

Table 5.1 presents the final revision by the CropWatch team of the global maize, rice, wheat and soybeans production estimates for 2019. It is issued at a time when all 2018-2019 winter crops and 2019 summer crops in the temperate northern hemisphere have been harvested; in the southern hemisphere winter crops are growing and the planting of the summer season/monsoon season is underway or about to start. The planting of the second crop is ongoing or about to start in equatorial areas.

CropWatch production estimates differ from most other global or regional estimates by the use of near-real time geophysical data and models. They are based on a combination of remote-sensing models (for major commodities at the national level) and statistical trend-based projections for minor producers and for those countries which will harvest their crops in the two last months of 2019, for which no directly observed crop condition information is as yet available. In Table 5.1 below, modeled outputs are in red bold font. The percentage of modeled global production varies according to crops: 85% for maize, 94% for rice, 89% of wheat (most of it being northern hemisphere winter wheat) and 82% for soybeans.

The 42 countries for which production estimates are provided are described in detail in chapter 3 while a whole chapter is devoted to China (Chapter 4). Kyrgyzstan was added for the first time in this bulletin. The 42 + 1 countries are referred to conventionally as the “Major producers”. “Others” include the 141 countries from Albania, Algeria, Armenia [...] to Venezuela, Yemen and Zimbabwe. The total output for “other” countries was obtained by adding national projections for 2019 rather than projecting the sum.

Production estimates

This production outlook focused on major cereal and oil crops (maize, rice, wheat and soybean) countries in the southern Hemisphere and some tropical and sub-tropical countries. Production estimates and predictions in CropWatch are based on time series vegetation index dataset covering the period from sowing up to end of January 2020, combining the crop masks of those countries. The calibration of the yield prediction model is carried out for different crops (Table 5.1), which is based on the statistical indicators over different crop masks and the historical production information. The remote sensing-based annual variation of the planted area is also taken into consideration when calculating crop production.

Table5.1 2019 cereal and soybean productions estimates in thousands tonnes. Numbers in black are trend-based while red bold numbers corresponds to modeled crops that have been harvested or were growing at the time of reporting. Rice is expressed as paddy. Δ is the percentage of change of 2019 production when compared with corresponding 2018 values.

	Maize		Rice		Wheat		Soybean	
	2019	**Δ%**	**2019**	**Δ%**	**2019**	**Δ%**	**2019**	**Δ%**
Africa								

	Maize		Rice		Wheat		Soybean	
	2019	Δ%	2019	Δ%	2019	Δ%	2019	Δ%
Angola	2917	5	46	3				
Egypt					12348	5		
Ethiopia	7206	0			3830	-1		
Kenya	3101	13						
Morocco					5018	-25		
Mozambique	2100	1	391	2				
Nigeria	11811	3	4620	1				
South Africa	14012	20						
Zambia	1788	-5						
Asia								
Bangladesh			50934	6				
Cambodia			8747	8				
India					94186	4		
Indonesia			62083	-3				
Myanmar			29093	5				
Pakistan			10885	0	27543	4		
Philippines			21362	4				
Sri Lanka			2410	0				
Thailand			40785	3				
Vietnam			46616	2				
America								
Argentina	53672	1	1837	-1			51927	1
Brazil	87773	3	11202	-4			103155	2
Mexico	20571	-7						

Maize

Table 5.1 lists the results of the maize production prediction for seven countries in Africa and three countries in the America, including Brazil and Argentina, the 2nd and 3rd largest exporters of maize. CropWatch predicts that maize production in Argentina and Brazil will grow by 1% and 3% compared to 2019, respectively, which is beneficial to the maize supply on the international market. Of the 10 maize producing countries being monitored, only Zambia and Mexico showed decreases in maize production, which were down by 5% and 7% respectively. Zambia was mainly affected by the poor soil moisture during the maize sowing period as a result of rainfall deficit; Maize production in Mexico decreased as a result of the reduced planted area and low yield due to the delayed growth at early stage. Maize production in other African countries is flat or slightly increasing; it is noteworthy that South Africa recovered from the drought year in 2019, with a significant recovery (+20%) in maize production. Angola also recovered from a drought-affected 2019 with a 5% increase of its maize production. Although local areas of Horn of Africa including Kenya and Ethiopia were affected by desert locust disasters, most of the maize had been harvested when the locusts infested and the pests had limited impact on production.

Rice

This current production prediction covers 14 rice-producing countries, including most of the key producing countries in South and South-East Asia. Except for 3% drop of rice production in Indonesia, rice production in other Southeast Asian countries is expected to recover from the dry and hot year of 2019. Rice productions of Bangladesh, Cambodia, Myanmar, the Philippines, Thailand and Vietnam are expected to increase by more than 3% while Pakistan and Sri Lanka are expected to be stable. Rice production of Nigeria, Mozambique and Angola increased by 1% to 3%. Rice outputs in Argentina and Brazil decreased by 1% and 4%, respectively, but the two countries were not among the top 10 key rice exporters, and the production decreases in both countries has limited impact on the global rice market.

Wheat

Table 5.1 lists wheat production in five countries: Egypt, Ethiopia, Morocco, India and Pakistan. Harvest of wheat in the southern hemisphere countries (Australia, Argentina, Brazil, South Africa, etc.) already concluded by 2020 and wheat production in those countries has been revised in the previous bulletin. This bulletin focuses on the countries where wheat is either being harvested in early 2020 or still in development stage but will soon reach maturity.

Of the five wheat-producing countries monitored in the current bulletin, Morocco's wheat production decreased the most by 25% compared to 2019, mainly due to difficulties in sowing caused by persistent less rainy weather which affected the early growth of wheat, leading to the decrease of wheat cultivation and yield.

The agroclimatic conditions during the sowing and early growth stage of wheat in Egypt is generally conducive to wheat growth and development. Wheat production increased slightly by 5%. As the world's largest wheat importer, the increase of wheat production in Egypt might result in lower import this year. Wheat production in India and Pakistan is generally self-sufficient. Although parts of India and Pakistan are affected by desert locust disasters, the impact is concentrated in the arid areas of northwest India and the lower Indus River basin in Pakistan, with limited impact on the main wheat-producing areas of the Ganges Basin. Wheat production in both countries increased by 4%. Also, the areas affected by desert locust are currently in dry season which will prevent the reproduction and further spread of desert locusts. In Ethiopia, only parts of Oromiya Zone of Amhara Region are affected by desert locust disasters during wheat harvesting period. Crop losses have been very limited and national wheat production merely dropped by 1% compared to 2019.

Soybean

Brazil has overtaken the United States as the world's largest soybean producer in 2019. Argentina's soybean production ranks as the fourth in the world. CropWatch expects soybean production in Brazil and Argentina to increase by 2% and 1% in 2020, reaching 103.16 million tons and 51.93 million tons, respectively. Soybean production in Brazil and Argentina has increased by about 2.88 million tons that will only have a good effect on the global supply. The international soybean market is therefore expected to remain stable.

5.2 Disaster events

Introduction

The tense humanitarian situations are interlinked with fast and apparently accelerating climatic warming conditions. In the wake of a series of global temperature records reported in the previous CropWatch Bulletins, January 2020 was the warmest January on record globally, with large positive temperature anomalies in parts of Scandinavia, Asia and Central and South America. In the United States, January was the 5th warmest on record, as well as one of the wettest. Temperature was as much as 5°C above the recent averages over large swathes of Russia, Scandinavia and eastern Canada.

The financial cost of coping with the increasing frequency of extremes was described in a much quoted December 2019 report issued by Christian Aid under the title "Counting the cost 2019: a year of climate breakdown." The report identifies 15 of the most destructive weather events of the year, mostly on the basis of insured losses, which is to say that actual impacts are largely underestimated. All of the disasters listed in the Christian Aid report caused damage of over US$1 billion, and four of them cost at least $10 billion. All have been reported on in the previous CropWatch bulletins, including (1) Floods in Argentina and Uruguay, in Queensland , Midwest and South US, Iran, China, Northern India , Spain; (2) Storms and tropical cyclones in Europe (Eberhard), Southern Africa (Idai), Asia (Bangladesh, Fani; China, Lekima; Japan: Faxai and Hagibis) and Central and Northern America (Dorian, Imelda).

The list also includes California fires, the first category in the list of disasters below. Fires seem to have become a recurrent feature: the previous bulletin provided details about northern hemisphere and Amazon fires, while the current reporting period was characterised by the huge south-west Australian fires that were essentially out of control until rain helped extinguish them. Their impact extended well beyond Australia through atmospheric pollution (which reached South America) and through their impact on local and global trade.

During the current reporting period, floods constituted the major group of disasters, mostly in Africa, while also creating conditions conducive to the development of desert locusts as vegetation develops in normally arid desert areas. Following a common scenario, locusts then move into agricultural areas and feed on crop biomass. Their potential population explosion and expansion into wide areas in western Asia and western Africa arguably constitute the major threat to food security in the immediate future.

Extreme conditions by type

Fires

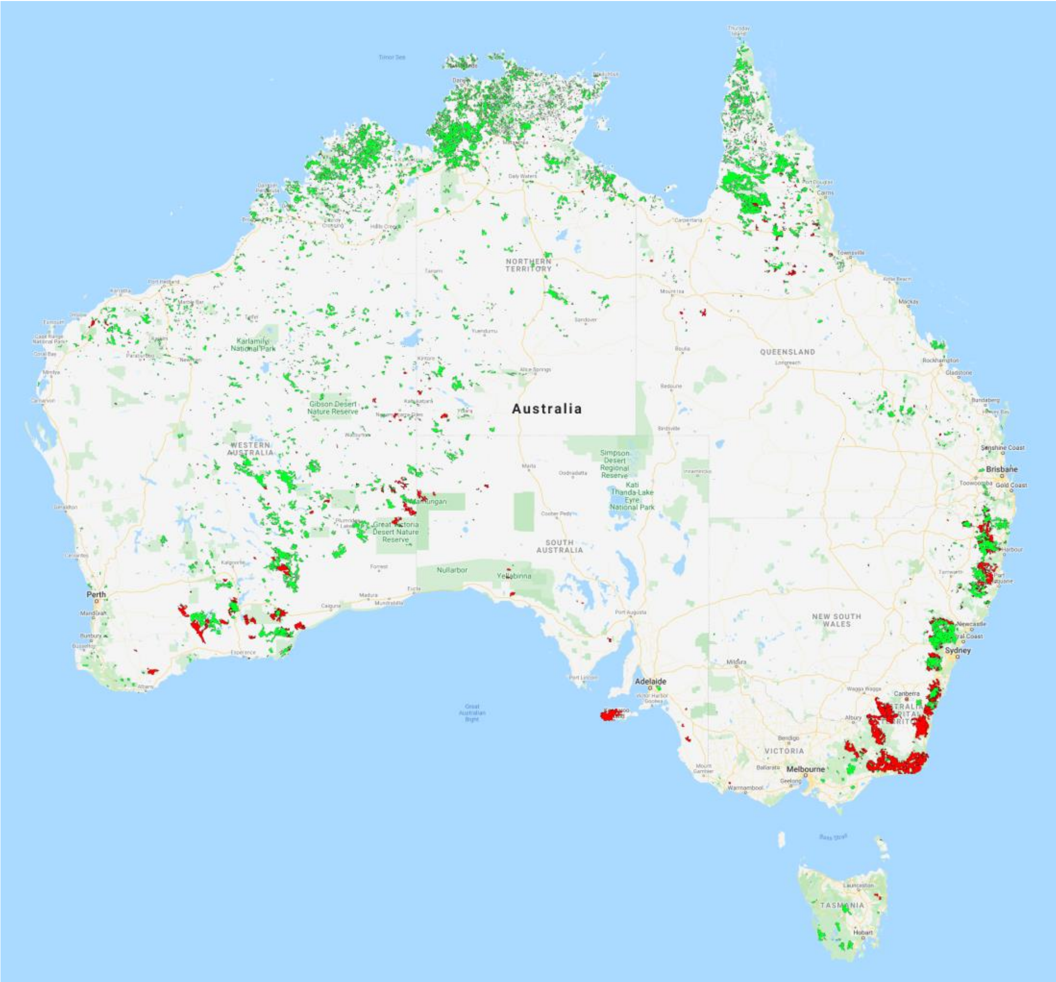


Figure 5.1 Location of Australian fires during this year (red) and last year (green). Map based on data captured from https://myfirewatch.landgate.wa.gov.au/map.html on 2020-02-18.

The Australian fires (Figure 5.1) have caused the death of 25 people (mostly in New South Wales) and destroyed 2500 buildings in six States. More than half of all Australians have been directly affected through respiratory problems. Recent estimates put the burnt area at 10.7 million hectares. This includes mostly "forest and bush" but in a country where much grazing of sheep takes place on "natural pastures", it is difficult to define the loss of "agricultural areas." Some sources state that agricultural land makes up 14% of total area burnt, and that 9% of the national cattle herd and 12% per cent of the national sheep flock live in areas impacted by the fires. Mercado, an agricultural market analyst company estimates that 8.6 million head of sheep and 2.3 million cattle live in areas impacted by the bushfires across Victoria and New South Wales.

In addition to farm infrastructure, the Australian Agriculture Ministry mentioned that stock losses probably exceed 100,000, as farmers around the country begin to assess the fires' impacts to their properties and livestock. This compares with livestock numbers (from FAOSTAT) of 400,000 for sheep and 2 million for beef cattle. The economic damage is still being assessed but is likely to exceed 3 billion US$.

In the immediate future, the dairy industry and live animal and meat exports will be affected. Reports also stress longer term effects linked with increased stream flow (and resulting loss of water) do to reduced vegetation as well as water pollution due to ashes.

Cold wave

Unusually severe winter conditions and abundant snowfall have been reported from several countries in western Asia during January, including Pakistan, Afghanistan and Iran. In Pakistan, the cold wave claimed 109 lives; Azad Jammu-Kashmir (AZK) and Balochistan were hit hardest. On 10 January as many as 700 villages in AJK were inaccessible. According to the National Disaster Management Authority (NDMA) 19 people have died in avalanches and 49 in collapsed buildings in Muzaffarabad (AZK).

During the same period, Afghanistan suffered from snow, floods and avalanches, mostly in the southern Provinces of Helmand, Kandahar, Zabul and Uruzgan and in the Center and West: Laghman, Herat, Badghis, Ghor, Daykundi, Bamyan and Baghlan Provinces. Houses were damaged or destroyed and people had to be helped to relocate by the Afghan Red Crescent Society (ARCS).

Floods

Heavy and widespread floods have affected close to fifteen African countries in mostly unrelated events as rainy seasons do not coincide in west, central, eastern and southern Africa. On other continents, floods are essentially reported from Indonesia and isolated locations in south America, which are not included. Since the timing of the floods coincides with the respective rainy seasons, this provides a simple, albeit somewhat schematic way to structure the narrative below.

Central-west Africa

October and early November floods occurred at the end of the west-African monsoon season in the Sahel and some adjacent central African areas. This includes essentially Chad, Nigeria and the Central African Republic. In some areas, precipitation excesses started well before the current reporting period, as in Chad, where heavy rainfall was recorded between July and October in several provinces. Almost 200,000 people were affected, about half of them in Mayo-Kebbi Est Region along the Logone River near the Cameroon border, resulting in destroyed houses and loss of life. In neighbouring Nigeria, abundant precipitation from September caused high water flows in the Niger and Benue rivers to the extent that 32 of 36 States and the Federal Capital Territory were severely affected at the beginning of October. The heaviest downpours between August and October affected an estimated 200,000 people in the States of Borno, Adamawa and Yobe. Rainfall continuing until November, well into the northern dry season, led to flash floods and prevented the flow of humanitarian assistance required by Boko Haram activity in Borno and Adamawa States. Somewhat similar climatic conditions prevailed the Central African Republic between late October and mid-November, to the extent that government declared a natural catastrophe on 25 October and issued an appeal for international assistance. By mid-December, close to 100,000 people suffered from the floods, which also affected the capital Bangui. At least 10,000 houses were lost.

Horn of Africa

Heavy precipitation leading to damage and direct and indirect suffering is also reported across much of the Horn of Africa, at different points in time ranging from October (Somalia, Kenya, Uganda) to

November (Somalia, Kenya, Ethiopia, south Sudan) to December (Uganda, Sudan), where large numbers of internally and internationally displaced people are particularly exposed.

At the end of October, floods, mud and landslides affected border areas with Kenya in Uganda, especially in the districts of Balambuli and Butaleja. In South Sudan, intense seasonal rains destroyed shelters and infrastructure and 420,000 people have been displaced, creating added constraints to humanitarian assistance. In Kenya, seasonable but intense short rains in October triggered landslides, flash floods and floods in 29 counties. Close to 200,000 people were affected and just fewer than 20,000 were displaced. Mandera, Wajir, Marsabit, and Turkana counties suffered most as the communications infrastructure was damaged and access to services reduced. South Sudan had unusually heavy rain from September to the extent that the government had to declare a state of emergency in eight States at the end of October, including Eastern Equatoria, Central, Jonglei, Lakes, Northern Bahr el Ghazal, Unity, Upper Nile, and Warrap. According to UN OCHA, more than 600,000 people were in need of immediate humanitarian assistance.

At the beginning of December Uganda and South Sudan again suffered heavy rains causing floods and landslides, cutting some major roads.

Excess precipitation that often started in October was reported during the first half of November in Somalia and Ethiopia, the easternmost countries in the Horn that are also linked by the fact that heavy rains in Ethiopian highlands eventually reach the Shabelle and Juba rivers in Somalia and increase their water levels. About 300000 people were displaced.

Southern Africa, Tanzania and Madagascar

The region is currently at the peak of its summer (maize) season. About 70% of Angolan Provinces recorded excess precipitation that affected more than 10,000 people, damaging thousands of houses and killing 41 during December and early January. In Mozambique, late January floods left 28 dead and disrupted the lives of 60000, especially in Zambezia, Cabo Delgado and Sofala Provinces. Lindi Region in Tanzania, which borders Cabo Delgado, lost three people due to floods, which also left 5000 homeless. Large scale Malagasy floods also occurred late in January, killing 31 and displacing 16,000 people, inundating 10,000 homes and destroying about 50.

Indonesia

At the very end of December, seasonable but excessive monsoons lead to floods in 74 districts of West Java, Banten, and Djakarta provinces. The floods were compounded by landslides, high tides and debris left behind by the water. About 70 people were left dead and close to 30,000 were displaced and had to be accommodated in emergency shelters. At the end of January 7 people were killed by floods in Sumatra while others were injured as Aek Sirahar river flowed over.

Desert locust outbreak

Largely brought about by above-average rainfall in arid areas (see “Floods” above), desert locust outbreaks currently affect the Horn of Africa and Pakistan, causing loss of crops and pastures and endangering the livelihoods of crop and livestock farmers. FAO stresses that desert locusts are considered the most destructive migratory pest in the world and that a small swarm covering one square kilometre can eat the same amount of food in one day as 35,000 people. The locust infestation in Africa is now reportedly FAO’s top priority (Figure 5.2).

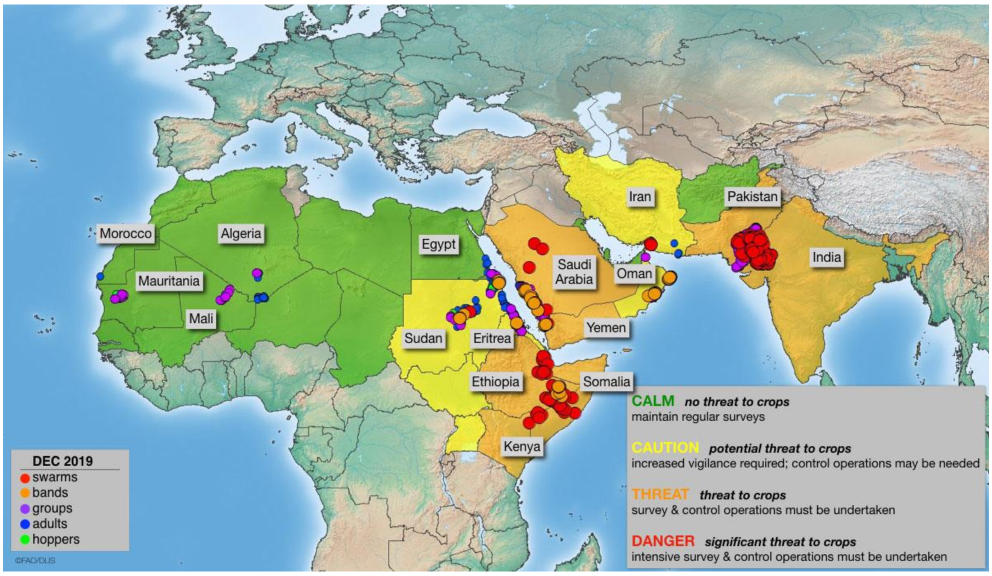


Figure 5.2. Desert Locust risk map as for December 2019 issued on 6 January 2020 by FAO. Source of image: http://www.fao.org/ag/locusts/common/ecg/2518/en/DLrisk495e.jpg

In Somalia, at least 70,000 hectares of land have been infested so far, primarily in Gadung, Puntland, and Somaliland. In Ethiopia, locust presence has been reported in the regions of Afar, Amhara, Dire-Dawa, Oromia, Somali, and Tigray. In Kenya, the outbreak is reportedly the worst in 70 years, with swarms 60 km long and 40 km wide in the north of the country. Locust populations started developing in July 2019 due to favourable environmental conditions and the limited control capacity of countries. Djibouti, Eritrea, and Sudan have also reported swarms. Breeding of the locusts is projected to intensify into mid-2020 (with populations increasing up to 400 times) and to expand internationally if no measures are taken. They could reach Iran and India, all the more so since Pakistan is also experiencing a locust infestation assessed as “the worst since 1990”. The Chamber of Agriculture estimates that up to 40% of crops may have been destroyed, including wheat, vegetables and cotton, threatening the livelihoods of many farmers.

On 30 January FAO issued an appeal to the international community to donate 76 million US$ required to tackle the outbreak in Ethiopia, Somali, Kenya, Djibouti and Eritrea and prevent its extension to Oman, Saudi Arabia, Sudan, Yemen and beyond.

By integration of up-to-date multi-source remote sensing data, agro-climatic information till the end of January 2020, CropWatch assesses the impact of Desert locusts in Ethiopia, Kenya, Somalia, Pakistan, and India. The impact of the Desert locusts on cereal production in Horn of Africa and South-Asia is limited, but locusts damaged rangeland and orchards and threated the livestock in those countries.

Since June 2019, desert locusts have continued to breed and spread. The monitoring results using high-resolution remote sensing data show that the impacts are mainly concentrated in Ethiopia, Kenya, Somalia, Pakistan, and India.

In Ethiopia, most of the maize had been harvested as the locusts pass through, so desert locusts had no impact on the country's maize production. Nevertheless, in mid-to-late November 2019, in some areas of Ethiopia, 2.4% of the country's wheat-growing area was affected by desert locust swathes, mainly in eastern Amhara region, eastern Oromia region and central to north of Southern Nations, Nationalities, and Peoples' Region (Southern Region). Figure 1 shows the proportion of wheat affected by locusts in various regions in Ethiopia, of which the eastern part of Amhara Region is the main wheat-producing region, but the overall proportion of affected wheat is less than 1%. About 16.9% of wheat fields in the Gamo Gofa zone in southern region was affected by locusts, although it is not the major wheat producing area. Ethiopia's national wheat production is predicted at 1% drop from year previous season, and desert locusts had limited impact on national wheat production.

Pastures in Somalia were damaged by desert locusts, which threats livestock. Although the rainfall in Somalia's pastoral areas has increased significantly by 78% over the past four months (October 2019 to January 2020), the ravages of desert locusts had a devastating impact on pastures, the greenness of rangelands in Bay and Jubbada Dhexe drop by 9.2% and 4.1% respectively in late November when locusts passed through. The spread of locusts is curbing the recovery of pasture lands from early dry conditions.

Desert locusts entered in Kenya from southern Ethiopia and Somalia in late December 2019 to early January 2020. Since the harvesting of maize during long rainy season already concluded, locusts had a limited impact on maize outputs. However, local pastures were affected by locust plagues. The most severely damaged rangelands were observed in Turkana and Wajir in northern Kenya where the greenness of pastures dropped by 4.9% and 4.2%. If locusts further spreed to southern directly, they will also threat maize production during short rainy season.

India and Pakistan were both affected by desert locusts in the second half of 2019, but the impact was concentrated in the Rajasthan of India and the northern part of Sindh province in Pakistan, which are not core wheat producing areas in both countries. Wheat production in both countries increased by 4%. However, substantial losses on pasture in Nawabshah and orchards in Hyderabad, Tando Allahyar, Matiari, and Mirpurkhas were observed. About 8.4% of decline in greenness in the above mentioned zones was caused before of desert locusts.

At present, proper measures to control the desert locusts in both countries are undergoing. The areas affected by desert locust are currently in dry season which will prevent the reproduction and further spread of desert locusts.

Cyclones and tropical depressions

Several relatively weak depressions and cyclones are not covered in detail below. They include mostly Nakri (early November) which affected Luzon (Philippines) through heavy rainfall, causing about 15 deaths and damage amounting to about 35 million US$; and Belna (early to mid-December) which made landfall in Soalala district of Boeny Region on the western coast of Madagascar. Damage and casualties were limited.

Matmo/Bulbul, early November; Vietnam, India, Bangladesh

Tropical depression Matmo formed over the South China Sea on 29 October then crossed south-east Asia, losing power and releasing abundant precipitation on the way, and reformed over the Bay of Bengal as a cyclonic storm (Bulbul) during the first days of November. Although the different phases of the depression affected Thailand, Myanmar, Andaman and Nicobar Islands, most damage occurred in Vietnam, India and Bangladesh, when wind gusts reached 120 km/h. The Central Steering Committee for Natural Disaster Prevention and Control of Vietnam reported 179 houses destroyed and 2,314 buildings damaged in the Provinces of Quang Ngai, Binh Dinh, Phu Yen, Gia Lai and Thua Thien Hue. One person was reported missing and 20,000 were displaced. In north-east India, at least 12 people died between West Bengal and Odisha States, where 26,000 houses were damaged. In Bangladesh, mostly in Khulna and Bagerhat Districts, about 30 people died (most of them fishermen) and 17,000 houses have been damaged.

The total damage is put at about 3.5 billion US$ with heavy losses in the agricultural sector in Bangladesh through flooding of cropland and shrimp enclosures. Impact estimates vary significantly among sources. Some sources estimate that 14% of the country's cropland was affected (just under 300,000 hectares), resulting in the loss of about 100,000 tons of crop. Reliefweb lists flooded cropland in Barguna (55 thousand hectares), Patuakhali (28) and Satkhira (16) districts, with less than 10 in Khulna, Bagerhat and Bhola Districts (total: 120 thousand hectares) and a value of 31 million US$. Shrimp enclosures also suffered.

Tisoy (or Kammuri), late November-early December), Philippines

At the beginning of December, typhoon Tisoy (international name: Kammuri) repeatedly made landfall from 2 December, with strong winds (gusts up to 230 km/H) and rain, resulting in flooding. Preliminary impact assessments issued by mid-December by the National Disaster Risk Reduction and Management Council (NDRRMC) report that Tisoy affected 5 regions and close to 2 million people. The Department of Agriculture estimates of losses in the agriculture sector (crops, freshwater and marine) at close to 60 million US$, of which about half results from damage to high-value crops (HVC) like mango, bananas and papayas, while affecting lives and income of some 40,000 farmers in five regions. With early harvest of crops in several areas anticipated to be on the path of the typhoon, greater damage was to a large extent prevented. For example in Nabua, Camarines Sur, 70 per cent of rice was already harvested before the typhoon stroke. Nevertheless, 14,600 hectares of land in Calabarzon and Bicol Region was damaged, with an estimated production loss of some 18,500 tons.

Phanfone (Ursula in the Philippines), mid to late December; Philippines

Typhoon Phanfone made its first landfall on 23 December over the eastern Visayas, affecting close to three million people regions in regions IV-B (now referred to as MIMAROPA or Southwestern Tagalog Region), V or Bicol, VI or Western Visayas, VII or Central Visayas, VIII or Eastern Visayas and XIII (Caraga Region). Phanfone has destroyed more than 60,000 houses and damaged about 10 times more. More than 90% of the destruction has been recorded in two regions: VI (Western Visayas: East Java and Bali) and especially VIII (the five provinces of West and East Nusa Tenggara, West, South and Southeast Sulawesi) where more than 50% of the population was affected. Region VIII was severely affected by Typhoon Haiyan in 2013 (refer to February 2014 CropWatch Bulletin, http://www.cropwatch.com.cn/htm/en/files/2014241647486651.pdf, where the typhoon is covered in detail.)

Phanfone "hopped islands" in repeated landfalls between 24 and 25 December, leaving 57 dead 369 injured and more than 3 millions affected, more than half a million houses damaged. The total damage reached about 70 million US$ of which 21 in agriculture. For the Southwestern Tagalog Region, Bicol, Western, Central and Eastern Visayas the agricultural damage is distributed about equally between infrastructure and production loss for rice, maize, fisheries. OCHA reported at the end of December that the majority of agricultural losses are in the fisheries sector, threatening the livelihoods of 43,000 fisherfolk through damage to fishponds, fish cages and pens, fishing boats and seaweed farming.

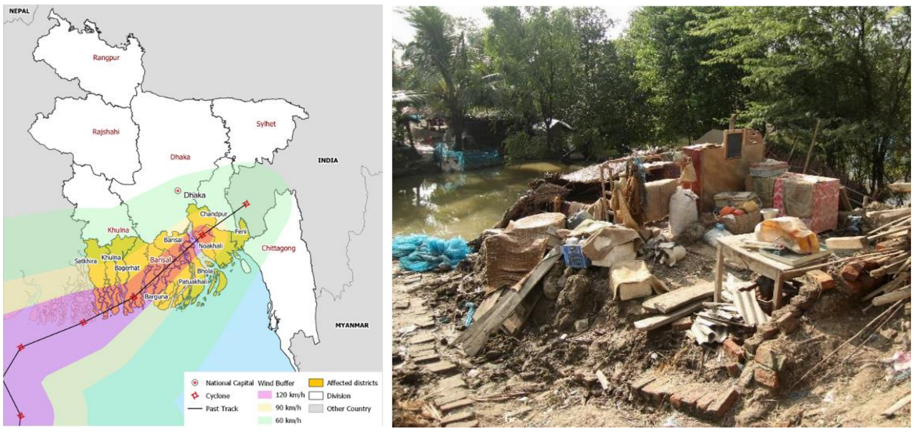


Figure 5.3. Track of Very Severe Cyclonic Storm Bulbul over Bangladesh on 9 November 2019 (left) and damaged houses in Satkhira district. Map issued on 12 November by the International Federation of Red Cross and Red Crescent Societies and quoted by https://reliefweb.int/sites/reliefweb.int/files/resources/MDRBD023do.pdf; damage photograph by IFRC, https://reliefweb.int/sites/reliefweb.int/files/resources/MDRBD023do.pdf.

Volcanic eruptions

Volcanic eruptions receive usually limited attention in the CropWatch disaster overviews as their impact on agriculture tends to be limited. However, the Taal eruption in the Philippines from 12 January produced large amounts of ash which reached Manila (100 km away) and led to the precautionary evacuation of populations from municipalities south-west and west of the volcano (covering a 14 km "danger zone"), because of the high risk of a hazardous explosive eruption (Figure 5.4). Large ash plumes have destroyed homes, killed livestock and caused an increase in respiratory diseases. Close to 100,000 families (just under 400,000 people) had been affected at the end of January when the risk was downgraded from level 4 (out of 5) to 3.

According to the Ministry of Agriculture the losses have exceeded 60 million US$, affecting 15,790 hectares and about 2000 farm animals, mostly in Batangas, Cavite and Laguna provinces (Calabarzon, also referred to as Region IV-A, southern-central Luzon island). High value crops (HVC) were affected, especially coffee, cacao, pineapple and other fruits and vegetables, in addition to maize, rice, coconut fish farms (mostly Tilapia). In terms of losses, fisheries were the most affected sector, with an estimated loss of 15,000 tons of product. On 24 January, the National Disaster Risk Reduction and Management Council (NDRRMC) estimated the damage (million US$ equivalent) at 1.8 for maize, 0.1 for rice, 27.6 for HVC, 2.5 for livestock and 31.7 for fisheries.

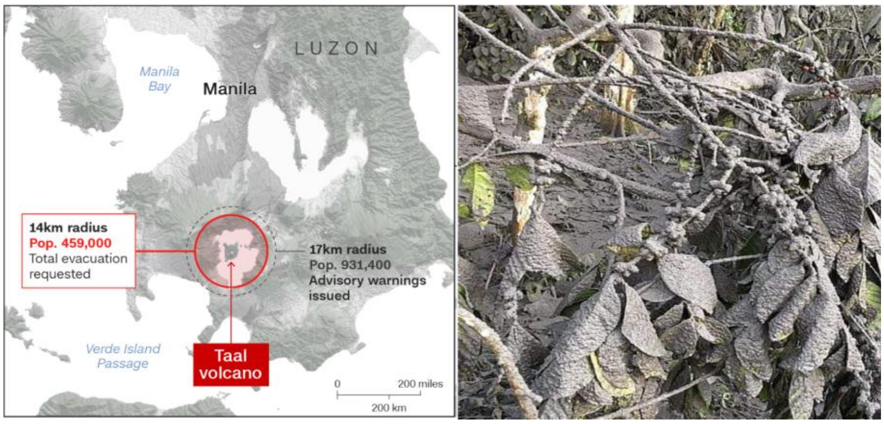


Figure 5.4. Location of Taal on south-western Luzon and coffee plant covered with volcanic dust in Laguna Province. The map was prepared by https://edition.cnn.com/2020/01/15/asia/philippines-taal-volcano-animals-shelters-intl-hnk/index.html based on Philippines Government and UNOCHA data. Source of coffee plant: http://www.da.gov.ph/agri-damage-from-taal-eruption-reaches-php3b/.

5.3 Update on El Niño

Neutral El Nino condition prevails across the Pacific Ocean continuously. Figure 5.5 illustrates the behavior of the standard Southern Oscillation Index (SOI) of the Australian Bureau of Meteorology (BOM) from January 2019 to January 2020 [1]. Sustained positive values of the SOI above +7 typically indicate La Niña while sustained negative values below −7 typically indicate El Niño. Values between about +7 and −7 generally indicate neutral conditions. During this monitoring period, SOI decreased from -5.6 in October to -9.3 in November, then increased gradually to -5.5 in December, further to +1.3 in January, 2020, indicating a neutral El Nino situation. The sea surface temperature anomalies in January 2020 for NINO3, NINO3.4, and NINO4 regions were +0.3°C, +0.5°C, and +0.9°C, respectively, somewhat warmer than the 1961-1990 average according to BOM (see Figure 5.6-5.7) [2-3]. Both BOM and NOAA conjecture that the warmer condition indicates a neutral El Niño [4]. CropWatch will keep monitoring the situation.

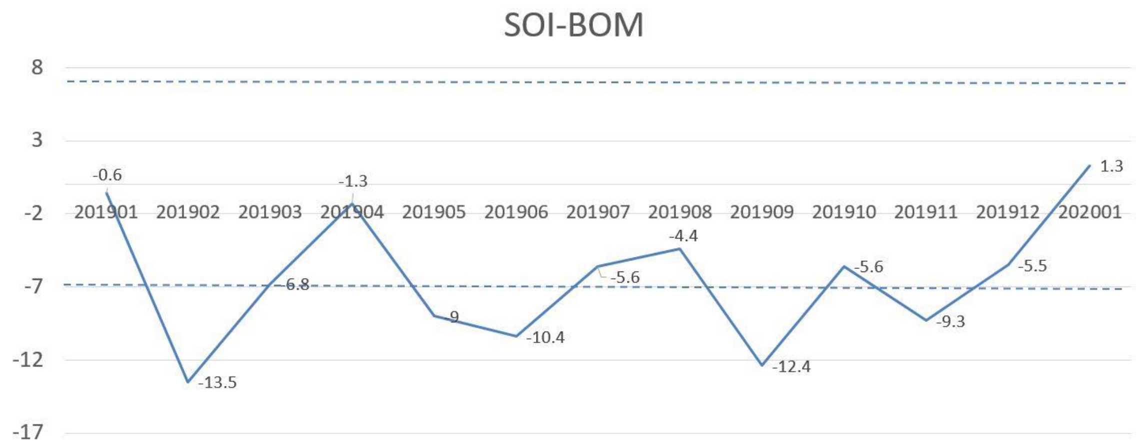


Figure 5.5. Monthly SOI-BOM time series from October 2018 to October 2019

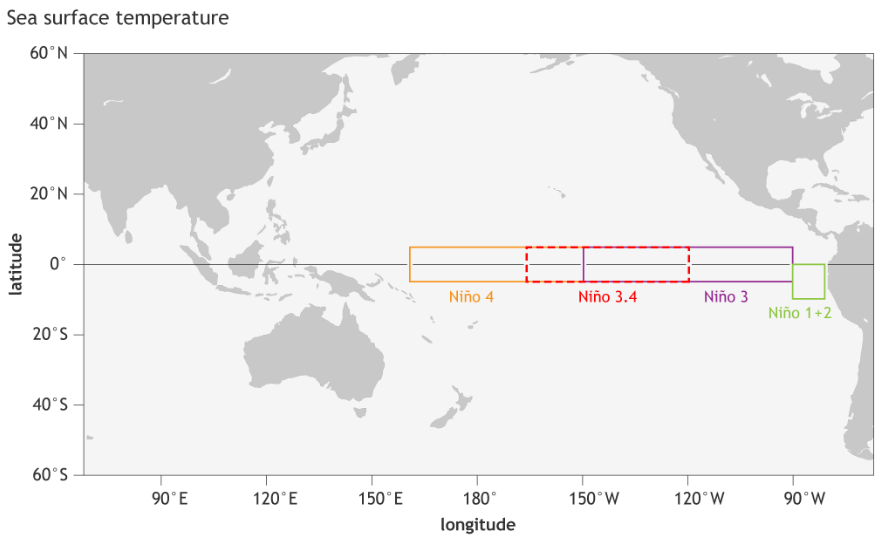


Figure 5.6 Map of NINO Region

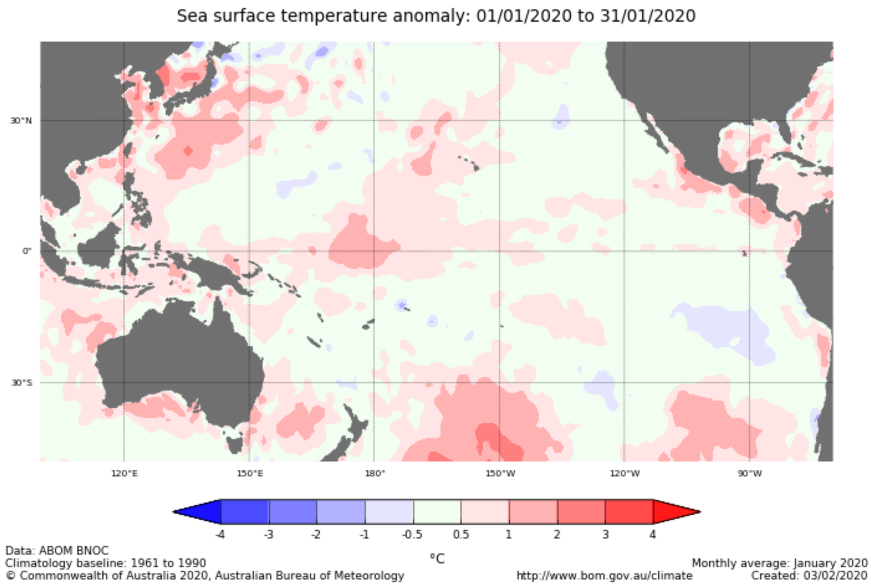


Figure 5.7. July 2019 sea surface temperature departure from the 1961-1990 average

Main Sources:

[1] **http://www.bom.gov.au/climate/current/soi2.shtml**

[2] **https://www.climate.gov/sites/default/files/Fig3_ENSOindices_SST_large.png**

[3] **http://www.bom.gov.au/climate/enso/wrap-up/archive/20200204.ssta_pacific_monthly.png?popup**

[4] **www.climate.gov/enso**

Annex A. Agroclimatic indicators and BIOMSS

Table A.1 Oct 2019 - Jan 2020 agroclimatic indicators and biomass by global Monitoring and Reporting Unit (MRU)

65 Global MRUs		RAIN Current (mm)	RAIN 15YA dep. (%)	TEMP Current (°C)	TEMP 15YA dep. (°C)	RADPAR Current(MJ/m^2)	RADPAR 15YA dep. (%)	BIOMSS Current (gDM/m^2)	BIOMSS 5YA dep. (%)
C01	Equatorial central Africa	943	3	22.7	-0.4	1192	0	652	-7
C02	East African highlands	396	97	17.4	-0.3	1247	-5	450	4
C03	Gulf of Guinea	306	38	25.0	-0.3	1221	0	444	-12
C04	Horn of Africa	691	84	22.4	-0.5	1211	-6	704	1
C05	Madagascar (main)	1051	19	23.1	0.4	1332	1	806	-3
C06	Southwest Madagascar	240	-37	27.2	1.0	1515	9	901	9
C07	North Africa-Mediterranean	162	-20	11.4	-0.2	737	4	212	-12
C08	Sahel	150	230	24.9	-0.7	1212	-3	233	14
C09	Southern Africa	591	16	23.9	0.3	1397	2	846	3
C10	Western Cape (South Africa)	160	9	17.8	-0.3	1526	0	709	-4
C11	British Columbia to Colorado	343	-8	-3.3	-0.6	439	1	60	-8
C12	Northern Great Plains	218	17	0.3	-0.9	461	-4	80	-10
C13	Corn Belt	473	17	2.2	0.0	402	-5	79	-6
C14	Cotton Belt to Mexican Nordeste	456	25	12.0	0.5	633	-5	235	-1
C15	Sub-boreal America	207	-9	-6.6	-0.3	237	-1	29	-5
C16	West Coast (North America)	451	-14	8.2	-0.2	549	3	109	-18
C17	Sierra Madre	465	106	14.9	0.1	991	-5	339	5
C18	SW U.S. and N. Mexican highlands	163	20	8.6	-0.1	775	-1	185	2
C19	Northern South and Central America	693	0	23.0	0.3	1073	4	602	-2
C20	Caribbean	410	9	23.6	0.1	1042	4	645	1
C21	Central-northern Andes	863	-3	14.2	-0.1	1132	-2	414	-10
C22	Nordeste (Brazil)	270	12	26.6	0.4	1383	3	829	-1
C23	Central eastern Brazil	930	0	24.9	0.4	1299	4	840	1
C24	Amazon	1002	-2	25.4	-0.2	1197	5	791	3
C25	Central-north Argentina	581	21	24.1	-0.5	1383	-1	874	-2
C26	Pampas	520	-3	22.0	0.0	1401	-1	822	-2
C27	Western Patagonia	248	-23	12.6	0.3	1499	2	436	0
C28	Semi-arid Southern Cone	197	30	18.8	0.1	1626	-1	660	2
C29	Caucasus	248	-18	4.7	0.9	583	5	126	5

C30	Pamir area	261	30	1.8	-0.9	681	-6	129	8
C31	Western Asia	156	13	7.6	0.4	662	-2	168	29
C32	Gansu-Xinjiang (China)	67	7	-2.7	0.5	583	-3	85	4
C33	Hainan (China)	249	-55	21.3	0.8	873	16	510	16
C34	Huanghuaihai (China)	105	37	6.8	1.2	615	-7	151	7
C35	Inner Mongolia (China)	57	21	-5.4	0.7	578	-2	82	7
C36	Loess region (China)	99	37	1.6	0.8	661	-7	115	-5
C37	Lower Yangtze (China)	250	-17	11.7	1.2	658	2	227	7
C38	Northeast China	88	-3	-6.9	0.7	490	0	67	7
C39	Qinghai-Tibet (China)	278	39	0.0	-0.1	819	-8	116	-11
C40	Southern China	234	-31	15.5	0.8	813	11	301	-3
C41	Southwest China	336	25	8.5	0.6	551	-7	149	-12
C42	Taiwan (China)	178	-51	20.3	0.6	888	10	377	8
C43	East Asia	344	9	-0.2	1.0	491	-2	86	1
C44	Southern Himalayas	250	27	15.7	-0.4	898	-3	291	12
C45	Southern Asia	477	59	22.0	-0.1	1036	-5	497	18
C46	Southern Japan and Korea	566	18	10.2	1.5	570	-2	185	6
C47	Southern Mongolia	24	-4	-7.7	1.2	498	0	36	-29
C48	Punjab to Gujarat	136	345	19.7	-0.9	931	-7	369	175
C49	Maritime Southeast Asia	1291	-9	24.1	0.2	1152	9	739	6
C50	Mainland Southeast Asia	270	-40	22.9	0.3	1133	10	535	-5
C51	Eastern Siberia	229	-9	-8.8	0.9	282	3	33	9
C52	Eastern Central Asia	73	-1	-13.5	0.1	376	1	34	5
C53	Northern Australia	432	-46	26.8	0.5	1503	10	872	-2
C54	Queensland to Victoria	141	-44	21.4	0.6	1561	7	779	-1
C55	Nullarbor to Darling	48	-57	20.2	0.8	1618	7	813	8
C56	New Zealand	257	-25	13.5	0.5	1357	8	494	7
C57	Boreal Eurasia	421	12	-2.1	1.1	121	-3	18	-1
C58	Ukraine to Ural mountains	254	-8	1.9	2.9	180	-3	39	15
C59	Mediterranean Europe and Turkey	396	7	8.8	0.7	532	-1	156	2
C60	W. Europe (non Mediterranean)	388	7	6.1	1.2	296	0	73	3
C61	Boreal America	462	17	-7.0	-0.5	133	-2	17	3
C62	Ural to Altai mountains	224	18	-4.7	2.2	262	-1	39	11
C63	Australian desert	48	-52	22.2	0.4	1647	5	799	0
C64	Sahara to Afghan deserts	84	85	17.1	0.1	958	-2	272	39
C65	Sub-arctic America	97	-10	-19.5	0.7	36	0	2	5

Table A.2 Oct 2019 - Jan 2020 agroclimatic indicators and biomass by country

Country code	Country name	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure(°C)	RADPAR Current (MJ/m^2)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m^2)	BIOMSS 5YA Departure (%)
ARG	Argentina	475	15	21.7	-0.5	1421	-2	817	-1

Country code	Country name	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure(°C)	RADPAR Current (MJ/m^2)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m^2)	BIOMSS 5YA Departure (%)
AUS	Australia	143	-45	21.8	0.7	1567	7	791	1
BGD	Bangladesh	306	17	20.6	-0.2	942	-5	418	26
BRA	Brazil	888	-2	24.8	0.3	1290	4	824	1
KHM	Cambodia	298	-37	24.7	0.3	1198	12	605	-8
CAN	Canada	312	-3	-4.4	-0.4	276	-1	36	-5
CHN	China	213	-4	6.7	0.8	632	-1	146	0
EGY	Egypt	81	99	17.3	0.5	772	0	174	-14
ETH	Ethiopia	264	72	17.8	-0.3	1283	-3	439	12
FRA	France	542	39	7.4	0.8	300	-10	79	-9
DEU	Germany	317	-5	5.3	1.2	230	0	54	1
IND	India	323	76	19.8	-0.3	973	-7	404	37
IDN	Indonesia	1250	-11	24.4	0.2	1188	9	764	6
IRN	Iran	212	22	7.7	-0.1	754	-3	191	22
KAZ	Kazakhstan	189	15	-3.0	1.8	347	-2	54	8
MEX	Mexico	456	62	18.0	0.4	973	-3	386	2
MMR	Myanmar	259	-19	19.1	0.0	1075	6	364	-17
NGA	Nigeria	282	57	24.6	-0.4	1216	-3	313	-10
PAK	Pakistan	183	149	13.3	-1.3	815	-8	285	113
PHL	Philippines	898	-16	24.0	0.0	1083	8	699	6
POL	Poland	221	-20	5.3	2.2	215	3	51	12
ROU	Romania	160	-35	5.3	2.1	412	9	90	10
RUS	Russia	236	-1	-2.4	2.4	216	-1	36	13
ZAF	South Africa	268	0	20.6	0.2	1500	3	795	2
THA	Thailand	240	-43	23.4	0.6	1170	10	561	-4
TUR	Turkey	301	-14	6.5	1.2	599	4	147	9
GBR	United Kingdom	520	9	6.3	-0.2	163	-3	40	-7
UKR	Ukraine	156	-34	4.6	2.6	294	8	73	26
USA	United States	389	18	5.6	-0.1	533	-4	126	-5
UZB	Uzbekistan	127	-14	5.5	-0.1	617	1	117	-1
VNM	Vietnam	416	-28	20.0	0.4	912	11	481	1
AFG	Afghanistan	194	43	3.8	-0.7	746	-5	147	21
AGO	Angola	1029	20	22.9	-0.2	1240	1	768	2
BLR	Belarus	240	-15	3.9	3.2	155	-5	37	19
HUN	Hungary	197	-16	6.0	1.6	355	4	80	1
ITA	Italy	499	20	8.7	0.8	460	1	143	1
KEN	Kenya	831	122	19.7	-0.6	1210	-6	629	-8
LKA	Sri_Lanka	1230	3	24.6	0.2	1158	9	767	7
MAR	Morocco	142	-33	11.4	-0.2	799	5	185	-17
MNG	Mongolia	60	28	-12.7	0.4	450	-1	41	2
MOZ	Mozambique	710	12	25.7	0.3	1332	1	838	-3
ZMB	Zambia	962	12	23.7	0.1	1315	0	786	2

*Note: Departures are expressed in relative terms (percentage) forall variables, except for temperature, for which absolute departure in degrees Celsius is given. Zero means no change from the average value; relative departures are calculated as (C-R)/R*100, with C=current value and R=reference value, which is the fifteen-year average (15YA) for the same period between July and October.*

Table A.3 Argentina, Oct 2019 - Jan 2020 agroclimatic indicators and biomass (by province)

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure(°C)	RADPAR Current (MJ/m^2)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m^2)	BIOMSS 5YA Departure (%)

Buenos Aires	259	0	19.7	-0.5	1496	-2	799	1
Chaco	650	14	24.3	-0.7	1320	-2	853	0
Cordoba	310	17	22.5	-0.3	1478	-3	894	2
Corrientes	511	-20	23.7	0.1	1377	-1	839	-4
Entre Rios	629	49	21.2	-1.2	1389	-6	810	-5
La Pampa	171	-22	21.7	-0.1	1574	0	917	9
Misiones	706	-10	23.2	0.5	1393	0	872	-1
Santiago Del Estero	606	25	24.0	-1.1	1347	-2	864	-2
San Luis	230	7	21.9	0.1	1550	1	916	8
Salta	1116	39	21.3	-0.5	1294	-3	739	-10
Santa Fe	564	34	22.9	-0.9	1374	-5	838	-2
Tucuman	674	36	20.5	0.2	1346	-7	747	-16

Table A.4 Australia, Oct 2019 - Jan 2020 agroclimatic indicators and biomass (by state)

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure(°C)	RADPAR Current (MJ/m^2)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m^2)	BIOMSS 5YA Departure (%)
New South Wales	114	-54	22.7	1.0	1633	8	785	-3
South Australia	125	-4	19.4	-0.3	1479	1	777	5
Victoria	192	-17	17.0	-0.4	1392	-1	674	-1
W. Australia	71	-50	21.0	0.8	1614	7	803	6

Table A.5 Brazil, Oct 2019 - Jan 2020 agroclimatic indicators and biomass (by state)

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m^2)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m^2)	BIOMSS 5YA Departure (%)
Ceara	240	66	27.7	0.0	1401	1	895	8
Goias	1087	-5	24.8	0.6	1337	5	865	4
Mato Grosso Do Sul	788	-12	26.5	0.7	1355	3	918	3
Mato Grosso	1173	-3	25.4	0.0	1230	7	824	5
Minas Gerais	1272	13	22.6	0.4	1291	3	776	-3
Parana	840	-7	22.4	0.8	1365	4	821	1
Rio Grande Do Sul	478	-25	21.9	0.7	1389	0	787	-6
Santa Catarina	736	-6	19.7	0.5	1294	3	681	-4
Sao Paulo	1046	-8	23.4	0.5	1333	6	841	4

Table A.6 Canada, Oct 2019 - Jan 2020 agroclimatic indicators and biomass (by province)

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m^2)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m^2)	BIOMSS 5YA Departure (%)
Alberta	145	-5	-5.7	-1.0	267	-1	35	-8
Manitoba	217	9	-5.9	-0.3	248	-12	30	-22
Saskatchewan	129	-19	-5.9	-0.7	277	-2	36	-7

Table A.7 India, Oct 2019 - Jan 2020 agroclimatic indicators and biomass (by state)

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m²)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m²)	BIOMSS 5YA Departure (%)
Andhra Pradesh	438	70	22.9	0.1	1056	-5	551	9
Assam	416	43	17.7	-0.1	809	-9	362	-7
Bihar	112	7	18.5	-0.7	899	-8	291	14
Chhattisgarh	182	40	19.8	0.1	1034	-4	354	22
Daman and Diu	79	98	25.7	-0.2	1098	-5	469	110
Delhi	147	370	17.2	-0.8	845	-10	269	60
Gujarat	145	351	23.6	-0.7	1055	-4	434	179
Goa	494	113	26.6	-0.1	1145	-5	550	32
Himachal Pradesh	307	120	6.6	-1.3	826	-8	162	40
Haryana	134	385	17.1	-0.8	844	-8	289	88
Jharkhand	243	89	17.8	-0.3	958	-7	338	27
Kerala	994	34	25.2	0.2	1131	-1	691	7
Karnataka	622	93	22.6	0.0	1057	-8	540	5
Meghalaya	428	6	17.2	0.2	828	-8	339	3
Maharashtra	399	230	22.3	-0.3	1037	-9	452	47
Manipur	430	21	13.4	-0.5	889	-1	279	-9
Madhya Pradesh	184	223	18.8	-0.6	940	-11	357	74
Mizoram	280	-18	15.5	-0.8	1000	3	344	3
Nagaland	698	68	12.9	-0.4	766	-8	270	-13
Orissa	299	41	20.4	0.1	1032	-4	405	14
Puducherry	957	6	25.9	0.1	1201	8	813	13
Punjab	202	290	15.8	-1.4	784	-9	287	53
Rajasthan	107	420	19.3	-0.7	932	-8	371	237
Sikkim	49	-42	7.4	-0.3	1035	-2	130	2
Tamil Nadu	890	20	23.9	-0.1	1096	2	694	2
Tripura	287	-13	19.3	0.1	931	-4	384	13
Uttarakhand	177	179	9.3	-1.2	893	-6	135	13
Uttar Pradesh	123	125	17.7	-0.7	882	-9	276	39
West Bengal	321	70	20.3	-0.3	942	-6	400	30

Table A.8 Kazakhstan, Oct 2019 - Jan 2020 agroclimatic indicators and biomass (by oblast)

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m²)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m²)	BIOMSS 5YA Departure (%)
Akmolinskaya	224	54	-4.1	2.5	284	-6	45	17
Karagandinskaya	162	31	-4.9	1.9	356	-5	47	3
Kustanayskaya	196	32	-3.6	2.5	266	-2	44	19
Pavlodarskaya	147	21	-4.4	2.5	275	-2	30	-20
Severo kazachstanskaya	193	21	-4.2	2.8	225	-2	35	20
Vostochno kazachstanskaya	237	13	-5.1	1.0	393	-1	46	-4
Zapadno kazachstanskaya	144	-21	0.5	2.7	273	-6	55	17

Table A.9 Russia, Oct 2019 - Jan 2020 agroclimatic indicators and biomass (by oblast, kray and republic)

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m^2)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m^2)	BIOMSS 5YA Departure (%)
Bashkortostan Rep.	263	4	-3.3	2.6	181	-5	29	12
Chelyabinskaya Oblast	170	7	-4.4	2.2	218	3	34	19
Gorodovikovsk	148	-37	5.3	1.9	391	18	103	35
Krasnodarskiy Kray	223	-21	-0.9	1.9	316	11	58	24
Kurganskaya Oblast	184	5	-4.7	2.2	190	4	30	28
Kirovskaya Oblast	407	31	-2.2	2.8	95	-15	15	-5
Kurskaya Oblast	211	-24	2.4	2.9	200	1	43	20
Lipetskaya Oblast	220	-18	1.8	3.1	185	-3	38	17
Mordoviya Rep.	252	-7	0.1	3.0	159	-4	29	12
Novosibirskaya Oblast	266	20	-5.8	2.7	188	0	27	21
Nizhegorodskaya O.	351	19	0.0	3.2	113	-16	20	-5
Orenburgskaya Oblast	218	4	-2.0	2.6	242	-4	43	19
Omskaya Oblast	216	9	-5.2	3.0	178	2	28	29
Permskaya Oblast	348	18	-3.8	2.6	108	-11	16	2
Penzenskaya Oblast	240	-12	0.1	2.8	169	-8	31	6
Rostovskaya Oblast	147	-41	4.3	2.3	343	12	85	31
Ryazanskaya Oblast	278	-1	1.5	3.4	149	-7	30	13
Stavropolskiy Kray	147	-41	4.9	1.4	415	14	103	24
Sverdlovskaya Oblast	227	8	-4.9	2.3	139	0	21	19
Samarskaya Oblast	215	-11	-0.8	2.8	187	-8	34	11
Saratovskaya Oblast	174	-24	0.7	2.8	231	-3	46	15
Tambovskaya Oblast	220	-20	1.4	3.1	185	-5	37	14
Tyumenskaya Oblast	217	6	-5.3	2.5	160	6	25	37
Tatarstan Rep.	249	-6	-1.5	2.8	139	-11	23	1
Ulyanovskaya Oblast	198	-19	-0.6	2.8	173	-5	31	10
Udmurtiya Rep.	338	17	-2.7	2.8	106	-16	16	-7
Volgogradskaya O.	145	-32	2.3	2.6	292	5	65	21
Voronezhskaya Oblast	172	-33	2.2	2.8	230	-1	50	19

Table A.10 United States, Oct 2019 - Jan 2020 agroclimatic indicators and biomass (by state)

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m²)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m²)	BIOMSS 5YA Departure (%)
Arkansas	583	29	9.2	-0.1	564	-6	175	-5
California	274	-22	9.9	-0.1	671	3	117	-23
Idaho	291	-13	-1.3	-0.7	458	0	71	-6
Indiana	464	14	4.8	0.3	448	-5	110	-3
Illinois	446	24	4.2	-0.2	447	-8	105	-9
Iowa	318	26	1.1	-0.7	448	-6	83	-13
Kansas	216	19	5.4	-0.6	609	-2	143	-3
Michigan	461	26	1.1	-0.1	313	-11	59	-14
Minnesota	319	38	-2.9	-0.7	339	-11	49	-23
Missouri	422	30	5.4	-0.4	518	-6	125	-10
Montana	165	-10	-2.4	-1.1	427	-1	61	-14
Nebraska	185	21	1.7	-1.2	555	-1	104	-8
North Dakota	216	33	-3.6	-1.2	348	-11	48	-23
Ohio	420	7	4.7	0.7	440	-1	106	0
Oklahoma	409	66	8.6	-0.5	624	-5	177	-6
Oregon	439	-19	3.6	-0.3	419	3	81	-1
South Dakota	207	32	-1.2	-1.6	452	-6	71	-20
Texas	293	9	13.1	0.1	703	-3	261	2
Washington	519	-4	2.7	-0.1	331	0	67	0
Wisconsin	373	31	-1.2	-0.3	347	-11	56	-18

Table A.11 China, Oct 2019 - Jan 2020 agroclimatic indicators and biomass (by province)

	RAIN Current (mm)	RAIN 15YA Departure (%)	TEMP Current (°C)	TEMP 15YA Departure (°C)	RADPAR Current (MJ/m²)	RADPAR 15YA Departure (%)	BIOMSS Current (gDM/m²)	BIOMSS 5YA Departure (%)
Anhui	239	16	10.0	1.4	608	-7	180	-1
Chongqing	368	52	9.3	0.6	494	-13	143	-12
Fujian	200	-47	13.4	1.0	743	17	280	16
Gansu	117	6	-0.2	0.6	673	-6	105	-8
Guangdong	170	-53	17.4	1.3	848	17	336	3
Guangxi	285	-17	15.2	1.0	667	0	272	-3
Guizhou	426	23	9.4	0.7	469	-4	142	-7
Hebei	59	35	0.6	0.7	602	-4	112	7
Heilongjiang	88	-4	-8.7	0.8	448	1	56	5
Henan	154	54	8.1	1.1	611	-10	158	3
Hubei	262	35	9.1	1.0	590	-10	167	-9
Hunan	303	4	10.9	1.0	623	0	218	7
Jiangsu	199	7	10.3	1.6	606	-7	190	5
Jiangxi	212	-35	12.4	1.5	692	8	257	16
Jilin	93	-6	-5.6	0.9	533	1	78	8
Liaoning	80	-1	-1.8	0.6	569	-1	102	8
Inner Mongolia	53	11	-7.6	0.6	537	0	70	8
Ningxia	68	27	-0.4	0.5	695	-4	111	-1
Shaanxi	154	50	3.4	0.6	631	-9	119	-10
Shandong	100	48	6.5	1.3	629	-5	154	6
Shanxi	83	50	0.0	0.8	628	-7	105	2
Sichuan	323	29	6.7	0.5	560	-10	131	-18
Yunnan	294	-2	10.0	0.2	780	6	213	-8
Zhejiang	321	-14	10.7	1.0	605	-1	202	-1

Annex B. Quick reference to CropWatch indicators, spatial units and methodologies

The following sections give a brief overview of CropWatch indicators and spatial units, along with a description of the CropWatch production estimation methodology. For more information about CropWatch methodologies, visit CropWatch online at www.cropwatch.com.cn**.**

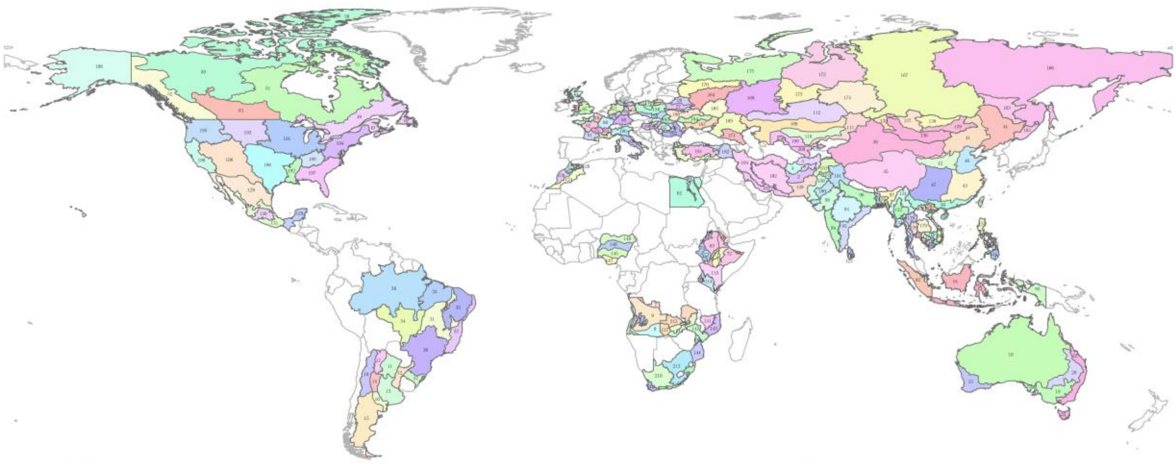
Agroecological zones for 42 key countries

Overview

212 agroecological zones for the 42 key countries across the globe

Description

42 key agricultural countries are divided into 212 agro-ecological zones based on cropping systems, climatic zones, and topographic conditions. Each country is considered separately. A limited number of regions (e.g., region 001, region 027, and region 127) are not relevant for the crops currently monitored by CropWatch but are included to allow for more complete coverage of the 42 key countries. Some regions are more relevant for rangeland and livestock monitoring, which is also essential for food security.



001. Central region with sparse vegetation
002. Dry region
003. Mixed dry farming and irrigated cultivation region
004. Mixed dry farming and grazing region
005. Arid Zone
006. Central Plateau
007. Humid zone
008. Semi-Arid Zone
009. Sub-humid zone
010. Andes
011. Chaco
012. Mesopotamia
013. Humid Pampas
014. Pampas hills
015. Arid part of Patagonia
016. Dry Pampas
017. Subtropical highlands
018. Arid and semiarid zone
019. Southeastern wheat area
020. Subhumid subtropical zone
021. Southwestern wheat area
022. Wet temperate and subtropical zone
023. Coastal region
024. Gangetic plain
025. Hills
026. Sylhet basin
027. Center
028. North
029. South-west
030. Amazonas
031. Central Savanna
032. Coast
033. Northeastern mixed forest and farmland
034. Mato Grosso
035. Nordeste
036. Parana basin
037. Southern subtropical rangelands
038. Gansu-Xinjiang
039. Hainan
040. Huang Huaihai
041. Inner Mongolia
042. Loess region
043. Lower Yangtze rtegion
044. North East China
045. Qinghai-Tibet
046. Southern China
047. South-West China
048. China Taiwan
049. Saint Lawrence basin
050. Arctic
051. Hudson Bay
052. Western Canada
053. Prairies
054. East-German lake and Heathland sparse crop area
055. Central wheat zone of Saxony and Thuringia
056. Wheat zone of Schleswig-Holstein and the Baltic coast
057. Mixed wheat and sugarbeets zone of the north-west
058. Bavarian Plateau
059. Western sparse crop area of the Rhenish massif
060. Nile Delta and Mediterranean coastal strip
061. Nile Valley
062. Desert
063. Central-northern maize-teff highlands
064. Eastern arid area
065. Great Rift region
066. Northern Arid area
067. North-western cereal-root-sesame lowlands
068. North-western sesame irrigated lowlands
069. North-western semi-arid lowlands
070. South-eastern mixed maize zone
071. South-eastern Mendebo highlands
072. Semi-arid pastoral areas
073. South-western coffee-enset highlands
074. Western mixed maize zone
075. Massid Central dry zone
076. Alpes region
077. Mediterranean zone
078. Northern barley zone
079. Maize_barley and livestock zone along the English Channel
080. Rapeseed zone of eastern France
081. Southwest maize zone
082. Mixed maize_barley and rapessed zone from the Centre to the Atlantic Ocean
083. North England, Wales and North Ireland sparse crops area
084. Barley area in Scotland
085. South English mixed wheat and Barley zone
086. Central Hungary
087. Puszta
088. North Hungary
089. Transdanubia
090. Java
091. Kalimantan and Sulawesi
092. Sumatra
093. West Papua
094. Deccan Plateau
095. Eastern coastal region
096. Gangatic plain
097. Assam and north-eastern regions
098. Agriculture areas in Rajastan and Gujarat
099. Western coastal region
100. North-western dry region
101. Western Himalayan region
102. Central and Eastern wasteland region
103. Arid Red Sea coastal low hills and plains
104. Semi-arid to sub-tropical western and northern hills
105. East coast
106. Po Valley
107. Islands
108. Western Italy
109. Central non-agriculture region
110. South zone
111. Eastern plateau and southeastern zone
112. Northern zone
113. Coast
114. Highland agriculture zone
115. nothern rangelands
116. South-west
117. Tonle-sap
118. Mekong valley between Tonle-sap and Vietnam border
119. Northern plain and northeast
120. Southwest Hilly region
121. Dry Zone
122. Intermediate Zone
123. Wet zone
124. Desert
125. Sub-humid northern highlands
126. Warm semiarid zones
127. Warm subhumid zones
128. Arid and semi-arid regions
129. Humid tropics with summer rainfall
130. Sub-humid temperate region with summer rains
131. Sub-humid hot tropics with summer rains
132. Central plain
133. Delta and southern-coast
134. Hills
135. Altai
136. Gobi Desert
137. Hangai Khuvsgul Region
138. Selenge-Onon Region
139. Central and Eastern Steppe
140. Buzi basin
141. Northern high altitude areas
142. Low Zambezia River basin
143. Northern coast
144. Southern region
145. Derived savanna zone
146. Guinean savanna
147. Humid forest zone
148. Soudano-Sahelian zone
149. Balochistan
150. Lower Indus basin in south Punjab and Sind
151. Northern highlands
152. Northern Punjab
153. Forest islands
154. Negros and central Visayas Islands
155. Northern lowlands of Mindanao to western Visayas
156. Central rye and potatoes area
157. Northern oats and potatoes areas
158. Northern-central wheat and sugarbeet area
159. Southern wheat and sugarbeet area
160. Central mixed farming and pasture Carpathian hills
161. Eastern and southern maize wheat and sugarbeet plains
162. Western and central maize wheat and sugarbeet plateau
163. Amur and Primorsky Krai
164. Central Russia
165. Central black soils area
166. Eastern Siberia
167. Middle Siberia
168. Middle Volga
169. Northern Caucasus
170. Northwest Region including Novgorod
171. South Caucasian
172. Subarctic region
173. Ural and wetsrn Volga region
174. Western Siberia
175. West subarctic region
176. Central double and triple-cropped rice lowlands
177. South-eastern horticulture area
178. Western and southern hill areas
179. Single-cropped rice north-eastern region
180. Black Sea region
181. Central Anatolia region
182. Eastern Anatolia region
183. Marmara Agean Mediterranean lowland region
184. Central wheat area
185. Eastern Carpathian hills
186. Northern wheat area
187. Southern wheat and maize area
188. Alaska and Hawaii
189. Blue Grass region
190. California
191. Corn Belt
192. Lower Mississippi
193. Northern Plains
194. North-eastern areas
195. Northwest
196. Southern Plains
197. Southeast
198. Southwest
199. Central region with sparse crops
200. Eastern hilly cereals zone
201. Aral Sea cotton zone
202. North Central Coast
203. North East
204. Red River Delta
205. South East
206. South Central Coast
207. North West
208. Central Highlands
209. Mekong River Delta
210. Arid and desert zones
211. Humid Cape Fold mountains
212. Mediterranean zone
213. Dry Highveld and Bushveld maize areas
214. Luangwua Zambezi rift valley
215. Northen high rainfall zone
216. Central-eastern and southern plateau
217. Western semi-arid plain

CropWatch indicators

The CropWatch indicators are designed to assess the condition of crops and the environment in which they grow and develop; the indicators—RAIN (for rainfall), TEMP (temperature), and RADPAR (photosynthetically active radiation, PAR)—are not identical to the weather variables, but instead are value-added indicators computed only over crop growing areas (thus for example excluding deserts and rangelands) and spatially weighted according to the agricultural production potential, with marginal areas receiving less weight than productive ones. The indicators are expressed using the usual physical units (e.g., mm for rainfall) and were thoroughly tested for their coherence over space and time. CWSU are the CropWatch Spatial Units, including MRUs, MPZ, and countries (including first-level administrative districts in select large countries). For all indicators, high values indicate "good" or "positive."

INDICATOR			
BIOMSS			
Biomass accumulation potential			
Crop/ Ground and satellite	Grams dry matter/m^2, pixel or CWSU	An estimate of biomass that could potentially be accumulated over the reference period given the prevailing rainfall and temperature conditions.	Biomass is presented as maps by pixels, maps showing average pixels values over CropWatch spatial units (CWSU), or tables giving average values for the CWSU. Values are compared to the average value for the last five years (2015-2019), with departures expressed in percentage.
CALF			
Cropped arable land and cropped arable land fraction			
Crop/ Satellite	[0,1] number, pixel or CWSU average	The area of cropped arable land as fraction of total (cropped and uncropped) arable land. Whether a pixel is cropped or not is decided based on NDVI twice a month. (For each four-month reporting period, each pixel thus has 8 cropped/ uncropped values).	The value shown in tables is the maximum value of the 8 values available for each pixel; maps show an area as cropped if at least one of the 8 observations is categorized as "cropped." Uncropped means that no crops were detected over the whole reporting period. Values are compared to the average value for the last five years (2015-2019), with departures expressed in percentage.
CROPPING INTENSITY			
Cropping intensity Index			
Crop/ Satellite	0, 1, 2, or 3; Number of crops growing over a year for each pixel	Cropping intensity index describes the extent to which arable land is used over a year. It is the ratio of the total crop area of all planting seasons in a year to the total area of arable land.	Cropping intensity is presented as maps by pixels or spatial average pixels values for MPZs, 42 countries, and 7 regions for China. Values are compared to the average of the previous five years, with departures expressed in percentage.
NDVI			
Normalized Difference Vegetation Index			
Crop/ Satellite	[0.12-0.90] number, pixel or CWSU average	An estimate of the density of living green biomass.	NDVI is shown as average profiles over time at the national level (cropland only) in crop condition development graphs, compared with previous year and recent five-year average (2015-2019), and as spatial patterns compared to the average showing the time profiles, where they occur, and the percentage of pixels concerned by each profile.
RADPAR			
CropWatch indicator for Photosynthetically Active Radiation (PAR), based on pixel based PAR			
Weather /Satellite	W/m^2, CWSU	The spatial average (for a CWSU) of PAR accumulation over agricultural pixels, weighted by the production potential.	RADPAR is shown as the percent departure of the RADPAR value for the reporting period compared to the recent fifteen-year average (2005-2019),

INDICATOR			
			per CWSU. For the MPZs, regular PAR is shown as typical time profiles over the spatial unit, with a map showing where the profiles occur and the percentage of pixels concerned by each profile.
RAIN			
CropWatch indicator for rainfall, based on pixel-based rainfall			
Weather /Ground and satellite	Liters/m^2, CWSU	The spatial average (for a CWSU) of rainfall accumulation over agricultural pixels, weighted by the production potential.	RAIN is shown as the percent departure of the RAIN value for the reporting period, compared to the recent fifteen-year average (2005-19), per CWSU. For the MPZs, regular rainfall is shown as typical time profiles over the spatial unit, with a map showing where the profiles occur and the percentage of pixels concerned by each profile.
TEMP			
CropWatch indicator for air temperature, based on pixel-based temperature			
Weather /Ground	°C, CWSU	The spatial average (for a CWSU) of the temperature time average over agricultural pixels, weighted by the production potential.	TEMP is shown as the departure of the average TEMP value (in degrees Centigrade) over the reporting period compared with the average of the recent fifteen years (2005-19), per CWSU. For the MPZs, regular temperature is illustrated as typical time profiles over the spatial unit, with a map showing where the profiles occur and the percentage of pixels concerned by each profile.
VCIx			
Maximum vegetation condition index			
Crop/ Satellite	Number, pixel to CWSU	Vegetation condition of the current season compared with historical data. Values usually are [0, 1], where 0 is "NDVI as bad as the worst recent year" and 1 is "NDVI as good as the best recent year." Values can exceed the range if the current year is the best or the worst.	VCIx is based on NDVI and two VCI values are computed every month. VCIx is the highest VCI value recorded for every pixel over the reporting period. A low value of VCIx means that no VCI value was high over the reporting period. A high value means that at least one VCI value was high. VCI is shown as pixel-based maps and as average value by CWSU.
VHI			
Vegetation health index			
Crop/ Satellite	Number, pixel to CWSU	The average of VCI and the temperature condition index (TCI), with TCI defined like VCI but for temperature. VHI is based on the assumption that "high temperature is bad" (due to moisture stress), but ignores the fact that low temperature may be equally "bad" (crops develop and grow slowly, or even suffer from frost).	Low VHI values indicate unusually poor crop condition, but high values, when due to low temperature, may be difficult to interpret. VHI is shown as typical time profiles over Major Production Zones (MPZ), where they occur, and the percentage of pixels concerned by each profile.
VHIn			
Minimum Vegetation health index			
Crop/ Satellite	Number, pixel to CWSU	VHIn is the lowest VHI value for every pixel over the reporting period. Values usually are [0, 100]. Normally, values lower than 35 indicate poor crop condition.	Low VHIn values indicate the occurrence of water stress in the monitoring period, often combined with lower than average rainfall. The spatial/time resolution of CropWatch VHIn is 16km/week for MPZs and 1km/dekad for China.

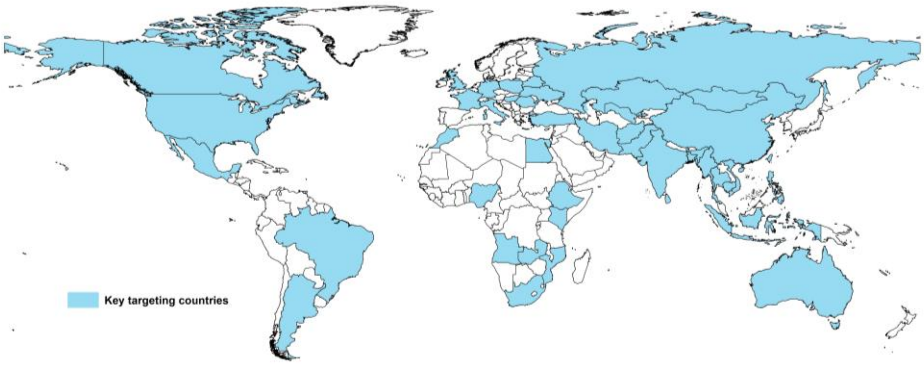
Note: Type is either "Weather" or "Crop"; source specifies if the indicator is obtained from ground data, satellite readings, or a combination; units: in the case of ratios, no unit is used; scale is either pixels or large scale CropWatch spatial units (CWSU). Many indicators are computed for pixels but represented in the CropWatch bulletin at the CWSU scale.

CropWatch spatial units (CWSU)

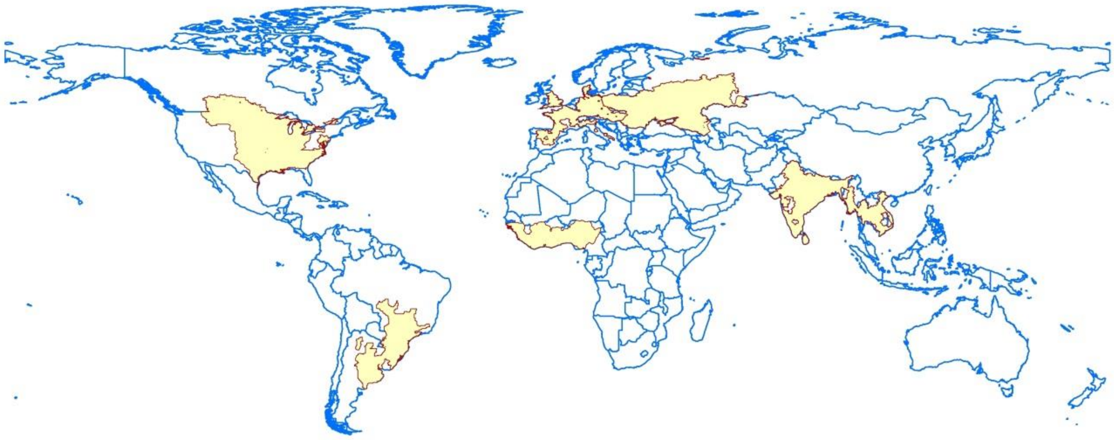
CropWatch analyses are applied to four kinds of CropWatch spatial units (CWSU): Countries, China, Major Production Zones (MPZ), and global crop Monitoring and Reporting Units (MRU). The tables below summarize the key aspects of each spatial unit and show their relation to each other. For more details about these spatial units and their boundaries, see the CropWatch bulletin online resources.

SPATIAL LUNITS	
CHINA	
Overview	*Description*
Seven monitoring regions	The seven regions in China are agro-economic/agro-ecological regions that together cover the bulk of national maize, rice, wheat, and soybean production. Provinces that are entirely or partially included in one of the monitoring regions are indicated in color on the map below.

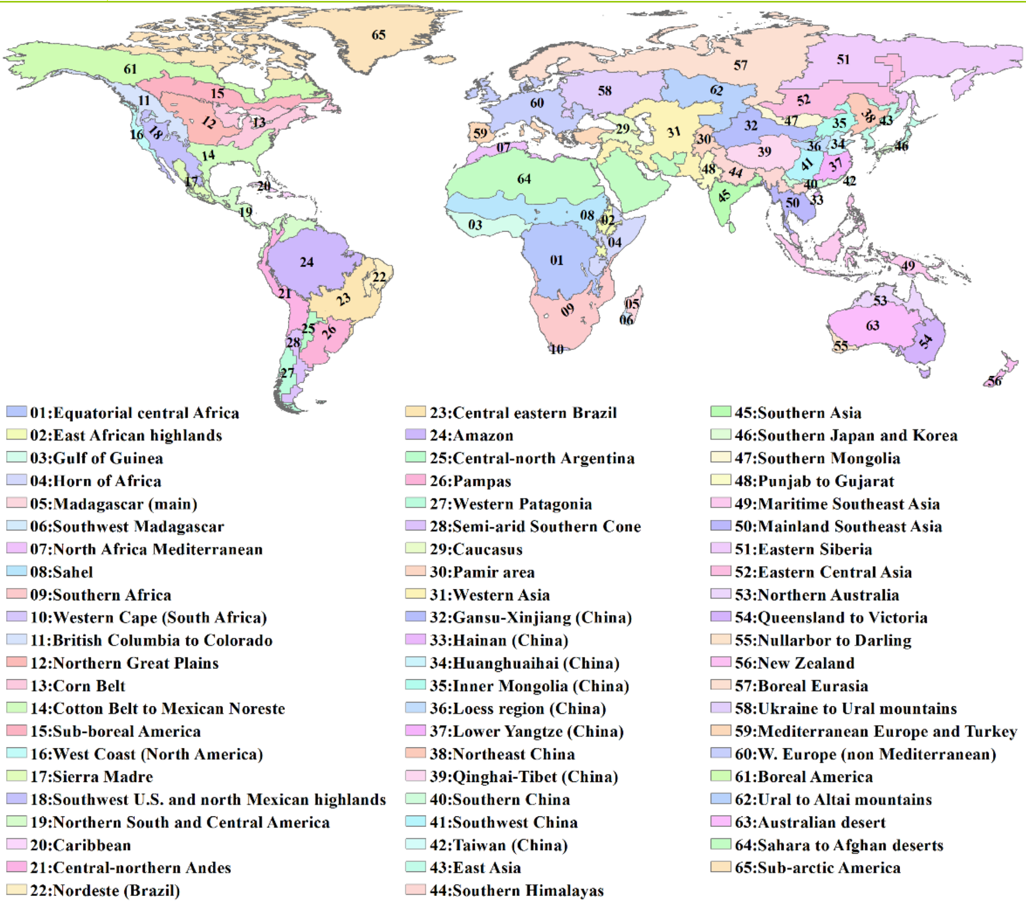
Countries (and first-level administrative districts, e.g., states and provinces)	
Overview	*Description*
"Forty two plus one" countries to represent main producers/exporters and other key countries.	CropWatch monitored countries together represent more than 80% of the production of maize, rice, wheat and soybean, as well as 80% of exports. Some countries were included in the list based on criteria of proximity to China (Uzbekistan, Cambodia), regional importance, or global geopolitical relevance (e.g., four of five most populous countries in Africa). The total number of countries monitored is "forty two plus one," referring to forty two countries and China itself. For the nine largest countries—, United States, Brazil, Argentina, Russia, Kazakhstan, India, China, and Australia, maps and analyses may also present results for the first-level administrative subdivision. The CropWatch agroclimatic indicators are computed for all countries and included in the analyses when abnormal conditions occur. Background information about the countries' agriculture and trade is available on the CropWatch Website, **www.cropwatch.com.cn**.



Major Production Zones (MPZ)	
Overview	*Description*
Seven globally important areas of agricultural production	The six MPZs include West Africa, South America, North America, South and Southeast Asia, Western Europe and Central Europe to Western Russia. The MPZs are not necessarily the main production zones for the four crops (maize, rice, soybean, wheat) currently monitored by CropWatch, but they are globally or regionally important areas of agricultural production. The seven zones were identified based mainly on production statistics and distribution of the combined cultivation area of maize, rice, wheat and soybean.



Global Monitoring and Reporting Unit (MRU)	
Overview	*Description*
65 agro-ecological/agro-economic units across the world	MRUs are reasonably homogeneous agro-ecological/agro-economic units spanning the globe, selected to capture major variations in worldwide farming and crops patterns while at the same time providing a manageable (limited) number of spatial units to be used as the basis for the analysis of environmental factors affecting crops. Unit numbers and names are shown in the figure below. A limited number of units (e.g., MRU-63 to 65) are not relevant for the crops currently monitored by CropWatch but are included to allow for more complete coverage of global production. Additional information about the MRUs is provided online under **www.cropwatch.com.cn** .



Production estimation methodology

The main concept of the CropWatch methodology for estimating production is the calculation of current year production based on information about last year's production and the variations in crop yield and cultivated area compared with the previous year. The equation for production estimation is as follows:

$$Production_i = Production_{i-1} * (1 + \Delta Yield_i) * (1 + \Delta Area_i)$$

Where i is the current year, $\Delta Yield_i$ and $\Delta Area_i$ are the variations in crop yield and cultivated area compared with the previous year; the values of $\Delta Yield_i$ and $\Delta Area_i$ can be above or below zero.

For the 42 countries monitored by CropWatch, yield variation for each crop is calibrated against NDVI time series, using the following equation:

$$\Delta Yield_i = f(NDVI_i, NDVI_{i-1})$$

Where $NDVI_i$ and $NDVI_{i-1}$ are taken from the time series of the spatial average of NDVI over the crop specific mask for the current year and the previous year. For NDVI values that correspond to periods after the current monitoring period, average NDVI values of the previous five years are used as an average expectation. $\Delta Yield_i$ is calculated by regression against average or peak NDVI (whichever yields the best regression), considering the crop phenology of each crop for each individual country.

A different method is used for areas. For China, CropWatch combines remote-sensing based estimates of the crop planting proportion (cropped area to arable land) with a crop type proportion (specific type area to total cropped area). The planting proportion is estimated based on an unsupervised classification of high resolution satellite images from HJ-1 CCD and GF-1 images. The crop-type proportion for China is obtained by the GVG instrument from field transects. The area of a specific crop is computed by multiplying farmland area, planting proportion, and crop-type proportion of the crop.

To estimate crop area for wheat, soybean, maize, and rice outside China, CropWatch relies on the regression of crop area against cropped arable land fraction of each individual country (paying due attention to phenology):

$$Area_i = a + b * CALF_i$$

where a and b are the coefficients generated by linear regression with area from FAOSTAT or national sources and CALF the Cropped Arable Land Fraction from CropWatch estimates. $\Delta Area_i$ can then be calculated from the area of current and the previous years.

Data notes and bibliography

Notes

[1] Although Yemen is not part of the Horn of Africa (HoA), it is geographically close and maintains close links to the region. The countries of the HoA are grouped in the regional development association IGAD (Inter-governmental Authority on Development, with headquarters in Djibouti). IGAD has recently established the IGAD Drought Disaster Resilience and Sustainability Initiative (IDDRSI, 2016).

[2] Under-investment in agriculture was one of the main drivers of the 2008 crisis of high food prices (Mittal 2009, ATV 2010), even if several other local and global triggering factors can be identified (Evans 2008).

[3] Previous large humanitarian crises were those of the West African Sahel (from the early sixties to the mid eighties), the Ethiopian droughts of the mid-eighties, the Indian Ocean tsunami of 2004, several large earthquakes (for example, Haiti, 2010), and floods and medical emergencies (such as the West African Ebola outbreak, 2013-16).

[4] http://www.agrhymet.ne/eng/index.html

[5] http://www.icpac.net/

[6] Belg is harvested before or during July.

[7] "Purely man-made disasters" is, however, a concept that deserves a closer look, as many wars and insurgencies are partially triggered by shortages of natural resources, including land. As such, most “man-made disasters” do have an environmental component.

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Online resources

Online Resources posted on **www.cropwatch.com.cn** , **http://cloud.cropwatch.com.cn/**

This bulletin is only part of the CropWatch resources available. Visit **www.cropwatch.com.cn** for access to additional resources, including the methods behind CropWatch, country profiles, and other CropWatch publications. For additional information or to access specific data or high-resolution graphs, simply contact the CropWatch team at **cropwatch@radi.ac.cn**.

CropWatch bulletins introduce the use of several new and experimental indicators. We would be very interested in receiving feedback about their performance in other countries. With feedback on the contents of this report and the applicability of the new indicators to global areas, please contact:

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