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**ECTD\_091**

**TITLE:** World beekeeping.

**SOURCE:** *Bee World* 56 (1): 9 - 16

**DATE:** 1975

## WORLD BEEKEEPING

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*This article is a slightly abbreviated short extract from Chapter 4, World honey production, of a forthcoming book\*. Here, a single summary table sets out the position continent by continent; the Chapter has six further tables, giving figures for the separate countries of each continent, and assesses their validity. It also includes references to sources of data which are omitted here, and much other information.*

### Europe and USSR

Each European country, and each area within it, has its own characteristic honey flora and beekeeping conditions—hot or cool in summer, cold or mild in winter, wet or dry, high or low in altitude, sheltered or windy, open land or urban development. The honey yield, its sources, and the capabilities of the local bees, all vary from place to place. The honey yields quoted in Table 1 are averages of results depending on the intimate relationships between bees and the plants within their flight range, throughout the area in question.

The most notable general feature of Europe from the point of view of honey production is the high population density of colonies of bees (*C/A*). The average is 2.8 per sq km, 7 times as high as in Africa or USSR—the runners up—and 50 times as high as in Australia. This is partly linked with a high human population density, but not entirely. Many countries in Asia that are as densely populated have far fewer hives of bees; three equivalent pairs will serve as examples: Belgium has 10 times the hive density of Taiwan; Switzerland 400 times that of India; Czechoslovakia 900 times that of Pakistan and Bangladesh. Czechoslovakia, Greece, and Switzerland have the highest hive densities (*C/A*) in the world.

The root cause of the high concentration of bees in Europe would seem to be the long tradition of beekeeping there. It is certainly not high honey yields, for the average European yield per hive is only a third or a quarter as much as in the New World continents.

Of the individual countries of Europe, the German Federal Republic and France are the largest honey producers (*H*), Spain and Poland coming next. These four large countries all produce over 10 000 tons a year. Each of them has around a million colonies of bees or more (*C*), as do Czechoslovakia, Greece and Rumania.

Sweden, with a very low population density of humans and of bees, comes out as having the highest honey yield per colony (*H/C*), probably because of the long summer days and intense short growing season.

In many countries of Europe, the urge to keep bees does not necessarily depend on getting financial profit from them. Central Europe is probably the greatest traditional stronghold of beekeeping in the world, and in parts of this region hives are kept packed

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\* "Honey: a comprehensive survey" edited by Eva Crane, published by William Heinemann Ltd in collaboration with Bee Research Association, 608 pages with 65 plates, price £15. Orders can be sent to BRA for dispatch on publication.

TABLE 1. Honey production: world summary

For each continent:

*A* = area in 1000 km<sup>2</sup>*B* = number of beekeepers in 1000s*C* = number of colonies of bees in 1000s*H* = average annual honey harvest in metric tons (tonnes)*H/P* = average annual honey consumption per person in 100 mg*S/P* = average annual sugar consumption per person in kg

Entries relating to the Old World are in roman type and those relating to the New World are in italics.

1 <i>Continent</i>	2 <i>A</i> (1000 km <sup>2</sup> )	3 <i>B</i> (1000s)	4 <i>C</i> (1000s)	5 <i>H</i> (tons)	6 <i>H/C</i> (kg)	7 <i>C/B</i>	8 <i>C/A</i> (/km <sup>2</sup> )	9 <i>H/P</i> (100 g)	10 <i>S/P</i> (kg)	11 <i>H/B</i> (kg)
Europe*	4 682	1 367	12 983	120 680	9	9.5	2.8	4	36	90
USSR	22 400	1 150	10 000	103 000	11	8	0.4	5	45	90
<i>N. America</i>	<i>19 636</i>	<i>435</i>	<i>4 754</i>	<i>125 200</i>	<i>26</i>	<i>14</i>	<i>0.24</i>	<i>7</i>	<i>49</i>	<i>300</i>
<i>S. &amp; C. America</i>	<i>20 785</i>	<i>235</i>	<i>4 000</i>	<i>102 000</i>	<i>25</i>	<i>17</i>	<i>0.19</i>	<i>1</i>	<i>42</i>	<i>50</i>
<i>Oceania</i>	<i>7 956</i>	<i>12</i>	<i>684</i>	<i>23 850</i>	<i>35</i>	<i>56</i>	<i>0.09</i>	<i>5</i>	<i>57</i>	<i>2 000</i>
Asia*	27 896	900	6 000	73 000	12	7	0.2	0.04	7	70
Africa	32 315	2 526	12 000	82 700	6	6	0.4	2.6	11	30
TOTAL	135 670	6 625	50 421	630 430	12.5	8	0.4	1.7	20	95
Old World	87 293	5 943	40 983	379 380	9	7	0.5	1.3	15	64
% of total	64%	90%	81%	60%						
<i>New World</i>	<i>48 377</i>	<i>682</i>	<i>9 438</i>	<i>251 050</i>	<i>27</i>	<i>14</i>	<i>0.2</i>	<i>3.8</i>	<i>46</i>	<i>370</i>
% of total	36%	10%	19%	40%						
<i>New World/Old World</i>					× 2	× 2	× 0.4	× 3	× 3	× 6

\* excluding USSR

together in a bee house, and the average beekeeper's holding (*C/B*) is more than where hives are free-standing in the open, as elsewhere in the world. The bee-house tradition is more or less confined to areas where German is the primary or secondary language (Germany, Austria, German-speaking Switzerland, Czechoslovakia, Slovenia in Yugoslavia).

Widespread sources of honey in Europe are clover and rape, with heather also on the Atlantic seaboard. In Central Europe the acacia or locust (*Robinia pseudoacacia*) is perhaps the most notable. A native of North America, it thrives on sandy soil and has been planted in large areas of Hungary, Rumania, and Yugoslavia, where it provides the main export honey. Various species of lime (*Tilia*) are important also in Rumania and Poland. Honeydew from coniferous forests is predominant in many parts of Austria and Germany. Orange honey is notable in Spain, rosemary there and also in France, where lavender is another specialty honey. Greek thyme honey is famous.

The USSR is such a large country that it is treated as a separate "continent" in comparative statements, and in Table 1, instead of being combined with the rest of Europe and Asia. The whole USSR is five times the size of the rest of Europe. The best honey-producing regions are in the large Asiatic section. The total number of colonies is rather less than in the rest of Europe, and these are much more sparsely scattered, at an average of only 0.4 per sq km; this is about the same as in the United States. The total honey production is also about the same as in the States—but there the honey is produced from less than half as many hives. Honey sources over this vast Union of Republics are many and varied; limes, sunflower, buckwheat, willow-herb (fireweed), raspberry, and cotton are among the most important.

## North America

North America is a continent where modern frame-hive beekeeping is even more universal than in Europe. The two countries concerned (Canada and USA) are about the same size, but the latter has 10 times as many colonies, 10 times the colony density (and 10 times the human population); it has 40 times as many beekeepers, but they tend to have fewer hives each than in Canada. Canada's high honey productivity (57 kg per colony) is a notable example of the honey yields obtainable at high latitudes, which are here harvested with package bees raised much further south. Honey consumption is higher in Europe or the USSR, partly because honey can be produced more cheaply; the sugar consumption is also higher, but not by such a large factor.

Canada is a country of commercial honey production, for home consumption and export; the average holding of 41 hives per beekeeper covers a range from several thousand down to less than 10 among the hobbyists. The USA also has large holdings, up to 10 000 or more; but in the east especially there is also a considerable amount of hobby beekeeping, and this brings the national average down.

Honeys from white clover, sweet clover, and a mixture of these with alfalfa, are widely produced in Canada and some northern parts of the USA; these honeys are usually described as "clover". Basswood (*Tilia*) is also common to both countries. British Columbia produces more aromatic honeys. Further south in the United States, cotton, and citrus (usually marketed as orange) are important, and in California *Erigonum fasciculatum* (wild buckwheat, Californian sage). There is a host of other sources.

## Central and South America

We now leave the comparatively well documented regions of the world, returning to them in only one other (the next) Section. But future expansion of honey production is likely to be greatest in the less developed, less well documented regions, which are thus in need of special attention.

Central America is dominated by Mexico, whose growth as a honey-producing country has been dramatic. In several other countries the honey yield per hive is also higher than in the United States. In spite of this high honey productivity, the honey *consumption* is very much smaller than in Europe or North America.

Central and South America between them produce about as much honey as the USSR or the USA. But, unlike the two last countries, those of Latin America export most of what they produce, and in so doing they dominate the world honey trade. The average holding is  $12\frac{1}{2}$  colonies per beekeeper, about the same as in the United States, and the yield per colony rather higher—but without all the expertise that has been applied to North American beekeeping.

Argentina is the greatest honey producer in South America, with Brazil and Chile a long way behind. Colonies are more thinly spread than in the USA, and very much more so than in Europe. Sugar consumption is around half that in continents considered previously; Cuba, with sugar as its main crop, is an exception—it tops the world for sugar consumption. Throughout Latin America honey consumption is low; honey is a source of income rather than something to eat at home.

White clover and lucerne (alfalfa) are among the main honey sources now exploited in temperate South America, as well as the thistle-like cardoon, *Cynara cardunculus*. In tropical regions the sources are much less known, and indeed it is here (for instance in the Amazon basin) that the honey resources are barely exploited at all, let alone known and evaluated. In various parts of Central America the following are especially important: dzidzilché, tah, campeche, Jamaica dogwood, campanilla, royal palms. Their botanical names are *Gymnopodium antigonoides*, *Viguiera helanthoides*, *Haematoxylon campechianum*, *Piscidia piscipula*, *Ipomoea* spp. and *Rivea corymbosa*, *Roystonea* spp.

## Oceania

This region includes Australia and New Zealand, and a host of islands to the south and east of Asia proper which, however, contribute only 7% to the total area and are unimportant in the present context. Oceania is nearly twice as large as Europe, but less than half the size of any other continental unit.

New Zealand honey production is not unlike that in other productive temperate regions. The native flora yields some most interesting honeys, and a few that have objectionable properties. But the bulk of the honey comes from white clover; it is eaten at home, and exported.

Australia has several unusual or unique features from the beekeeping point of view. The large proportion of the country that is desert gives it the lowest overall hive density of any land mass in the world. Yet it is a country of large holdings and high honey yields. The average number of hives per beekeeper (83) would be higher still if it were not for the immigrants from Europe since the last war, who brought with them their tradition of hobby beekeeping, with ten hives or less.

The bulk of Australian honey comes from indigenous species of eucalypt. Many of these produce nectar copiously, but some have other less convenient characteristics

from the beekeeper's point of view. Some yield no pollen, and most of them flower only at biennial or less frequent intervals. Stands of different trees may provide rich honey flows in succession, which a beekeeper can harvest by moving his hives from one flow to the next. Very large annual crops can thus be obtained—up to say 300 kg per hive—but a low price for honey may set a limit to the amount it is worth paying out in transport costs. The classic migration story relates how two beekeepers once moved 1600 hives nearly 4000 km, by train, from New South Wales to Western Australia to work the karri (*Eucalyptus diversicolor*). The trees bloomed from December 1948 until July 1949; during this time some 15 000 hives were in the karri forest, and there were recorded instances of 25 kg of honey being harvested from the same hive every 14 days. But after one flowering it may be 4, 8 or 12 years before the karri forest flowers again.

## Asia

Here, again, is a completely different region: another Old World continent, with indigenous honeybees—but four separate species, three of which occur nowhere else. The fourth (*Apis mellifera*) has been introduced into many areas from Europe, and it is also native to parts of Asia around the Black and Caspian Seas.

Statistics are hard to come by, and a number of those used are very imprecise. Apart from notable exceptions such as Israel, Japan, and Taiwan, and possibly parts of the Chinese People's Republic, honey productivity is low in Asia. Reasons for this include the wide use of fixed-comb hives and the accompanying lack of control over the bees; lack of knowledge and of mechanization which would allow migratory beekeeping; the generally low productivity of *Apis cerana*; the difficulties of harvesting honey from the other two species, *dorsata* and *florea*, which build a single comb in the open and cannot be kept in normal hives; finally, the many enemies of bees in tropical regions. In our present circuit of the world, Asia is the first continent discussed which has tropical regions with honeybees *that evolved there*—and with enemies of honeybees that evolved there too. Africa is the only other such continent.

The People's Republic of China, three times as large as India and twice the size of Europe, is coming more and more to dominate honey production in Asia—as Mexico and Argentina dominate the situation in Central and South America respectively. But the development in China is more recent, and is probably still gathering momentum; no full assessment of the conditions is available, and so the future is very difficult to predict—except that further expansion is likely. The present national average yield per hive (11 kg) is depressed by the many fixed-comb hives still remaining, and the present estimated total production is not much more than twice that of Japan, a country only 4% as large. Israel and Taiwan are two tiny countries which show something of the honey-producing potential of parts of Asia.

In general, sugar is a much less important food in Asia than in any other continent, and the same is true of honey. Habits are changing, however. In the next ten years the honey situation in Asia is likely to change markedly, and figures may perhaps be available to give a more complete and reliable picture of the position then.

With Asiatic USSR, the continent stretches from the Arctic to the Equator and beyond. Even without the northern Soviet area, the plants from which honey is harvested are legion, and in many areas have still not been documented. The exported honey from China includes much from limes (*Tilia*) and litchi (*Litchi chinensis*); in Israel citrus is the main source.

## Africa

The final continent to be considered includes the largest tropical land area on earth. It is an Old World region where the most widespread indigenous honeybee is the subspecies *adansonii* of the European bee *Apis mellifera*. No honeybee except *Apis mellifera* lives there, but there are several sub-groups. In much of Africa there is a strong beekeeping tradition, as in Europe. But the marketed product in tropical Africa has not been honey but beeswax, which is easier to transport where there is no roads. Most of the honey is used for fermentation, in the production of honey beer.

North of the Sahara, beekeeping is not dissimilar from that in other Mediterranean countries. At the southern extremity of Africa normal modern beekeeping is practised, except that one local subspecies (*A. m. capensis*) has some unusual characteristics.

In countries between the Sahara and Kalahari deserts, *A. m. adansonii* thrives. It is prolific, building sizable colonies which swarm freely; the swarms occupy any available cavity of a suitable size. Beekeeping is based on setting up empty bait hives into which swarms move; this is true even in modern commercial systems. Combs are built quickly, temperatures being high enough to encourage wax production by the bees. A "traditional" beekeeper might have up to several hundred hives, hung in trees as a protection against their many enemies, half the hives being empty, awaiting the next occupants. At the right season most or all of the combs are cut out, using smoke and working at night. There is a crude extraction of honey by straining and pressing, and the wax is melted and made into blocks for transport to a marketing point. The honey is likely to be sold to the local beer maker, or used domestically for the same purpose.

Data for these countries are extremely vague: few statistics have been collected, and many Africans dislike counting things, considering it unlucky to do so. In the wax-producing countries the most reliable figures are those for *beeswax exports*. From these the total amount of beeswax produced has been estimated, and the number of occupied hives is calculated on the basis of one for every  $\frac{1}{2}$  kg of beeswax produced. The honey production is estimated at 6 kg per hive, i.e. a ratio of 12 to 1 for honey and beeswax yields. The average holding is taken as 4 occupied hives per beekeeper; individual ownership may vary from 1 to 1000, and half the hives are likely to be empty. Honey consumption is calculated on the assumption that all available is collected, and that none is exported. This basis was suggested by Dr. F. G. Smith in the late 1950s; in view of the changes taking place in tropical Africa, adjustments might well be necessary for any future calculations.

Accepting the limitations of the figures used, which are not contradicted by such independent checks as can be made, the following facts can be deduced. The important honey-producing countries in tropical Africa are Tanzania, Malagasy Republic, Angola, and Ethiopia. North of the Sahara, Morocco and Egypt produce most honey. The average honey "consumption" *per capita* is much higher than in any other group of countries except the highly developed ones, but as some 80% of the honey in tropical Africa is used for brewing, comparatively little is eaten as such. The beer is normally drunk by men only, so their consumption of honey will be 2-3 times that quoted in Column 9.

There are, and have been, many beekeeping development programmes in Africa, some of which are successful in a number of ways. Most aim to increase the output of marketable honey by improving methods of collection and processing, as well as by getting bee management on a more rational basis—though not necessarily by use of

precision-made frame hives. Traditional beekeeping is on the wane in many parts. So, as with Asia, the next ten years may well see many changes in this rich honey-producing region, which has heretofore been remarkable as the world's main source of beeswax. The fertile regions of Africa north of the Sahara are also capable of much development, by use of efficient beekeeping methods and by migratory beekeeping as and when roads are made. Citrus and eucalypts are two of the main honey plants in the north, and also in South Africa, which has other prolific sources including aloes. In the tropical miombo areas *Brachystegia* and *Julbernardia* are among the trees that are good honey producers, and they also provide sites for hanging hives.

## World summary

Table 1 gives the averages and totals for the continents whose countries are entered separately in six tables in the book. Some of the component figures are frail, but estimates are complete in that they have been adjusted to include notional figures for countries without statistics of their own; there are no hidden gaps.

The world production of honey fluctuates from year to year; the present average is assessed at rather more than 600 000 tons. This honey is harvested from 50 million colonies of bees, by about 4½ million beekeepers. The estimated human population in the world is about 3 500 million, and the number of individual honeybees will be about 500 times as great as this. A summary published ten years ago gave the annual honey production as 500 000 tons, the number of colonies as 40–45 million and the number of beekeepers as 5 million. The increase in honey production and the number of colonies, and the slight decrease in the number of beekeepers who manage them, are in accordance with general experience.

The final entries in Table 1 have been added to bring out what is perhaps the most striking feature of world honey production: the high productivity of the New World (which had no indigenous honeybees) compared with the Old World (where they evolved). With only 18% of the hives of bees, the New World produces 40% of the honey, exporting a substantial amount of this to the Old World. The average honey production per colony is 27 kg for the New World as a whole, three times as much as the Old World average of 9 kg.

The number of colonies managed by any one beekeeper may be anything between 1 to over 1 000; the average is twice as high in the New World (14, compared with 7 in the Old World). The colony density in Europe is relatively so high that it raises the Old World average to 1 per 2 sq km, compared with 1 per 5 sq km in the New World. Honey consumption is highest in the advanced countries, and three times as high in the New World as in the Old. Tropical Africa holds a special position, the honey being used for fermentation into beer.

On a world basis, the amount of honey *produced per beekeeper* is perhaps the most striking figure, and it is included as Column 11 of Table 1. The highest productions are achieved where both plenty of land and mechanized equipment are available. The New World outstrips the Old by a factor of nearly 6. Asia and Africa (and South and Central America) still have unexploited land, and when mechanization can be applied effectively to beekeeping in these continents, their *per capita* production could rise steeply. It is less likely to do so in Europe, where shortage of land (and bee forage) is more likely to be the limiting factor.

The evidence shows why honey is a world industry, and it points to the establishment of honey as a connoisseur's food, although there are still some regions of the

world where it is one of the subsistence foods. There is at present a world shortage of honey, and part of the increasing demand is from young people interested in “natural” foods. Honey straight from the comb comes near to this ideal; the more extensively honey is processed—especially by heat treatment—the less “natural” it becomes. So we are now seeing a move away from the bulk blending and processing which has been so successful in establishing a stable honey trade in the past decades. Many customers are willing to pay more for honeys of specific types, with their own special flavours and aromas, than for a standardized product.