

*Plant and Animal Genome XX  
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# **Epigenetic regulation of flower development in the oil palm**

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# Why studying the oil palm at all?

- Because it is the 1<sup>st</sup> world source of vegetable oil and consumption for food and energy can only rise with increasing population.
- Because its *mantled* floral phenotype provide an original model where agro-economical interests fuel the search for basic knowledge in a tropical perennial.

# Characteristics of the *mantled* phenotype



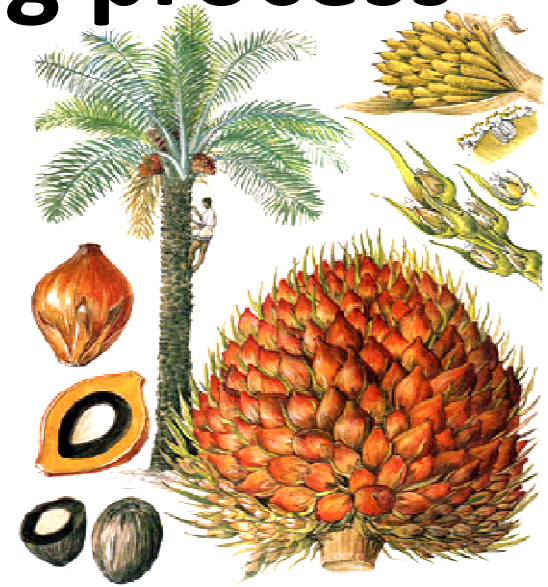
- Somaclonal variation: arises from *in vitro* cloning
- Alteration of floral organs:  
poor oil accumulation, infertility, visible in adult trees only
- Highly heterogeneous: frequency, severity, genotype effect
- Unstable: spontaneous reversion

# Dealing with *mantledness* from both ends of the cloning process



Embryogenic cell culture

Somatic embryogenesis



Adult regenerant palm

- Working on adult palms to understand the molecular origin of the floral phenotype
- Working on *in vitro* cultures to test potential markers for early detection

# A few things we know about *mantled*

- No genetic/cytologic alteration
- Non-mendelian inheritance
- Hypomethylated genome



-19.3%



-7.4%

- Altered gene transcription
- Phenotype: stamen converted into carpels, reminiscent of B-class MADS-box gene mutants



Wildtype



B mutant

# **The hypothesis**

- **Epigenetic mechanisms regulating gene expression are perturbed by the cloning process (hormones, re-programming)**
- **Most of these alterations have no detectable impact on the phenotype and/or subside**
- **The pathway governing floral organ formation remains affected in the adult stage (sensitivity shared amongst Palms?)**

# **The strategy**

- ***In vitro* material: investigating the genomic and epigenetic stability during the tissue culture process**
- **Adult (inflorescence) material: exploring the epigenetic regulation of flower development**

# The strategy

- ***In vitro* material: investigating the genomic and epigenetic stability during the tissue culture process**

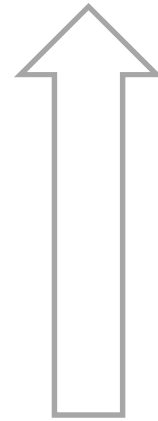


Follow-up on the  
phenotypic stability  
in the field

- **Adult (inflorescence) material:  
exploring the epigenetic regulation of  
flower development**

# The strategy

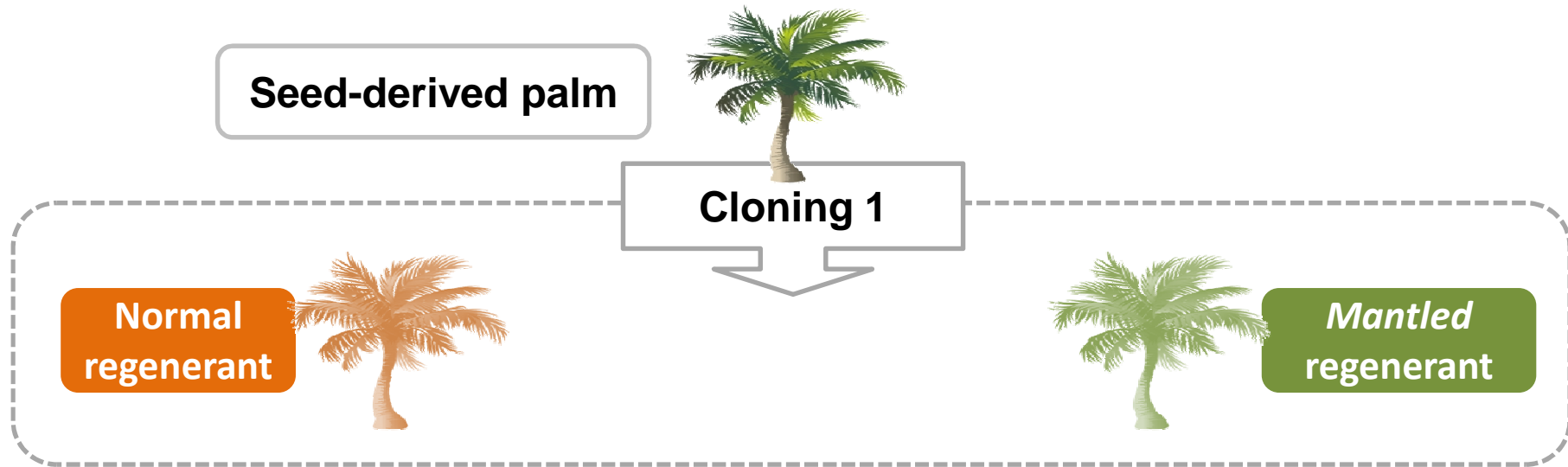
- ***In vitro* material: investigating the genomic and epigenetic stability during the tissue culture process**



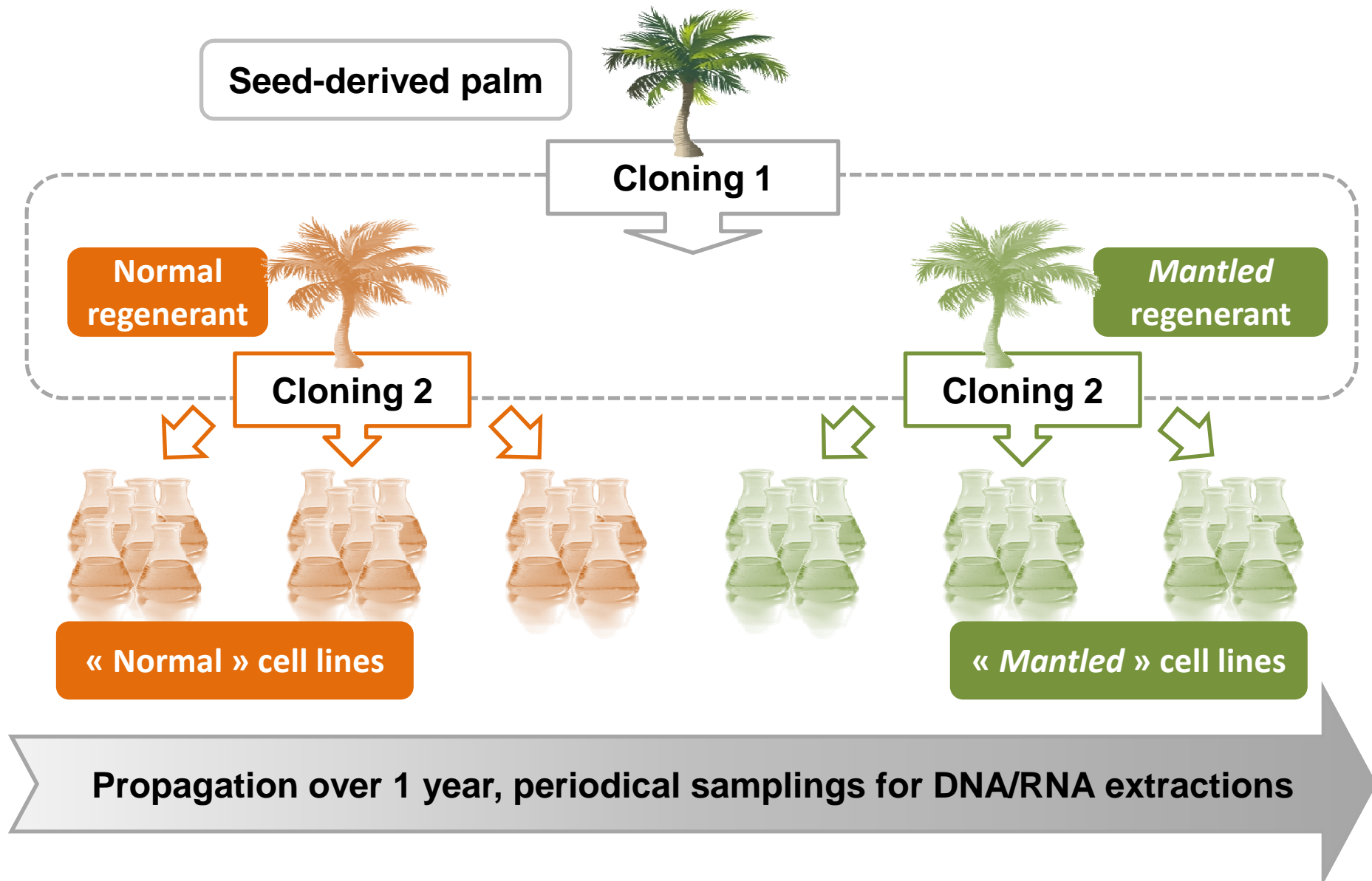
Tracing back the origin  
of the *mantled*  
phenotype

- **Adult (inflorescence) material:  
exploring the epigenetic regulation of  
flower development**

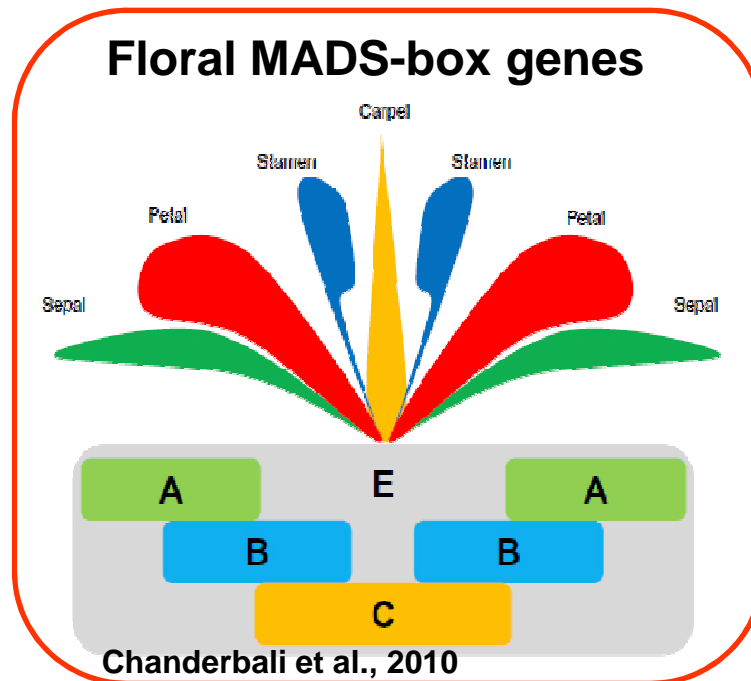
# Investigating the stability of cell cultures



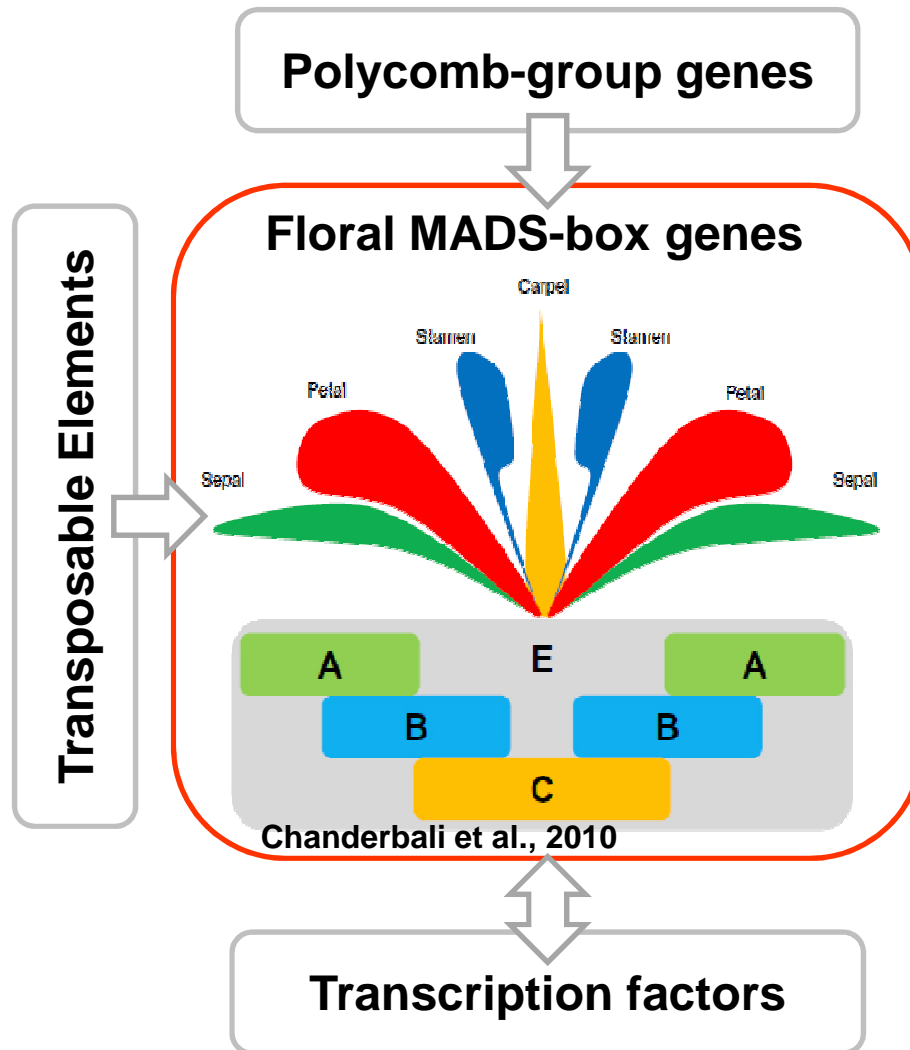
# Investigating the stability of cell cultures



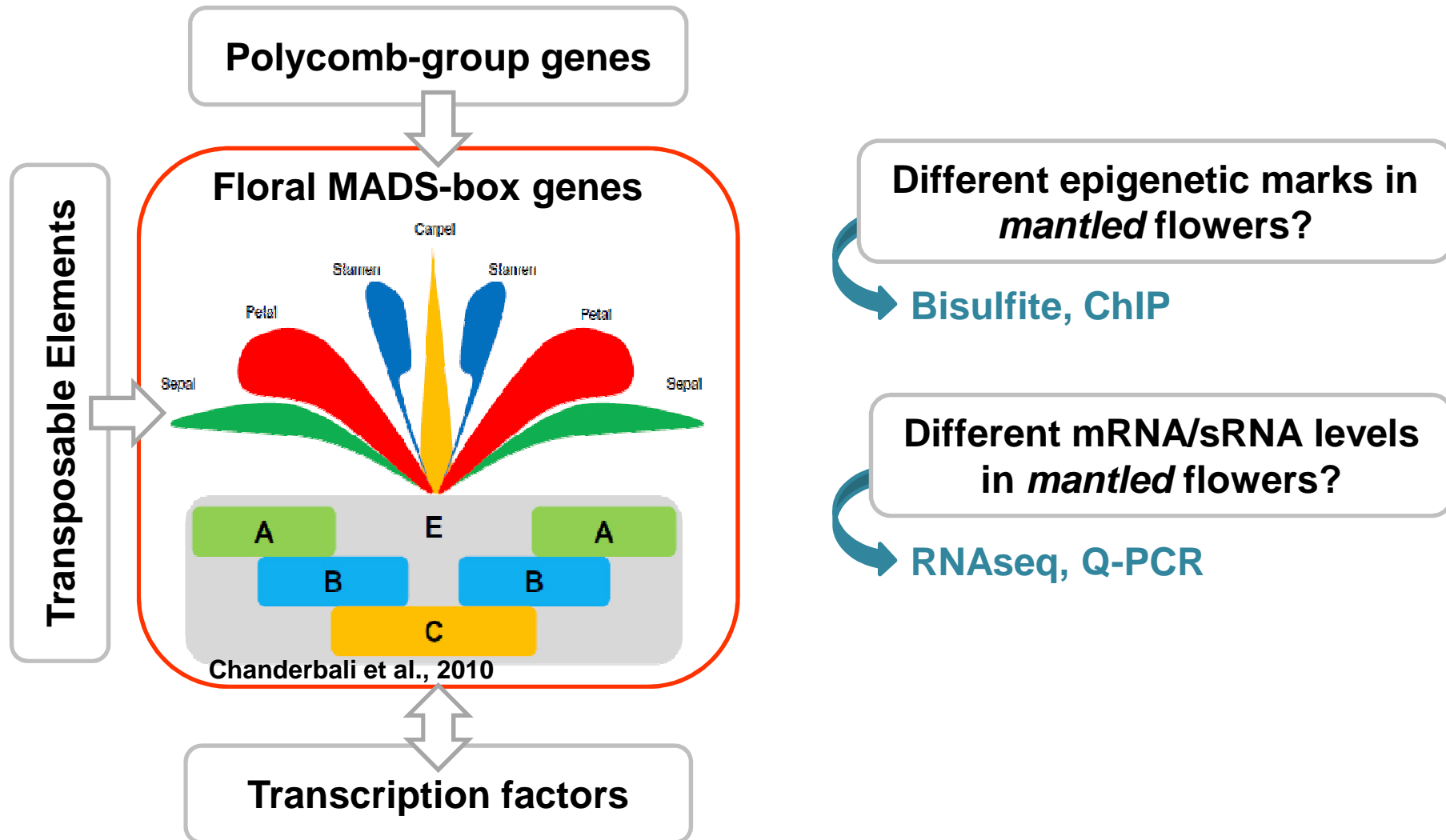
# Exploring the epigenetic regulation of flower development



# Exploring the epigenetic regulation of flower development



# Exploring the epigenetic regulation of flower development



**« Things written in pen you can't change. That's DNA.  
But things written in pencil you can. That's epigenetics »**

**Danielle Reed, geneticist**  
*National Geographic, January 2012 issue*

**Thank you for your attention**

