

Toward understanding Honeybees in Asia

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Honeybees are the most beneficial insects worldwide. Honey production has been proven as a promising profitable venture, which is a mean of low cost/high yield enterprise for rural people without requiring compulsory land ownership or capital investment. Beekeeping also can play an important role as one of the small economic activities by generating substantial income for people who do not have enough resources.

While best known for honey production, the honeybees also contribute tremendously to human nutrition through crop pollination. Pollination by honeybees increases the quantity and quality of fruits, nuts, and seeds in Asian countries. Moreover honeybee is an essential to global ecology through pollination.

In most Asian countries, a large number of nectar source plants are found throughout the country year round. In Asia, there is a long history of honey hunting and traditional beekeeping using Asian wild honeybees. Therefore, Asia has a suitable background for development of modern beekeeping as part of foundation for the agriculture based economy. Actually, beekeeping is becoming an important industry in some of Asian countries. However, there is still large room for beekeeping development in Asia. One of the most important issues for accelerating beekeeping in Asia is to improve genetical traits of honeybees suitable in the tropical condition.

There are two species for honey production in Asia, that is, European honeybee, *Apis mellifera* and Asian honeybee, *Apis cerana*. Each species has its strengths and weaknesses for beekeeping in the tropic areas and there has been no clear conclusions regarding which species is suitable for beekeeping in tropical Asia.

Recently, the genome sequence of the European honeybee was completed by the Honey Bee Genome Sequencing Consortium. Sequencing the honeybee genome provides researchers an invaluable tool for better understanding bee traits. In the joint project, using this tool, first we plan to conduct exclusive gene expression analyses of European honeybee, and expand these analyses to Asian Honeybees. Next, we plan to compare expression of these genes in two species, which will lead to understanding which gene or genes are responsible for the target traits that we would like to improve. Then, favorable traits of Asian honeybee will be introduced into European honeybee, by genetic transformation or other systems such as artificial selection, which has been traditionally conducted. Finally, we will be able to breed European honeybee. Because of the lack of genetical tools in Asian honeybees, favorable traits of European honeybee will not be introduced directly into Asian honeybees. Despite that, gene expression analyses will be useful in the future breeding program of Asian honeybee.

In this workshop, to promote the joint project, first, we are going to review several aspects of honeybee science, which are strongly related to the objectives of the joint program.