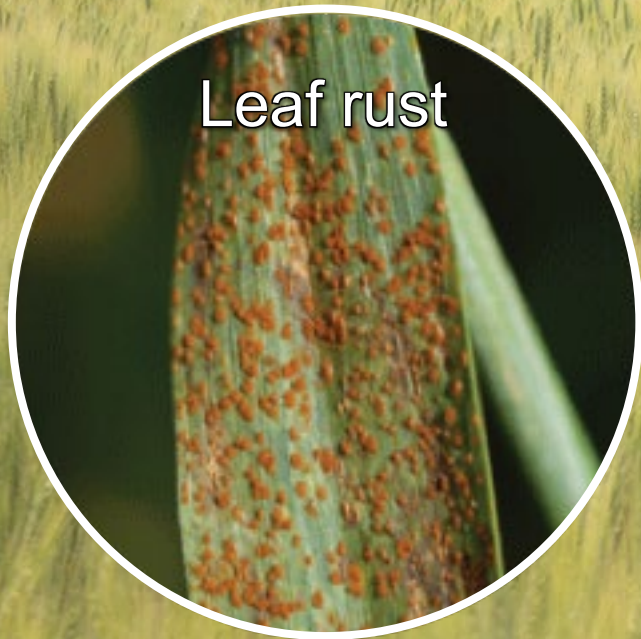


MARPLE diagnostics: A pioneering step in wheat rust management



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On the trail of the Wheat rust “Cereal killers”



**Globally 6.2 million tonnes lost
~ \$1.12 billion per yr.**



**Most common & widely distributed
>SR or YR per yr.**



**Globally 5.47 million tonnes lost
~ \$1 billion per yr.**

2010 – the worst yellow rust outbreak in recent history



Losses greater than \$250 million = more than 15% total national production lost

The wheat rust early warning system



3+ million subscribers

1. Coordinated wheat rust surveys



2. Infrastructure & capacity in rust pathology

MISSING

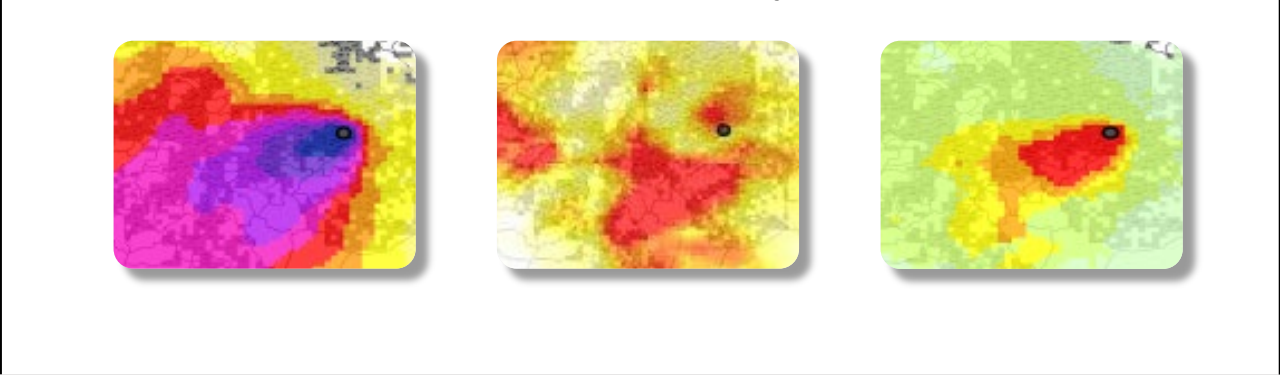
Strain-level, real-time diagnostics



Dispersal + Suitability → Risk



3. Screening nurseries & fast-track variety release



4. Real-time disease forecasting models



Develop a simple genotyping platform for complex fungal pathogens for use in resource poor regions

Mobile And Real-time PLant disEase (MARPLE) diagnostics



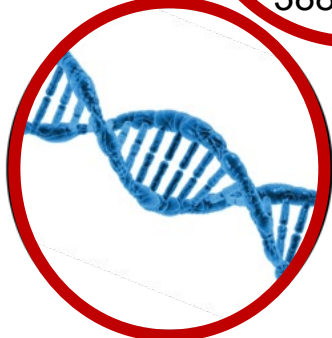
MARPLE
DIAGNOSTICS



PCR
388 genes



Identify
disease



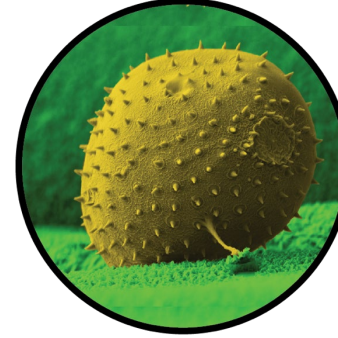
Extract
DNA



Mobile
sequencing



Data
analysis



Diagnostics
define strain



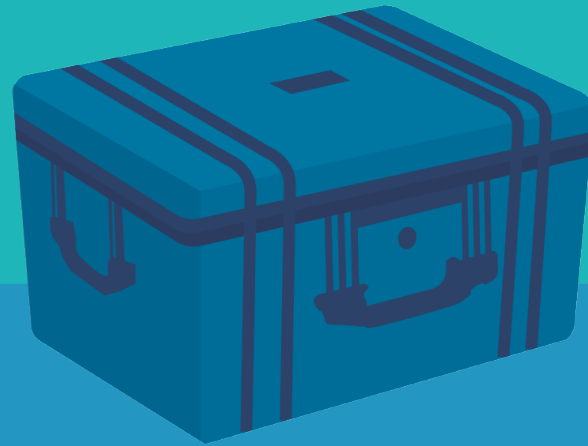
Data Integration
IN SEASON
> Early Warning
System

2 days from sample prep to results!!

Radhakrishnan et al & Saunders (2019) BMC Biology



MARPLE
DIAGNOSTICS



A truly mobile, rapid response lab

What are the practical advantages of MARPLE?

Rapid diagnostics

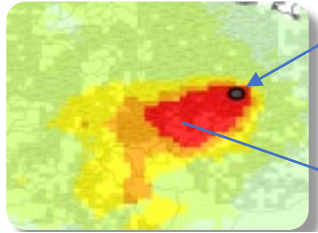


Near **real-time** diagnostics
IN SEASON
+ disease risk forecasting

Early
Control



Risk Forecast



Early warning of new races entering East Africa via Ethiopia **AND** inform varietal selection



Early indications of breakdown in fungicide sensitivity **AND** efficient use of fungicides

2019: MARPLE Diagnostics deployment in Ethiopia



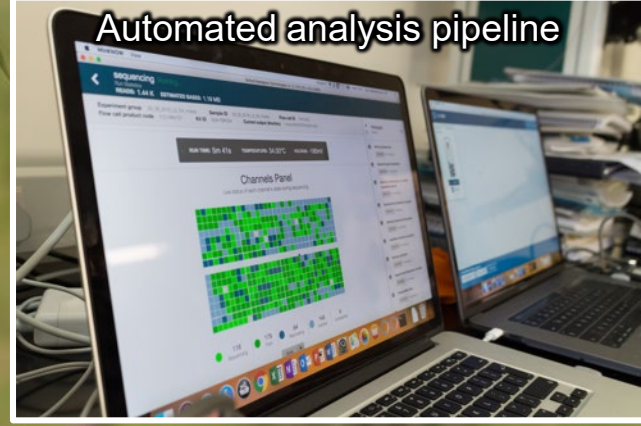
2021: Virtual workshop in Ethiopia



Simple prep; no cold-chain storage



Internet independent; no stable electricity



Automated analysis pipeline

Wheat Rust Advisory No. 4
8 September 2018

Met Office UNIVERSITY OF CAMBRIDGE CIMMYT

Wheat Rust Advisory – risk assessment of wheat rust outbreaks and spread in Ethiopia

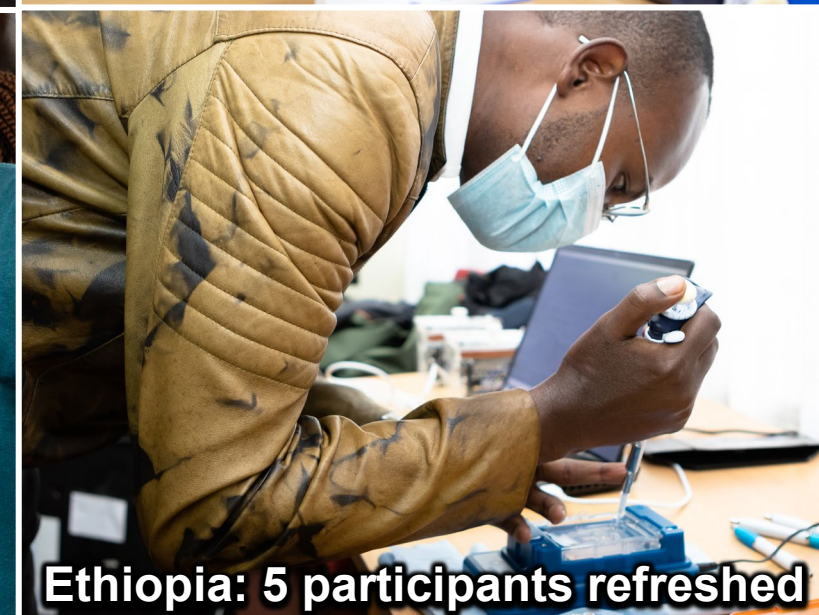
Summary Period: 25 August – 8 September 2018

Summary:

- Both Stripe and Stem rust are increasing rapidly. Urgent control is needed in several areas to stop further spread. Stripe rust is the immediate threat, but high incidence of stem rust in early stage crops in some areas is a big concern.
- Surveys undertaken by OARI/Oromia Bureau of Agriculture and Natural Resource (26th Aug – 6th Sept) in Arsi, West Arsi and Bale indicated heavy infections of stripe rust.

2 days from sample collection to genotyping results

2022: MARPLE Diagnostics workshops in Nepal (NARC) Kenya (KALRO) & Ethiopia (EIAR)



Nepal: 22 participants trained

Kenya: 17 participants trained

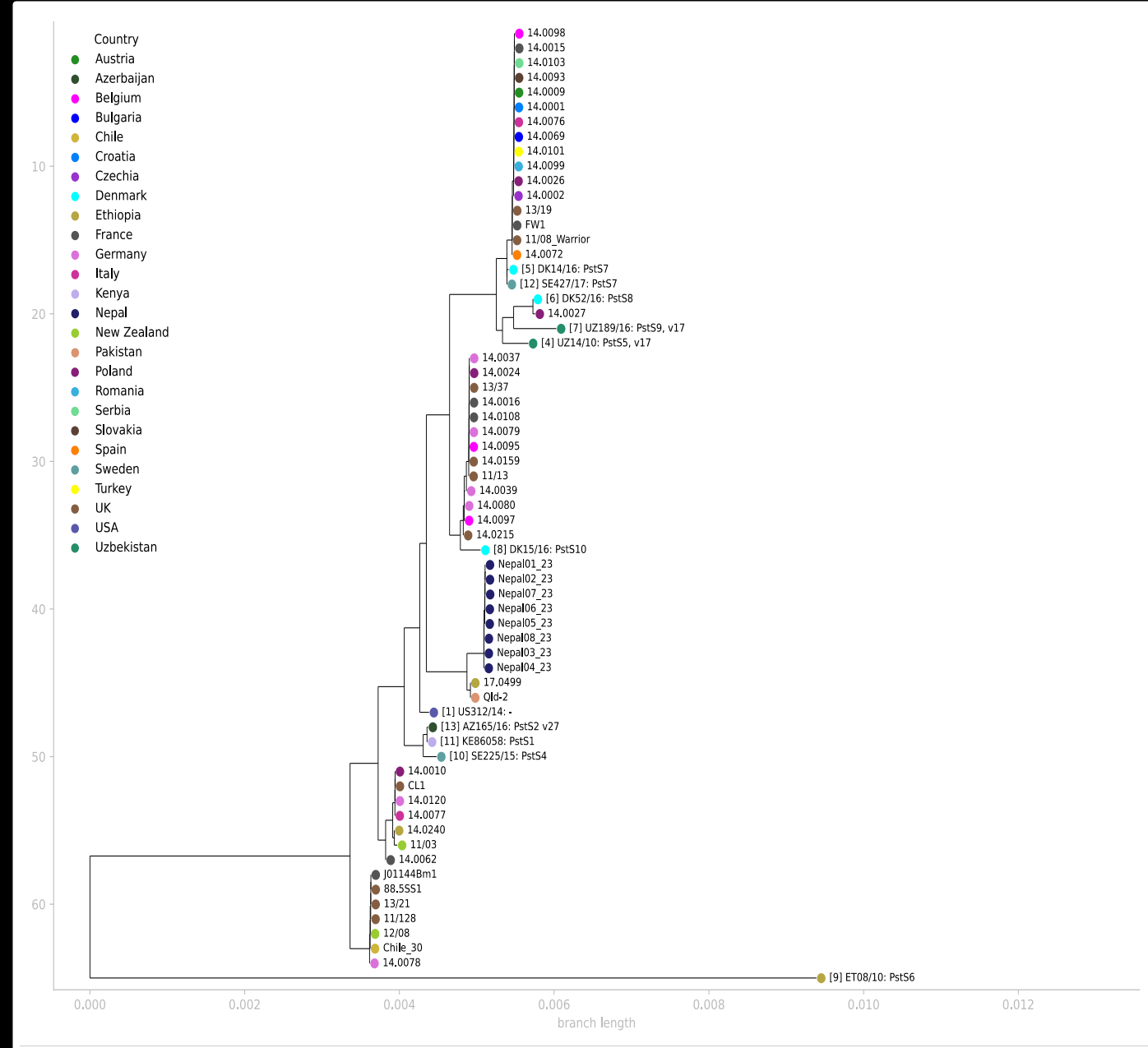
Ethiopia: 5 participants refreshed

2023: MARPLE Diagnostics workshop led by researchers in Nepal



February 2023

Generated data within 48 hours of initiating protocol





Trials led by Dominik Vinopal (JIC) and Zennah Kosgey (KALRO) 2022



MARPLE diagnostics platform developed for wheat stem rust

Resources

Open access guides, links and further materials

MARPLE TRAINING GUIDE

Download booklet

PRIMER LISTS

Access primers

MARPLE EQUIPMENT

Equipment list

MARPLE CODE

Access repository

<https://marple-diagnostics.org/resources/>

