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CANADIAN
ASSOCIATION OF
PROFESSIONAL
APICULTURISTS

RESEARCH
WORKSHOP
REPORT

Dr. C.D.F. Miller, Chairman
Coordinator of Apiculture
Research Branch
Agriculture Canada

Victoria, British Columbia
November 19-20, 1977

A Research Workshop was held by the Canadian Association of Professional Apiculturists at Victoria, British Columbia, November 19-20, 1977. Appendix I provides a list of participants with their office addresses and telephone numbers.

The purposes of the workshop were as follows:

1. To inform apiculturists and beekeepers of developments in the honey-producing and pollinating industry in Canada (Appendix II).
2. To review the history of apicultural research in Canada (Appendix III).
3. To describe current research programs in Canada (Appendix IV).
4. To identify, analyze, and assign priorities to apicultural subjects that require research and development (Appendix V).
5. To record recommendations made by the meeting for bringing order to current and future programs of research and development intended to resolve problems facing the industry.

The following recommendations are to be used as guidelines by agencies that are now or may become involved with research programs aimed at helping the Canadian honey-producing industry achieve its full potential. The recommendations are restricted to topics essential to the well-being of the industry, such as production, utilization, regulation, marketing, and education. They relate directly to subject areas listed in Appendix V under the above-mentioned topics. These subjects were debated and evaluated in committee and assigned a priority according to their importance to the honey-producing industry.

The participants at the research workshop reached a consensus on both the priority list of subjects and the recommendations referring to them.

The workshop participants are aware that the agencies at which these recommendations are aimed cannot now provide all the resources needed to resolve the many problems facing the honey-producing industry. They prepared the recommendations in such a way that the agencies can take action without straining their resources beyond their present capacity.

The Canadian Association of Professional Apiculturists hereby asks decision-making heads of these agencies to give the recommendations a full hearing, and make decisions that will directly or indirectly implement them.

RECOMMENDATIONS

1. PRODUCTION

a) Stock Selection and Breeding

There is a need to initiate and coordinate breeding programs designed to improve regionally desirable characteristics of honey bee stock, such as honey production, docility, wintering ability, disease resistance, and pollination behavior.

Recommendation

Make available at least one position for an apicultural geneticist and provide sufficient funds to initiate and maintain a meaningful program of stock selection and breeding.

b) Diseases

It is recognized that diseases are still a major problem in the bee-keeping industry.

Recommendation

Expand research to develop and evaluate new disease control methods. Make available a position to evaluate the needs of Western Canada and resolve problems related to bee diseases.

c) Improved Colony Management Methods

There is still a need for continued research in techniques for overwintering honey bees, to increase honey production and pollination.

Recommendation

Expand existing research by making available additional funds for cooperative programs among federal, provincial, and university agencies.

2. UTILIZATION

a) Nectar Production and Pollination of Specific Crops

Rapeseed, which is the third most important crop in Western Canada, is also one of the main sources of nectar and pollen for honey bees. Little is known about the possible value of this crop to the honey-producing industry as a nectar resource, or about the impact of pollination by honey bees on the crop itself in terms of increased seed production, quality of seed, and early maturity.

Recommendation

Expand and coordinate existing programs in pollination and rapeseed breeding related to the problems outlined above.

b) New Nectar and Pollen Sources

It is recognized that nectar-and pollen-producing crops are diminishing throughout Canada because of changing farming practices, such as expansion of the corn crop area in Ontario. There is also a need to use roadsides, powerlines, pipelines, rights of way, and other waste areas to grow nectar-producing plants in ecological repair programs.

Recommendation

Establish programs aimed at determining the feasibility of planting waste areas and submarginal lands with nectar-secreting plants. Encourage plant breeders to include nectar secretion as a valuable characteristic in their breeding programs.

3. REGULATIONS

a) Chemicals used in Honey Production

The bee-keeping industry is aware that there is a continuing need to monitor the use of chemicals in honey production.

Recommendation

Expand and coordinate existing programs aimed both at monitoring chemical use in the industry, and at replacing or modifying existing methods of application to ensure a pure product.

b) Evaluation of Pesticides under Canadian Conditions

The honey-producing industry is concerned with the killing of bees by pesticides. There are little or no data available on the effect of pesticide residues over time on honey bees and other domesticated pollinators under Canadian conditions.

Recommendation

Develop a continuing program for accumulation of data on the toxic effects of pesticide residues on insect pollinators (honey bees and alfalfa leafcutter bees) under field conditions in Canada.

4. MARKETING

a) Marketing Problems

The Canadian Association of Professional Apiculturists suggests that the Canadian Honey Council identify and assign priorities to the industry's marketing problems. If outside help is required to resolve these problems, it is suggested that the Council request assistance through a separate brief to be submitted to Agriculture Canada, or other agencies with economic research resources, or both. Some specific examples of possible study areas might be:

- i) identification of factors accounting for variations in prices and an indication of their importance;
- ii) impact of tariff changes on the honey industry;
- iii) analysis of strengths and weaknesses in the market structure.

5. EDUCATION

a) Training Apiculturists

Based on current and future priorities for apicultural research and extension in Canada, decisions about the number and type of professional positions required should be made immediately. It may be necessary to train personnel for the positions in apiculture that may be created over the next 5-10 years.

Recommendation

Educational agencies should be prepared to train 10 apiculturists for research and extension positions in Canada. These apiculturists should be highly versatile, that is, trained in biology, ecology, entomology, apiculture, and other fields. The training could be done at universities, inside or outside Canada, with the following timetable in mind:

<u>Year</u> <u>Required</u>	<u>Number</u> <u>A* B**</u>	<u>Year</u> <u>Required</u>	<u>Number</u> <u>A* B**</u>
1978	0 0	1982	0 0
1979	2 0	1983	0 2
1980	0 3	1984	0 1
1981	0 1	1985	0 1

A* New requirement (Microbiologist, Geneticist)

B** Replacements (Provincial Apiculturists)

Consideration should also be given to future training programs for foreign students, honey producers, the general public, and school children.

APPENDIX I

<u>Name</u>	<u>Title</u>	<u>Address</u>	<u>Telephone</u>
Anderson, Robert	Head, Horticulture & Special Crops Unit	Agriculture Canada, Economics Branch, Room 299, Sir John Carling Bldg. Ottawa, Ont. K1A 0C5	(613)994-5571 Local 288
Barker, Randy	Apiarist, M.D.A.	Manitoba Dept. of Agriculture, 910 Norquay Bldg., 401 York Avenue, Winnipeg, Manitoba R3C 0P8	(204)946-7801
Beauchesne, F.	Director of Bee- keeping & Maple Products	Quebec Dept. of Agriculture, Beekeeping Division, Complex Scientifique, 2700 Einstein, Ste. Foy, Quebec G1P 3W5	(418)643-8550
Bland, Ed	Apiary Admini- strator	Sask. Dept. of Agriculture, 196 - 9th Street E, Prince Albert, Sask. S6V 0X5	(306)764-5261
Burke, Phil	Provincial Apiarist	Dept. of Environmental Biology, Graham Hall, University of Guelph, Guelph, Ontario N1G 2A6	(519)824-4120 Local 2477/8
Calvert, Fran	Apiary Inspector & Research Person	5918 Fraser Street, Powell River, B.C. V8A 4T5	(604)483-4160
Colter, Doug	Graduate Student (MSC)	Dept. of Environmental Biology, University of Guelph, Guelph, Ontario N1G 2A6	(519)824-4120 Local 8548
Corner, John	Head, Apiculture Branch	Ministry of Agriculture, 4607 - 23rd Street, Vernon, B.C., V1T 4K7	(604)545-1387
Crozier, Lorne	Apiarist & Exten- sion Entomologist	N.S. Dept. of Agriculture & Marketing, Horticulture & Biology, Truro, N.S., B2N 5E3	(902)895-1571

<u>Name</u>	<u>Title</u>	<u>Address</u>	<u>Telephone</u>
Gray, Don	Associate Director, Animal Diseases, Research Institute.	Agriculture Canada, Health of Animals Branch, 801 Fallowfield Rd., Ottawa, Ont. K2J 1A1	(613)995-9800
Gochnauer, Tom	Research Scientist	Agriculture Canada, Entomology Section, Ottawa Research Station, Central Experimental Farm, Ottawa, Ont., K1A 0C6	(613)996-7676
Hillbig, Floyd	Secretary of A.I.A.	Apiary Inspectors of America, Box 11100, Rena, Nevada 89502 U.S.A.	(702)784-6401
Jay, S. Cam	Professor	Entomology Dept., University of Manitoba, Winnipeg, Manitoba R3T 2N2	(204)474-9204
Kreutzer, Glenn	Vice President, Canadian Honey Council	2004 Crescent Road W., Portage la Prairie, Manitoba, R1N 1A8	(204)857-3041
McCutcheon, Doug	Apiary Specialist	Ministry of Agriculture, Box 1172, Station A, Surrey, B.C., V3S 4P9	(604)576-2911
Miller, Doug	Research Coordinator, Biosystematics, Apiculture, Problem Wildlife.	Room 1111, K.W. Neatby Bldg., C.E.F., Carling Avenue, Ottawa, Ontario, K1A 0C6	(603)994-5060
Nelson, Don	President, C.A.P.A., Research Scientist	Agriculture Canada, Research Station, 195 Dafoe Road, Winnipeg, Manitoba R3T 2M9	(204)269-2100
Pankiw, Peter	Research Scientist	Agriculture Canada, Research Station, Box 29, Beaverlodge, Alberta T0H 0C0	(403)354-2212
Paradis, G.	President, Canadian Honey Council	Box 568, Falher, Alberta T0H 1M0	(403)837-2354

<u>Name</u>	<u>Title</u>	<u>Address</u>	<u>Telephone</u>
Shuel, Reg	Professor	Dept. of Environmental Biology, University of Guelph, Guelph, Ont., N1G 2A6	(519)824-4120 Local 2478
Siddiqui, I.R.	Principal Research Scientist & Head of Chemistry Section	Agriculture Canada, Food Research Institute, 2002 Neatby Building, Central Exp. Farm, Ottawa, Ontario K1A 0C5	(613)994-9688
Smith, Darrell W.	Provincial Apiarist	N.B. Dept. of Agriculture, Box 6000, Fredericton, N.B., E3B 5H1	(506)453-2507
Smith, Eric	Assistant, Processed Products Section.	Fruit & Veg. Division, Production & Marketing Branch, Agriculture Canada, Ottawa, Ont., K1A 0C5	(613)994-9645
Soehngen, Ulf	Supervisor of Apiculture	Alberta Dept. of Agriculture, OS Longman Regional Lab., 6905 - 116 Street, Edmonton, Alberta, T6H 4P2	(403)427-2450
Szabo, Tibor	Res. Scientist	Agriculture Canada, Research Station, Box 29, Beaverlodge, Alberta T0H 0C0	(403)354-2212

APPENDIX II

THE CANADIAN HONEY INDUSTRY

The Canadian Honey Industry is unique in that it is an important segment of agriculture in every province with the exception of Newfoundland. It is often overlooked as an important industry because the honey and beeswax produced is valued at only 25.9 million dollars *. The industry itself has not been as effective as it might be in promoting honey products and obtaining government recognition.

The true value of the industry in Canada is immeasurably increased if one includes the related container and equipment manufacturers it supports and the pollination service it provides for crop production of fruits, vegetables, legume seed, etc.

The Canadian Honey Industry proper is made up of production, processing or packing and marketing segments all of which are vital to it. The 1976 statistics (Table 1) indicate that 15,295 Canadian beekeepers managed 530,930 colonies which produced 56.1 million pounds of honey. Seventy-four percent of this (Table 2) was produced in the Prairie Provinces of Manitoba, Saskatchewan and Alberta. Of the 56.1 million pounds, 10.46 million pounds (Table 3) were exported, most of it going to the U.S.A., France and Germany. High quality, white mild flavored Canadian honey usually finds a ready market in these countries. The same crop year 3.99 million pounds of honey (Table 4) of mainly Argentine origin entered Canada.

It is legal for beekeepers in all areas of Canada to sell ungraded honey directly to the consumer from his premises. The amount of honey marketed in this way is unknown but is significant. To market honey retail under Agriculture Canada regulations a licence is required. There are at present in Canada 266 beekeepers licenced as Producer-Graders, 44 honey packing plants and 16 registered pasteurizing plants.

Domestic movement of bulk honey is not subject to grading regulations. International movement, however, is subject to federal regulation and an individual or firm must be licenced with Agriculture Canada as a Producer-Grader, Packer or Pasteurizing Plant before Canadian honey can be marketed internationally. In addition there are less than half a dozen food brokers who assist any or all the above classes in the international sale of bulk Canadian honey.

* A total Canadian figure based on 1976 production of 56.1 million pounds of honey at a value of 44.7¢ per pound (\$25,085,000.00) and wax production valued at \$842,000.00.

The Canadian honey industry is closely allied to the Canadian Association of Professional Apiculturists. It is made up of a group of professionally trained apiculturists employed by federal and provincial governments and universities. They provide the regulatory, extension and research components of the honey industry. There are at the present time 4 federal and 11 provincial employees falling into this group and 4 apiculturists on university staff.

The Canadian honey industry is healthy and vigorous, producing a product of excellent quality that is recognized as such throughout the world. This industry has, however, its share of problems many of which we hope to identify and prioritize over the next two days. This exercise only has meaning if we can find solutions to these problems and carry them to fruition. This I believe can only be done through a strong, unified and correctly directed national organization, The Canadian Honey Council.

Respectfully submitted by
Mr. Randy Barker, to the C.A.P.A.
Research Workshop, November 19-20, 1977,
Victoria, B.C.

TABLE 1

BEEKEEPING STATISTICS FOR CANADA

	<u>Beekeepers</u> No.	<u>Colonies</u> No.	<u>Production</u> <u>per colony</u> Lbs.	<u>Total</u> <u>Production</u> '000 lbs.
1967	9,660	445,070	103	45,682
1968	9,600	414,060	81	33,372
1969	9,310	419,060	127	53,312
1970	8,590	407,560	125	51,041
1971	8,630	401,420	130	52,016
1972	8,340	417,300	121	50,599
1973	8,880	437,910	125	54,643
1974	11,350	473,570	97	45,942
1975	13,310	508,450	91	46,419
1976 P	15,295	530,930	106	56,095
<u>5-YEAR AVERAGES</u>				
1962-66	10,428	385,132	105	40,635
1963-67	10,286	406,052	108	43,629
1964-68	10,074	416,852	101	41,875
1965-69	9,784	424,216	107	45,205
1966-70	9,432	423,122	108	45,582
1967-71	9,158	417,434	113	47,085
1968-72	8,894	411,880	117	48,068
1969-73	8,750	416,650	126	52,322
1970-74	9,158	427,552	120	50,814

TABLE 2

BEEKEEPING STATISTICS BY PROVINCE

	<u>Beekeepers</u> No.	<u>Colonies</u> No.	<u>Average Yield</u>	<u>Total</u> <u>Production</u> '000 Lbs.
<u>British Columbia</u>				
1967	1,600	37,140	68	2,540
1968	1,500	31,360	65	2,038
1969	1,840	30,000	75	2,250
1970	1,850	31,000	108	3,348
1971	1,900	31,650	118	3,735
1972	1,900	32,500	110	3,575
1973	1,700	33,030	103	3,402
1974	2,800	41,000	79	3,239
1975	3,600	45,000	79	3,555
1976 P	4,500	50,000	53	2,650

P-PRELIMINARY

TABLE 2 (con't)

BEEKEEPING STATISTICS FOR CANADA

	<u>Beekeepers</u> No.	<u>Colonies</u> No.	<u>Average Yield</u>	<u>Total</u> <u>Production</u> '000 Lbs.
<u>Alberta</u>				
1967	1,400	120,000	145	17,380
1968	1,500	110,000	93	10,230
1969	1,400	120,000	169	20,280
1970	1,200	110,000	184	20,240
1971	1,200	115,000	196	22,540
1972	1,200	130,000	155	20,150
1973	1,300	145,000	149	21,605
1974	1,800	156,000	116	18,096
1975	2,000	158,000	88	12,904
1976 P	2,000	160,000	128	20,480
<u>Saskatchewan</u>				
1967	1,110	46,680	153	7,150
1968	1,000	45,000	113	5,085
1969	1,000	44,000	197	8,668
1970	800	43,000	177	7,611
1971	800	43,000	186	7,998
1972	720	47,000	182	8,554
1973	760	51,600	128	6,605
1974	830	54,000	132	7,123
1975	930	58,000	112	6,496
1976 P	950	60,000	148	8,880
<u>Manitoba</u>				
1967	850	55,000	166	9,140
1968	830	52,000	83	4,316
1969	800	50,000	185	9,250
1970	500	50,000	186	9,300
1972	470	51,500	184	9,476
1973	510	52,000	161	8,372
1974	810	60,000	143	8,580
1975	900	76,000	106	8,056
1976 P	1,100	80,000	151	12,080
<u>Ontario</u>				
1967	2,440	133,170	45	6,032
1968	2,590	126,100	71	8,947
1969	2,200	126,570	71	8,986
1970	2,180	123,160	62	7,636
1971	2,160	115,000	63	7,245
1972	2,100	103,200	65	6,708
1973	2,200	97,900	94	9,203
1974	2,400	99,900	54	5,395
1975	2,800	104,000	83	8,632
1976 P	3,200	106,000	68	7,208

P-PRELIMINARY

TABLE 2 (con't)

BEEKEEPING STATISTICS FOR CANADA

	<u>Beekeepers</u> No.	<u>Colonies</u> No.	<u>Average Yield</u>	<u>Total</u> <u>Production</u> '000 Lbs.
<u>Quebec</u>				
1967	1,660	47,120	65	3,063
1968	1,480	43,550	55	2,395
1969	1,390	42,690	82	3,501
1970	1,450	44,700	57	2,548
1971	1,460	40,970	62	2,540
1972	1,430	46,750	34	1,590
1973	1,830	52,000	93	4,836
1974	1,990	55,870	55	3,073
1975	2,200	59,650	86	5,130
1976 P	2,400	67,000	62	4,154
<u>New Brunswick</u>				
1967	260	1,740	62	108
1968	290	1,930	72	138
1969	290	1,900	68	129
1970	280	1,900	68	129
1971	280	1,900	100	190
1972	210	1,950	76	148
1973	200	1,850	106	196
1974	240	2,300	53	122
1975	310	2,300	84	193
1976 P	470	2,700	80	216
<u>Nova Scotia</u>				
1967	290	3,500	67	236
1968	360	3,400	53	181
1969	320	3,300	65	214
1970	290	3,300	61	201
1971	290	3,400	69	235
1972	270	3,800	90	342
1973	320	3,900	89	347
1974	380	3,800	75	285
1975	440	4,800	80	384
1976 P	515	4,350	81	352
<u>Prince Edward Island</u>				
1967	50	720	46	33
1968	50	720	58	42
1969	50	600	57	34
1970	40	500	56	28
1971	40	500	66	33
1972	40	600	93	56
1973	60	630	122	77
1974	100	700	35	24
1975	130	700	98	69
1976 P	160	880	85	75

P--PRELIMINARY

TABLE 3

HONEY IMPORTS

1974	757,900 lbs.
1975	2,053,000 lbs.
1976	3,997,600 lbs.

TABLE 4

HONEY EXPORTS

1974	6,991,800 lbs.
1975	10,367,760 lbs.
1976	10,455,550 lbs.

APPENDIX III

HISTORY OF BEE RESEARCH IN CANADA

The following is a listing of formalized or recognized beekeeping projects in Canada. It consists of the date, the responsible investigator(s) and short project title. The workers are listed arbitrarily by date and location, i.e., from western through to eastern stations. Some project titles covering a single area have been lumped under one heading for simplicity. Stations listed are given under their present names where possible.

BRITISH COLUMBIA

Agriculture Canada

<u>Date</u>	<u>Name</u>	<u>Title</u>
1947-1951	J. Corner, Prince George	Bees and alsike clover Package vs. overwintered bees. Honey production. Outside wintering.

B.C. Dept. of Agriculture

1960	J. Corner	Effects of ants on honey bee colonies.
	J.C. Arrand, J. Corner	Effects of orchard sprays on bees.
1961	J. Corner	Alsike pollination in Peace River.
1965	P. Pankiw, J. Corner	Package bees and European foulbrood.
1966	P. Pankiw, J. Corner	Package bees and American foulbrood.
1967	P. Pankiw, J. Corner	Package bees from Southern British Columbia.
1968	P. Pankiw, J. Corner	Production of package bees.
1971	J. Corner, T.A. Gochnauer	Tetracyclines in wintering colonies.
1972	T.A. Gochnauer, J. Corner, S.J. Hughes	Isolation of chalkbrood diseases in southern B.C.
1974	T.A. Gochnauer, J. Corner	<u>Bacillus</u> larvae from commercial pollen.
1974-1977	J. Corner	Honey production from fireweed
1975-1977	J. Corner, D. McCutcheon	Ethylene Oxide Fumigation of Combs.
1975-1976	D. McCutcheon	Raspberry pollination in Fraser Valley.
1975	D. McCutcheon	Controlled Atmosphere wintering.
1976-1977	J. Corner, Fran Calvert	Stock Selection and development.

Alberta-Beaverlodge Research Station

<u>Date</u>	<u>Name</u>	<u>Title</u>
1953-1970	P. Pankiw	Outdoor wintering. E.F.B. and A.F.B. control. Alsike clover, red clover and alfalfa pollination. Package bee production, trials and diseases. Controlled atmosphere wintering.
1971-1977	D. Nelson	Indoor vs. outdoor wintering. Chalkbrood disease distribution. Isotope tagging of queens & bees. Supplemental feeding.
1974-1977	T.I. Szabo	Outdoor wintering. Comb building. Queen introduction. Queen storage.

University of Alberta

1960	B. Hocking, F. Matsumura	Bee Brood as Food.
1964	B. Hocking, C.D. Sharplin	Bees in the High Arctic.

SASKATCHEWAN

Saskatchewan Dept. of Agriculture

1952	J. Arnott, S.E. Bland	Antibiotics and EFB (Katznesson)
1972	S.E. Bland	Antibiotics in package bee colonies (Gochnauer)

Prairie Regional Laboratories,
N.R.C., Saskatoon

1970-1971	Dr. A.P. Tulloch	Chemical Properties of Beeswax.
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MANITOBA

University of Manitoba

<u>Date</u>	<u>Name</u>	<u>Title</u>
1925-1950	A.V. Mitchener	Overwintering honey bee colonies. Transporting package bees. Effects of hive colors. Nectar plants and nectar flows.
1961-1964	S.C. Jay	Life History Studies of Honey Bees.
1964-1968	E.V. Nelson S.C. Jay	Studies of Honey Bees in Flight Rooms.
1965-1966	S.C. Jay	Laboratory Rearing Studies.
1965-1977	S.C. Jay	Drifting of Honey Bees in Commercial Apiaries.
1966	S.C. Jay D.H. Jay	Gynandromorphs
1966-1967	C. Plowright S.C. Jay	Bumblebees - Rearing and Caste Determination.
1964-1967	S.C. Jay	Nosema Disease Surveys
1965-1967	S.C. Jay	Reducing Queen Losses in Package Bees.
1968-1977	S.C. Jay	Factors Affecting Ovary Development in Worker Bees.
1967-1977	S.C. Jay	Drifting and Loss of Bees After Hiving.
1970-1974	V. Soehngen S.C. Jay	Honey Sac Studies in Honey Bees.
1969-1972	D. Nelson B. Smirl, S.C. Jay	Package Bees - Population Studies.
1965-1977	S.C. Jay, R. Barker, B. Smirl, S. Malaipan	Pollination Studies on Various crops.
1972-1977	Y. Peng S.C. Jay	Caste Determination Studies.
1973-1974	R. Barker S.C. Jay	Foraging Studies.
1975-1977	J. Gruszka, B. Fingler, D. Nelson, S.C. Jay	Indoor Wintering.
1975-1977	L. Harris, S.C. Jay	Population Studies.
1965-1977	J. Marcus, D. Dixon S.C. Jay	Queen Rearing and Behaviour Studies.

Brandon Research Station (Morden Research Station)

<u>Year</u>	<u>Name</u>	<u>Title</u>
1889	Establishment of first federal apiary	
1920	Apiary moved to Morden Station	
1934	Apiary moved back to Brandon	
1920-1951	E. Braun	Package bee size and hiving dates, optimal size of wintering colonies, productivity of wintered vs. package bee colonies,
1935-1969	J. Geiger	pollination of legumes, winter stores consumption, quality of winter feed, indoor vs. outdoor wintering, types of insulation for outdoor wintered colonies, American foulbrood disease, resistance to nosema disease, hybrid stock and testing of bee races; selection for pollen collecting activity.
1956-1966	J.C.M. L'Arrivee	
1900-1910	J. Fixter	Management of bees (a-f-experiments in wintering bees) Bee cellar, inside wintering bee chamber, ventilation of doors, feeding bees, outdoor wintering, improvement in bee stock, Italianizing of bees, Queen rearing, care of combs and honey, prevention of robbing, introducing queens, honey supply not equal to the demand, how to increase honey yields.

Agriculture Canada, Ottawa (cont'd)

<u>Year</u>	<u>Name</u>	<u>Title</u>
1910-1914	J.I. Beaulne	Cross pollination requirements of fruit. Diagnosis and control of AFB and EFB.
1914-1922	F.W.L. Sladen Dom. Apiarist	Establishment of experimental apiaries in: Agassiz, B.C., Brandon, Man., Cap Rouge, Que., Charlottetown, P.E.I., Fredericton, N.B., Indian Head, Sask., Summerland, B.C., Lennoxville, Que., Kapuskasing, Ont., Invermere, B.C., Kentville, N.S., Lacombe, Alta., Lethbridge, Alta., Nappan, N.S. Sidney, B.C., Ste. Anne de la Pocatiere, Que. These apiaries were established to test wintering methods, study colony build-up and honey production in respect to local flora. In addition, at Ottawa, studies carried out on - quality of honey from different sources (e.g. alfalfa asters, clovers, fireweed, goldenrod, honey dew), wintering (control of humidity in hives), swarming, control by breeding, mating, control on islands, Italian bees, safe queen introductions, pollination of alfalfa by wild bees, foulbrood control, honey granulation, methods of moving bees short distances.
1922	C.B. Gooderham	Expansion of experimental and demonstration apiaries to include: La Ferme, Que., Morden, Man. Beaverlodge, Alta., Fort Vermilion, Alta., Saanichton, B.C. At these stations, (22, including Ottawa), studies on wintering, swarm-control, crop condition were carried out under the discretion of the Dominion Apiarist. At Ottawa, experimental work was carried out on: Swarm control Prevention of swarming by management; methods for detecting swarming; breeding experiments; Italian vs. Carneolan stocks, methods of queen rearing, wintering two-queen colonies, aluminum foundation, methods of detection of AFB, EFB and insecticide damage, wintering in cellars vs. wintering outdoors.

Agriculture Canada, Ottawa (cont'd)

<u>Year</u>	<u>Name</u>	<u>Title</u>
1923-1925	C.B. Gooderham	Experimental work conducted at 21 stations, including Ottawa on wintering, various stocks, indoors vs. outdoors, ventilation, top vs. bottom entrances, multiple queens, bees as agents in cross pollination of fruit trees, tests of foundations from 12 different producers of wax foundations, aluminum foundations, swarm control; comparison between races of bees, methods of detecting swarming, methods of queen rearing, comparison between Jumbo and Langstroth hives.
1926-1927	" "	Age of queen in relation to brood production, package bees as a means of strengthening weak colonies in the spring.
1928	" "	A method for determining colour of honey, control of honey granulation.
1929	" "	Change in design of wintering cases for hives wintered outdoors, change in method of determining brood area.
1930	" "	Package bees kg. overwintered colonies. Methods of making increases.
1931-1936	" "	Italian vs. Caucasian stock; honey yields per colony, Upper vs. lower supering for increased honey crop, overwintered vs. package bees for pollination (orchards) and honey production, swarm prevention methods (separation of Queen from brood), dual colonies and two-queen colonies for honey production, colony buildup: relation of bees and brood in a normal colony, nuclei vs. package bees, drawn combs vs. foundation for honey production, determination of specific gravity and sugar concentration in honey. Moisture content of honey in storage tanks, fermentation of honey.

Agriculture Canada, Ottawa (cont'd)

<u>Year</u>	<u>Name</u>	<u>Title</u>
1937-1948	C.B. Gooderham C.A. Jamieson J.H. Arnott E. Braun (Brandon)	Experimental apiaries at Ottawa, Brandon, Man., Kapuskasing, Ont., Kentville, N.S., St. Anne, P.Q., Prince George, B.C. Provide laboratory services in disease detection, honey grading. Overwintering vs. package bees for orchard pollination and honey production, outdoor wintering of bees; hive entrances for winter, two-queen system for honey production; also the question of foundation vs. drawn comb. Queen supersedure in package colonies, Italian vs. Caucasian bees. overwintering of surplus queens, upper vs. lower supering, honey bees and orchard sprays, effectiveness of sulphathiazole in control of AFB, taxonomy of pollen, nectar concentration, moisture in honey of various crops. Removal of moisture from honey by artificial means, studies on the thermal resistance of honey yeasts, effect of storage temperature on honey quality, relationship of moisture content and yeast count in honey fermentation, controlled crystallization of honey.
1949-1953	C.A. Jamieson E. Braun G.H. Austin P. Pankiw	Pollination Studies: Insect surveys on red clover, alfalfa, alsike clover, sunflower, cucumbers, nectar investigations, seed yields, toxicity of insecticides to honeybees on legumes and in orchards, effect of herbicides on honeybees, control of crystal development in packed honey; factors in the breakdown in texture of re-crystallized honey; stack heat and cooling rates of commercially packed honey; determination of flow rates and viscosity of honey, development of equipment for processing honey; pasteurization of honey by heat and irradiation. Bee diseases: Sterilization of contaminated combs and honey by irradiation; experiments with antibiotics for the control of AFB and sacbrood disease. Susceptibility of

Agriculture Canada, Ottawa (cont'd)

<u>Year</u>	<u>Name</u>	<u>Title</u>
1949-1953 (cont'd)		queen and worker larvae to American foulbrood. Studies on the Chemotherapeutic Control of Nosema, affects on the bee behaviour of carbon dioxide anaesthesia, Colony Management: Effect of pollen supplies on overwintered colonies; effect of "side-packing" on the survival of colonies during winter, hybrid stock testing program in collaboration with USDA and OAC.
1953-1956	C.A. Jamieson) E. Braun) G.H. Austin) P. Pankiw) D. Peer) -	Continuation of the above projects Control of mating behaviour in honeybees
1957-1959	C.A. Jamieson) G.H. Austin) R. Boch)	Continuation of above projects to include safflower. Strong emphasis on nosema control with FUMIDIL.
1959-1967	T.A. Gochnauer B. Furgala R. Boch J.C.M. L'Arrivee	Better methods of rearing and maintaining colonies, better employment of colonies as pollinators of various seed crops, response of colonies to winter environment, studies of the food requirements of larvae, investigations into the pheromone communication system in the honey bee colony, diseases of honey bees mode of action of drugs and antibiotics used in the control of diseases. Toxic products of the disease organisms, including chemistry of bee viruses, effectiveness of ionizing irradiation on disease causing organisms.
1962-1970	I.R. Siddiqui B. Furgala	Sugars in royal jelly, sugars in honey.
1969-1970	I.R. Siddiqui R. Wood J.W. Vandermeer T.A. Gochnauer	Sugars in <u>Nosema apis</u> spores.
1970-present	G.R. Timbers G. Robertson T.A. Gochnauer	Physical properties of beeswax.

Agriculture Canada, Ottawa (cont'd)

<u>Year</u>	<u>Name</u>	<u>Title</u>
1973-present	C. Buckner B. McLeod T.A. Gochnauer	Impact of spruce budworm control measures on bees.
1967-1977	T.A. Gochnauer R. Boch	Honey bee behaviour: Investigations on the composition and activity of pheromones, substitute honey bee diet; development of a pollen substitute, American foulbrood disease: mode of action of <u>Bacillus larvae</u> ; ethylene oxide fumigation of contaminated combs, etc. chalkbrood disease: development of control methods.

Ontario - University of Guelph

1932	E.J. Dyce	Dyce Process for honey.
1938	W.G. LeMaistre	O.A.C. Strainer
1939	G.F. Townsend	Pasteurization times and temperatures for honey
1940	G.F. Townsend	Methyl bromide for wax moth control
1940-1945	G.F. Townsend	Testing of new containers for honey
1942-1950	G.F. Townsend	Sulfathiozole for the control of of American Foulbrood
1945-1965	G.F. Townsend M.V. Smith	Improved hybrid strains of bees
1949-1955	M.V. Smith	Legume pollination
1950-1955	M.V. Smith G.F. Townsend	Fruit pollination
1950-present	R.W. Shuel	Factors influencing nectar secretion
1950-1952	M.V. Smith	Nosema control in queens
1953-1963	G.F. Townsend A. Adie	Honey processing, packing and extracting
1954-1955	G.F. Townsend A. Adie	Honey pressure straining

Ontario - University of Guelph (cont'd)

<u>Year</u>	<u>Name</u>	<u>Title</u>
1955-1963	G.F. Townsend W.H. Brown, etc.	The anti-tumour effects of Royal Jelly, its fractions and derivatives
1954-57	M.V. Smith	Development of a technique for large scale production of Royal Jelly
1957	M.V. Smith	Septicemia in bees
1957-present	R.W. Shuel S.E. Dixon Graduate Students & Research Associates	Mode of action of Royal Jelly in honeybee development
1958	M.V. Smith & G.F. Townsend	Development of an automatic dispenser of pollen
1960-1965	M.V. Smith A. Adie G.F. Townsend	A pollen trap for commercial use
1960-1962	M.V. Smith	Development of a portable incubator for importing miniature stages of the honeybee
1964	G.F. Townsend	Benzaldehyde as a repellent for removing honey
1965-1967	M.V. Smith	Adaptability of <u>Megachile</u> <u>rotundata</u> to Ontario conditions
1965-1969	G.F. Townsend	Color classification of honey with a colorimeter
1966	G.F. Townsend	Development of a set of colour classification standards for Canadian honey
1967-1969	G.F. Townsend A. Adie	Effect of beekeeping equipment and extracting methods on honey quality
1969-1972	G.F. Townsend Eva Crane	Computer generated index for Apiculture Abstracts
1969-1972	R.W. Shuel L.R. Verma	Factors influencing longevity of honeybee sperm

Ontario - University of Guelph (cont'd)

<u>Year</u>	<u>Name</u>	<u>Title</u>
1969-1974	G.F. Townsend	Black locust as a possible source of honey in Ontario
1970-1971	G.F. Townsend A. Adie	Blending of honey at moderate temperatures
1972-1975	M.V. Smith G.F. Townsend T.I. Szabo	Behavioural studies on queen introduction in the honeybee
1973	G.F. Townsend I.K. Kigatiira	Hive designs, and extracting and processing equipment for developing countries

Quebec

1970	F. Beaughesne J. Guilbault J.B. Blanchet M. Dirren	Divisions from Wintered Hives
1971-1972	F. Beaughesne J.L. Villeneuve	Feeding Invert Sugar for Wintering
1974	F. Beaughesne	Sugar syrup vs. Clover Honey vs. Maple Syrup as Feed Heating Colonies with Bulbs
1974-1975	F. Beaughesne J.L. Villeneuve	Amino Acids in Pollens Pollen Substitutes Populations and Honey Crops
1975	F. Beaughesne J.L. Villeneuve	Queen Rearing Methods
1975-1976	F. Beaughesne P. Bernier	Survey of Inside Wintering Cellars
1975	F. Beaughesne J.L. Villeneuve B. Levec	Testing Ethylene Oxide for A.F.B.

Nova Scotia

1954	E.A. Karmo V.R. Vickery	Apple Pollination Trials
1955	E.A. Karmo V.R. Vickery	Apple Pollination Trials Rotation of Colonies

Nova Scotia (cont'd)

<u>Year</u>	<u>Name</u>	<u>Title</u>
1955	E.A. Karmo	Pollen Exchange Inside the Hive Blueberry Pollination Trials
1958	E.A. Karmo V.R. Vickery	Blueberry Cross Pollination
1959	E.A. Karmo V.R. Vickery	Apple Pollination
1960	E.A. Karmo	Pollination of MacIntosh Apples
1961	E.A. Karmo	Pollination of Red Delicious Apples
1963	E.A. Karmo	Polyethylene as a Wrapping for Wintered Colonies Use of Pollen Supplement Lowbush Blueberry Pollination Trials
1963-1976	E.A. Karmo	Selecting Strains of Bees for Nova Scotia Wintering Trials - Single vs. Multiple Colony Packs

Respectfully submitted by
Dr. Cam Jay to the C.A.P.A.
Research Workshop, November 19-20, 1977,
Victoria, B.C.

APPENDIX IV

THE PRESENT STATUS OF APICULTURE RESEARCH IN CANADA

There are 19 positions directly associated with teaching research and extension in apiculture; 4 university positions, 4 federal research positions and 11 provincial positions as either apiarists, assistant apiarists or specialists.

Research areas presently under study include breeding, behaviour, disease, fumigation, honey production, nutrition and feeding, pheromones, wintering, wax production and quality and pollination. (See Addenda A and B).

The present strengths of apicultural research are in the areas of wintering, fumigation, behaviour and breeding. There is an apparent total lack of research in areas such as honey chemistry, product development, engineering, economics, marketing, pesticides in relation to foraging bees and pesticide residues in honey. Other areas in Addendum A are intermediate in their present status.

Apiarists and researchers solicited for information in this report showed that they needed assistance to a lesser or greater degree in the following research areas: biochemistry, engineering, bacteriology, plant science, analytical chemistry, physiology, biosystematics, carbohydrate chemistry and statistics. This information indicates an increasing need for backup in specified fields of expertise.

Respectfully submitted by
Mr. Don Nelson to the C.A.P.A.
Research Workshop, November 19-20, 1977,
Victoria, B.C.

Addendum A

Number of People Working in Each Research Area

	<u>Univ.</u>	<u>Fed.</u>	<u>Prov.</u>	<u>Total</u>
Breeding	1	3	1	5
Behaviour	2	3	0	5
Disease	0	2	1	3
Fumigation	0	3	3	6
Honey Production	2	2	0	4
Feeding and Nutrition	1	3	2	6
Pheromones	1	2	0	3
Wintering	3	3	5	11
Wax Production and Quality	0	2	0	2
Pollination	1	1	2	4
Other	1	1	0	2

Addendum B

People in Each Research Area

	2*	1	2	1	2	1	2	2	3	3	3	3	3	3	Total
	Szabo	Shuel	Gochbauer	Vickery	Nelson	Jay	Boch	Gray	Soehngen	McCutchen	D. Smith	Crozier	Barker	Villeneuve	
Breeding	X	X			X		X			X					5
Behaviour	X	X	X			X	X								5
Disease			X		X									X	3
Fumigation			X		X		X			X			X	X	6
Honey Production	X	X			X	X									4
Feeding and Nutrition	X	X			X		X		X					X	6
Pheromones	X					X	X								3
Wintering	X	X		X	X	X	X		X	X		X	X	X	11
Wax Production and Quality	X		X												2
Pollination	X					X				X	X				4
Others		X						X							2
Research m/y	1.0	.66	1.0	.15	1.0	.25	1.0	.15	.15	.15	.15	.15	.15	.25	6.21
Extension & Teaching m/y	0	.33	0	.85	0	.75	0	0	.85	.85	.85	.85	.85	.75	6.93

* 1 - University 2 - Federal 3 - Provincial

APPENDIX V

PRODUCTION

Selection and Breeding

1. Develop stocks better suited to Canadian conditions
2. Maintain honey bee stock importation regulations (HA)

Diseases

1. Chalkbrood
2. Nosema
3. EFB
4. AFB
5. Viral diseases

Improved Colony Management Methods

1. Wintering colonies indoors and outdoors
2. Queens and queen banking
3. Substitute feeding
4. Basic studies of behavior (pheromones)

UTILIZATION

1. Nectar production and pollination of specific crops
(currently important rapeseed in Western Canada)
2. New nectar and pollen sources
3. Physiology of nectar secretions and pollen availability

REGULATION

1. Chemicals used in honey production
2. Evaluation of pesticides under Canadian conditions
3. Legal definitions, measurements of honey purity,
methods and equipment for determination of honey
color.

MARKETING

1. Marketing problems

EDUCATION

1. Training of apiculturists

A Research Workshop was held by the Canadian Association of Professional Apiculturists at Victoria, British Columbia, November 19-20, 1977. Appendix I provides a list of participants with their office addresses and telephone numbers.

The purposes of the workshop were as follows:

1. To inform apiculturists and beekeepers of developments in the honey-producing and pollinating industry in Canada (Appendix II).
2. To review the history of apicultural research in Canada (Appendix III).
3. To describe current research programs in Canada (Appendix IV).
4. To identify, analyze, and assign priorities to apicultural subjects that require research and development (Appendix V).
5. To record recommendations made by the meeting for bringing order to current and future programs of research and development intended to resolve problems facing the industry.

The following recommendations are to be used as guidelines by agencies that are now or may become involved with research programs aimed at helping the Canadian honey-producing industry achieve its full potential. The recommendations are restricted to topics essential to the well-being of the industry, such as production, utilization, regulation, marketing, and education. They relate directly to subject areas listed in Appendix V under the above-mentioned topics. These subjects were debated and evaluated in committee and assigned a priority according to their importance to the honey-producing industry.

The participants at the research workshop reached a consensus on both the priority list of subjects and the recommendations referring to them.

The workshop participants are aware that the agencies at which these recommendations are aimed cannot now provide all the resources needed to resolve the many problems facing the honey-producing industry. They prepared the recommendations in such a way that the agencies can take action without straining their resources beyond their present capacity.

The Canadian Association of Professional Apiculturists hereby asks decision-making heads of these agencies to give the recommendations a full hearing, and make decisions that will directly or indirectly implement them.

RECOMMENDATIONS

1. PRODUCTION

a) Stock Selection and Breeding

There is a need to initiate and coordinate breeding programs designed to improve regionally desirable characteristics of honey bee stock, such as honey production, docility, wintering ability, disease resistance, and pollination behavior.

Recommendation

Make available at least one position for an apicultural geneticist and provide sufficient funds to initiate and maintain a meaningful program of stock selection and breeding.

b) Diseases

It is recognized that diseases are still a major problem in the bee-keeping industry.

Recommendation

Expand research to develop and evaluate new disease control methods. Make available a position to evaluate the needs of Western Canada and resolve problems related to bee diseases.

c) Improved Colony Management Methods

There is still a need for continued research in techniques for overwintering honey bees, to increase honey production and pollination.

Recommendation

Expand existing research by making available additional funds for cooperative programs among federal, provincial, and university agencies.

2. UTILIZATION

a) Nectar Production and Pollination of Specific Crops

Rapeseed, which is the third most important crop in Western Canada, is also one of the main sources of nectar and pollen for honey bees. Little is known about the possible value of this crop to the honey-producing industry as a nectar resource, or about the impact of pollination by honey bees on the crop itself in terms of increased seed production, quality of seed, and early maturity.

Recommendation

Expand and coordinate existing programs in pollination and rapeseed breeding related to the problems outlined above.

b) New Nectar and Pollen Sources

It is recognized that nectar-and pollen-producing crops are diminishing throughout Canada because of changing farming practices, such as expansion of the corn crop area in Ontario. There is also a need to use roadsides, powerlines, pipelines, rights of way, and other waste areas to grow nectar-producing plants in ecological repair programs.

Recommendation

Establish programs aimed at determining the feasibility of planting waste areas and submarginal lands with nectar-secreting plants. Encourage plant breeders to include nectar secretion as a valuable characteristic in their breeding programs.

3. REGULATIONS

a) Chemicals used in Honey Production

The bee-keeping industry is aware that there is a continuing need to monitor the use of chemicals in honey production.

Recommendation

Expand and coordinate existing programs aimed both at monitoring chemical use in the industry, and at replacing or modifying existing methods of application to ensure a pure product.

b) Evaluation of Pesticides under Canadian Conditions

The honey-producing industry is concerned with the killing of bees by pesticides. There are little or no data available on the effect of pesticide residues over time on honey bees and other domesticated pollinators under Canadian conditions.

Recommendation

Develop a continuing program for accumulation of data on the toxic effects of pesticide residues on insect pollinators (honey bees and alfalfa leafcutter bees) under field conditions in Canada.

4. MARKETING

a) Marketing Problems

The Canadian Association of Professional Apiculturists suggests that the Canadian Honey Council identify and assign priorities to the industry's marketing problems. If outside help is required to resolve these problems, it is suggested that the Council request assistance through a separate brief to be submitted to Agriculture Canada, or other agencies with economic research resources, or both. Some specific examples of possible study areas might be:

- i) identification of factors accounting for variations in prices and an indication of their importance;
- ii) impact of tariff changes on the honey industry;
- iii) analysis of strengths and weaknesses in the market structure.

5. EDUCATION

a) Training Apiculturists

Based on current and future priorities for apicultural research and extension in Canada, decisions about the number and type of professional positions required should be made immediately. It may be necessary to train personnel for the positions in apiculture that may be created over the next 5-10 years.

Recommendation

Educational agencies should be prepared to train 10 apiculturists for research and extension positions in Canada. These apiculturists should be highly versatile, that is, trained in biology, ecology, entomology, apiculture, and other fields. The training could be done at universities, inside or outside Canada, with the following timetable in mind:

<u>Year</u> <u>Required</u>	<u>Number</u> <u>A* B**</u>	<u>Year</u> <u>Required</u>	<u>Number</u> <u>A* B**</u>
1978	0 0	1982	0 0
1979	2 0	1983	0 2
1980	0 3	1984	0 1
1981	0 1	1985	0 1

A* New requirement (Microbiologist, Geneticist)

B** Replacements (Provincial Apiculturists)

Consideration should also be given to future training programs for foreign students, honey producers, the general public, and school children.