



# Ergonomic interventions to achieve Modernised Silviculture

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**PRECISION  
FORESTRY**

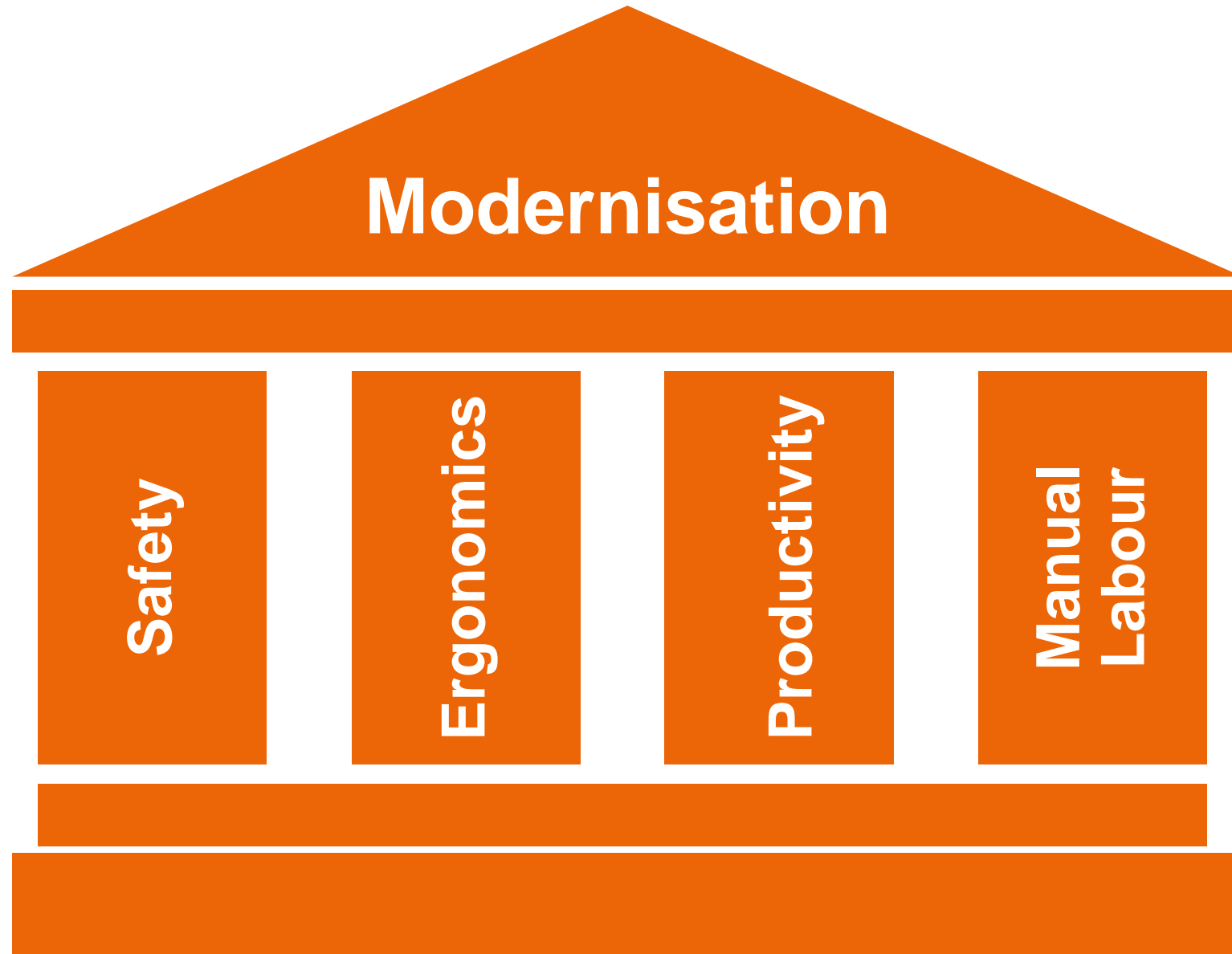


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October 2019

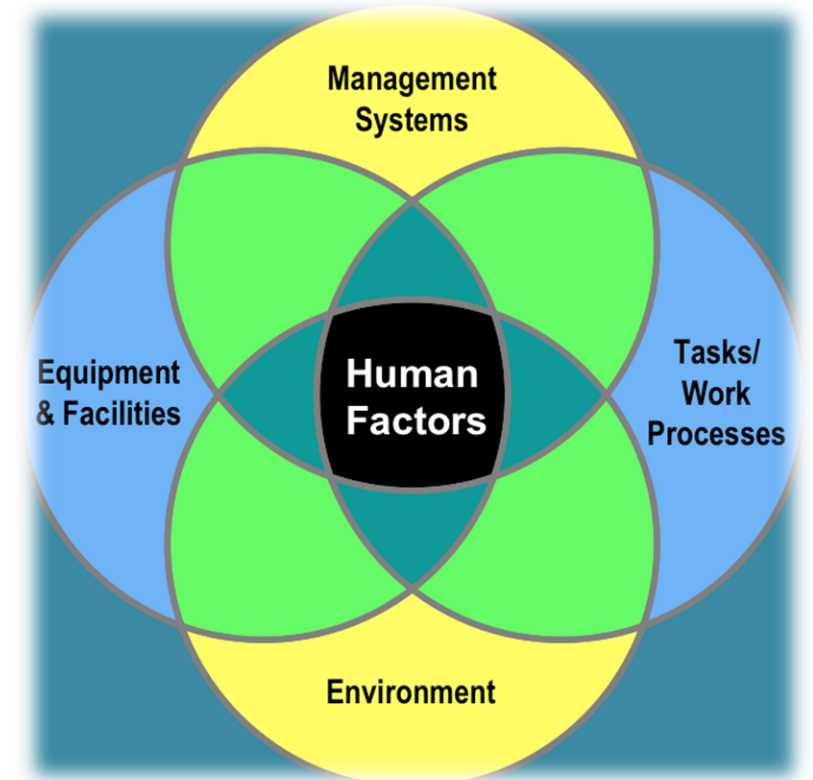
# Factors driving modernisation



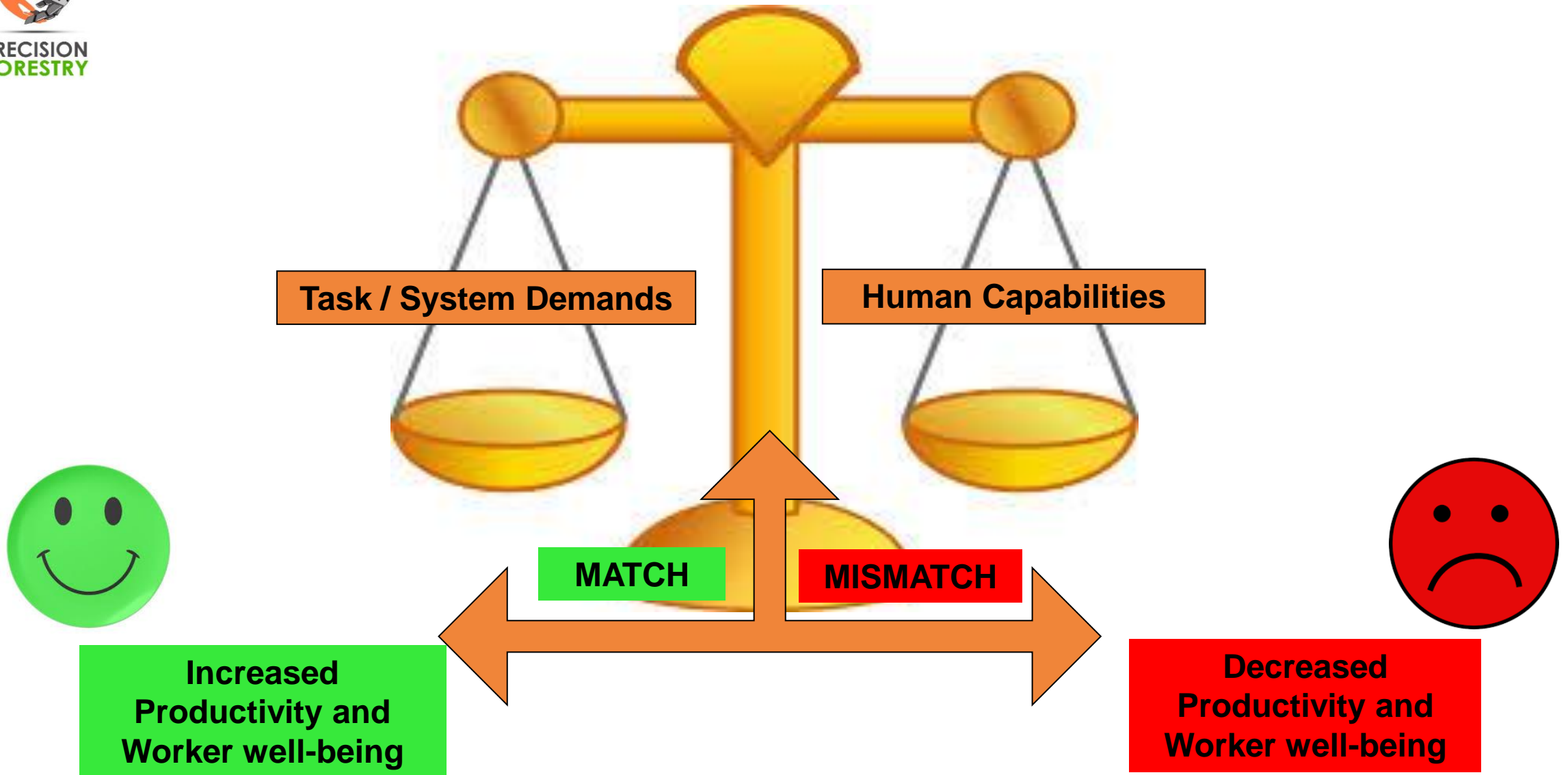
# What is human factors/ Ergonomics ?

Ergonomics (or human factors) is the **scientific discipline** concerned with the **understanding of interactions among humans and other elements of the system** , and the profession that applies theory principles , data and methods to design in order to **optimize human well-being and overall system performance**

(International Ergonomics Association)



# What is ergonomics ?



# Domains of Ergonomics



## Physical

Concerned with the human anatomical , anthropometric , physiological and biomechanical characteristics as related to the physical activity



## Cognitive

Concerned with mental processes, such as perception, memory, reasoning, and motor response, as they affect interactions among humans and other elements of a system



## Organizational

Concerned with the optimization of sociotechnical systems, including their organizational structures, policies, and processes.

# Ergonomic risk factors

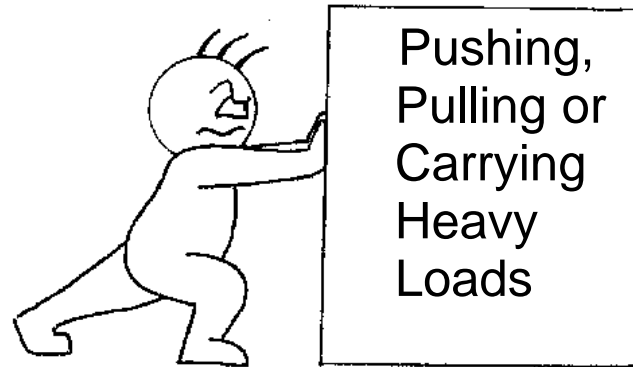


Working in Awkward Postures



Repetitive motions

Heavy, Frequent, or Awkward Lifting



High impact forces



Fatigue

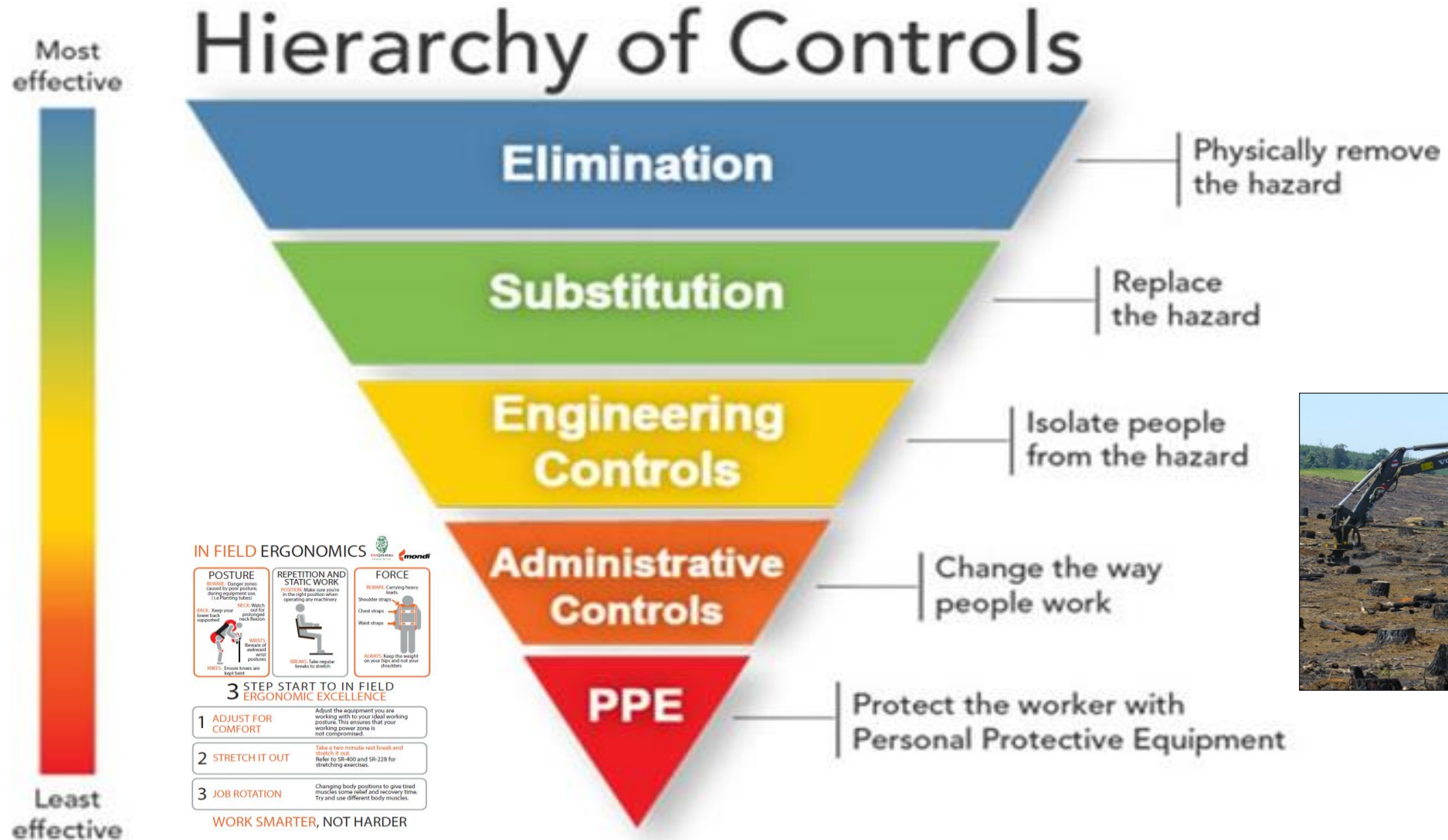
Vibration





# Ergonomic interventions

A number of interventions were applied to reduce ergonomic risk

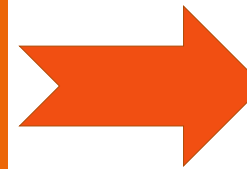




# Continuous improvement interventions

## Pitting

### Physically Demanding Task



### Cognitively Demanding Task



#### Ergonomics Risks

- Repetitive Shoulder movement
- Awkward lower back posture

#### Ergonomic Risks

- Awkward lifting and carrying

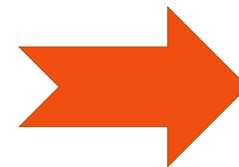
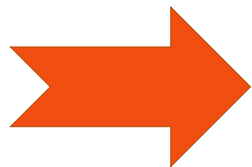
#### Ergonomic Risks

- Static working posture
- Cognitive Fatigue

# Continuous improvement interventions

## Planting

### Physically Demanding Task



#### Ergonomics Risks

- Awkward lower back posture (stooping)
- Awkward wrist posture
- Heavy lifting

#### Ergonomics Risks

- Prolonged walking with weight on back

### Cognitively and Physically Demanding Task



#### Ergonomics Risks

- Prolonged walking with no weight on back at machine pace

# Physiological response to work



BT 45 Auger



BT 130 Auger



Manual Hoe



Imvukuzane

Machine	Average heart rate (bpm)	Max heart rate (bpm)	Work Load
BT 45 (1- man)	100.25	126	Moderate
BT 130 (1-man)	131	158	Very Heavy
BT 130 (2-man)	118	149	Moderate
Imvukuzane (1-man)	120	188	Heavy
Hoe	94	120	Moderate



# Benefits of applying ergonomics



Risk of WSMDs

Quality of Work

Safety Risk

Productivity

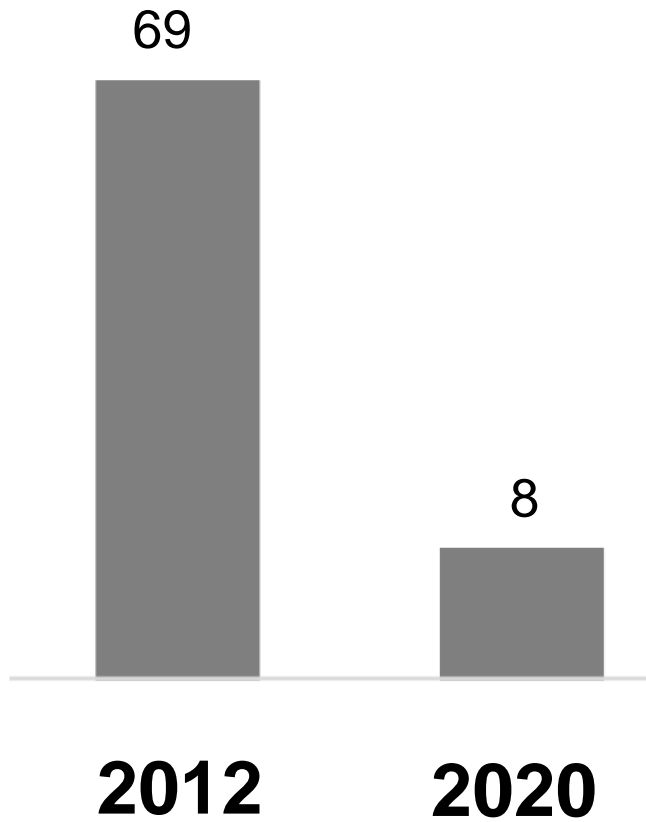




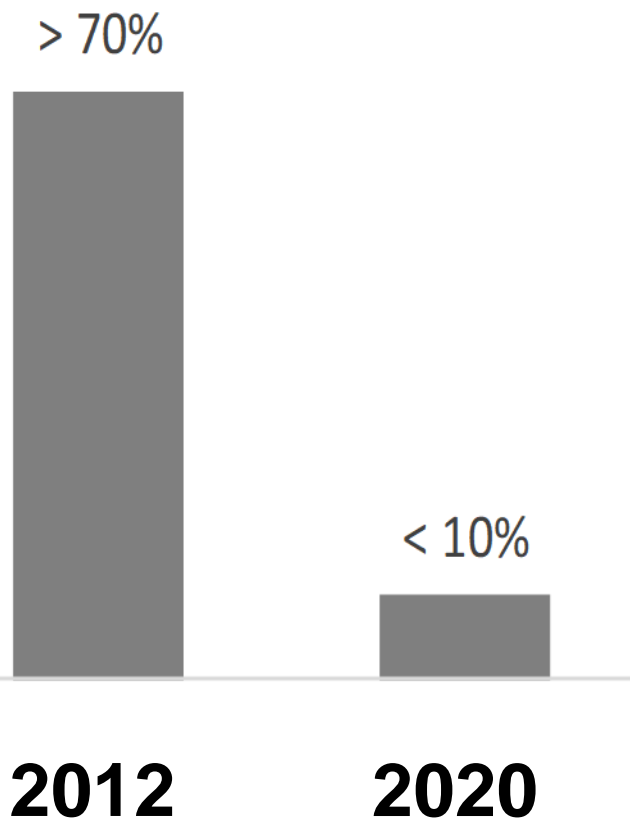
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# Safety improvements

**Safety improvement**  
Total recordable cases

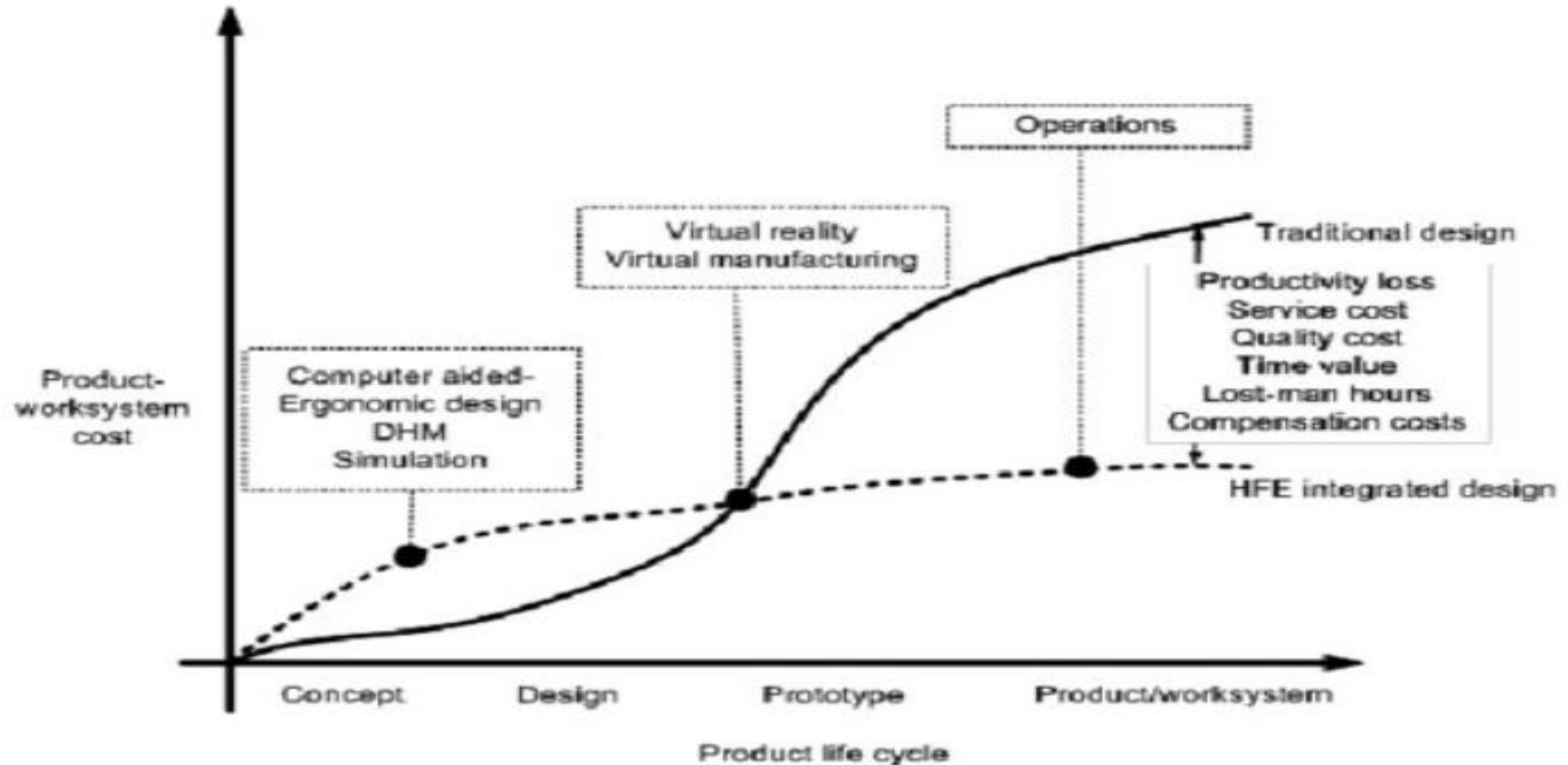


**Ergonomic challenging work**  
Percentage of forest work



# Ergonomics in Design

The benefit of an Ergonomics integrated design





# Conclusion

- Good ergonomic practices takes a human centred approach
- A number of interventions applied in modernisation were focused on reducing the physical risks of manually intensive operations
- Due to the number of engineering interventions , modernised silviculture work is now highly cognitively demanding
- There a cost benefit associated with including ergonomics at the design stage of product development

Thank- You  
Work Smarter , Not Harder

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