

Table S4. Processes and feedbacks in the colony models. For each colony model, all main processes are listed, including the factors on which the process depends. These factors can be complex in themselves. If a process includes no factor, it is represented via a constant parameter. Feedbacks between processes and state variables of the model are underlined.

Omholt 1986	deGrandi-Hoffman <i>et al.</i> 1989	Martin 2001	AlGhamdi & Hoopingarner 2004	Thompson <i>et al.</i> 2005/2007	Schmickl & Crailsheim 2007	Becher <i>et al.</i> 2010	Khoury <i>et al.</i> 2011
Egg laying - Queen state - <u>N bees</u> Brood mortality Development In-hive bee mortality - Season	Queen ageing Egg laying - Queen age - Weather - <u>N foragers</u> Fertilization - N spermatozoa - Photoperiod - <u>N foragers</u> Brood mortality Development In-hive bee mortality Foraging - Weather Forager mortality	Egg laying - Weather - <u>N adult bees</u> Brood mortality - <u>N adult bees</u> - <u>Varroa</u> Development In-hive bee mortality - Age - <u>Trend in egg production</u> - Virus Mite dynamics	Queen ageing Egg laying - Queen age - Weather - <u>N adult bees</u> Brood mortality Development In-hive bee mortality - Season - Mites Mite dynamics	Egg laying - Seasonal factor - Pesticide exposure Brood mortality - <u>N in-hive bees</u> Development Adult bee mortality - Seasonal factor - Pesticides Foraging - Premature foraging due to pesticides	Egg laying - Seasonal factor - <u>N empty cells</u> Brood mortality - Eggs, pupae: const - Larvae: <u>Pollen store</u> , <u>N larvae</u> , <u>N adults</u> Larvae cannibalism - <u>Pollen store</u> - <u>N larvae, adults</u> Development In-hive bee mortality - <u>Task-specific</u> - <u>Colony structure</u> - <u>Stores nectar, pollen</u> Foraging - Weather - <u>Demand pollen, nectar</u> Nursing - <u>N brood</u> - <u>Age larvae</u> Food processing - <u>Stored nectar</u> Use of pollen, nectar,	Egg laying - <u>N empty and brood cells</u> - <u>Temperature in brood cells</u> Development Heating of brood cells - <u>N in-hive bees</u> In-hive bee mortality Foraging - Age at first foraging determined by <u>temperature during development</u> Forager mortality	Eclosion - <u>N in-hive and foragers</u> Foraging - Recruitment to foraging depends on <u>fraction of foragers</u> Forager mortality

				honey - <u>Stores</u> - <u>N larvae, adults</u> Forager mortality Forage availability - Seasonal factor		
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