

## Review of Sustainable Korea's Oak Tree Resource Management Model for Cultivation of Oak mushroom

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### Abstract

Oak mushroom is one of the most popular edible mushrooms in Asia, including Korea, China, and Japan. It has been grown by log cultivation method using oak tree species in Korea since the 1950s. However, the decades of reckless deforestation of oak trees for oak mushroom grow has recently led to the need for protection in Korea's forests to prevent oak resource depletion.

As of 2019, there were 3,764 log cultivation farms in Korea and the total amount of oak mushroom log was 39 million. Average cultivation period is 3 years and 12 million oak logs are needed every year. According to a survey of shiitake growers, 87.3% of the respondents said that the most preferred species were Sawtooth oak (*Quercus acutissima Carruth*), and the most preferred diameter was 16 to 20cm, with 43%. The distribution status of oak trees across the country was found to be 1.44 million hectares with growing stock of 160 million m<sup>3</sup>, and the preferred Sawtooth oak was 91,370 hectares with growing stock of 10 million m<sup>3</sup>. When oak trees which are between 20 and 30cm in diameter at breast height are cut, they are the most effective use of resources, the available quantity for log cultivation was 8 to 11. However, if the diameter at breast height exceeds 30cm, the available quantity decreases.

The number of Sawtooth oak trees that can be produced as logs for oak mushroom cultivation is 321 million, and the annual actual demand is 12 million, so the supply is sufficiently sustainable in the future. However, in the actual field, there are many restrictions on the use, such as the location accessibility, possibility of collecting felled trees, and possibility of using oak mushroom cultivation. It is expected to continuously produce Sawtooth oak logs for shiitake cultivation every 15 to 20 years due to its rapid growth compared to planted land, if the area where more than 1,200 oak trees are distributed per 1 hectares is harvested and then maintained through reproduction by sprout.



Oak mushroom log cultivation

### Results

#### Preference survey species of trees for oak mushroom cultivation

Total	Sawtooth oak ( <i>Q. acutissima</i> Carruth.)	Cork oak ( <i>Q. variabilis</i> Blume.)	Mongolian oak ( <i>Q. mongolica</i> Fisch.)	white oak ( <i>Q. aliena</i> Blume.)	Konara Oak ( <i>Q. serrata</i> Murray.)	Loose-flower hombearm ( <i>Carpinus laxiflora</i> Blume.)
126	110	13	-	-	1	2
100%	87.3%	10.3%	-	-	0.8%	1.6%

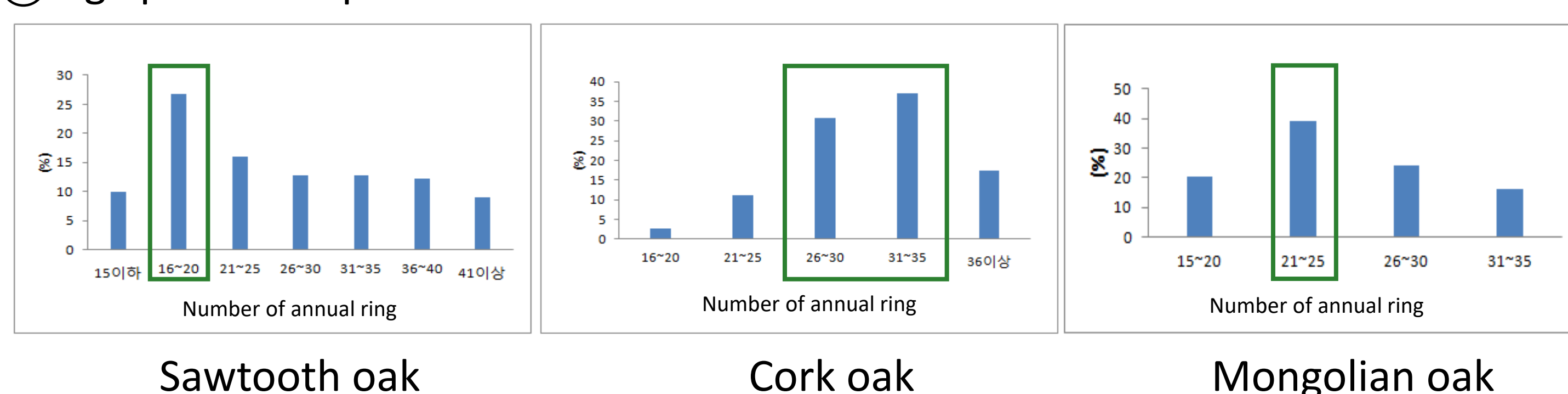
87.3% of the respondents preferred Sawtooth Oak (*Quercus acutissima Carruth*.)

#### Yearly supply and demand about sawtooth oak logs for cultivation

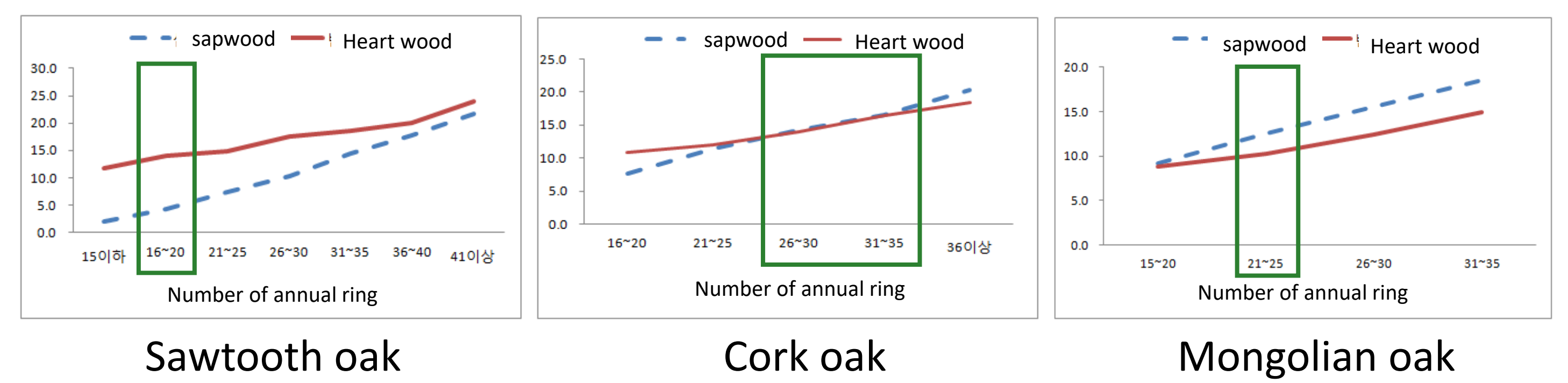
Area	Yearly potential supply <sup>(a)</sup> quantity(m <sup>3</sup> )	Yearly quantity <sup>(b)</sup> demanded(m <sup>3</sup> )	(A) - (B)
Total	353,086	221,347	131,739
Gyeonggi-do	57,459	15,409	42,050
Gangwon-do	6,554	5,237	1,317
Chungcheongbuk-do	56,510	15,199	41,311
Chungcheongnam-do	123,650	72,158	51,492
Jeollabuk-do	35,604	10,486	25,118
Jeollanam-do	17,866	56,483	△38,617
Gyeongsangbuk-do	45,501	32,992	12,509
Gyeongsangnam-do	9,777	10,353	△576
Jeju-do	165	3,029	△2,864

The yearly supply of sawtooth oak is adequate on a national scale.

#### Age profile of species of trees for oak mushroom cultivation

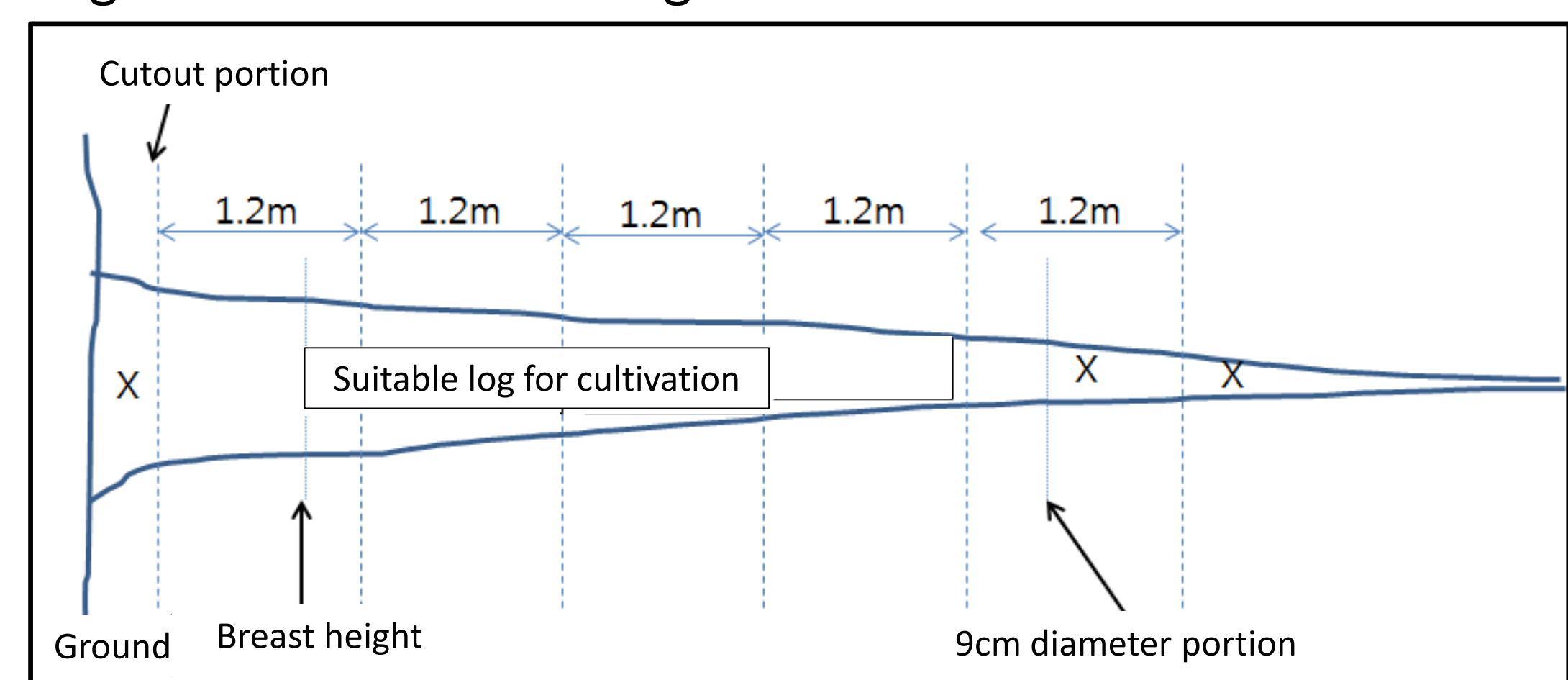


#### Sapwood and Heartwood profile of species of trees for oak mushroom cultivation



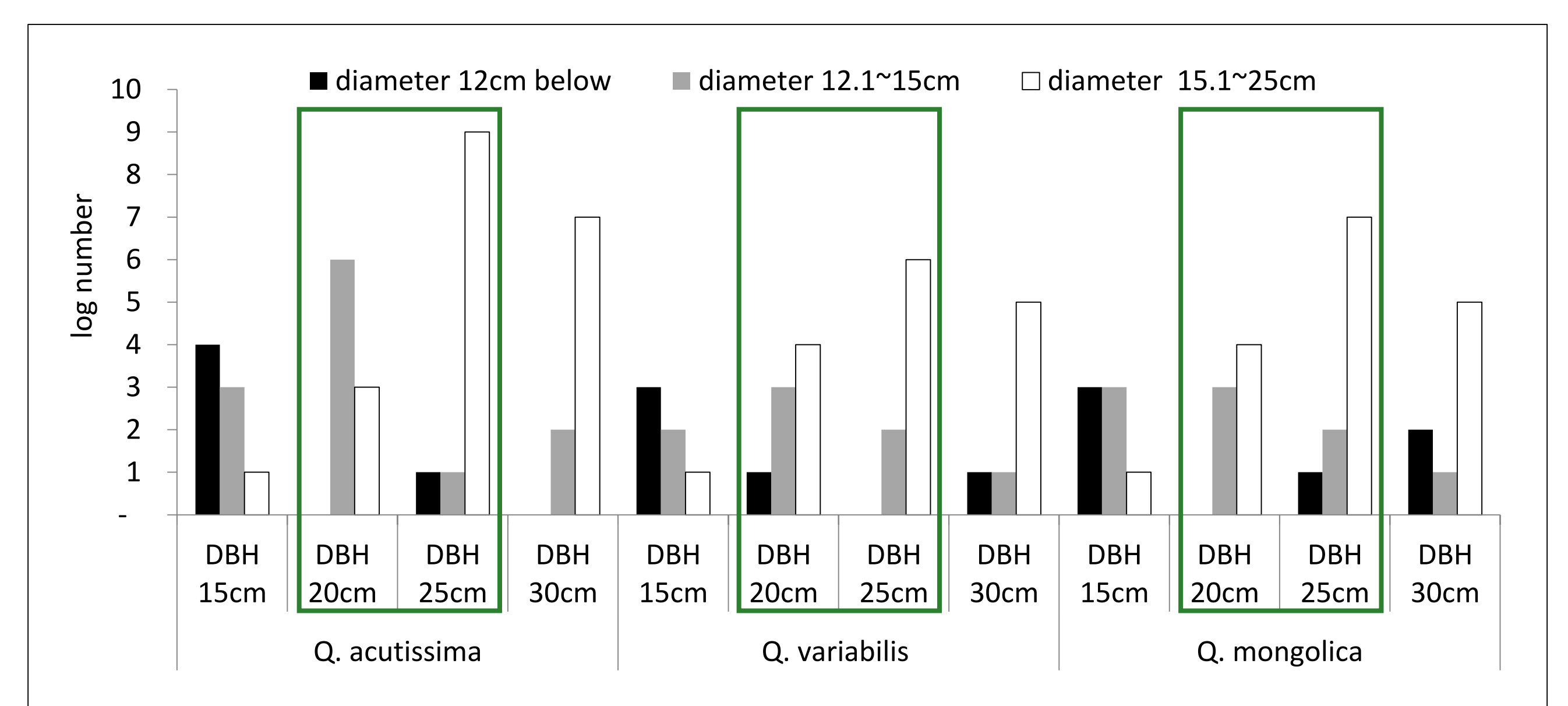
16~20 age Sawtooth Oak (*Quercus acutissima Carruth*.) is suitable for cultivation.

#### Producing method of suitable log for cultivation an Oak tree



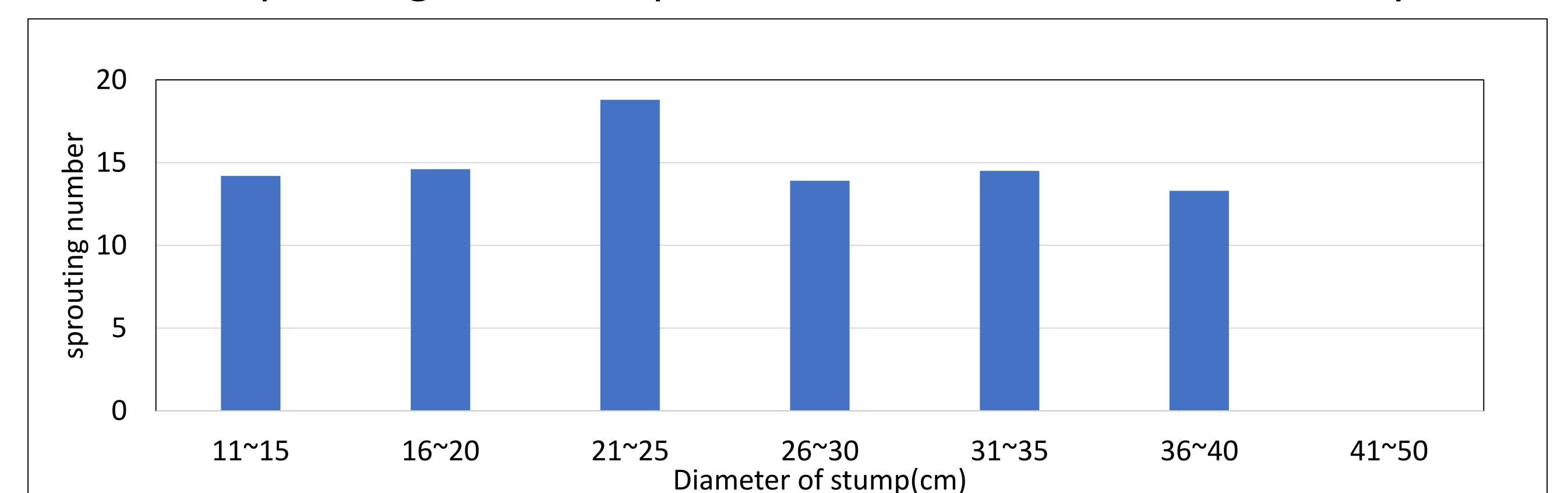
Within limits 9~30cm diameter of tree trunk is possible for producing log for cultivation.

#### Number of produced log for cultivation according to breast height



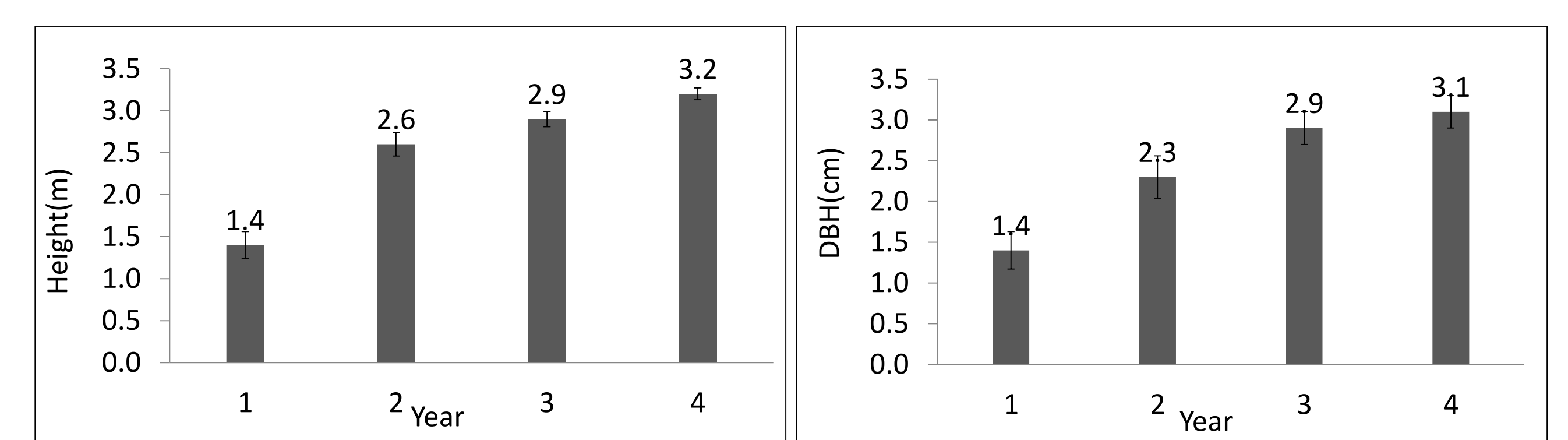
Within limits 20~25cm DBH of sawtooth oak is most productive.

#### Number of sprouting from stump of on sawtooth oak cut out after 1 year



Sprouted the most from 20~25 cm stump diameter of sawtooth oak after 1 year.

#### Height and DBH(breast height diameter) of oak sprouts in reproduction plantation



Sprouts growth form the Oak stump is annual average during 4 years 0.8m and DBH is 0.8cm.

### Conclusions

- Oak trees reproduction plantation by sprouting is a good method to maintain resource and prevent forest destruction.
- Long-term research is needed about plantation management method of consistently producing log of good quality for oak mushroom cultivation.