

**Innovation and Intellectual Property as Engines for
Competitive Agribusiness:
Empowering Women Researchers and
Entrepreneurs in Africa**

Casablanca, Morocco, November 15 to 17, 2017

**Promoting New Plant Varieties for Enhanced Agricultural Productivity and
Food Security**

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Case Study: Tea Breeding

TEA BREEDING OBJECTIVES



High yield

Good quality



Drought tolerance



Tolerance to pest
and disease

Altitude Range
1,720-2,305 masl

Adaptability to
growing locations

Tea Breeding Process



Closed flower



Emasculated flower



Flower with pollen



Manual hand
pollination



Covering a pollinated
flower



Mature fruit



Netting



Harvested seeds

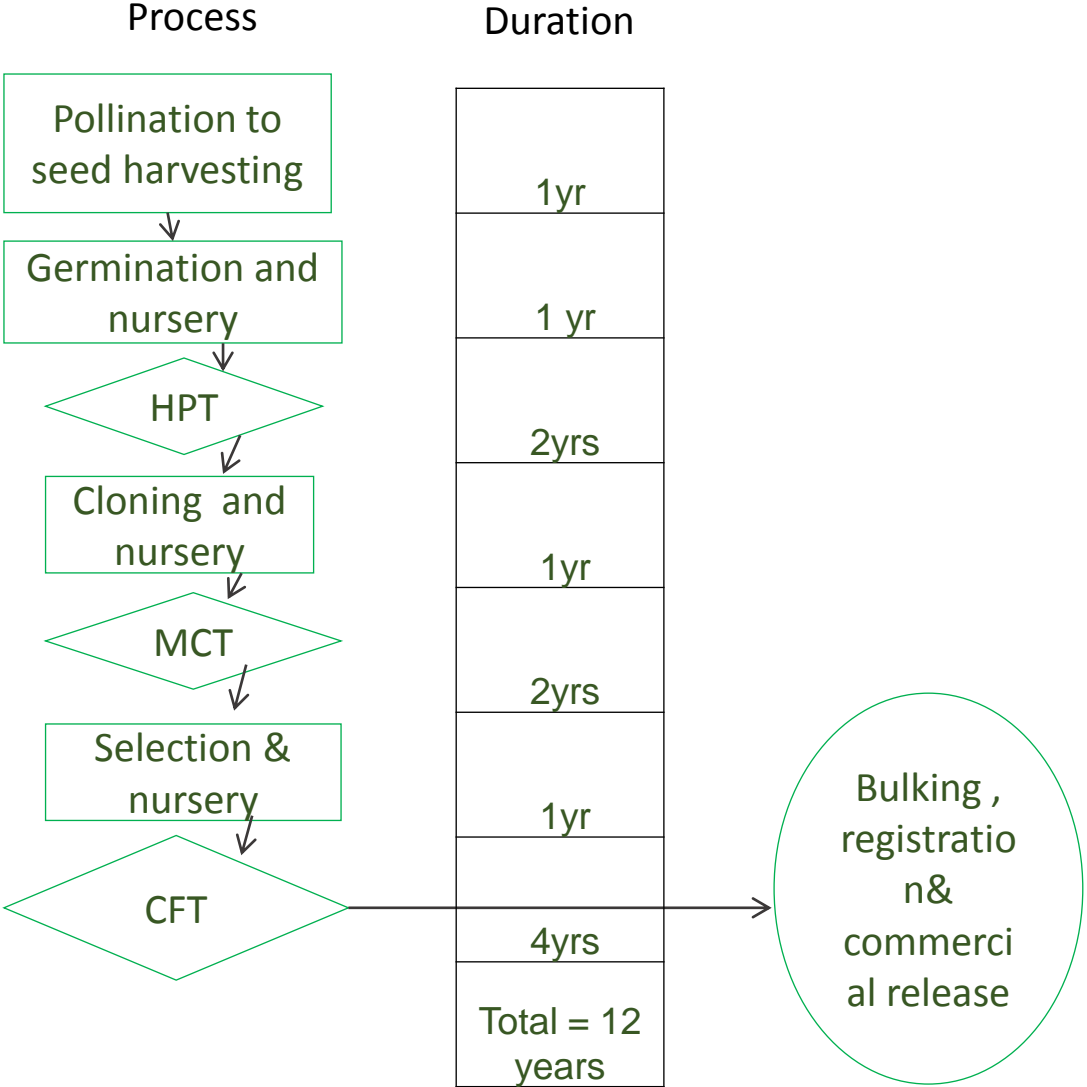


Seedlings



Mature tree

Breeding Process Duration



Young HPT



MCT



CFT

Future Proofing Tea

Ensure sustainable production of tea by:

1. producing **more** tea on **the same** land area while tackling **climate change**

(extreme weather conditions, emerging pests and diseases)

2. with **reduced inputs/ finite resources**

(water, agro-chemicals- WUE and NUE)



Smart Agriculture- Variety improvement

- Yields of 1700 – 2500KgMT/ha
- Declining yields resulting from senescence
- Lack of uniformity (yield)
- Varied resistance to climate change, diseases and pests
- Varied quality

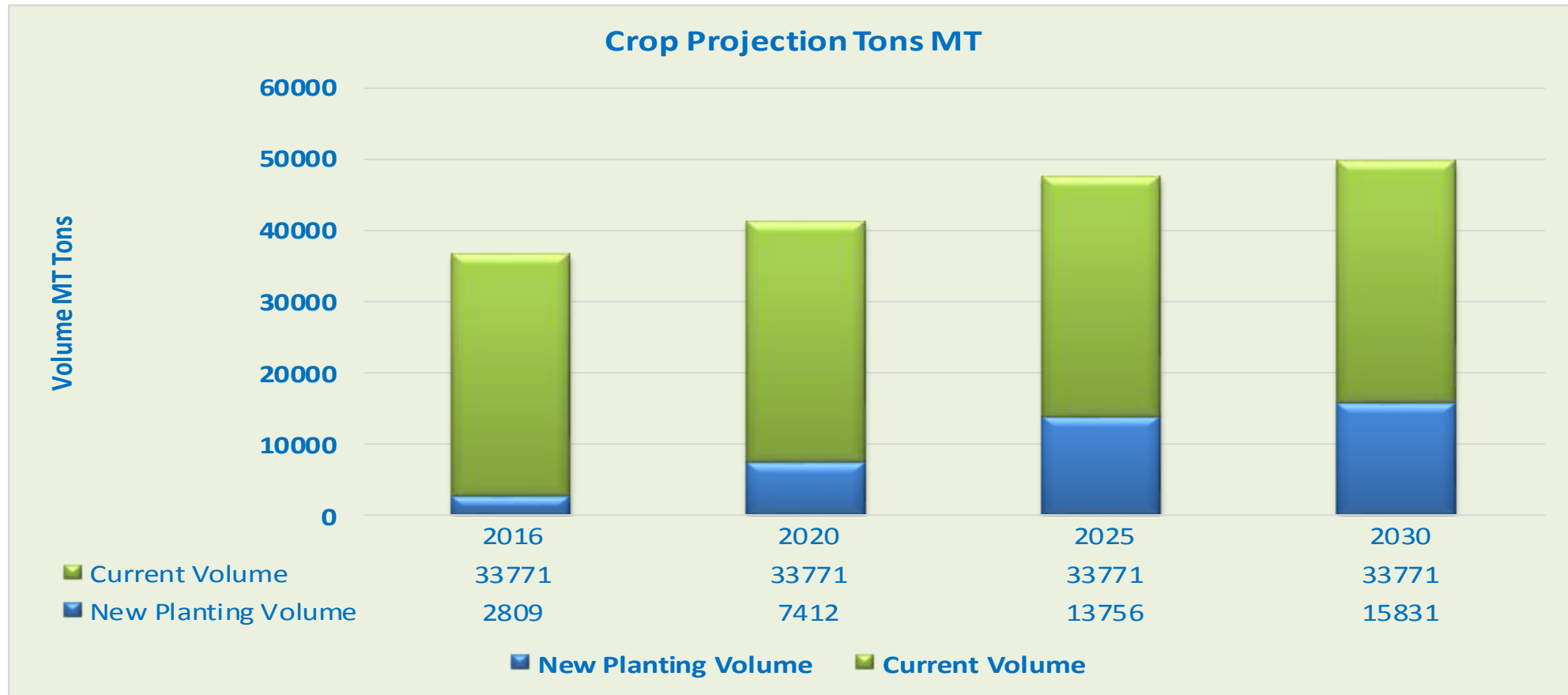
**Seedling
Tea**



**New Tea
Varieties**

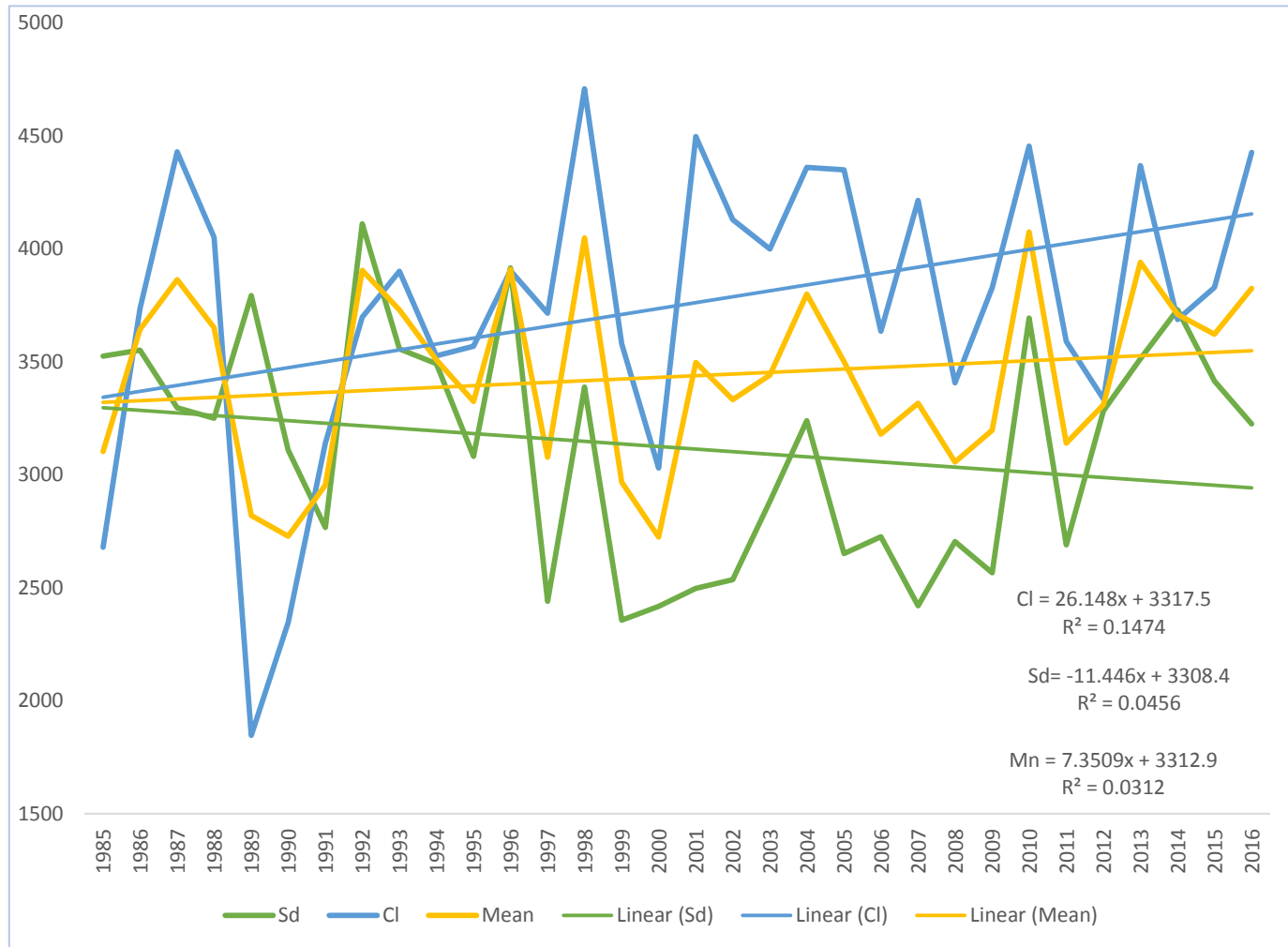
- Yields of above 7500 -8500KgMT/ha
- Uniform plucking rounds
- Adapted to climate change (e.g. drought tolerance)
- Reduced agrochemicals (input use efficiency, pest resistant)
- Reduced deforestation (increased yield)
- Premium tea through quality differentiation

Yield Projections with the Adoption of New Varieties



With adoption of new varieties the expected yield increased is projected to be over 35% from the current yields.

Yield Progress in the Breeding Program



Yield representation for 29 years in one estate shows the following:

- Seedling yield has declined over years
- New varieties of tea planted have higher yields that are increasing with the maturity of the crop
- The new varieties are performing above the mean
- Linear representation of the data shows that the yield of the new tea varieties is on the rise while that of the seedlings is decreasing





Empowering Women Researchers and Entrepreneurs in Africa, Casablanca, 2017



Benefits of New Varieties to Farmers

- ❖ Higher and stable yields adapted to a growing environment
- ❖ Resistance to biotic and abiotic stresses
- ❖ Increased rural income and social livelihood for farmers

Challenges in Adoption of New Varieties

- ❖ Time of variety release
- ❖ Farmer awareness- poor information flow
- ❖ Accessibility to planting material

How To Promote New Varieties

- ❖ Trade fairs/ shows
- ❖ Agricultural expos
- ❖ Farmers field day
- ❖ Participatory plant breeding (PPB)
- ❖ Local agricultural research committee (CIAL)
- ❖ Demand- led Breeding (DLB)

Demand-Led Breeding- An approach that enables breeders to develop higher performing varieties that meets customer requirements and market demand.

Demand- Led Breeding Principles

Six key principles:

- Client preferences
- Analyze value chain of target crop
- Market research to define the performance standard and priority
- Market trends and drivers
- Integration of public and private sector expertise
- Multi- disciplinary team approach

STEEP (Social, Technological, Economic, Environmental and Political/Policy) analysis and scenario creation:

- Step 1: Identify key drivers of change and assess their predictability
- Step 2: Access reliable information sources
- Step 3: Scenario creation using unpredictable drivers ('splitting factors')
- Step 4: Variety specification validation- IP

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- ✓ Principles
 - ✓ Vision and foresight of breeding goals
 - ✓ Understanding client needs
 - ✓ New variety design and product profiling
 - ✓ Variety development strategy and stage plan
 - ✓ M & E

Persley & Anthony, 2017

Variety Development Strategy- DLB:

1. Crop supply and demand landscape- 'the problem'
2. Policy and enabling environment
3. Market analysis
4. Target clients and market segments
5. Variety design and market positioning
- 6. *Intellectual property***
7. Development stage and activity plan/timetable
8. Development costs
9. Development investment case
10. Project governance and decision making
11. Client awareness and raising demand
12. Seed system and delivery to farmers
13. Monitoring post release performance and adoption
14. Performance measures and risk management

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Learnings From Tea Breeding That Can Be Applied To Neglected And Underutilized Crops (NUS)

Assess the existing production environment:

- Increasing global population
- Pressure on finite resources
- Climate change

Identify Existing Benefits of NUS crops:

Adaptation or tolerance to abiotic stresses increases their importance in food security

Identify Challenges:

- crops traits such as:
- low yield
 - poor nutritional value
 - production of toxic substances

Focus on Viable Solutions:

Increase breeding efforts to are focusing towards achieving improved cultivars that are adaptable to diverse environments and tolerant to biotic and abiotic stress

Reference:

- Persley, G. J., & Anthony, V. M. (2017). The business of plant breeding: market-led approaches to new variety design in Africa. *The business of plant breeding: market-led approaches to new variety design in Africa*

Thank You for Your
Attention