

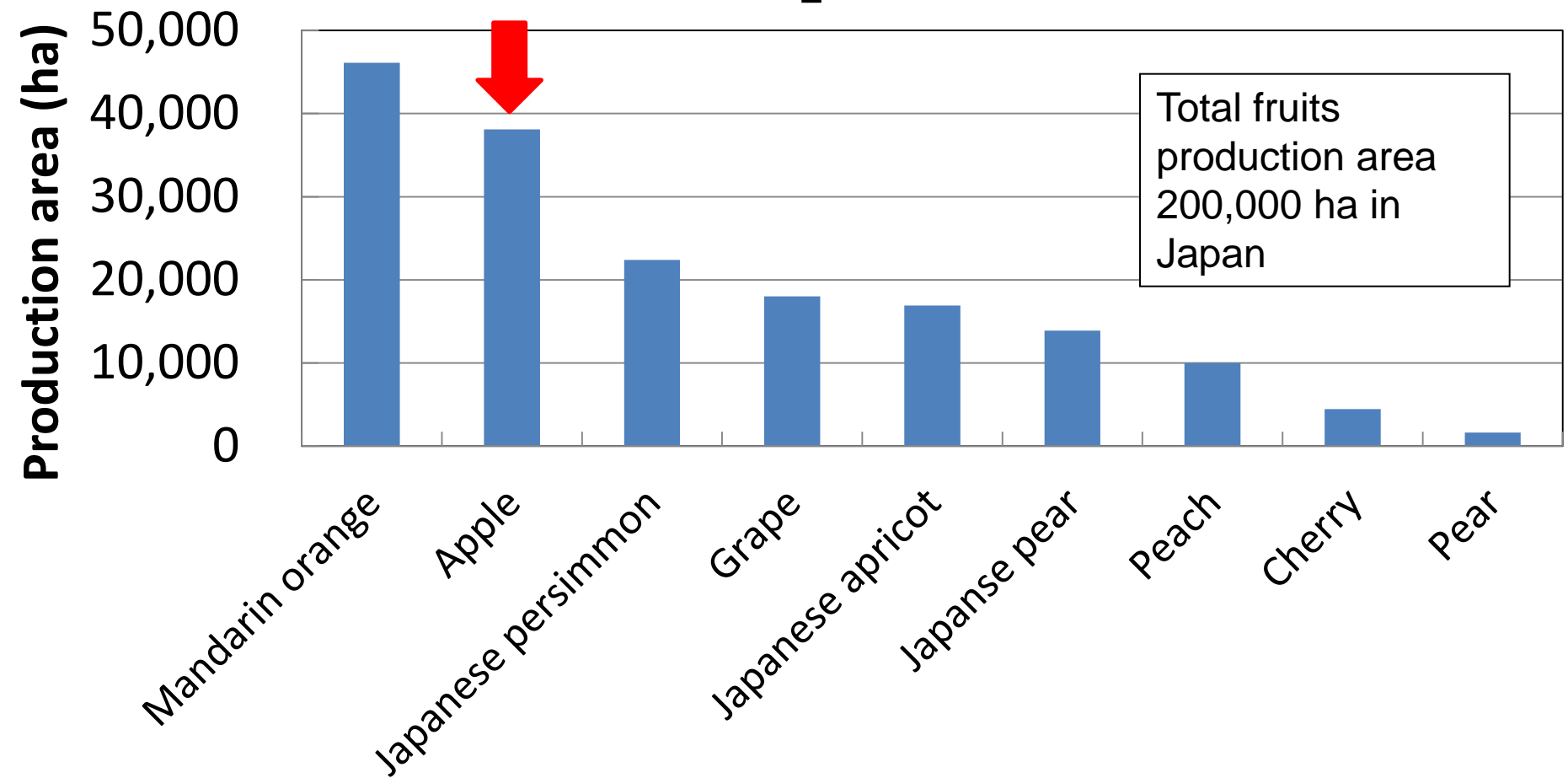
**Development of a Small
Electric Work Platform with
High Mobility for Apple
Production in Japan**

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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



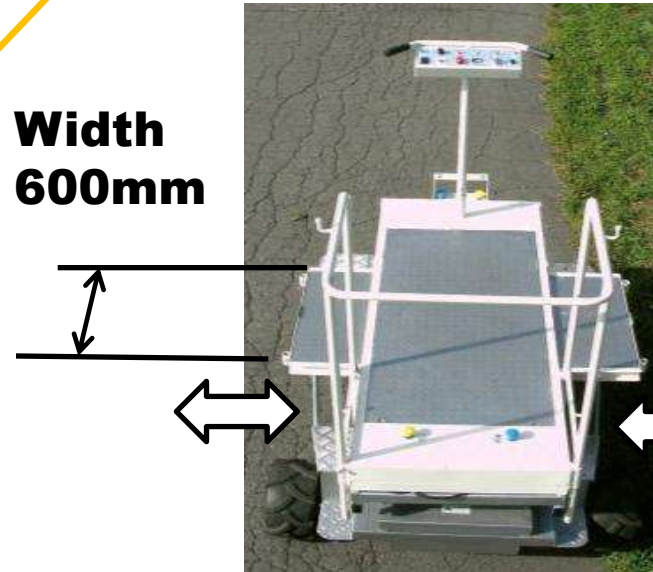
Electric platform

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

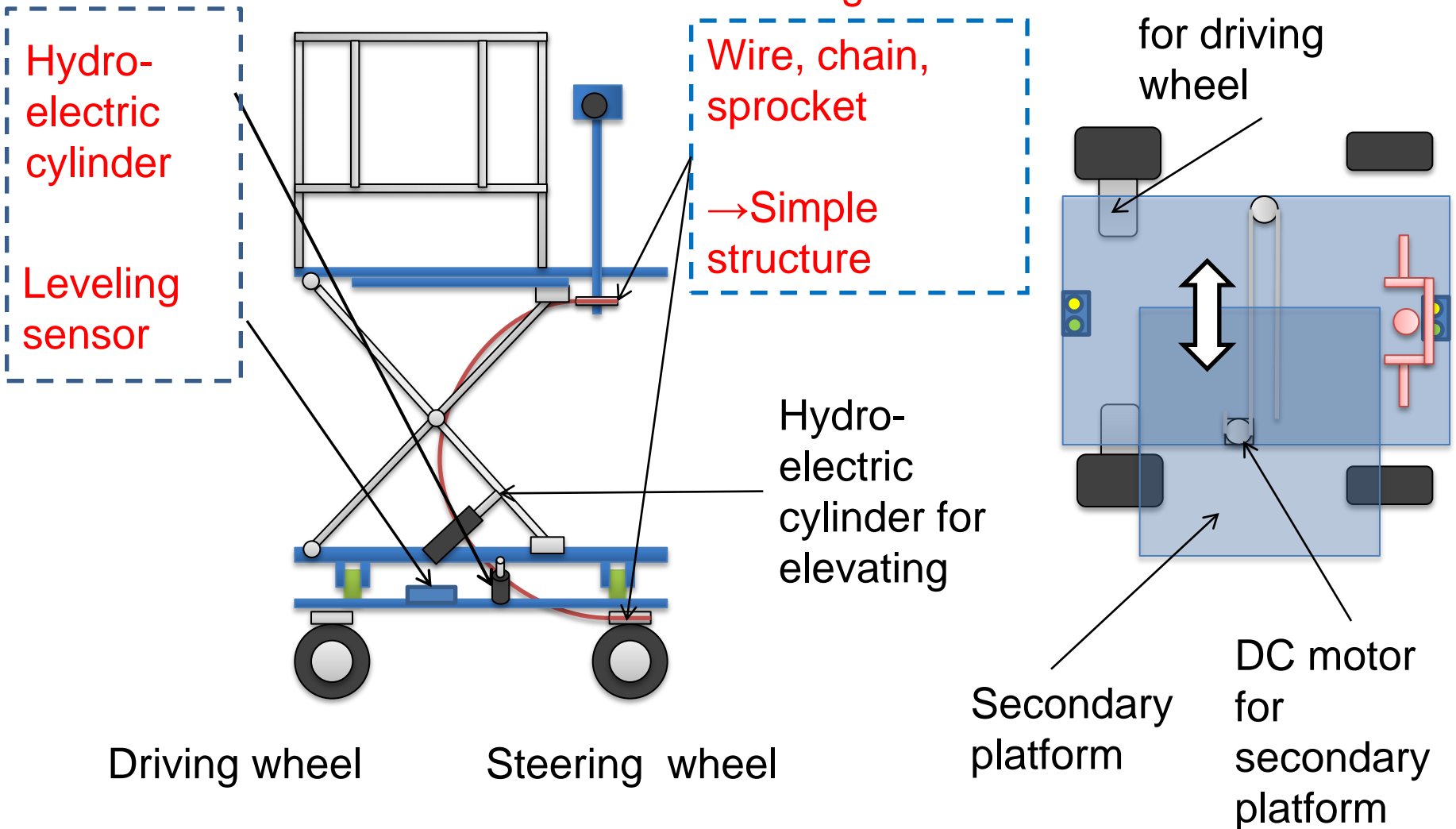
Hydro-electric cylinder for elevating

Driving wheel

Steering wheel

Secondary platform

DC motor for secondary platform



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

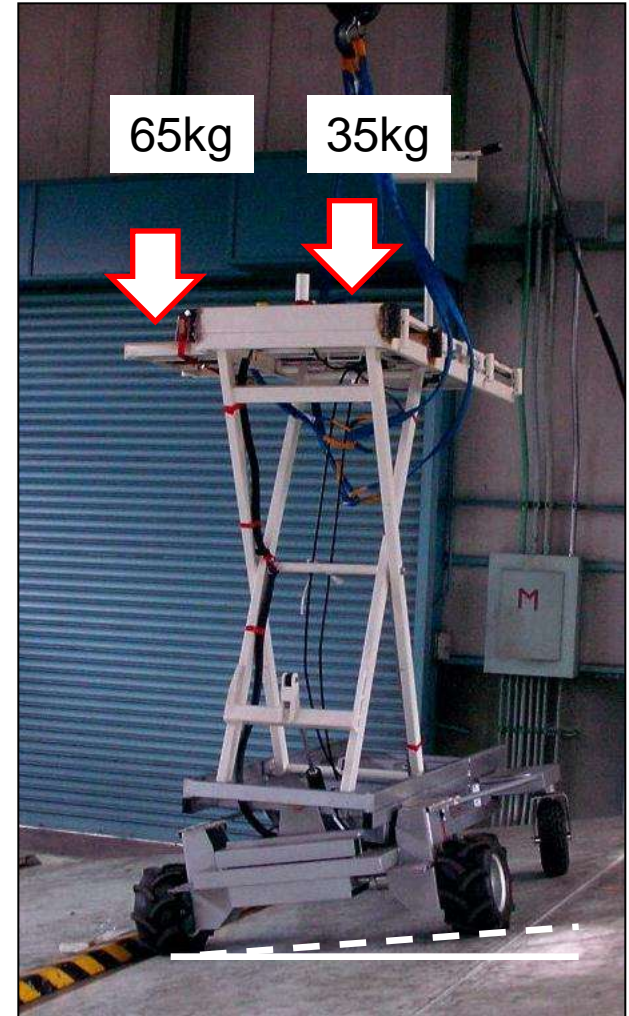
- ① Good working posture, easy to reach apples
- ② Reduce maneuvering time



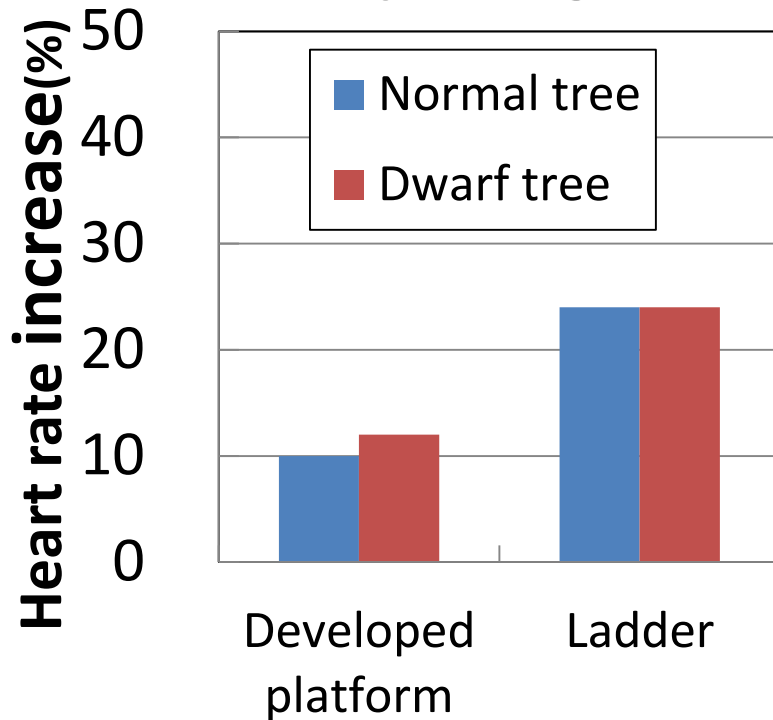
Safety

- 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

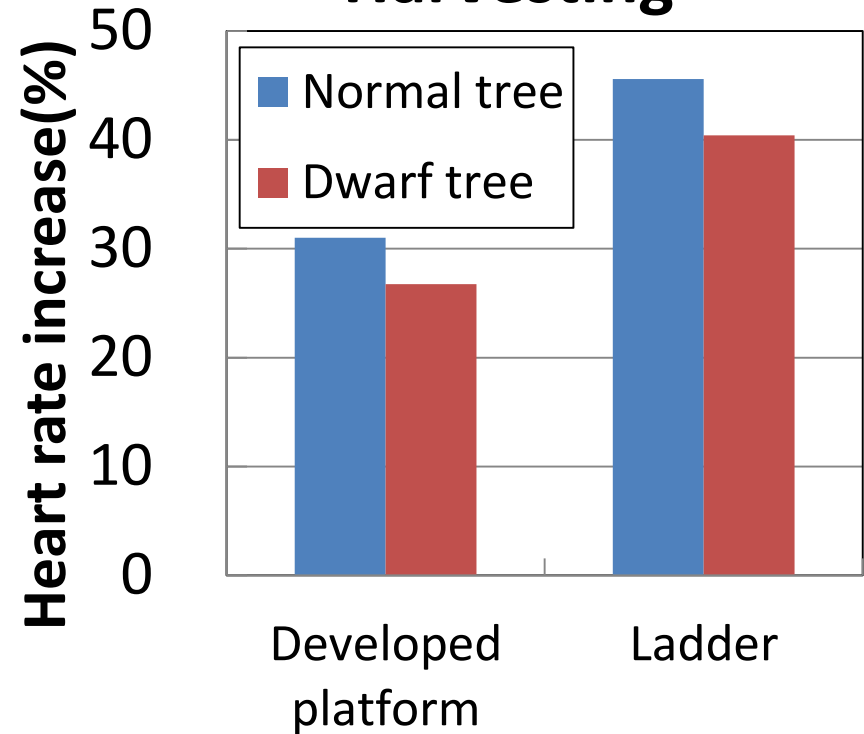
Criteria for safety: Roll over angle 15 deg, Limited speed(1km/h at higher 2m)



Leaf picking



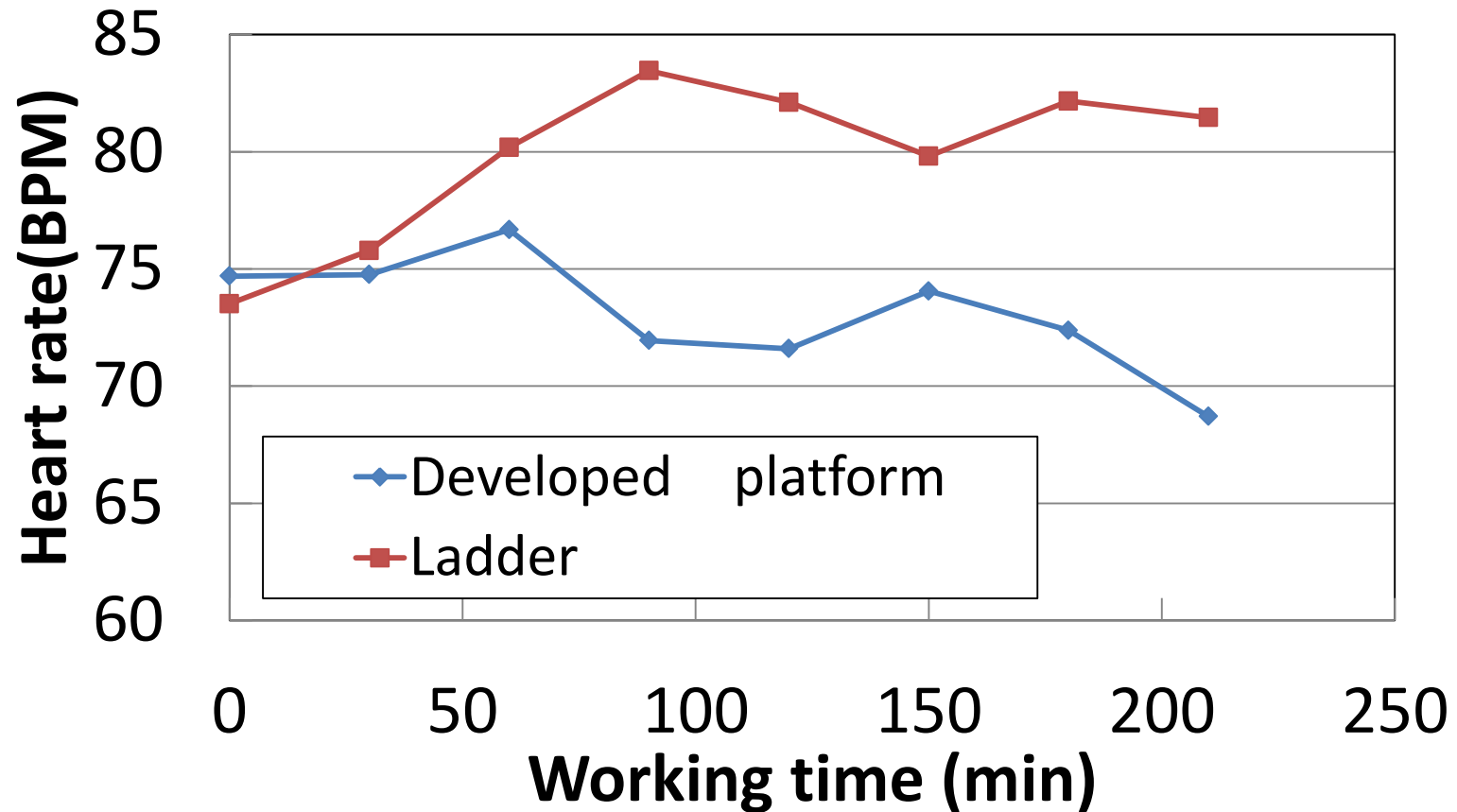
Harvesting



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

Growers can reduce workload.

Leaf picking for long time

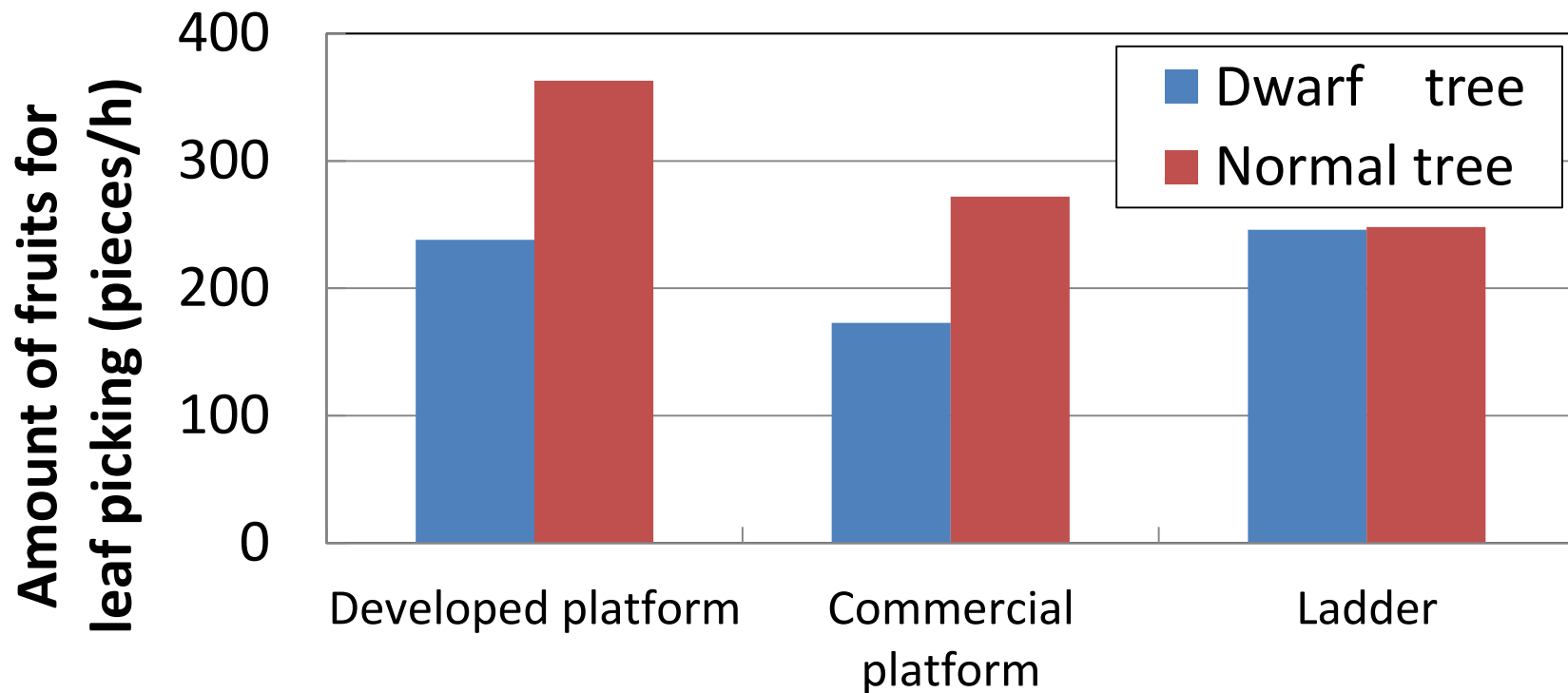


Continuous work of more than 2 h, 40s male worker,

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

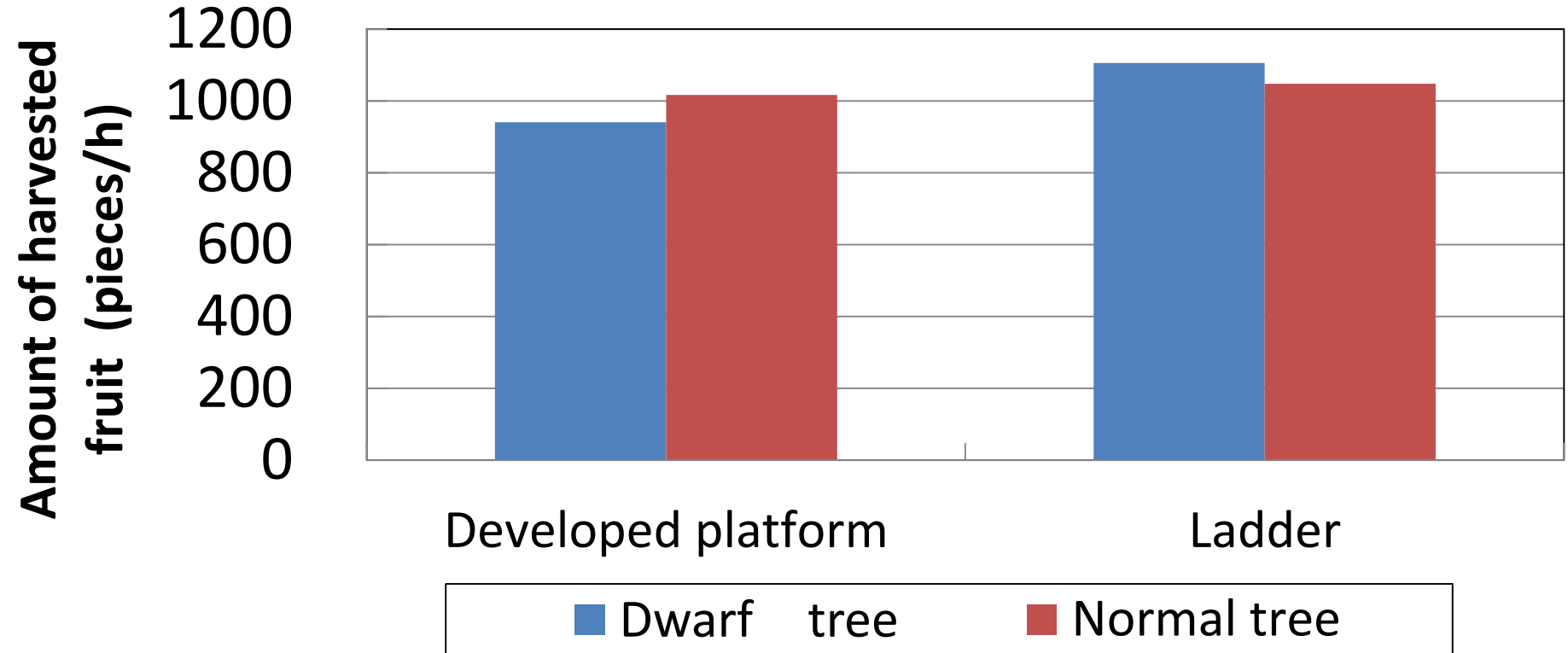
Same as ladder

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

