

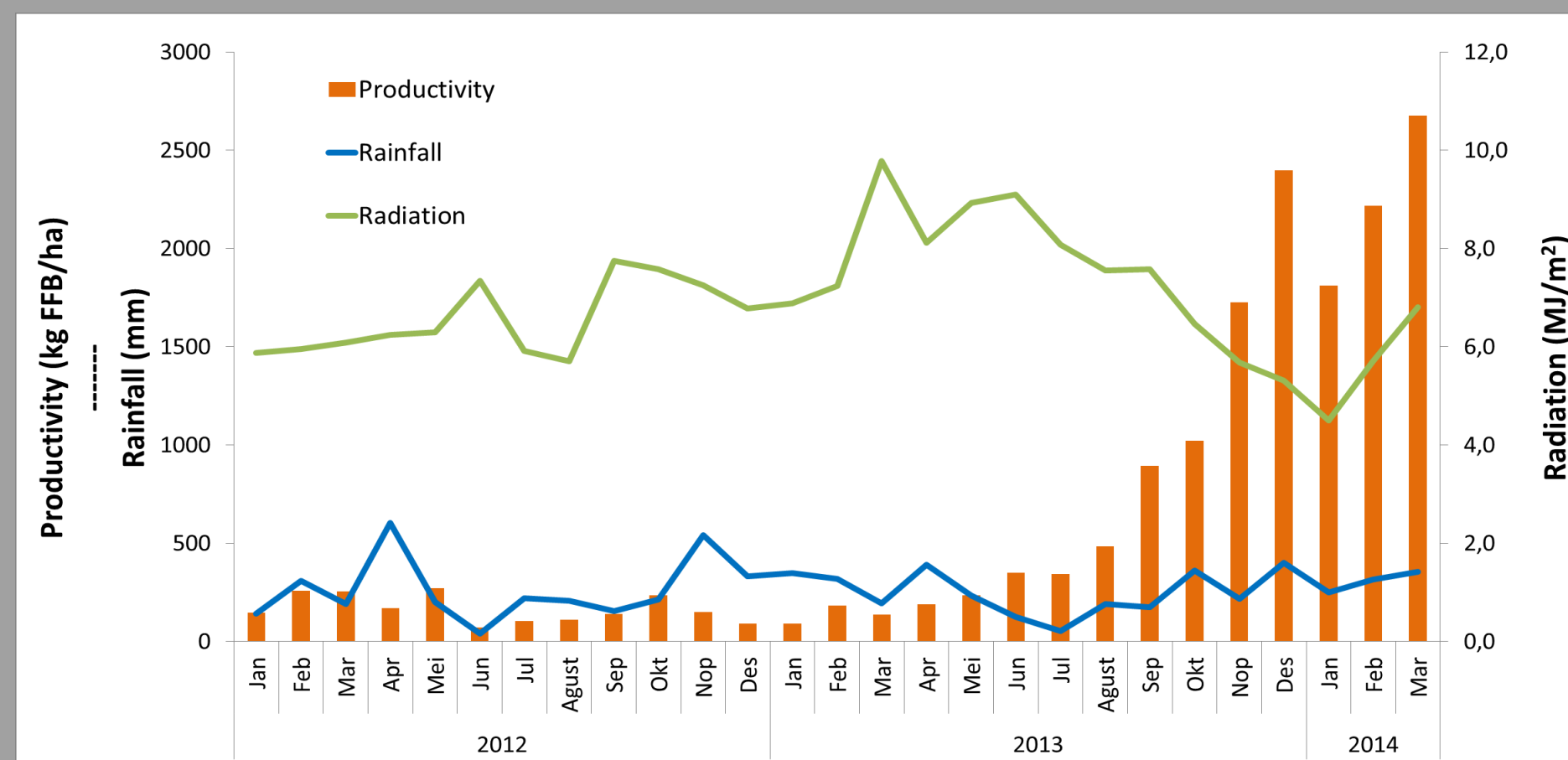
THE FIRST PERFORMANCE OF OIL PALM IN HIGH ALTITUDE

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The increasing temperature because of global warming causes oil palm development in high altitude (over 600 m asl) could be implemented. Nowadays, total of oil palm plantation in high altitude in North Sumatra was about 4,725 ha; and some of them was planted in altitude over 1,000 m asl. This study will discuss the performance of oil palm planted in altitude over 1,000 m asl based on climate conditions.

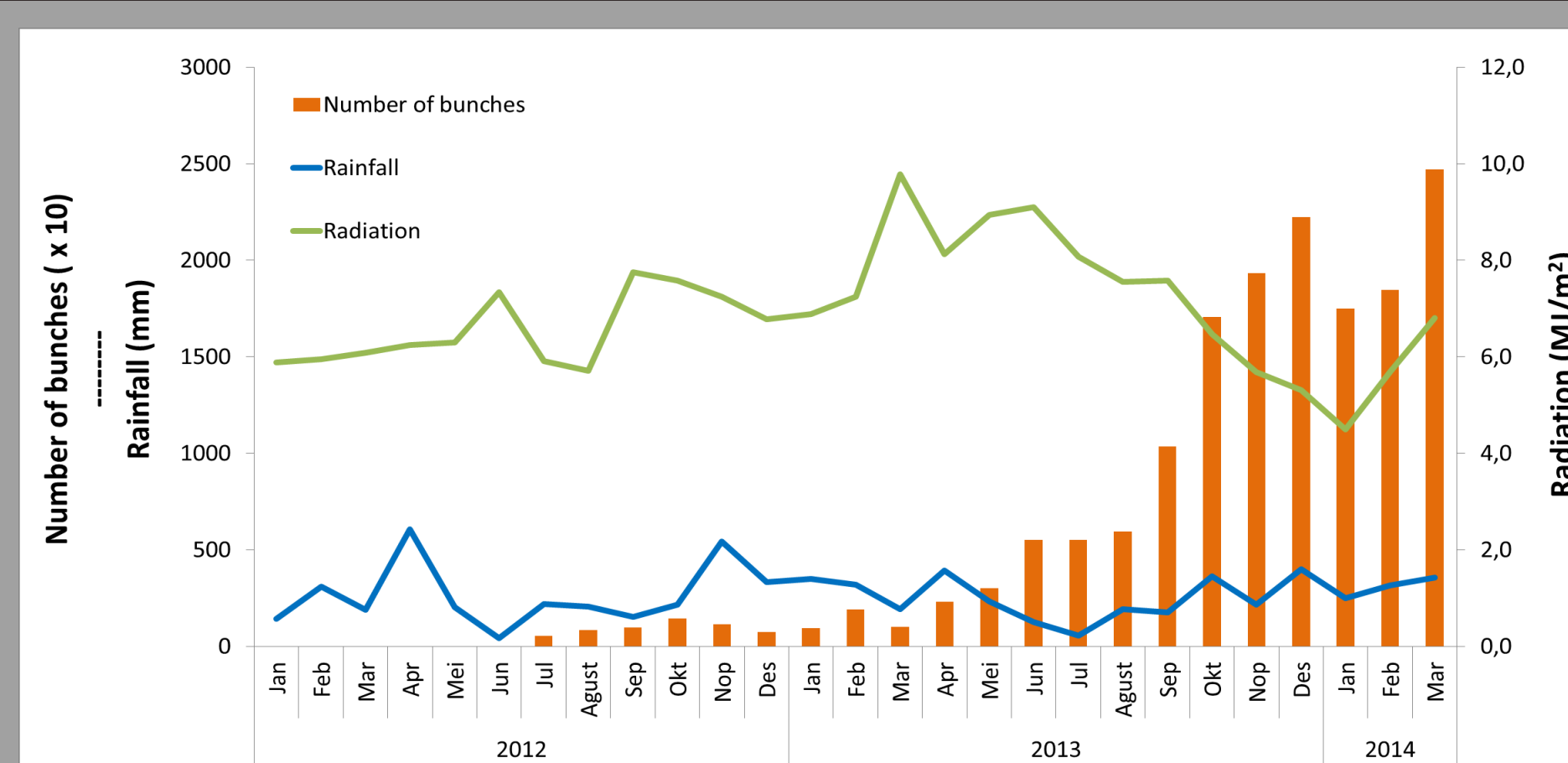
OIL PALM PERFORMANCE

Productivity



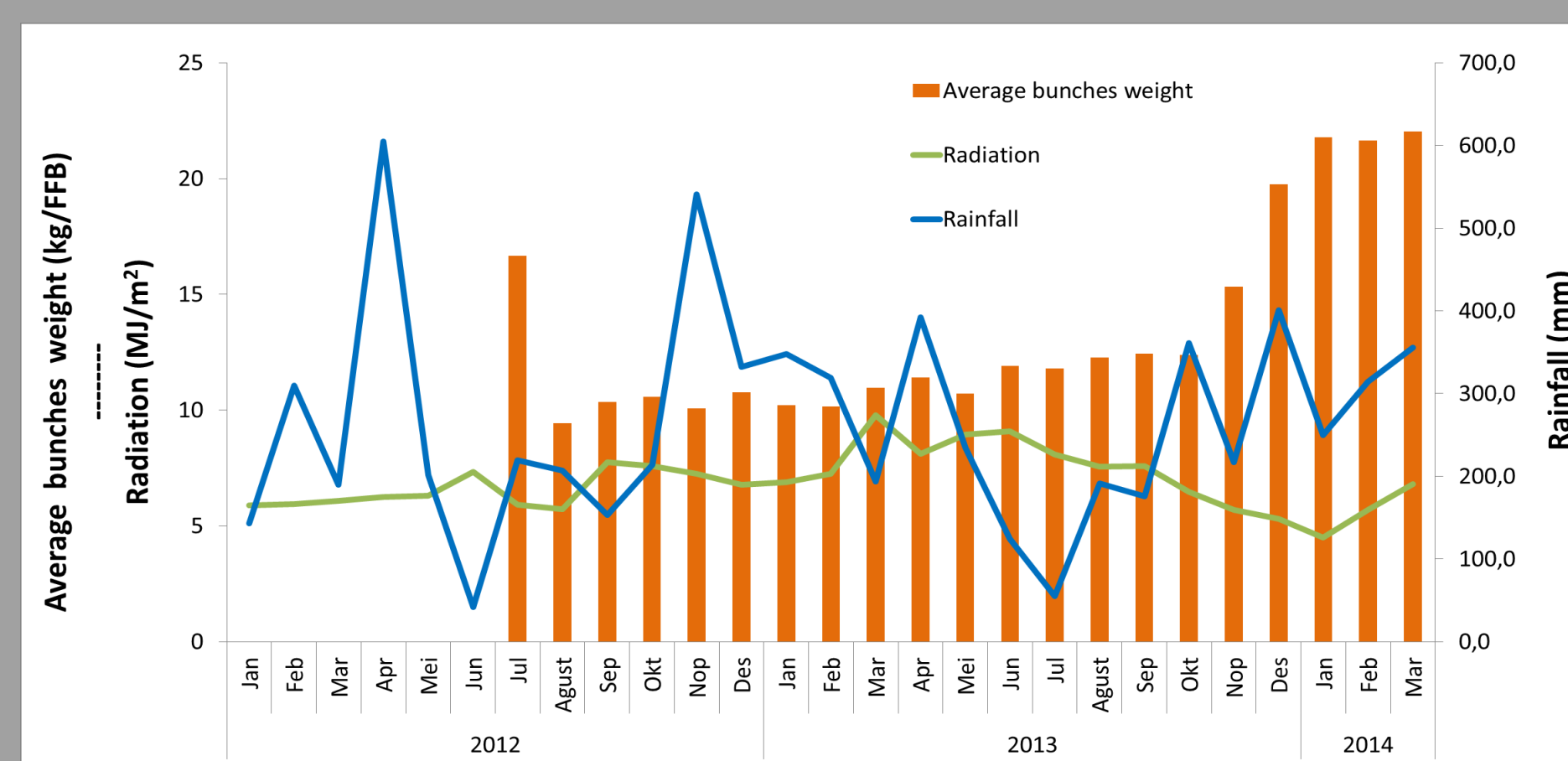
- The palm started to mature after 5 years since it was planted in 2008. It produced only 3,121 kg FFB/ha or 3.12 tonnes FFB/ha. It was because of climatic stresses, including temperature, radiation, and humidity.
- The minimum air temperature that less than 18°C will cause disruption of metabolism and growth rate, known as low-temperature stress.
- High humidity will induce a great occurrences of bunches rot diseases caused by *Marasmius* sp.

Number of bunches



In 2013, average number of bunches produced were 4 bunches per palm. It was directly influenced by the flower pollination and rot bunches disease. High rainfall and humidity, low temperature and radiation, without underestimate other factors was the dominant limiting factor in flower pollination.

Average bunches weight



Average bunches weight was 7.22 kg/bunch. It was heavier than its potential weight (7.00 kg/bunch) and longer time to ripen bunches (about 8 month) rather than in lower altitude (about 6 month) due to limited radiation. It will made more biomass accumulation into bunches. In other side, it will made palm lack of energy to photosynthesize which cause longer time to produce or ripen bunches.

CLIMATE CONDITIONS IN SITE STUDY

Temperature

The occurrences of minimum temperature below 18°C were almost happen every month that will interfere oil palm growth

Solar radiation and sunshine

Average solar radiation in this site was below 10 MJ/m². Sunshine duration in this site varied between 3 and 7 hours/day.

Rainfall

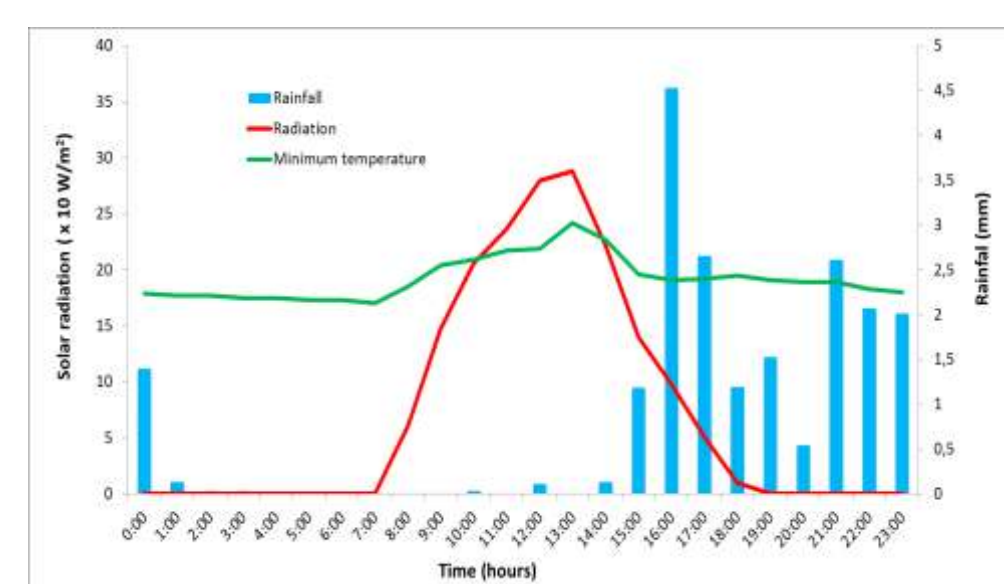
The site has sinusoidal rainfall type (two peaks rainy season). The dry month (rainfall < 60 mm/month) was occurred in July. However, the site has no water deficit.

Relative humidity (RH)

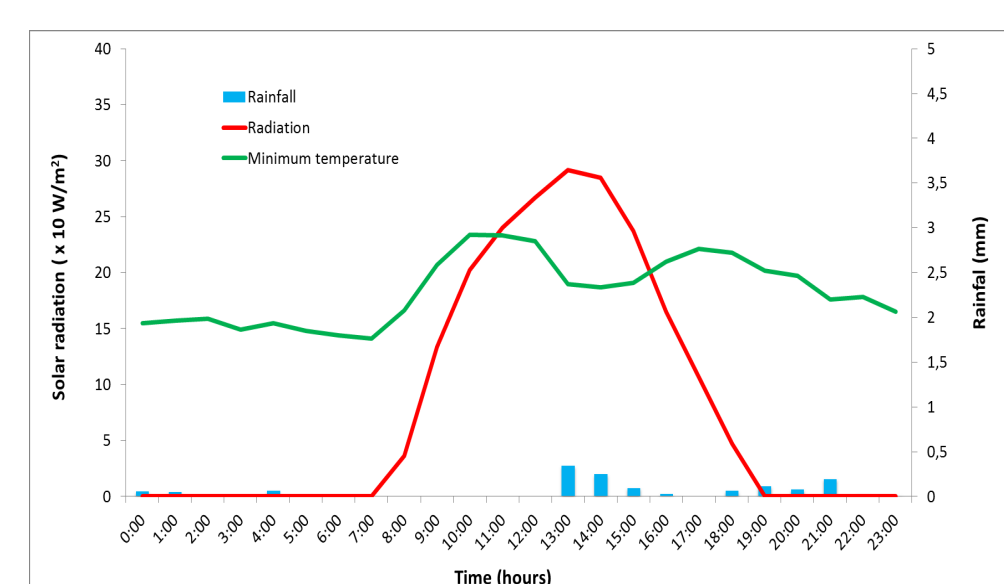
Average RH of the site was 83.4%.

Hourly climate data series (examples for month with the highest and the lowest rainfall)

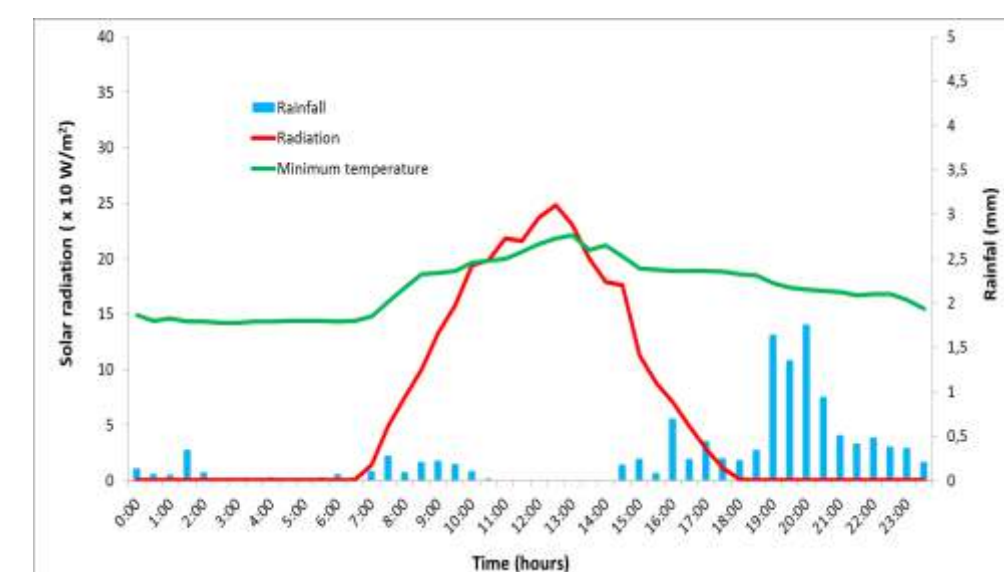
April 2012



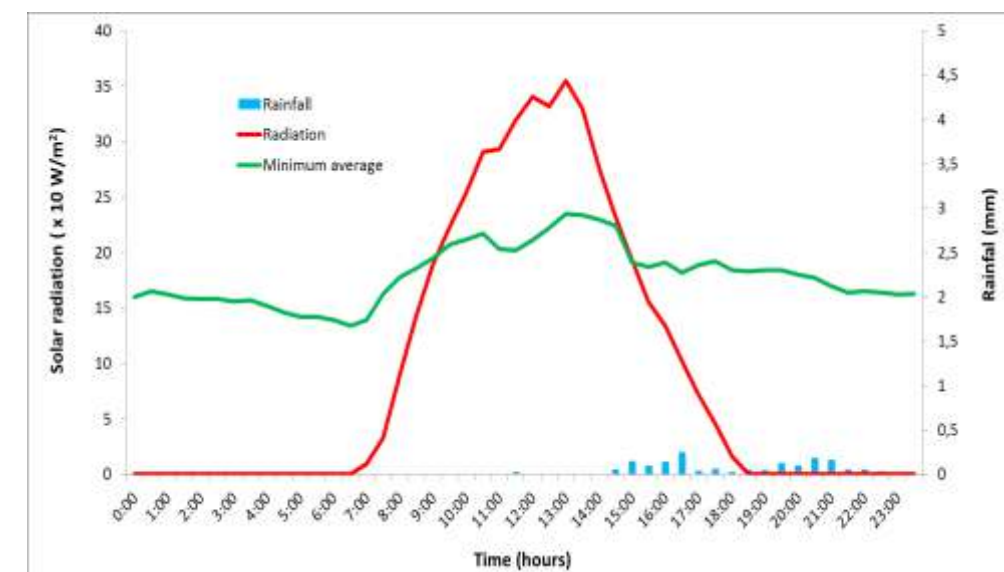
June 2012



December 2013



July 2013



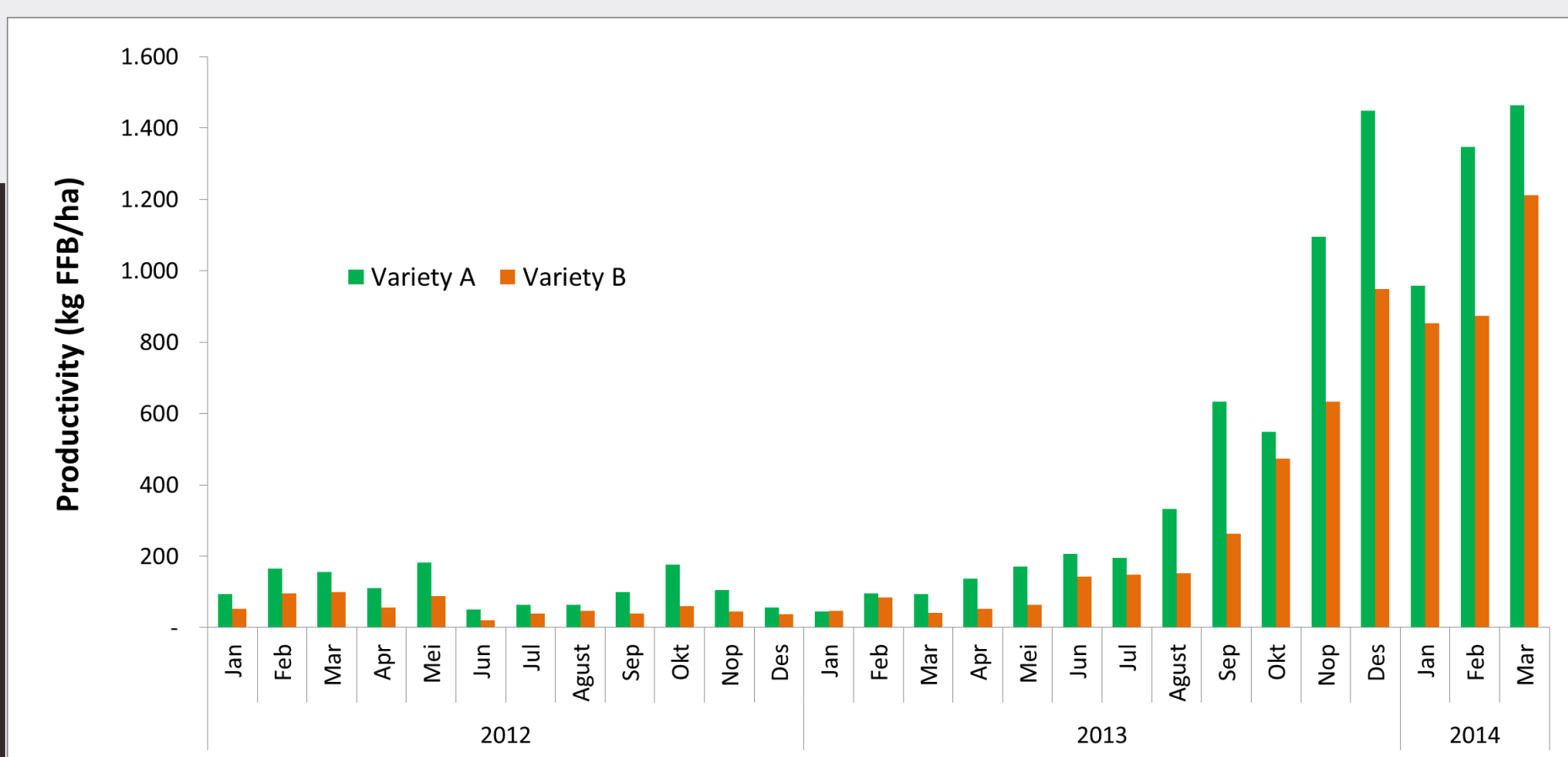
Male flowers : climate affect pollinator weevil activity during anthesis phase

OIL PALM VARIETIES PERFORMANCE

Extension of oil palm plantation in higher altitude is possible through three approaches, i.e. physical environmental factor, plant material genetic factor, and technical cultivation. Below are shown the oil palm performance of two different varieties. Variety A has a better performance than the variety B. It was indicated that variety A tends to suitable in highland altitude.

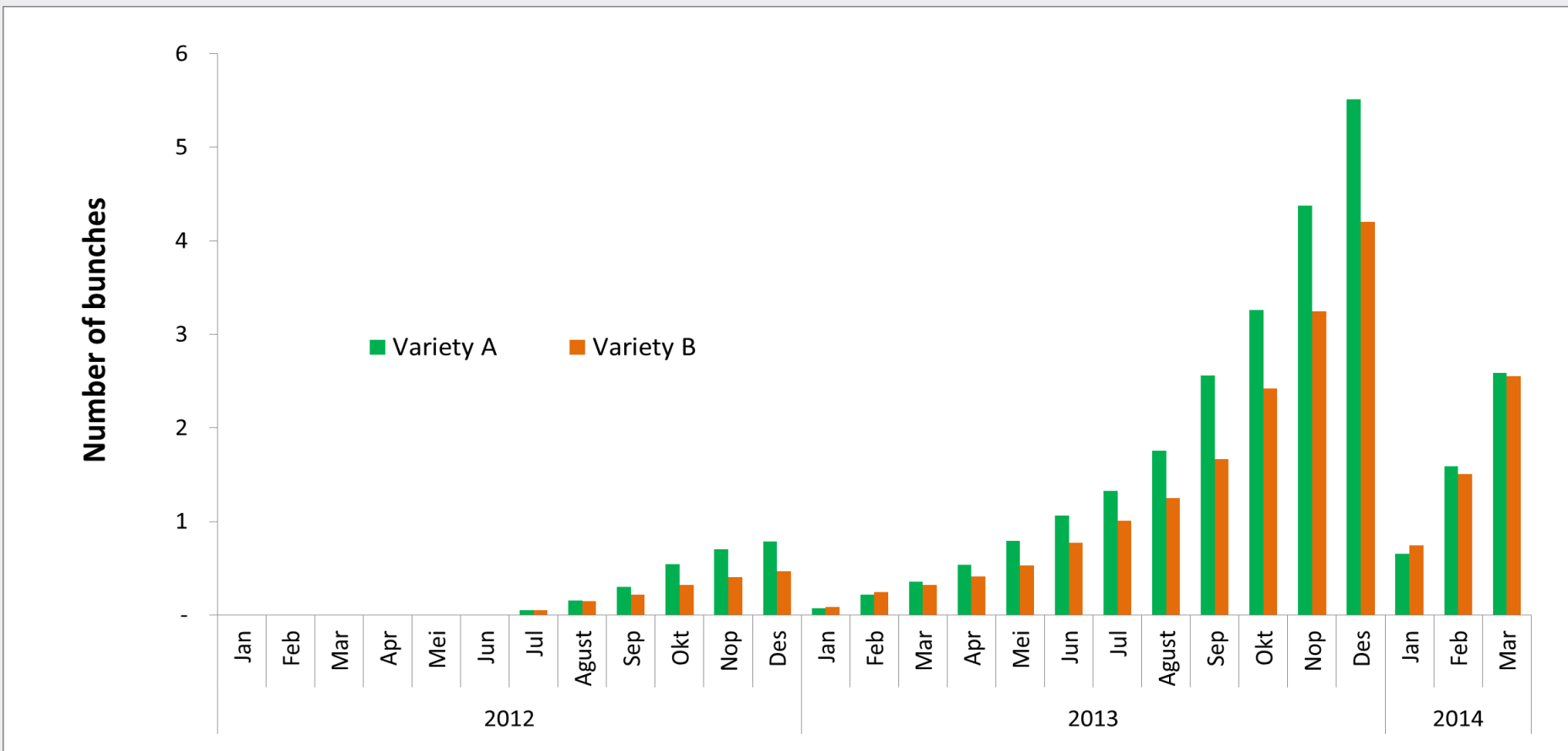
Productivity

Variety A always has higher productivity than B since it became mature palm in 2012. At the early 2014, productivity of variety A was 17% higher than B.



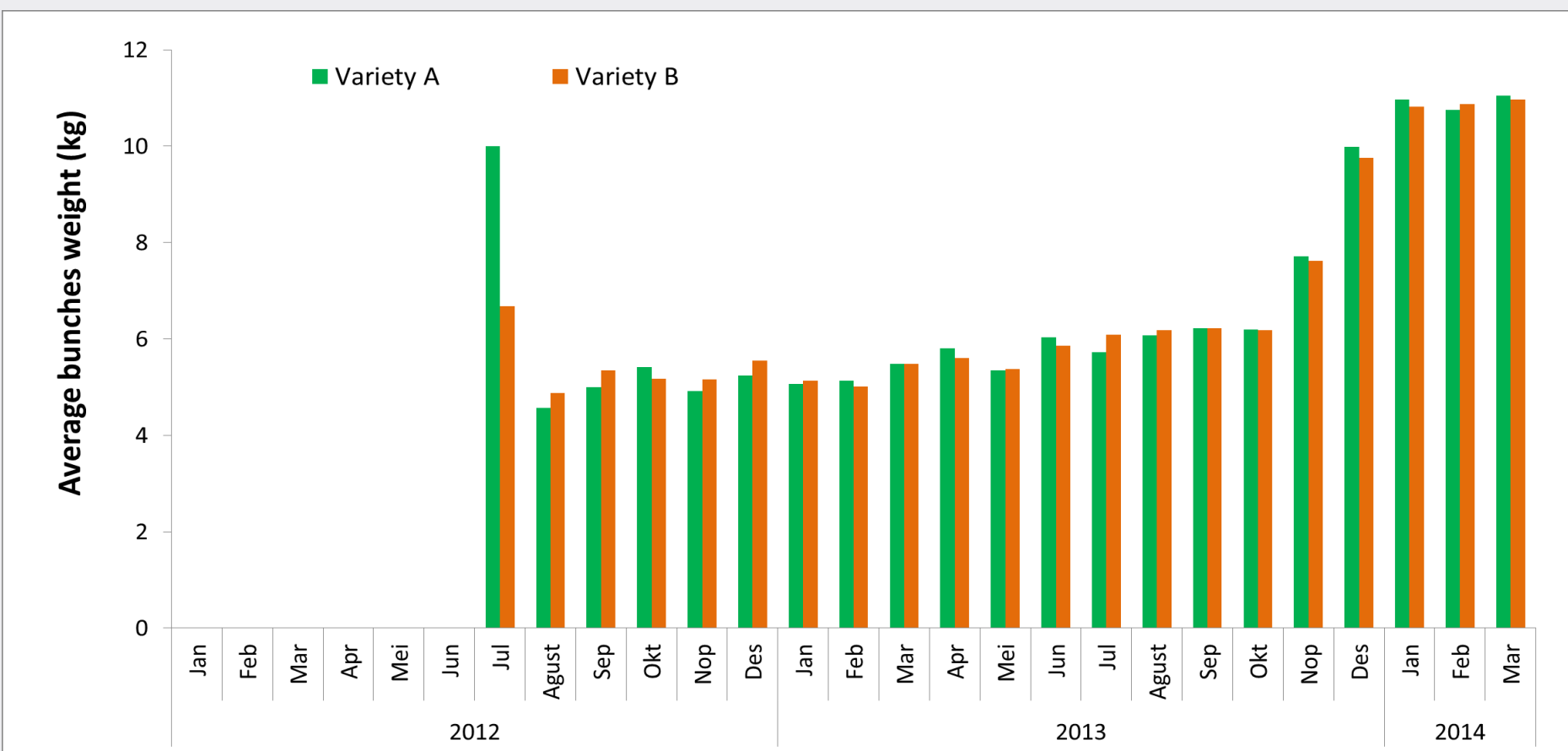
Number of bunches

In 2013, variety A produce more bunches (about 6 bunches/palm) than B (only 4 bunches/palm). It was indicated that variety A tends to adapt with environmental stresses in the highlands, related to pollination.



Average bunches weight

Average bunches weight (ABW) of variety A and B was relatively not different. Variety A has 6.8 kg/palm of ABW and B has 6.7 kg/palm.



Bunches rot diseases caused by *Marasmius* sp.

Conclusion

Generally, the oil palm in high altitude (over 1,000 m asl) tends to have longer immature period. In 2013, or 5 years after planting, the palm productivity were only 3.12 ton FFB/ha with bunches number of 4 bunches per palm, and 7.22 kg/bunch of average bunches weight. This condition due to low temperatures stress (less than 18°C), sunshine duration (less than 5 hours/day), and high humidity (higher than 80%) are still common. The utilization of suitable variety on high altitude will optimize the oil palm performance.



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