

GRiSP Global Rice Phenotyping Network & Priority Phenomics Traits at IRRI

Michael Dingkuhn

IRRI (Philippines)

CIRAD (France)

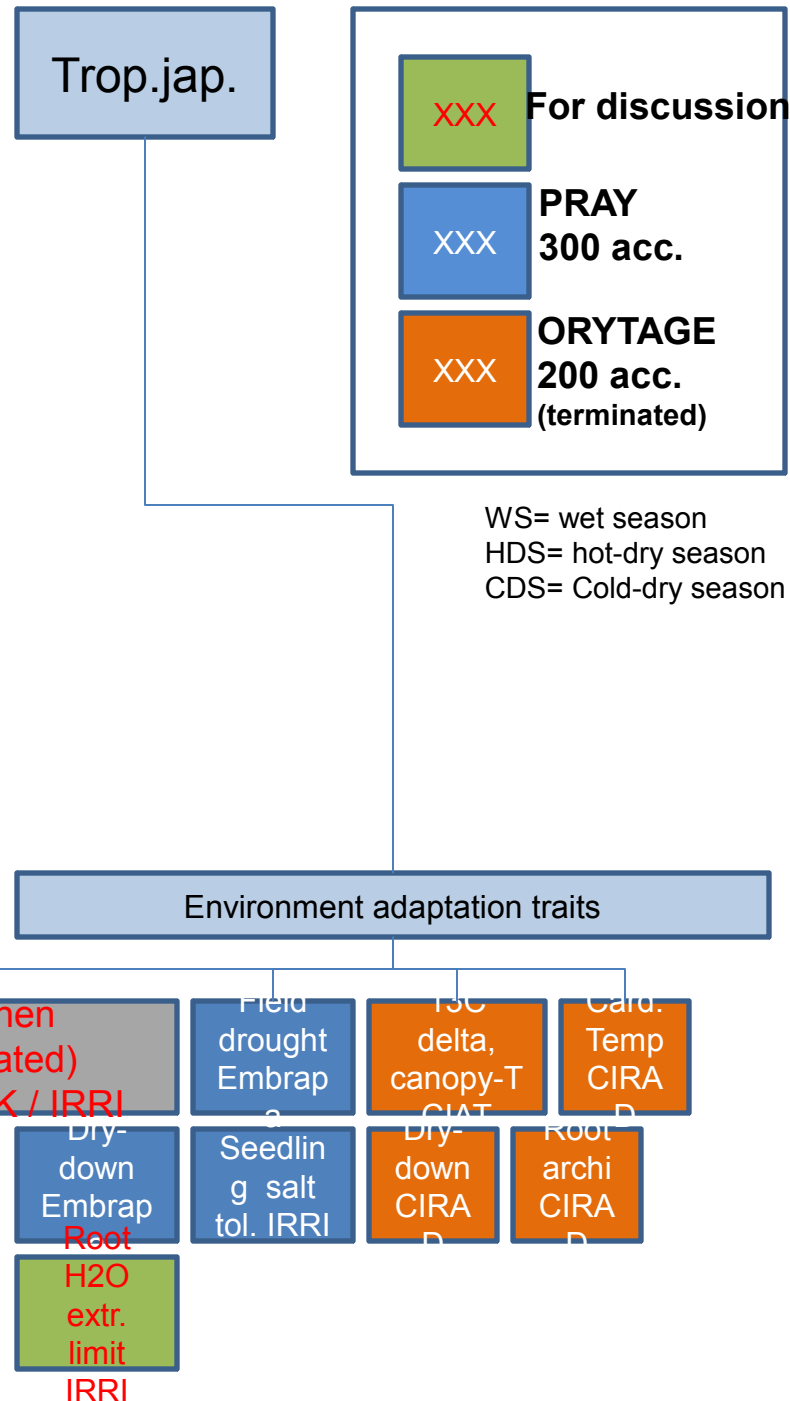
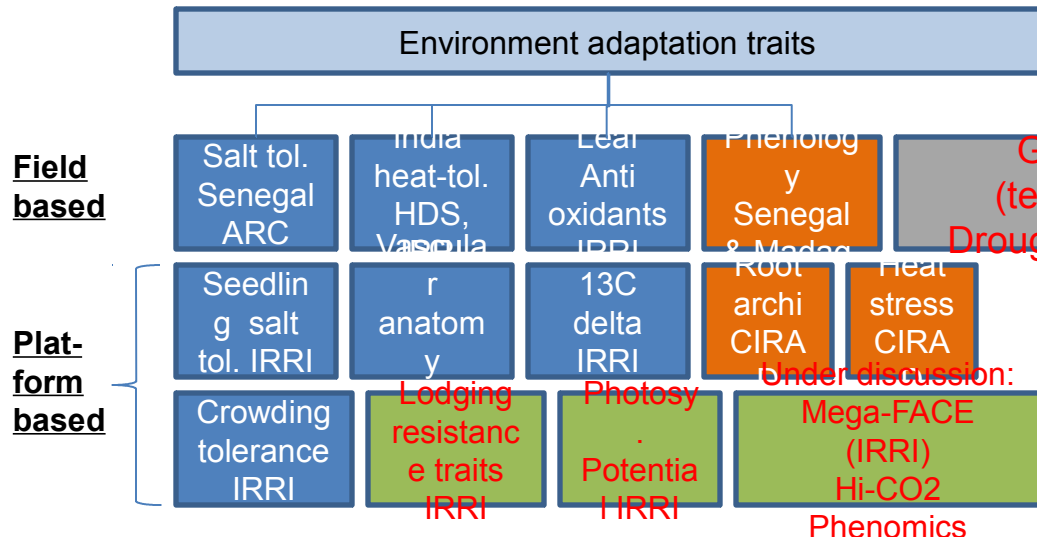
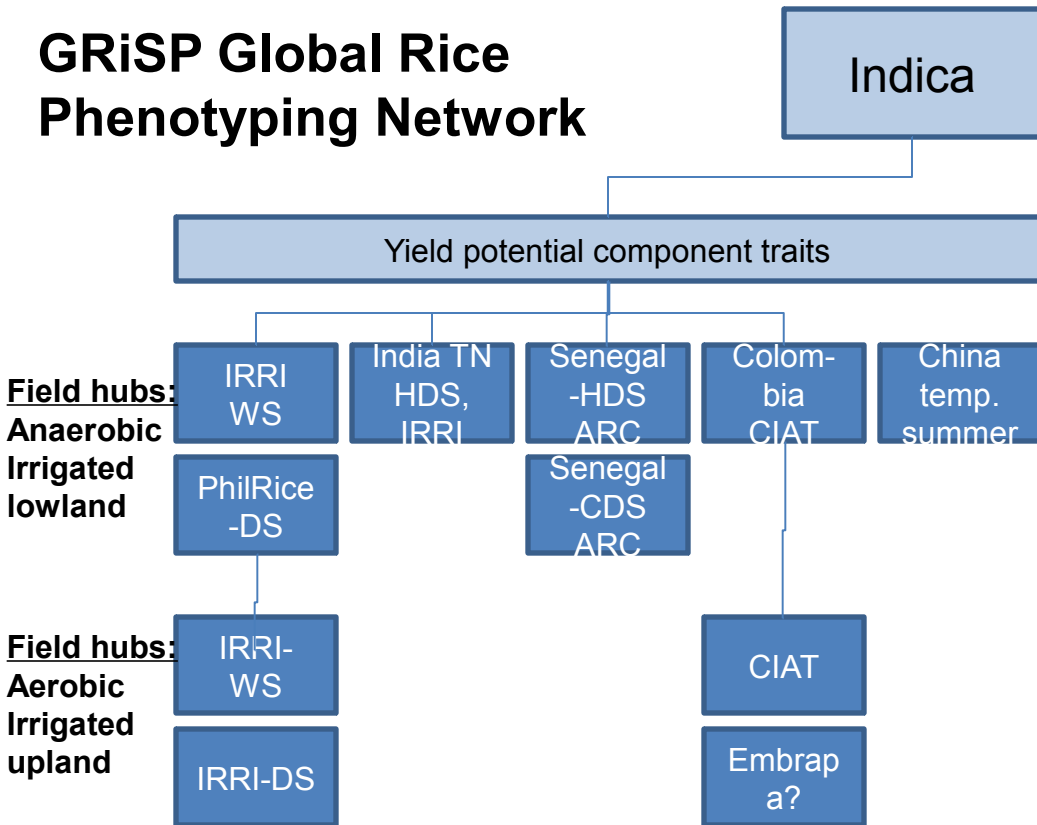
The network

- Initiated in March 2011
- An international community of rice scientists
 - IRRI, AfricaRice, CIAT
 - CIRAD, IRD (Fr)
 - JIRCAS, Tsukuba University (Jpn)
 - EMBRAPA (Br), CAS (China), PhilRice (Phils)
 - India (thru local IRRI teams)
 - CSIRO (Aus)
 - Cornell University, Colorado SU (USA)
 - Syngenta
- Agreed-on diversity panels for rice sub-species
- Objective: Gene/allele discovery for breeding

Basic approaches

- Multi-phenotyping on shared reference panels (300 acc. per sub-species)
- Yield potential and abiotic stresses
- Multi-environment field phenomics (hubs) for trait GxE
- Complementary HTP platforms
- 700K SNP chip of Oryza SNP Consortium, soon also genome sequencing

GRiSP Global Rice Phenotyping Network



Trait categories (1): Yield Potential

- Sink related
 - Spikelet number per panicle and ground area
 - 1000-grain weight
 - Sterility fraction
 - Grain weight and size histograms (new tool Histogram)
 - Grain moisture kinetics (proxy for filling duration at panicle scale)
 - Non-structural CH₂O reserves in stem
- Source related
 - Biomass
 - Green leaf area at anthesis and maturity (=> stay-green)
 - Flag and Flag-1 leaf dimensions
 - Specific leaf area (SLA)
 - Early vigor (proxies: phyllochron, RGR)

Trait categories (2): Generic adaptations

- Phenology (duration to flowering, phyllochron)
- Morphology
 - Classical shoot stuff (manual), 3D imagery planned
 - Root 2D morphology on hydroponics nail boards with glass bead matrix (CIRAD-IRRI)
- Water economy
 - Delta 13C (proxy for transpiration efficiency)
 - Canopy T (proxy for Tr when meteo factored in)
- Generic stress tolerance
 - Leaf anti-oxidant activity (ORAC test)
- Lodging resistance
 - Stem mechanical & morphological traits
 - Stem chemical composition (cellulose, lignins, starch)

Trait categories (3): Drought & other stresses

- Field drought
 - Canopy temperature
 - NDVI
 - Root mass density at 0-15 & 15-30 cm
- Drought in pots or columns (dry-down)
 - RGR (for early vigor)
 - Soil water extraction (transpiration, gravimetric)
 - Critical FTSW for stomatal response
 - Root biomass, length & diameter at <60cm
 - Ratio fine/course roots
- Salinity: in-door hi-thruput seedling screening
- Submergence: Field tank facility
- Heat:
 - Hotspot field screening in India
 - TOA (time of day of anthesis)

Trait categories (4): C4 rice project

- Leaf anatomy: cross sections, leaf thickness, cell type size number
- Leaf stable isotope carbon isotope ratio (C4 screen)
- Survival at low CO₂ (C4 screen)
- Leaf response to growth in low or high CO₂
- Instantaneous leaf photosynthesis in the field

Thank you / Merci / Salamat po