

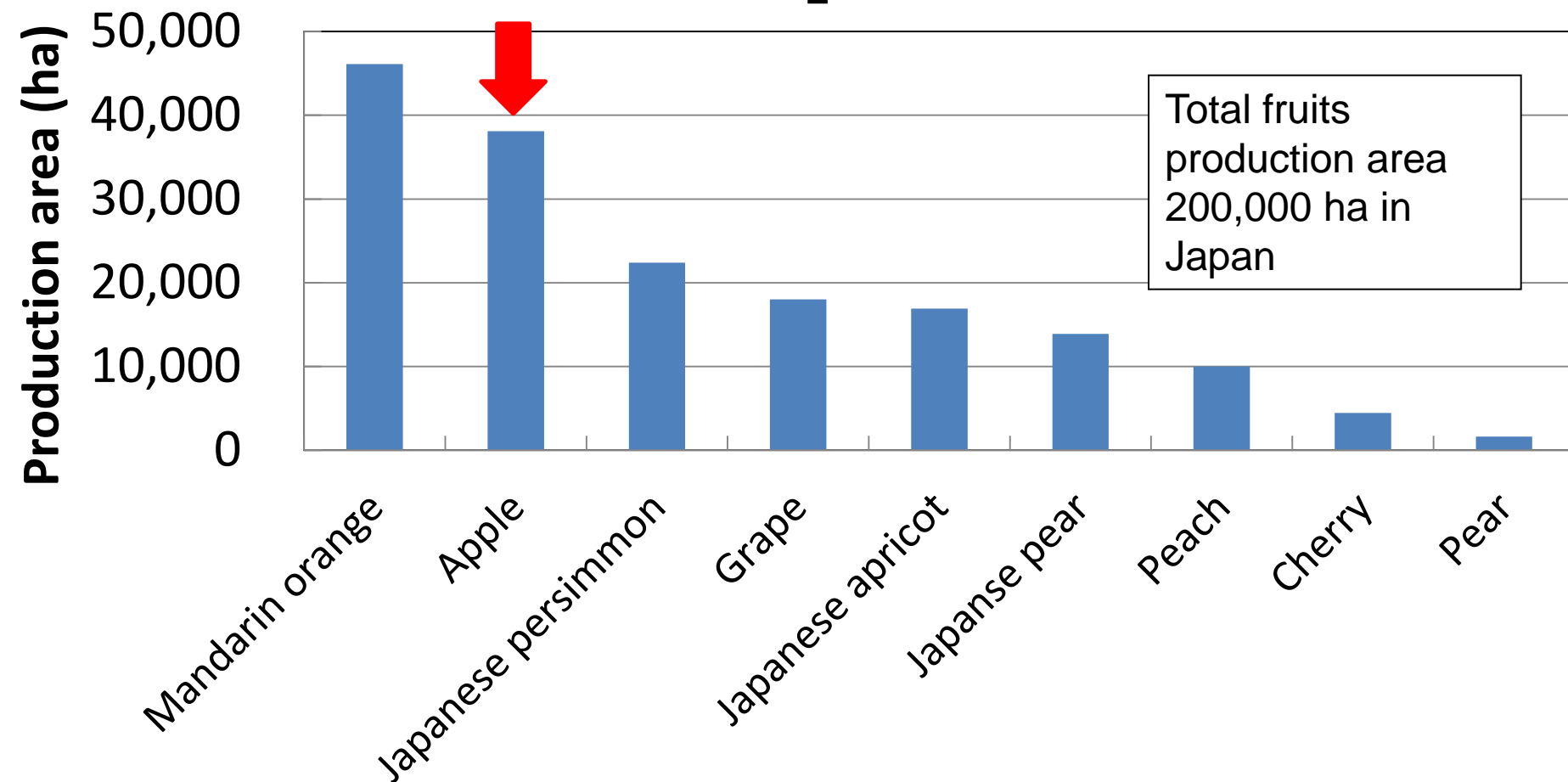
**Development of a Small  
Electric Work Platform with  
High Mobility for Apple  
Production in Japan**

**Tomohiko Ota**

**NARO BRAIN-IAM, Sunwa Co. Ltd.,  
Fukushima Agricultural Technology Center,  
Aomori Prefectural Industrial Technology  
Research Center**

# Fruits production

## in Japan



**Apple is main fruit.**

## Project

- **Urgent Project for agricultural machinery development, 2008-2010**
- **MAFF (Ministry of Agriculture, Forestry and Fisheries in Japan)**

## Objectives of development

- **To reduce the workload of using a ladder**
- **To develop a steering mechanism with high mobility**
- **To develop a leveling control system for the worker's safety at a high position**

# Conventional work



**Ladder**



**Deck type**



**Boom type**



**Electric platform**

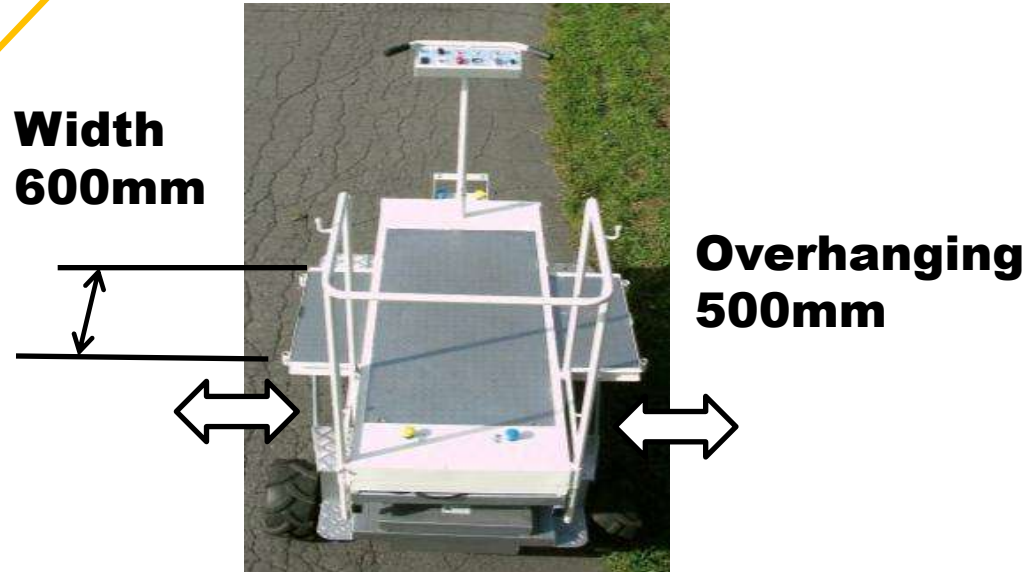


# Developed platform



**Additional platform**

**Width  
600mm**



**Elevating height of 2m**

**Steering device  
for high mobility**

**Leveling control system for  
stability of the platform**

# Structure

## Leveling control device

Hydro-electric cylinder

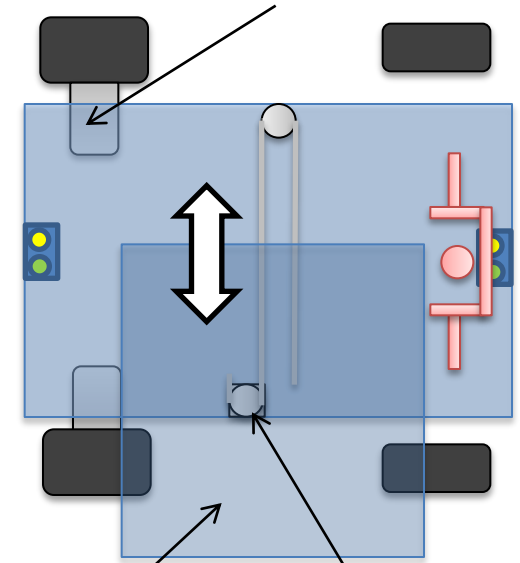
Leveling sensor

## Steering device

Wire, chain, sprocket

→ Simple structure

DC motors for driving wheel



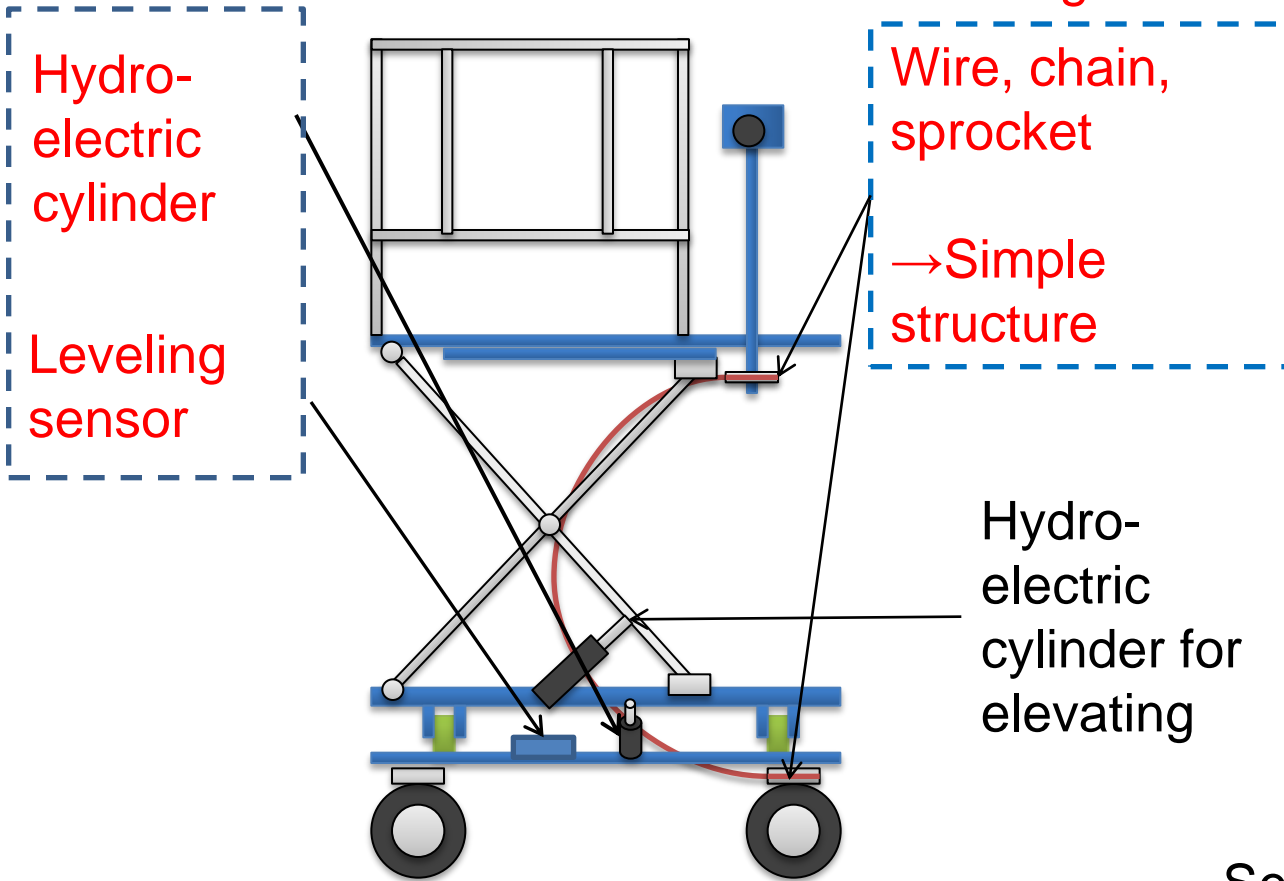
Hydro-electric cylinder for elevating

Secondary platform

DC motor for secondary platform

Driving wheel

Steering wheel



# Advantages

1. Can be transported by a small pick-up truck
2. Stable platform by leveling control
3. Ability to turn in a small radius 2m, **Steering angle 60deg**
4. Continuous working duration exceeds **10 hours**
5. Can be used as carrier, with a load capacity is **200 kg** at the lowest platform position





# Secondary platform

## Advantages

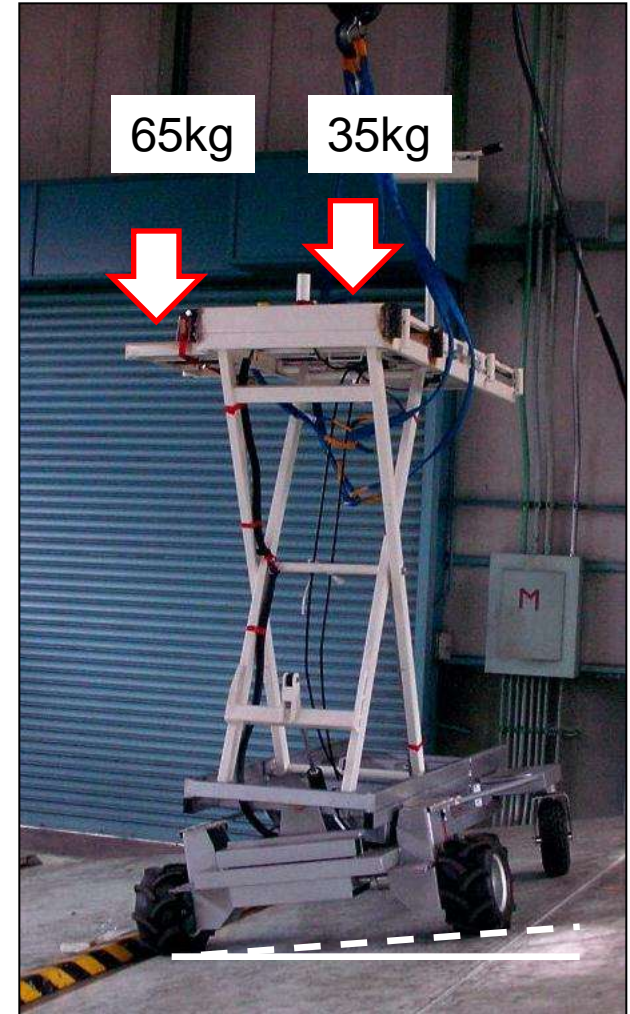
- ① Good working posture, easy to reach apples
- ② Reduce maneuvering time



## Safety

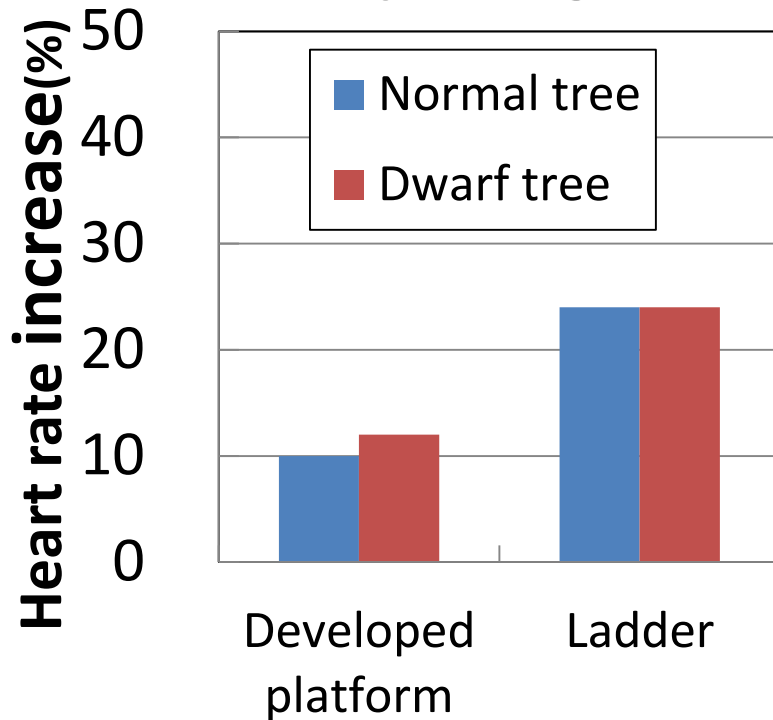
- ① **Leveling control**: Roll over angle 23 deg at highest platform, loaded maximum 100kg
- ② **Speed limited control**: At a platform height of 1.5 m or higher, limited speed of 1km/h

**Criteria for safety**: Roll over angle 15 deg, Limited speed(1km/h at higher 2m)

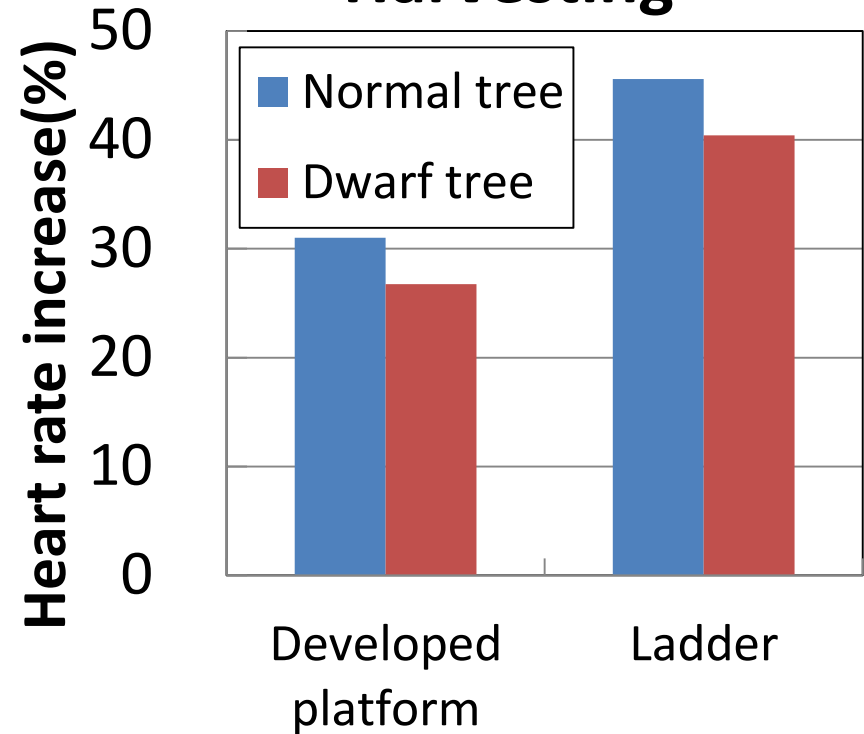




## Leaf picking



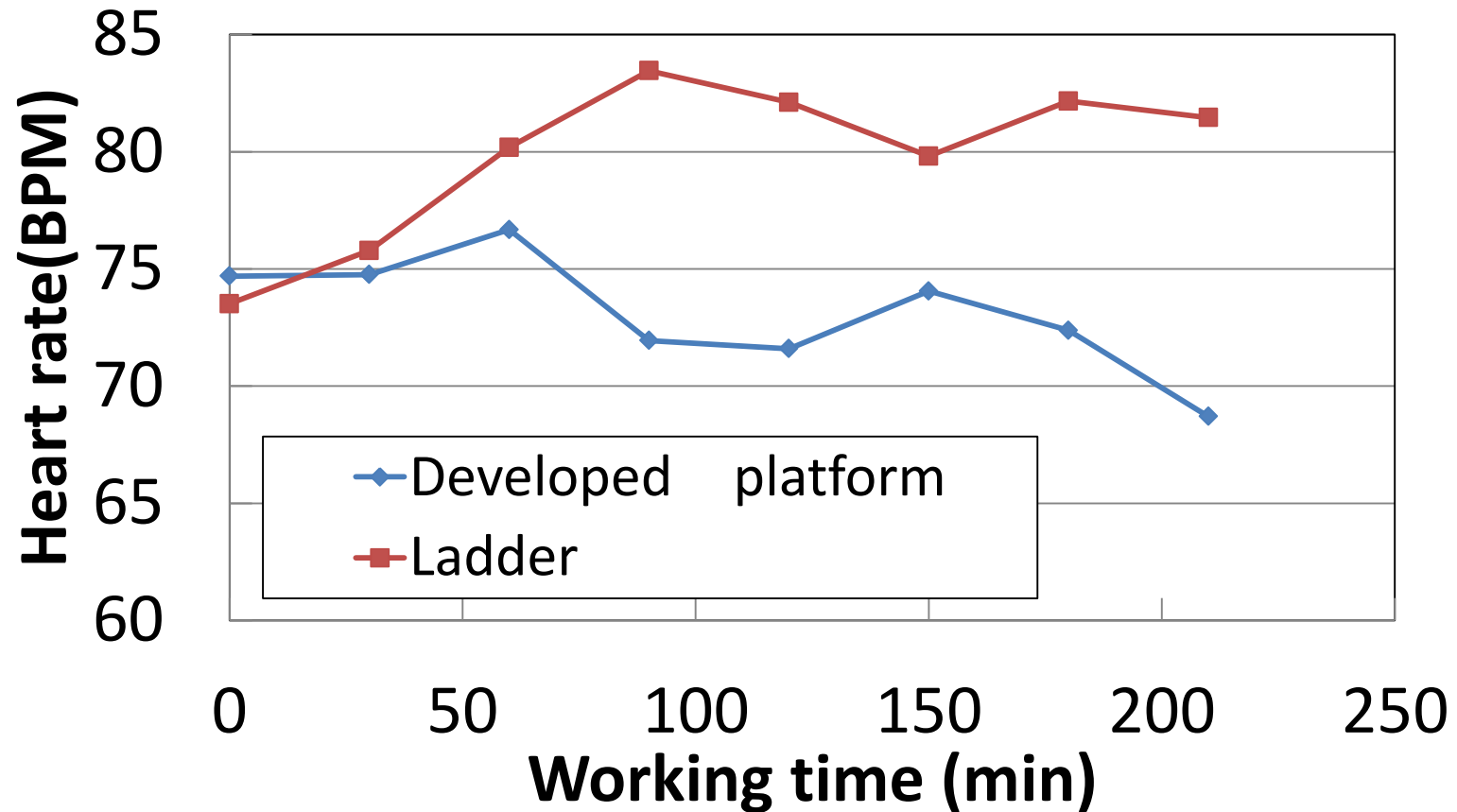
## Harvesting



Average of 30min's continuous work, age 40s, male worker

**Growers can reduce workload.**

# Leaf picking for long time

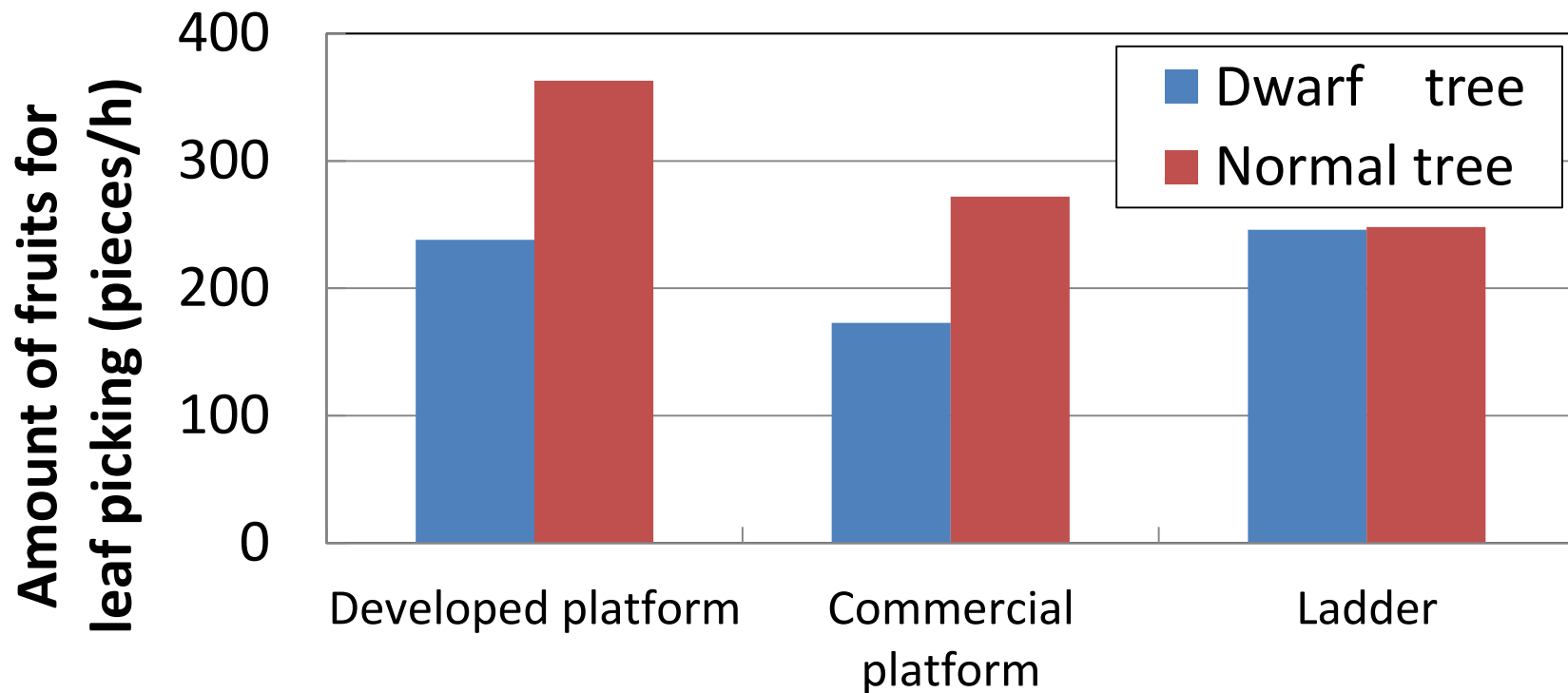


**Continuous work of more than 2 h, 40s male worker,**

Less fatigue, growers can continue working for a longer time

# Efficiency

## Leaf picking using the new platform



### Dwarf tree

**38% higher efficiency than commercial platform**

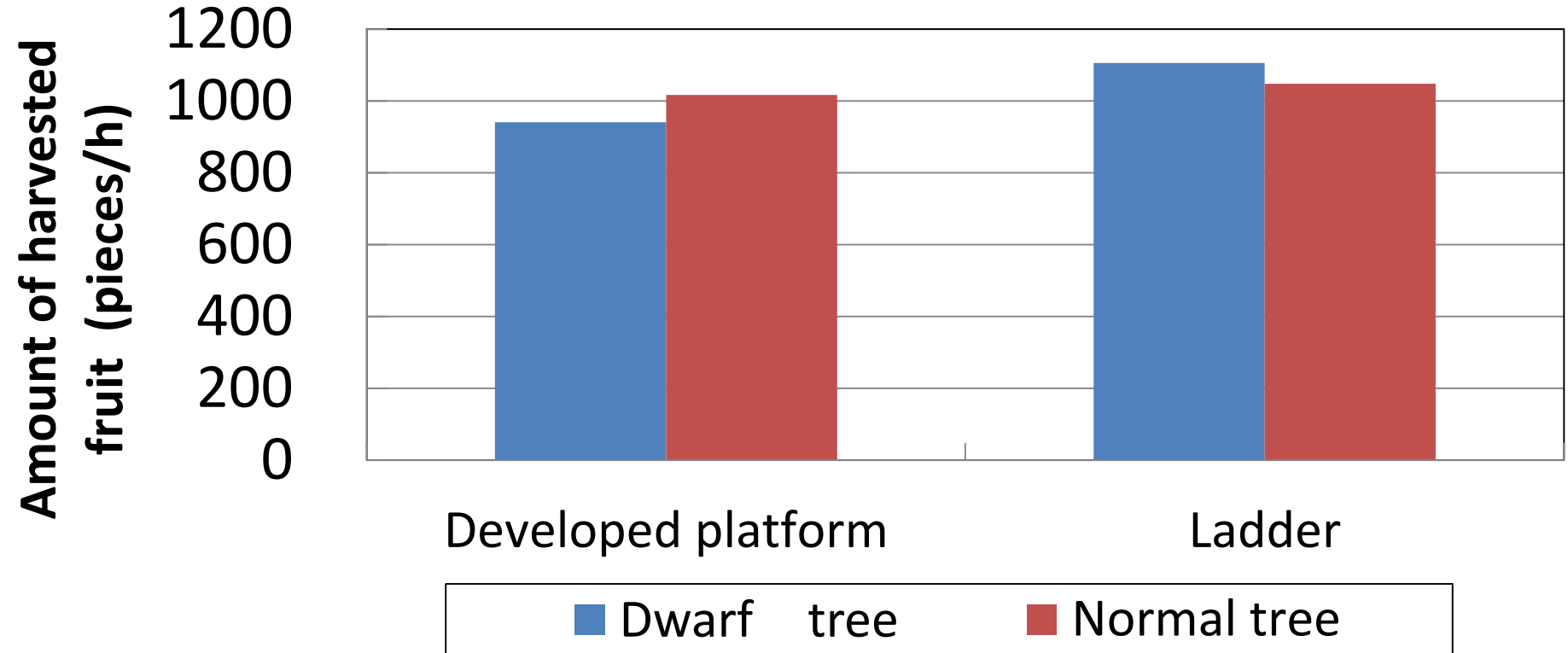
**Same as ladder**

### Normal tree

**46% higher efficiency than ladder**

**33% higher efficiency than commercial platform**

## Harvesting by the new platform



**For Dwarf tree and normal tree**

**Comparable efficiency as for ladder**



# Conclusions

- **Developed small electric work platform. Growers work safely, with reduced workload.**
- **Can be used for 4 m height fruit tree.**
- **Commercialized on Dec. 2011. 7 platforms are marketed.**
- **Only one model as platform with safety certification**



Commercialized  
model

# Harvesting





# Recovery in Fukushima

