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Smart Farm System : Case Studies in Thailand

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Smell, taste, appearance and flavor are central to the value of agricultural products, especially fruits and their post-harvest spin-offs such as teas, coffees and wines. In specific, the uniqueness of a wine depends on types and ratio of such aroma molecules collected in the leaves or fruits during the growing seasons, which is related to many external factors such as soil conditions, fertilizers, irrigation, sun light and climate. Aroma management is a complex task involving various kinds of day-to-day activities that require year-long vigilant attention from the people concerned. Recently, modern technologies, for example, "precision farming" , have been introduced to plantation at the farm level. We have developed several technologies for farm management. The system features: (1) wireless sensor networks to monitor microclimate conditions such as solar energy, temperature, humidity, rain, air mass flow and pressure, soil water contents throughout the farm area; (2) plant monitoring system to monitor various parameters for proper irrigation management and analysis of plant growth; (3) web-based farm monitoring tools that farmer can access all information over the farm intranet/internet; (4) daily activities monitoring in which GPS-tracking systems follow activities of all equipments in the farm; (5) electronic nose system to monitor soil abundance, fruit growth and development of the fermented wines. This system was tested at various sites such as GranMonte vineyard in Nakhon Ratchasima, paddy in Kanchanaburi, HCF eggplant farm in Chiang Rai and Edamame farm in Chiang Mai. We have integrated both commercial and in-house technologies to build up such smart farm system. For wireless sensor networks, we have developed microclimate monitoring system based on IEEE 802.15.4, or the so-called ZigBee, using the mesh topology. For the monitoring of fruit and its post-harvest products, electronic nose has been demonstrated that it can be helpful tool both in the field (vineyard) and winery. By that, grape ripeness and fermentation stage can be tracked, leading to better quality control of the products.

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