I. TENTATIVE SCHEDULE OF IMPLEMENTATION

Item / Year	1st	2nd	3rd	4th	5th	SITE
1 Improvement of AI techniques						PT
(1) Feeding and management of bull						
1) Suckling and raising						
2) General management						
3) Diagnosis of infectious diseases (mainly sample collection)						
(2) Improvement of process of frozen semen production						
1) Semen collection and processing						
2) Freezing method (diluent, development of motility)						
3) Semen evaluation						
4) Sanitary control of equipments						
(3) Investigation of AI service						
1) Investigation of AI service at AI unit						
2) Advice and guidance on AI unit						
(4) Trial experiment and demonstration on ET technique						
1) Superovulation						
2) Flusing of embryo						
3) Freezing of embryo						
4) Embryo transfer						
5) Sanitary control of equipment						
2 Development of appropriate dairy techniques						PT&CB
(1) Reproductive and hyginical techniques						PT&CB
1) Investigation of reproductive disorders except communicable diseases						
a) Ovarian diseases						
b) Uterine diseases (endometritis, pyometra)						
c) Repeat breeders						
d) Diseases of gestation period, before and after calving						
2) Mastitis						
3) Diagnosis, prevention and treatment for 1) and 2) mentioned above						
4) Publication of manual for diease control and treatment mentioned above 3)						
5) Trial experiment and demonstration of developed techniques						

PT:Pathum Thani AI Center

CB:Chai Badan Demonstration Farm

Item / Year	1st	2nd	3rd	4th	5th	SITE
(2) Feeding and management technique						PT&CB
1) Investigation of local condition						
2) Feed management technique						
3) Suckling, weaning and raising						
4) Improvement of milk quality control (miliking, handling of raw milk and milking machine, and milk quality test)						
5) General management of cow (recording, calving, foot trimming etc.)						
6) Economic evaluation on feed cost						
7) Herd replacement method (mating, selection, culling)						
8) Publication of feeding & management manual						
9) Trail experiment and demonstration of developed techniques						CB
(3) Technical development of forage and grassland management						PT&CB
1) Investigation of local condition						
2) Applied test of recommended grass						CB
3) Forage and grassland cultivation management						
4) Harvesting, processing and utilization						
5) production of silage						
6) Utilization of agricultural by-products						
7) Proximate analysis of feed						
8) Operation and maintenance of farm machinery						
8) Trial of pasture renovation						CB
10) Publication of manual for forage and grassland management						
11) Trial experiment and demonstration of developed technique						CB
3 Training						
(1) Instructor training course (a)						PT
(2) On-the-job training course (b)						PT&CB
(3) In-service training course (c)						CB
(4) Milk quality improvement course (d)						CB

Note: (a) Training course on dairy and AI techniques to instructors of DLD, CPD and Cooperative by DLD

(b) Training course on dairy techniques and farm management to key farmers(successors) by DLD and CPD

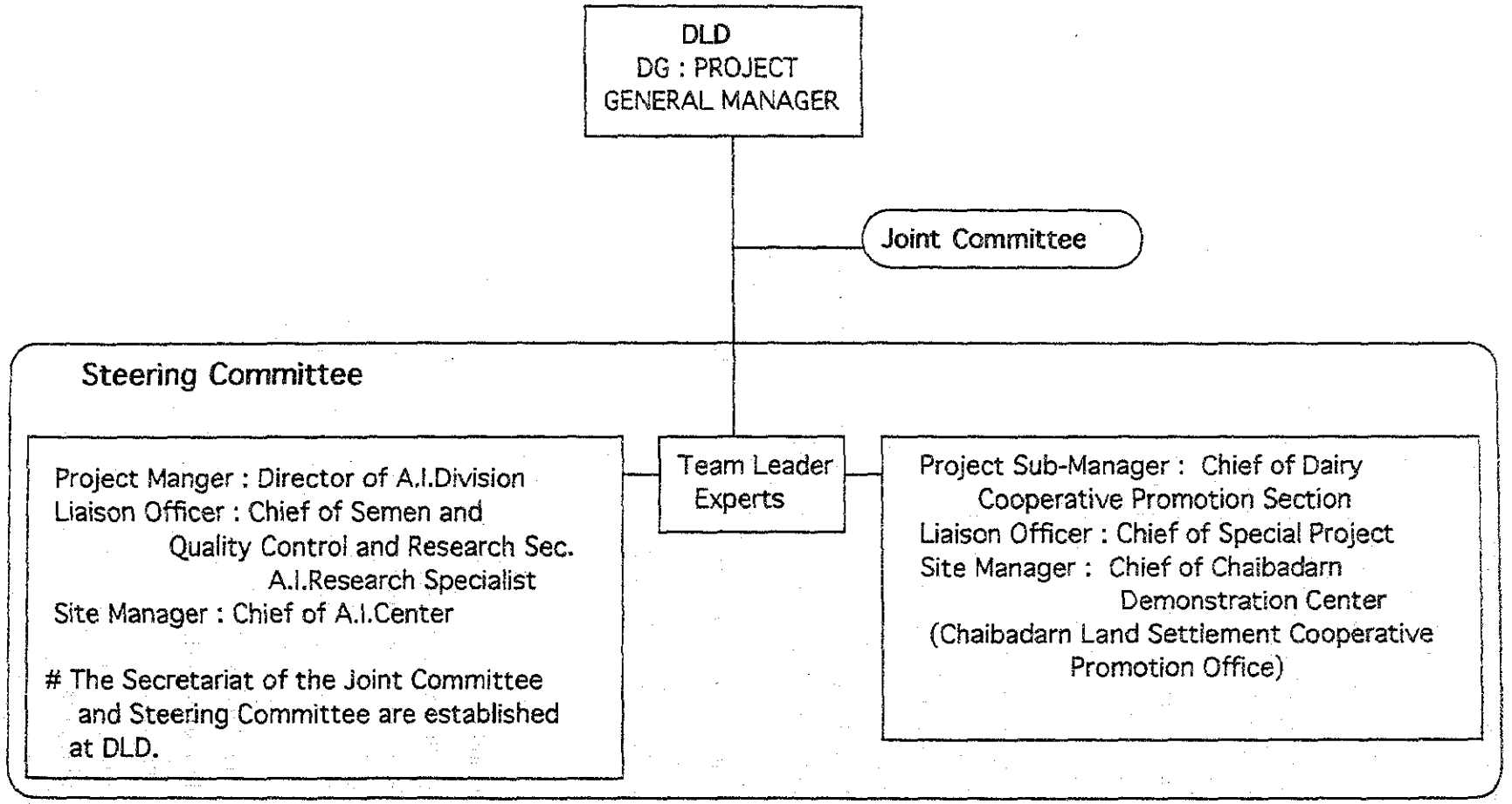
(c) In-service training course on dairy techniques to Cooperative staff and key farmers by DLD and CPD

(d) Training course on milk handling to Cooperative staff and key farmers by DLD and CPD

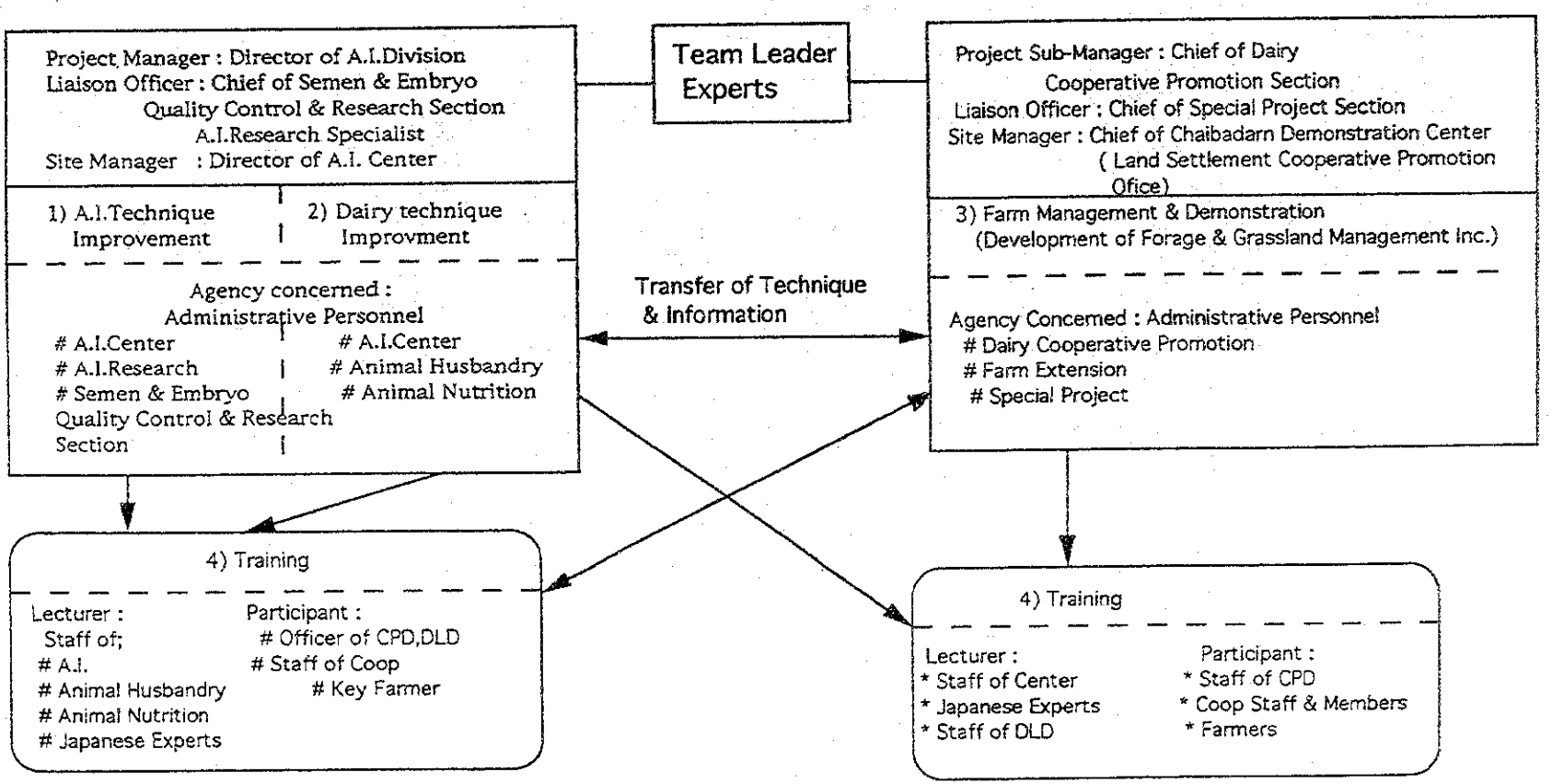
II. TECHNICAL COOPERATION PROGRAM

Item / Year	1st	2nd	3rd	4th	5th	
1 Japanese side:						
(1) long-term experts						
1) Team Leader						* In the five to six experts may be dispatched annually
2) Coordinator						
3) Artificial Insemination and Embryo Transfer						
4) Animal Reproduction and Health						
5) Animal Feeding and Management						
6) Forage crop and Grassland Management						
(2) Short-term Experts	(when necessity arises) (four to five persons annually)					
(3) Counterpart training in Japan						
(4) Provision of machinery and equipment						
(5) Dispatch of survey missions	(Missions may be dispatched when necessity arises.)					
2 Thai side:						
(1) Counterparts						
1) Project Manager						
2) Counterparts of Japanese Experts	(The Thai side will assign necessary number of qualified counteroparts of Japanese experts)					
3) Clerical Personnel						
(2) Provision of running cost of the Project						
(3) Provision of land, buildings and facilities						

PLAN OF THE PROJECT ORGANIZATION



PLAN OF THE PROJECT IMPLEMENTATION CHART



附属資料 2. 国民総生産と畜産の生産額（英文）

Gross national production and income at current market prices by industrial origin 1986-1989
(In million Baht)

	1986	1987	1988	1989
Agriculture	178,140	205,592	250,384	271,443
Crops	106,997	122,808	160,179	170,884
Livestock	19,784	22,448	24,623	29,022
Fishery	15,319	19,835	21,655	24,323
forestry	8,989	9,757	8,944	7,425
Agricluturalservices	7,109	8,061	8,729	9,113
Simple agricltutural processing products	19,952	22,682	26,254	30,676
Manufacturing	258,644	299,327	373,326	455,228
construction	56,572	66,097	84,791	118,359
GDP	1,095,368	1,253,147	1,506,977	1,790,810
GNP	1,072,931	1,230,753	1,482,207	1,767,406
per capita GDP	20,803	23,377	27,633	32,297
GNP	20,377	22,960	27,179	31,875

"Statistical Handbook of Thailand 1990"
National Statistical Office, Office of the Prime Minister

附属資料 3. 集乳量、生産農家、乳牛頭数及び集乳量（英文）

ตารางที่ 53. จำนวนสมาชิก จำนวนโคนม ราคาและปริมาณน้ำนมดิบที่ส่งเข้าศูนย์รวบรวมน้ำนมต่าง ๆ พ.ศ. 2534
Table 53. Number of member, dairy cow, average of price and quantity of fresh milk collected by milk collecting points, 1991

ศูนย์รวบรวมน้ำนมดิบ (Milk Collecting Points)	ปริมาณน้ำนมดิบ (ตัน) Quantity of fresh milk (tons)	ราคาเฉลี่ย (บาท/กก.) Average of price (baths/kg.)	จำนวนสมาชิก (ราย) Number of member (person)	จำนวนโคนม (ตัว) Number of dairy cows (heads) ทั้งหมด Total	ที่รีดนม Milk cows	
2533 รวมทั้งหมด	130,277.7	7.01	12,029	101,286	44,450	1990 Total
รวม อ.ส.ค. ทั้งหมด	63,772.0	6.97	4,905	58,956	21,940	Total D.F.P.O.
เขตมวกเหล็ก สระบุรี	47,048.0	6.98	3,109	44,045	16,315	Muaglek, Saraburi
เขตประจวบคีรีขันธ์	13,596.4	7.02	1,100	12,021	4,716	Prachuap Khiri Khan
เขตเชียงใหม่	3,127.6	6.89	696	2,890	909	Chiang Mai
สหกรณ์โคนมทั้งหมด	59,514.2	6.92	7,047	37,466	20,731	Total co-operative
หนองโพ ราชบุรี	38,946.9	7.06	4,147	22,126	12,800	Nong-Po, Ratchaburi
นครปฐม	4,735.2	7.12	514	*	*	Nakhon Pathom
เชียงใหม่	2,310.2	6.87	685	2,238	1,467	Chiang Mai
ปากช่อง นครราชสีมา	8,035.1	7.09	591	6,480	4,000	Pak Chong,Nakhon Ratchasima
สหกรณ์อื่น ๆ	5,486.8	6.84	1,110	6,622	2,464	Other co-operative
อื่น ๆ	6,991.5	6.40	77	4,864	1,779	Others
2534 รวมทั้งหมด	142,253.1	7.14	12,535	105,766	4,775	1991 Total
รวม อ.ส.ค. ทั้งหมด	64,884.6	6.95	5,172	58,692	24,255	Total D.F.P.O.
เขตมวกเหล็ก สระบุรี	47,084.8	6.98	3,615	43,561	18,716	Muaglek, Saraburi
เขตประจวบคีรีขันธ์	15,128.2	6.96	1,186	12,934	4,844	Prachuap Khiri Khan
เขตเชียงใหม่	2,671.6	6.91	371	2,197	695	Chiang Mai
สหกรณ์โคนมทั้งหมด	70,114.4	7.15	7,284	40,397	21,533	Total co-operative
หนองโพ ราชบุรี	41,030.6	7.37	4,366	22,126	12,800	Nong-Po, Ratchaburi
นครปฐม	3,571.4	7.39	553	*	*	Nakhon Pathom
เชียงใหม่	7,271.0	6.92	700	2,238	1,467	Chiang Mai
ปากช่อง นครราชสีมา	8,884.3	7.22	510	6,480	4,000	Pak Chong,Nakhon Ratchasima
สหกรณ์อื่น ๆ	9,357.1	7.11	1,155	9,553	3,326	Other co-operative
อื่น ๆ	7,254.1	6.87	79	6,677	1,927	Others

อ.ส.ค. = องค์การส่งเสริมกิจการโคนมแห่งประเทศไทย　D.F.P.O.= Dairy Farming Promotion Organization Of Thailand

出典「Agricultural statistics in Brief Crop Year 1991/92)
center for Agricultaral Statistics office of Agricultural Economics MAC

附属資料 4. AI部のAI研修のカリキュラム（英文）

ＤＬＤのＡ．Ｉ．研修コースの研修内容

コース１；AI FOR TECHNICIAN（１９－２１日）

	LECTURE(hrs)	PRACTICE(hrs)
1 POLICY AND AI ORGANIZATION	1	-
2 INTRODUCTION OF AI	2	-
3 ANATOMY AND PHYSIOLOGY OF FEMALE COW	4	2
4 HANDLING OF DEEP FROZEN SEMEN	2	-
5 TECHNIC OF AI	4	18
6 INFERTILITY	4	-
7 PREGNANCY DIAGNOSIS	2	4
8 DYSTOCIA	2	-
9 AI-DATA&RECORDING SYSTEM	2	-
10 AI-SERVICE EXTENSION	2	-
11 EVALUATION	-	3
12 FIELD WORK PRACTICE	-	80

LECTURE	25 HOURS
PRACTICE	27
FIELD WORK PRACTICE	80
TOTAL	132

コース２；AI FOR TECHNICIAN ADVISOR（１８日）

	LECTURE(hrs)	PRACTICE(hrs)
1 POLICY AND AI ORGANIZATION	1	-
2 INTRODUCTION OF AI	2	-
3 ANATOMY AND PHYSIOLOGY OF FEMALE COW	2	2
4 HANDLING OF DEEP FROZEN SEMEN	2	-
5 SEMEN EVALUATION	2	2
6 TECHNIC OF AI	4	18
7 INFERTILITY	4	-
8 PREGNANCY DIAGNOSIS	2	-
9 DYSTOCIA	2	-
10 AI-CENTER CO-ORDINATION	2	-
11 AI-SERVICE MANAGEMENT	2	-
12 IMPROVING PERSONNEL EFFICIENCY	2	-
13 SEMINAR	-	2
14 FIELD WORK PRACTICE	-	28

LECTURE	27 HOURS
PRACTICE	22
FIELD WORK PRACTICE	28
SEMINAR	2
TOTAL	79

コース3；FOLLOW UP PROGRAM （8日）

	LECTURE(hrs)	PRACTICE(hrs)
1 POLICY AND AI ORGANIZATION	1	-
2 INTRODUCTION OF AI	2	-
3 ANATOMY AND PHYSIOLOGY OF FEMALE COW	2	2
4 HANDLING OF DEEP FROZEN SEMEN	2	-
5 SEMEN EVALUATION	2	4
6 AI TECHNIC	4	4
7 INFERTILITY	2	-
8 DYSTOCIA	2	-
9 PREGNANCY DIAGNOSIS	2	2
10 PROBLEM OF AI-SERVICE EXTENSION	2	-
11 ROLE OF AI-SERVICE IN AI DEVELOPMENT	2	-
12 AI-SERVICE EXTENSION	2	-
13 DAILY WORK PLAN FOR AI-UNIT	2	6
14 AI-DATA RECORDING		2
15 EVALUATION		2
16 IMPROVING PERSONNEL EFFICIENCY	2	-
17 SEMINAR	-	2

LECTURE	29 HOURS
PRACTICE	22
FIELD WORK PRACTICE	24
SEMINAR	2
TOTAL	79

コース４；AI FOR FARMER （３０日）

	LECTURE(hr)	PRACTICE(Hr)
1 POLICY AND AI PLAN	4	-
2 BREED AND SEMEN	4	-
3 BREEDING METHOD	4	-
4 BULL SELECTING AND DEEP FORZEN SEMEN PRODUCTON	2	-
5 ANATOMY OF COW REPRODUCTIVE SYSTEM	4	-
6 INTRODUCTION OF AI	4	-
7 RECTAL PALPATION	-	8
8 REVIEW AND EXAM	4	4
9 PHYSIOLOGY OF COW REPRODUTIVE SYSTEM	8	-
10 TECHNIC OF AI	8	-
11 EQUIPMENT IN AI	4	-
12 PRACTICE PASSING THROUGH CATHETER	-	20
13 REVIEW	4	4
14 INFERTILITY	4	-
15 PRE/POST PARTURITION PROBLEM	4	-
16 INTRODUCTION OF DAIRY CATTLE MANAGEMENT	4	-
17 INTRODUCTION OF BULL MANAGEMENT	2	-
18 INTRODUCTION OF BEEF CATTLE MANAGEMENT	4	-
19 INFECTIOUS DISEASE	4	-
20 PRACTICE	-	20
21 REVIEW	4	4
22 PARTURITION AND AFTER CARE	4	-
23 AI-DATA RECORDING	8	4
24 PROVINCE VETERINARY OFFICE ACTIVITIES	4	-
25 TECHNIC AND EXPERIENCE IN AI	4	20
26 REVIEW	4	4
27 SEMINAR	2	-

LECTURE	100 HOURS
PRACTICE	88
OBSERVATION TOUR	24
SEMINAR	2
TOTAL	214

附属資料 5. タイ酪農協の推移

タイ国の酪農協の推移

年	酪農協数	酪農家戸数（戸）		搾乳牛頭数（頭）		集乳量（トン/日）		生乳生産額（百万バーツ）	
		全国	酪農協	全国	酪農協	全国	酪農協	全国	酪農協
1075	4		1,308			26.6	12.6		37
1980	4		2,750			54.7	29.8		87
1985	13	5,218	4,185	26,431	7,907	140.7	39.8		96
1990	31		10,949		36,655	417.0	212.6		736
1991	50		11,376		41,037		238.7		824
1992	53		12,283		60,107		296.0		947

※資料は、CPDより

INFORMATION FOR DAIRY COOPERATIVE SOCIETIES
AS OF MAY 31, 1992

No.	Name of societies	District/Province	Membership	No of cows (head)		Raw Milk (Jan.-May.1992)		Marketing in form of milk product (Jan.-Dec.1991) (Mil.Baht)	Raw milk (Jan.-Dec.1991)		Registration Date
				Total	Milked cows	Tons	Mil.Bath.		Tons	Mil.Baht	
1	Nong Po	Photharam,Ratchaburi	4054	46689	15563	18925	144.42	723.4	40984	302.2	April 15,1971
2	Nakhon Pathom	Muabh,Nakhon Pathom	565	5676	1892	2301	17.31	51.8	3574	26.4	July 1,1971
3	Moklek	Moklek,Saraburi	478	9495	3165	3849	28.39	0	9219	66.5	Aug 28,1972
4	Chiang Mai	Muang, Chiang Mai	707	3236	1078	1312	9.31	22.3	3280	23	July 1,1974
5	Bangkok	Nong Chok, BangKok	197	0	0	0	0	0	0	0	March 30,1981
6	Chai Badan	Chai Badan, Lop Buri	105	634	287	478	3.5	0	930	8.4	May 12,1981
7	Prachuap Khiri Khan	Pranburi, Prachuap Khiri Khan	193	2595	1015	1180	8.2	0	2832	19.8	Dec.3,1981
8	Phetcha Buri	Cha-um, Phetcha Buri	196	2424	812	996	6.92	0	2391	16.7	Sept.15,1983
9	Pak Chong	Pak Chong, Nakhon Ratchasima	627	8508	2836	3489	24.87	1.8	8914	64.2	June 19,1984
10	Nikom Prachuap Khiri Khan	Thapsakae, Prachuap Khiri Khan	160	2536	1190	1420	9.87	0	3409	23.9	Dec.3,1984
11	Mihan Dang	Mihan Dang, Saraburi	84	1740	792	654	5.13	0	293	2.1	Dec.27,1984
12	Phra Phutthabat	Phra Phutthabat, Saraburi	86	918	507	657	4.26	0	1704	12	Dec.27,1984
13	Phatthana Nikhom	Phatthana Nikhom, Lop Buri	268	7690	4400	907	7.1	0	14684	102.8	April 16,1985
14	Kao Khlung	Ban Pong, Ratchaburi	513	4900	1500	1268	9.07	2.6	3975	29.1	Jan.9,1987
15	Lam Phaya Klang	Moklek, Saraburi	45	468	156	456	3.17	0	1095	7.7	July 20,1987
16	Wang Ham Yen	Wang Ham Yen, Prachin Buri	237	3339	1112	2022	14.15	0	3961	27.7	July 22,1987
17	Muang Lop Buri	Muang, Lop Buri	39	347	134	0	0	0	365	2.4	Nov.17,1987
18	Bing Sam Phan	Bing Sam Phan, Phetchaboon	132	270	130	139	0.97	0	549	3.8	Jan.11,1988

19	Ban Bing	Ban Bing, Chon Buri	108	720	720	685	5.45	3	1812	14.1	Feb.12,1988
20	Ban Mee	Ban Mee, Lop Buri	68	923	675	821	5.71	0	1971	13.8	March 18,1988
21	Phetchaboon	Lomsak,Phetchaboon	56	321	266	7	0.04	0	0	0	Nov.20,1988
22	Songkhla	Rattaphum, Songkhla	17	0	0	0	0	0	0	0	July 8,1988
23	Phatthalung	Muang, Phatthalung	275	1019	340	430	3.18	12	1033	7.6	July 20,1988
24	Kamphaeng Saen	Kamphaeng Saen, Nakhon Pathom	154	2041	680	1017	7.22	0	1628	11.5	Aug.11,1988
25	Lunmaenam Lop Buri	Muang, Lop Buri	40	554	176	230	1.61	0	523	3.6	Aug.11.1988
26	Chachoengsao	Muag, Chachoengsao	21	251	104	137	1	0	182	1.2	Sept.2,1988
27	Si Thep	Thep, Phetchabun	107	390	130	208	1.46	0	336	2.7	Oct.24,1988
28	Khon Kaen	Muang, Khon Kaen	299	1872	1391	1584	12.67	0	595	4.3	Jan.17,1988
29	Ban Ta	Theing, Chiang Rai	137	217	12672	149	0.9	2.4	182	1.3	Jan.9,1989
30	Thapsakae	Thapsakae, Prachuap Khiri Khan	187	309	116	176	1.22	0	473	1.8	Apr.26,1988
31	Chainat	Muang, Chainat	21	109	72	120	0.84	0	35	0.2	Dec.11,1990
32	Sakonnakhon	Muang, Sakonnakhon	178	305	193	360	2.34	4.4	439	2.8	March 22,1991
33	Bangsapan	Bangsapan, Prachuap Khiri Khan	65	919	49	522	3.55	0	836	5.9	March 22,1991
34	Kumbong	Euay Phing, Kalasin	74	0	0	0	0	0	0	0	March 22,1991
35	Tha Luang	Tha Luang, Lop Buri	106	1299	433	485	3.88	0	1309	9.4	April 1,1991
36	Ao Noi	Muang, Prachuap Khiri Khan	249	3888	2625	1445	10.9	0	3486	24.4	April 3,1991
37	Khan Thalae Sao	Khan Thalae Sao, Nakhon Ratchasima	43	407	135	60	0.42	0	91	0.2	April 11,1991
38	Surin	Muang, Surin	31	217	72	195	1.37	0	100	0.7	April 15,1991
39	Udonthani	Muang, Udonthani	201	1346	812	1406	9.14	0.3	740	5.8	Dec.11,1990
40	Uthaithani	Muang, Uthaithani	18	121	40	84	0.55	0	54	0.4	March 22,1991
41	Phimai	Phimai, Nakhon Ratchasima	100	833	416	504	3.59	0	0	0	March 22,1991
42	Chum Phuang	Chum Phuang, Nakhon Ratchasima	100	804	402	552	4.07	0	90	0.6	March 22,1991
43	Maelay	Ladyao, Nakhon Sakan	246	0	0	0	0	0	0	0	April 1,1991
44	Kanchanaburi	Muang, Kanchanaburi	14	180	90	150	1.08	0	0	0	April 4,1991

45	Si That	Si That, Udon Thani	152	0	0	0	0	0	0	0	April 11,1991
46	Sub Mai Daeng	Bing Sam Phan, Phetchaboon	27	491	220	207	1.58	0	584	4.1	April 15,1991
47	Nong Ree	Nong Ree, Lop Buri	56	546	273	328	2.28	0	788	5.5	April 15,1991
48	Muang Nakhon Sawan	Muang, Nakhon Sawan	23	263	175	180	1.26	0	0	0	April 19,1991
49	Hauysatyai	Hau Hin, Prachuap Khiri Khan	80	372	194	380	2.64	0	912	6.38	Sep. 13,1991
50	Soydow	Soydow, Chantaburi	100	0	0	0	0	0	0	0	Dec. 24,1991
51	Intaburi	Intaburi, Singburi	15	50	25	30	0.21	0	0	0	April 8,1992
52	Varitchapoom	Varichapoom, Sakonnakon	194	83	42	51	0.38	0	0	0	Sep. 19,1992
53	Pichit	Tapan Hin, Pichit	35	0	0	0	0	0	0	0	May 28,1992
			12283	122315	60107	52556	387.18	824	120358	866.98	

DPO（酪農振興公社）と乳業工場との生乳基準の合意事項（仮訳）

酪農協は、次の事項に従わなくてはならない。

1　搾乳された生乳は、３．２%下回らないこと。この生乳は他と分離したり混合してはならない。

２４時間以内に工場に必着のこと。

2　レザーズリンテストは、１時間後で４．５以下でないこと

3　メチレンブルーテストは、４時間以上であること。

4　ＳＮＦ%は、８．５%を下回らないこと。この分析はＡＯＡＣ（１９７５）法による。

5　生乳は、牛乳本来の色、臭い、香りがあること。

6　生乳の酸度は、酪酸で０．１２～０．１６の間であること。

7　７５%のアルコールテストで凝集しないこと

8　生乳の温度は、８℃以上でないこと

9　煮沸試験で生乳が凝集しないこと

注；４の品質である生乳のＳＮＦが８．５%を下回れば、生乳価格（現在９．２５バーツ／kg）は、０．１０%ごとに０．１０バーツ減らされる。

生乳の品質による価格についての酪農協の規程

1　この規程は、○○酪農協の生乳価格規程という。

2　この規程は、○○から適用する。

3　乳牛を飼養している農家は、酪農協の会員として取り扱う。

4　会員は、集乳所に次の時間に生乳を搬入すべきである。

午前　　６．３０－　８．００

午後　１６．３０－１８．００

生乳の搬入が遅れた場合には、次の価格を減額する。

３０分以内	－０．２５ バーツ／kg	
３０分～１時間以内	－０．５０	
１時間以上	－１．００	または受乳拒否

5　酪農協は、脂肪率３．５%の生乳を標準価格７．５０バーツ／kgで購入する。

6　酪農協は、次の基準により、生乳価格を増減する。

乳　　質	基　　準	グレイドによる価格の増減
1　脂肪率	３．５％	基準より０．１％増ごと０．０２ バーツ／kg増 基準より０．１％減ごと０．０１ バーツ／kg減
2　比重	１．０２７	基準より０．００１増ごと０．０２ バーツ／kg増 基準より０．００１減ごと０．０２ バーツ／kg減
3　メチレン ブルーテスト		グレイド１（８時間後）　０．３５ バーツ／kg増 〃　２（６〃　）　０．２５　〃 〃　３（４〃　）　０．１０　〃 〃　４（２〃　）　１．１０ バーツ／kg減 〃　５（１〃　）　０．１５　〃 〃　６（0.5〃　）　０．５０　〃
4　牛舎の衛生 状況		グレイド１　０．１０ バーツ／kg増 〃　２　０．０５　〃 〃　３　０ 〃　４　０．０５ バーツ／kg減 〃　５　０．１０　〃

7　酪農協は、最小限月２回乳質検査を行う。

8　酪農協は、月に２回会員に生乳代金を支払う。

9　酪農協が、品質を検査し、明らかになった場合は、

9．1　会員は、生乳に水その他を加え、乳量を増量した場合は、検査で明らかになったその日の受取生乳代金の６０倍を支払わなくてはならない。

9．2　会員は、抗生物質、または化学物質が加えられていた場合は、検査で明らかになったその日の受取生乳代金の３０倍を支払わなくてはならない。

附属資料６．DPOと乳牛工場との生乳基準の合意事項及び乳質による生乳価格についての酪農協の規定（英文、仮訳）

Agreement between DPO & private Factory

about

Standard of raw milk

Which the dairy cooperative must follow.

1. Fat percentage is not less than 3.2% which is milked from the cow directly. The milk is not separated or mixed with any others.

   The milk is not kept more than 24 hours when arrives the private factory.
2. Resazurin test in 1 hour is not less than 4.5 point.
3. Methylene blue test is more than 4 hours.
4. Percentage of solid non fat is not less than 8.5%. This analysis is used AOAC (1975) method.
5. The raw milk must be natural colour, smell and taste.
6. The acidity of the raw milk is between 0.12-0.16 of lactic acid.
7. The milk does not coagulate in Clot on alcohol test at the concentration of alcohol 75 vol/vol.
8. Temperature of the raw milk is not more than8℃.
9. The milk does not coagulate in clot on boiling test.

** Remark If the quality in 4, Solid not fat of the raw milk is less than 8.50%, the price will be reduced 0.10 Baht from standard price in every 0.10% (now 9.25 Baht/kg.)

The Regulation of the dairy cooperative about the raw milk price which depends on the quality.

1. This regulation is called "The regulation of ..... dairy cooperative Ltd. about the raw milk price"

2. This regulation has been used since .....

3. "The members"mean the farmers who are raising dairy cows and have applied to be the cooperative menbers.

4. The menbers must deliver the raw milk to the milk collecting centre in time

—morning 6.30—8.00a.m.

—afternoon 16.30—18.00p.m.

If menbers deliver the raw milk too late, the price willbe reduced.

late within ½ hour —0.25 Baht/kg

late between ½—1 hour —0.50 〃

late more than 1 hour —1.00 〃 or reject to accept

5.The dairy cooperative will buy the raw milk. with fat 3.5% in standard price 7.50 Baht/kg.

6.The dairy cooperative will add or reduce the raw milk price from standard price in case of

Quality	Standard	Grading-pricing
Fat 4.0～4.2%	3.5%	—every 0.1% more than standard will be added 0.02 Baht/kg. —every 0.1% less than standard will be reduced 0.01 Baht/kg.
Specific gravity 1.027～1.032	1.027	—every 0.001 more than standard will be added 0.02 Baht/kg. —every 0.001 less than standard will be reduced 0.02 Baht/kg.
Methylene Blue Test		Grade 1 will be added 0.35 Baht/kg. 〃 2 〃 0.25 〃 〃 3 〃 0.10 〃 〃 4 will be reduced 0.10 〃 〃 5 〃 0.15 〃 〃 6 〃 0.50 〃 } 多い
Sanitation of the cow shed		Grade 1 will be added 0.10 Baht/kg. 〃 2 〃 0.05 〃 〃 3 〃 0 〃 〃 4 will be reduced 0.05 〃 〃 5 〃 0.10 〃

7. The dairy cooperative will check the milk quality at least twice a month.

8. The dairy cooperative will pay the money for the raw milk delivered to the members twice a month.

9. If the dairy cooperative checks and quality and finds-

9.1 water or something elseis/added in oder to increase the milk quantity, the members must pay 60 times of the amount of all his raw milk price at the day which is checked as fine.

9. 2 Antibiotic or chemical is added, the members must pay 30 times of the amount of all of his raw milk price at day which is checked as fine.

Dairy Development Project.

Principle

Milk powder has been imported at about 2,000 million Baht each year. At the present local raw milk is only 13% of the demand and cash crops' price are also decrease because of surplus production. Consequently, growing only cash crops cannot earn a living. Farmers are adviced to raise dairy cows instead of growing rice or crops only. It is called " intregrade farming system" because there is large market for milk production. Therefore, this project was put into Sixth and Seventh National Economic and Social Development Plan.

Objective;

1. To increase small farmers' income.
2. To create new job for Agricultural and dairy industrial section.
3. To increase local milk production in order to meet the demand and concurrently reduce the import of milk powder.
4. To rearrange the Agricultural structure by encouraging farmers to raise dairy cows instead of planting crops only.

Activities;

1. Activities of Dairy Farming Extention. (1988-1992)
2. Activities of Dairy Farming Promotion. (1988-1989)
3. Activities of Increasing Dairy Cows.(1989-1991)
** 4. Activities of Producing and Improving Semen. (Master Bull Project) (1989-1998)
** 5. Activities of Embryo Transfer Technology. (1989-1998))
6. Activities of Sahiwal Research.(1989-1990)
** 7. Activities of Holsteine Friesian Research. (1989-1995)
8. Activities of Promotion of Dairy crossbred. (1990-1992)

Note The activities that label ** are continuing to Seventh National Economic and Social Development Plan.

Objectives of Activities 1.

- To increase the number of dairy farmers in the intensive areas during 5 year. The target farmers are 2,000 annually.
- To decrease crop growing areas 30,000 Rai totally at the end of the project.

Budget of Activities 1.

(1) Soft loan during 5 years is 383 million provided by B.A.A.C. The fund for proving dairy breeds and for the cost of tending is 54 million Baht.

Objectives of Activities 2.

- To group dairy farmers for running business.
- To increase milk production locally.
- To improve milk hygiene.

Budget of the Activities 2.

- In 1990 the budget was 1,313,380 Baht.

Objectives of Activities 3.

- Increasing the number of Crossbred cows in the Northeastern part of Thailand.
- Increasing milk production in that area.
- Increasing farmers' income.

Budget of Activities 3.

- Each year the budget is 14,042,785 Baht.

Objectives of Activities 4.

- Providing proven sires for semen processing.
- Develop the methods of sires selection in order to improve dairy population genetic through artificial insemination.
- Collecting of data concerning milk production, and performance.

Budget of Activities 4.

The budget for the past two years is 20,000,000 Baht.

Objectives of Activities 5.

- To improve dairy population genetic through E.T.
- To distribute superior genetic cows to dairy farmers.

Budget of Activities 5.

- In 1989 = 11,599,998 Baht.
- In 1990 = 5,836,866 Baht.
- In 1991 = 5,034,459 Baht
- In 1992 = 5,202,878 Baht.

Objectives of Activities 6.

- To increase the number of dairy cows.
- To study and find dairy breed that is suitable for tropical environment.

Budget of Activities 6.

- In 1989 = 17,232,200 Baht
- In 1990 = 1 195,000 Baht

Objective of Activities 7.

- To study and find dairy breed that is suitable for tropical environment.
- To study the economic return in dairy farms that raise pure Holstein.

Budget of Activities 7.

- In 1989 = 11,958,000 Baht

Objectives of Activities 8.

- To increase local milk production.
- To increase small farmers' income.

Budget of Activities 8.

- In 1990 = 3,000,000 Baht.
- In 1991 = 3,000,000 Baht.
- In 1992 = 3,000,000 Baht.

BIOTECHNOLOGY STUDYING PROJECT

BACKGROUND : According to the National Economic and Social Development Plan VII ,the Ministry of Agriculture and Cooperatives is to be responsible for development and expansion of livestock population through utilization of Biotechnology.

OBJECTIVES : To study and develop Embryo Transfer Technology in Livestock including Sexing of sperm and embryo and Embryo Splitting.

ACTIVITIES : 1.Embryo Transfer Technology in Goats.
2.Preselection of sex of bovine by seperation of X and Y chromosome bearing spermatozoa.
3.Establishment of a simplified cytogenetic technique for sexing Bovine Embryo.
4.Production of Bovine Monozygotic Twins from Microsurgically Bisected Embryo.

DURATION : 5 YEARS (1992-1996)

BUDGET : 1992 = 14,639,750 Baht.
1993 = 5,685,000 "
1994 = 3,545,500 "
1995 = 3,404,300 "
1996 = 3,404,300 "
TOTAL =30,678,850 Baht.

PROJECT SITE : Patumthani A.I.Center.

PROJECT PROGRESS : Laboratories and Animal Houses are under construction.

PROJECT INVOLVED BY ARTIFICIAL INSEMINATION DIVISION 1992

(NATIONAL ECONOMIC AND SOCIAL DEVELOPMENT PLAN 7th;1992 - 1996)

1.DAIRY CATTLE DEVELOPMENT PROJECT

-EMBRYO TRANSFER TECHNOLOGY FOR DAIRY CATTLE GENETIC IMPROVEMENT

-MASTER BULL PROJECT

-DAIRY CATTLE EXTENSION ACTIVITY

Project sites:	1.Saraburi	9.Samutra Sakorn
	2.Lopburi	10.Nakorn Prathom
	3.Nakorn Nayok	11.Supanburi
	4.Pracheenburi	12.Ratchaburi
	5.Nakorn Ratchaseema	13.Petchaburi
	6.Kon Kaen	14.Prachaubkirikan
	7.Udorn Thani	15.Patthalung
	8.Pichitra	16.Trang

2.BEEF CATTLE DEVELOPMENT PROJECT

3.NORTH-EASTERN DEVELOPMENT PROJECT(E-SARN KEUW PROJECT)

4.THUNG KULAA RONG HAI-LIVESTOCK DEVELOPMENT PROJECT

5.REHABILITATION OF AREA DEMOLISHED BY TYPHOON GAYE(since 1990)

budget year	Number of AI Service(semen)				
	Dairy	Beef	Buffalo	Swine	Total
1978	12,128		25	8,204	
1979	15,151		337	6,934	
1980	19,923		1,141	7,384	
1981	16,535	10,886	1,404	8,117	36,942
1982	17,323	12,455	1,461	6,954	38,193
1983	22,701	17,685	1,992	8,155	50,533
1984	28,411	25,102	2,962	10,848	67,323
1985	35,842	28,891	2,618	9,380	76,731
1986	29,914	29,130	2,999	6,335	68,378
1987	35,618	69,874	15,533	5,735	126,760
1988	49,035	86,356	18,154	4,407	157,952
1989	56,157	107,034	22,544	3,189	188,924
1990	53,268	106,849	18,307	2,903	181,327
1991	49,155	120,077	14,673	2,027	183,905

ESTIMATION of DEMAND FOR FRESH MILK

year	drinking milk	powder milk	total milk	production	+/-
1988	141,000	-	141,000	102,060	- 38,940
1989	153,000	40,000	193,000	131,880	- 61,120
1990	166,000	42,000	208,000	152,880	- 55,120
1991	177,000	44,100	221,100	190,050	- 31,050
1992	188,000	46,300	234,300	133,100	- 1,200
1993	197,000	48,600	245,600	276,570	+ 30,970
1994	205,000	51,100	256,100	330,540	+ 74,440
1995	211,000	53,600	264,600	388,080	+123,480
1996	216,000	56,300	272,300	445,830	+173,530
1997	220,000	59,100	279,100	531,930	+252,830
		Increasing rate per year			
	5.03%	5.00%	5.00%	19.85%	

note: Drinking Milk:Fresh Milk = 1:1

Powder Milk :Fresh Milk = 1:7.7

NUMBER OF DAIRY CATTLE IN AREAS

area	1985	1986	1987	1988	1989
MUAKLEK	24,822	29,815	31,301	33,465	44,413
PRACHUABKIRI- -KAN	8,501	9,259	10,269	9,169	10.072
CHAINGMAI	2,315	2,082	3,296	4,270	3,825
NONG PHO	13,369	15,225	15,758		22,126
AYUDHAYA	452	812	844		
NAKORN PRATOM	700	1,824	2,328		
OTHERS	3,184	6,410	13,880	10,001	16,210
TOTAL	53,343	65,427	77,676	56,905	96,646

source: AGRICULTURAL ECONOMIC BUREAU,MOAC

TREND in DAIRY CATTLE POPULATION and POPULATION

year	farms	total dairy cattle	dairy cows	milk(tons)
1982	3,341	30,061	13,697	27,240
1983	3,980	41,733	17,667	34,653
1984	3,940	51,965	23,210	43,555
1985	5,218	57,094	26,466	51,371
1986	5,226	69,907	33,428	62,089
1987	5,226	73,607	35,600	75,000
1988		85,000	49,000	87,000
1989	8,000	110,000	60,000	108,000

PROJECTION in DAIRY CATTLE NUMBER and PRODUCTION

year	number cows	milk(tons)	lactation production (305 days)
1990	51,880	125	2,023
1991	59,850	147	2,063
NATION ECONOMIC AND SOCIAL DEVELOPMENT PLAN 7 th(1992-1997)			
1992	68,800	174	2,124
1993	78,660	204	2,179
1994	89,840	240	2,244
1995	102,900	281	2,294
1996	117,130	328	2,352
1997	133,500	385	2,409

source: Agricultural Economic Bureau,MOAC (1988)

MASTER BULL PROJECT

Objective

1. To select the top genetic dairy crossbred bull for semen production to be used sufficiently in the country

2. To improve the methods for sire evaluation, theoritically and practically

3. To promote milk recording in dairy herd and establishment of dairy herdbook in Thailand

4. To set up an appropriate data collecting system and establish National data bank for dairy records of Thailand

Duration 10 years (1990-1999)

Breeding Purpose

is to obtain the animals which

1. have vitality, health and productiveness and give few difficulties at birth

2. produce much milk with a high percentage of fat and protein

3. grow quickly and produce much meat of good quality

4. have stedy udders with well formed and well placed teats

5. have plenty of bone and good claws

6. reach full development

7. can assimilate much roughage

8. are easy to milk and have manageable nature

The breeding purpose will be reached by

1. Establish Nation recording system and National Recording Centre

2. Estimating of the Breeding Value of the animals

3. Selection of the animals which will be used as parents of the next generation

4. Mating of the selected animals

Breeding Programmes

1. Bull dam insemination programme (document 1)

2. Bull rearing programme (document 2)

3. Test-lay off-proven bull programme and progeny testing programme (document 3)

Semen production

First batch (1992)----10 bulls-----5,000 doses/bull

Second batch(1993)---10bulls------5,000 doses/bull

Third batch (1994)----10 bulls-----5,000 doses/bull

Fourth batch(1995)----10 bulls-----5,000 doses/bull

Document #1

200 DAIRY COWS WITH HIGH QUANTITY AND QUALITY

50% CONCEPTION RATE

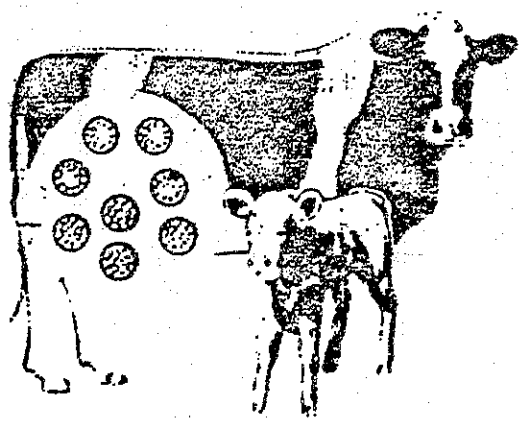
0.5 PROBABILITY OF BULL CALVES

SELECTION INTENSITY = 0.9

MORTALITY RATE = 0.1

40 PROVING BULL CALVES

(200 x 0.5 x 0.5 x 0.9 x (1 - 0.1))



	1	2	3	4	5	6	7	8	9	10
1. 1 – 4 MONTH BULL CALVES		40	40	40	40	97	58	99		
2. 4 – 12 MONTH BULL CALVES		40	40	40	40					
50 % PERFORMANCE CULLING		20	20	20	20					
3. 12 – 18 MONTH BULL SIRE			20	20	20	20				
4. 18 – 24 MONTH BULL SIRE			20	20	20	20				
50 % SEMEN QUALITY CULLING			10	10	10	10				
5. 2 – 3 YEAR BULL SIRE				10	10	10	10			
3 – 4 YEAR BULL SIRE					10	10	10	10		
4 – 5 YEAR BULL SIRE						10	10	10	10	

CULLING THE 5 – YEAR BULL SIRES (10 BULL SIRES / YEAR)

40 BULL CALVES / YEAR

↓

PERFORMANCE TEST

↓

SEMEN QUALITY TEST

↓

10 ♂ —	3rd YEAR SEMEN	PRODUCTION	5,000 dose/bull
10 ♂ —	4th YEAR	———	" ———
10 ♂ —	5th YEAR	———	" ———
10 ♂ —	6th YEAR	———	" ———

400 DAIRY HEIFERS x 1 PROVING BULL SIRE (以下、間違い、別紙により外相当者にて指摘済)

↓

67 DAUGHTERS / PROVING BULL SIRE

↓

50 COMPLETE MILK RECORDING DAUGHTERS / BULL SIRE

↓

5 PROVEN SIRES / YEAR

x HIGH PRODUCTION COWS

↓

HIGHER PRODUCTION HEIFERS
TO BE BULL - DAM
OF THE NEW GENERATION

DOCUMENT 3

NUMBER OF HEIFERS TO PRODUCE DAUGHTERS OF PROVING SIRES

50 DAUGHTERS (PROGENIES) / 1 PROVING SIRE

50 % CONCEPTION RATE (FIRST INSEMINATION C . R .)

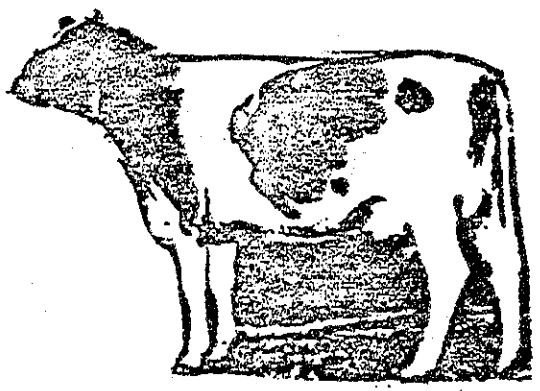
0.5 RATIO OF FEMALE CALF

67 % OF KNOWN CALVING RATE

75 % OF COMPLETE LACTATION RECORDS

400 DAIRY HEIFERS TO BE INSEMINATE WITH 1 PROVING SIRE

$$\left(\frac{50}{0.5 \times 0.5 \times 0.67 \times 0.75} \right)$$



(別紙)

1 Complete recording daugters/bull sire　　50 cows

(1)Rate of complete lactaion record　　75%

(2)Known calving rate　　67%

(3)Conception rate　　50%

or　40%

case 1;conception rate 50%

50H/(0.75×0.67×0.5)＝199.0≒200H

case 2;conception rate 40%

50H/(0.75×0.67×0.4)＝248.8≒250H

2 NO.of heifers of proving sire

(1)Raising rate (仮置き)　　80%?

(2)Rate of female calf　　50%

(3)Known calving rate　　67%

(4)Conception rate　　50%

or　40%

3 NO. of heifers to be AI with 1 proving bull

case 1;conception rate 50%

200H/(0.80×0.5×0.67×0.5)＝1,492.5≒1,500H

case 2;conception rate 40%

250H/(0.80×0.5×0.67×0.4)＝2,332.1≒2,350H

附属資料 10. チャイバダン開拓農協事務所の概要（英文）

The Office of Chaibadan Land Settlement Cooperative

Background Information

The Chaibadan natural reserved forest was encroached by villagers to plant field crops. The Government by the Forestry Department decided to hand over the forest to the Cooperative Promotion Department to organize Tenant Land Settlement Cooperative in the area. Therefore, on 1 July 1975, the Cooperative Promotion Department established the Office of Chaibadan Land Settlement Cooperative to be responsible for grouping villagers together and organizing Chaibadan Tenant Land Settlement Cooperative. Each member can rent the land of 10-20 acres per family and can utilize the land up to 30 years. The area of this natural reserved forest is about 158,172 acres in Chaibadan and Tha Luang District.

Duties and Responsibilities

The Office of Chaibadan Land Settlement Cooperative (CPD) is responsible for:-

1. cooperative promotion
2. land consolidation and infrastructure
3. occupational promotion
4. special project

1. Cooperative Promotion

The Office has organized four cooperatives in the area of the Chaibadan natural reserved forest:

- Chaibadan Tenant Land Settlement Cooperative,Ltd. (4,022 members)
- Lum Narai Tenant Land Settlement Cooperative, Ltd. (2,883 members)
- Tha Luang Dairy Cooperative, Ltd. (106 members)
- Chaibadan & Tha Luang Cattle Cooperative, Ltd. (81 members)

The Office gives assistance to the cooperatives in the field of training, agricultural extension and marketing promotion.

2. Land Consolidation and Infrastructure

The Cooperative Promotion Department, by the Office of Chaibadan Land Settlement Cooperative, is responsible for land consolidation, allocating land to farmer, seeking permission from the Forestry Department for farmers to utilized the land, and organizing cooperatives.

The Office is also responsible for building and maintenance infrastructure to facilitate farmers in living and farming. The infrastructure includes road, bridge, water resources, school, temple, health care unit and others.

3. Occupational Promotion

In order to support farmer members to earn sufficient income, the Office has coordinated with government agencies and private sector to implement many projects such as:-

- Maize and Sorghum Project, in collaboration with private sector
- Sugarcane Project, in collaboration with a sugar factory
- Dairy Farming Project (Tha Luang Dairy Cooperative, Ltd.), in collaboration with government and private sector
- Cattle Farming Project (Chaibadan & Tha Luang Cattle Cooperative, Ltd.)
- Fast - Growing Plant Project, for use and sell to factory, in the area of 1,000 acres.

4. Special Projects

4.1 Drinking Milk Promotion to School Children

The Tha Luang Dairy Cooperative, Ltd. sells milk to schools joining the Project at special price of 4 baht/kg. Each school will receive 20 litre of milk per week.

4.2 Saving Campaign

The cooperative members are encouraged to save 1 baht a day. The cooperatives will receive the deposit every 3 months.

附属資料 11. チャイバダン開拓農協事務所の酪農促進計画（英文）

Dairy Farming Promotion Project
Office of Chaibadan Land Settlement Cooperative, Lopburi Province

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Background Information

The Office of Chaibadan Land Settlement Cooperative, under the Cooperative Promotion Department, is in charge of the area of 158,172 acres in Chaibadan district and Tha Luang district. Majority of farmers planted field crops. Due to drought and low prices for crops, the Cooperative Promotion Department (CPD) and other agencies concerned tried to solve the problems by introducing other crops with high returns to cover the cost and with high marketing potential. Considering that dairy farming is suitable for the area and can give high income to farmers, the CPD and other government agencies started to train farmers in Chaibadan district to raise dairy cows, grouped them together and established Chaibadan Dairy Cooperative, Ltd. The Cooperative set up a milk collecting centre, with the capacity of 3 tons/day. The operation has been successful in increasing the members' income and uplifting their standards of living.

Later on, farmers in Tha Luang district were interested in dairy farming. The CPD, together with the Bank for Agriculture and Agricultural Cooperatives and the Livestock Development Department, conducted the feasibility study. The result was favourable and the area is in conformity with the dairy promotion plan of the Ministry. Therefore, the Dairy Farming Promotion Project has been launched in the area of the Office of Chaibadan Land Settlement Cooperative (Tha Luang District).

The Project is jointly organized among the Cooperative Promotion Department (CPD), Livestock Development Department (LDD), Forestry Department(FD), Dairy Promotion Organization (DPO), Bank for Agriculture and Agricultural Cooperatives (BAAC) and CP - Meiji Co. with the objectives to support the government policy in increasing the raw milk production so as to be self - sufficient , to distribute agricultural credit to small farmers, and to promote dairy cow raising in order to increase the farmers' income.

The organization of the Project is as follows:

1. The Project will be operated in the area of Chaibadan Land Settlement Cooperative, Lopburi Province, starting to recruit farmers in 1990, total farmer will be 100 persons with five cows for each farmer. The total cows will be 500 heads.

2. Provision of Dairy Cow BAAC is responsible for providing cross - bred cows of Sahival - Holstein to farmers.

3. Training DPO will train farmers on dairy cow raising, both in theory and practices for 17 days. BAAC and other agencies concerned will cooperate in training so as to increase their knowledge and skill.

4. Making pasture and building shed with milking place The farmers will prepare pasture of 5 rai for irrigated area or enough natural water resources or 10 rai for rainfed area and build cow shed with milking place. These must be ready before receiving cows.

5. Provision of concentrate Tha Luang Dairy Cooperative,Ltd. is responsible for providing concentrate and selling to members sufficiently.

6. Medical services The Livestock Development Department will help in vaccination and giving medical services to sick dairy cows as well as giving advices on cow hygiene. The farmers have to pay for these services.

7. Artificial insemination The Livestock Development Department will provide A.I. service and semen to farmers. However, farmers may use semen and A.I. service from other sources at the responsibility of farmers.

8. Marketing Tha Luang Dairy Cooperative, Ltd. is responsible for buying raw milk from farmers joining the Project. The farmers must deliver raw milk to the collecting centre of the cooperative.

9. Project Administration It is the responsibility of the executive committee comprising the representatives of the agencies involved in the Project and the representatives of the farmers.

Present Situation

The Project has completely been implemented. The Tha Luang Dairy Cooperative, Ltd. was set up and was registered on 26 January 1990. Each member of the total 100 farmers received 5 heads of dairy cow. The total cows are 285 heads of cross - bred Sahiwal - Holstein from New Zealand and 215 heads of domestic cross - bred from DPO. The BAAC provided long term loan for investment at the amount of 240,000 baht to each member. The members have to pay 9% rate of interest. The term of repayment is within 14 years, with the grace period of interest for

2 years and that of principal for the first 8 years. Since the Farmer members have no immovable property to be used as collateral, therefore farmer members have to join in group of not less 5 persons to jointly sign as the surety of the loan to each other.

The CP - Meiji Co. provided loan to the Cooperative to build the milk collecting centre, storage for feedstuff, cooling tank at the size 3 tons/day and others at the amount of 1 million baht at 6% rate of interest. The company will deduct the debt from the raw milk delivered to the company at 3% of total raw milk of each lot.

The Tha Luang Dairy Cooperative, Ltd. started the operation on 1 June, 1990 in the form of multi-purpose cooperative, to perform 3 main businesss: milk collecting, supply business and extension service (animal husbandry and A.I. service).

The Cooperative started to receive raw milk from members on 28 August, 1990. The buying price varies according to the quality following the regulation on pricing of the Cooperative. The average price is 7.32 baht/kg. The Cooperative sells the raw milk to the CP - Meiji Co. at 8 baht/kg. At present, the Cooperative collects raw milk from members about 3,500 kgs. per day. The average production is 8 kg./cow/day which is quite satisfactory for the young cow and newly trained dairy farmer. The maximum amount of raw milk that a member can deliver to the Cooperative is 63.4 kg./day/5 cows. The minimum is about 20 kg./day/5 cows.

As at the end of fiscal year 1990 (December 1990), the Cooperative earned the net profit of 118,944.28 baht.

Average income and expense per month of the member
(for the first pregnancy)

Expense (for 5 cows)

1. Concentrate	2,400	baht
2. medication, A.I. services	200	baht
3. transportation of raw milk	300	baht
4. cost in making pasture	280	baht
5. miscellaneous	50	baht
Total	3,250	baht

附属資料 12. タルアン酪農協の概要（英文）

Tha Luang Dairy Cooperative,Ltd.

It was registered on 26 January 1990, situated at Moo 5, Tha Luang Sub-district, Tha Luang District, Lopburi Province.

The Cooperative started the operation on 1 June 1990 and has performed multi-purpose function in 3 main business activities:

1. Collecting raw milk
2. Supply business
3. Extension services (animal husbandry & A.I. services)

1. Membership 106 persons (100 farmer members joining the Project, and 6 associate members who have their own capital to buy dairy cows.)

2. Member group 10 groups

3. Board of Directors There are 11 committee members elected at the general meeting on 8 May 1991.

4. Cooperative Staff There are 7 persons: 1 assistant manager and also accountant, 1 cashier, 1 marketing officer, 2 animal husbandry officers, 1 milk collecting officer and 1 janitor.

5. Number of Dairy Cows Total cows in the Project are 500 heads (5 heads for each member). The 6 associate members have about 200 dairy cows.

6. Milk Collecting Business

The Cooperative collects milk from member averagely 3,500 kg./day (milk from 6 associate members is about 600 kg./day). The amount of raw milk is decreasing because of drying. The Cooperative used to collect milk at about 4,000 kg./day.

The Cooperative buys milk from members at various prices according to the quality. The milk is classified into 3 grades:

grade 1	7.32	baht/kg.
grade 2	7.27	baht/kg.
grade 3	7.22	baht/kg.

(In January 1992, most of the members deliver grade 1 milk to the Cooperative.)

During January 1991- December 1991, the Cooperative bought milk from members at the amount of 9,382,788 baht. The Cooperative sold the raw milk collected to the CP - Meiji Co. for the same duration at the amount of 10,289,991 baht

7. Supply Business

The Cooperative provides goods to sell to members for dairy cow raising and household use at reasonable prices.

During January 1991 - December 1991, the total sale was 4,373,291 baht

concentrate	2,776,426	baht
milk powder for calves	435,048	baht
medicine	281,771	baht
minerals	58,665	baht
other goods	821,981	baht

8. Extension services

The Cooperative buys semen from DPO, Tapp Co. and some assistance from the Livestock Development Department Office in Lopburi.

During January 1991 - December 1991, the Cooperative received income for these services at the amount of 142,069 baht.

Animal husbandry services	18,399	baht
A.I. service	123,670	baht

9. Problem

9.1 the dairy cows in this Project were in 2 lots:

1st lot Received on June 1, 1990 from the BAAC. They are cross-bred cows from New Zealand, 285 cows for 59 members. The A.I. in the second pregnancy was quite satisfactory.

2nd lot Received on November 11, 1990 from DPO. They are domestic cross-bred cows, 215 cows for 43 members. There are 43 cows of 26 members received A.I. service for the second pregnancy but they are not pregnant. Moreover, some cows are suffering from Chronic Matitis.

9.2 Usually, each member grows grasses: Rucy, Jumbo and others, for cows at about 5 - 10 rai. It is enough to feed cows in the rainy season but it is not enough in dry season.

9.3 Some members lack enthusiasm in dairy cow raising and do not follow the proper practices in farm management.

Operating Capital (as of 31 December 1991)

- Share capital	117,030	baht
- Reserves	93,044.57	baht
- Social welfare fund	10,000	baht
- Educational fund	10,000	baht
- Deposit		
fixed	56,159.50	baht
Saving	531,358.50	baht

Fixed Asset (total 1,181,572.58 baht)

- Office inventory	90,086.17	baht
- Milk receiving equipment	5;343	baht
- Cooling tank	405,934.37	baht
- Building	629,656.27	baht
- Machinery	50,552.77	baht

Long term loan

The Cooperative has received the loan of one million baht from the CP Meiji Co. to build the collecting centre, storage, cooling tank of 3 tons and other. The interest rate is 6%. The loan will be deducted at 3% of the milk delivered to the company. As at 31 December 1991, the outstanding loan was 772,336.65 baht.

附属資料 13. ラチャブリ県における乳牛の繁殖障害（英文）

STUDY ON INFERTILITY OF DAIRY CATTLE IN THAILAND
1) A GENERAL ASPECTS OF INFERTILITY IN DAIRY CATTLE IN RATCHABURI PROVINCE

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Abstracts

Studying the history of 242 repeat breeder heifers and cows from 181 dairy farms in Ratchaburi province of which 85.1% were cows and 14.9% were heifer with different percentage of their age, i.e. 24.9% were 2-3.5 years, 32.2% were 4-5.5 years, 25.6% were 6-7.5 years, 16.9% were 8 years or more and 0.4% were unknown. Sixteen point five percent of those cows had calved once, 21.5% twice, 12.8% 3 times, 11.2% 4 times, 11.6% 5 times, 5% 6 times and 6.1% 7-10 times,. The percentage of cows subjected to different repetitive inseminations were as follows: 30.6% 3-4 times, 60.7% 5-10 times, and 8.7% 11-24 times. Thirtyfour point seven percent were first insemination at 1 year and a half old and 52.9% of them were first inseminated at 2 years of age. During 12 months these cows had been free from any diseases for 98.8% while 1.2% had no record. Among these cows, 3.4% had aborted of which 1.7% aborted during the first three months of prognancy and another 1.7% aborted after more than 3 months of prognancy. There were dystocia problem 0.4% and mortality in 1.1% of the cow. After treatment, 14.8% of them were still infertile while 0.8% conceived after 1-3 insemination. In addition, 0.4% of these cows had got cystic ovaries but all conceived after treatment. Sixtytwo point five percent of all cows had fairly high milk yield more than 8 kg per day while 21.1% had adequate milk yield. Feeding for 81.0% of these cows was fair while 16.9% of them were good. Farm management was fair, good and needed improvement for the figure of 86.8, 12.8 and 0.4%, respectively. Grade of housing which were good, fair and required improvement were 15.3, 84.3 and 0.4% respectively

Frozen Embryo Transferring and Pregnancy Rates in Dairy Cattle

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The report on the pregnancy rates of frozen - thawed bovine embryos in 94 heads of recipient was 52.1 %. There was a higher survival rates of cryopreserved embryos in a group of heifer compared to cows (72.9 VS 38.9). The success rates of transferring embryo in Morula stage was higher than Blastocyst and Expand blastocyst respectively (64.7,50.0 and 31.2)

Keywords : Morula Blastocyst Expand blastocyst

Reproductive Problem of Purebred Canadian Holstein

Nucha Simasatitkul Sompet Tuikumpee
Jirawudi Reonwong Adisorn Khunthong

Forty-seven pregnant Holstein heifers have been imported from Canada and were kept at NDTARI farm since September 1990. During the first one and half years of farm operation, two cows aborted, the other 2 died within the first 6 months of the project and six cows were culled at first and second year latter. The reproductive performance of remaining cows (37 heads) showed that service per conception averaged 3.8 ± 2.2 (1-8), Open day averaged 243 ± 137 days (64-532) and calving interval from 18 cows averaged 392 ± 48 days (345-554) or 13.1 ± 1.6 months (11.5 - 18.5)

In conclusion, factors as difficulty of heat detection, non return heat of bred and non pregnant cows, Cystic Ovary, non functional ovary, ovulation problem, infection by urea plasma and other effect associated with stress were observed to be the cause of reproductive disturbance.

Keywords : Reproductive Holstein

Study on Health and Productivity of Holstein Friesian from Australia in the Northeast of Thailand

1. Health Problems of Imported Dairy Cows in the Northeast

Somchai Srihakim

The study on health problem of imported dairy cows in Udornthani, Khon kaen and Nakornrachasima provinces was carried out during the period of May 1991 - July 1992. The following major findings were found: sudden death due to respiratory disease, infertility problems such as prolonged estrus, anestrus, defect of reproductive organs, mastitis, internal and blood parasites, mineral deficiency, malnutrition and poor adaptation of the cow to the local environment. Bacterial infections such as *Pseudomonas pseudomallei*, *Corynebacterium pyogenes*, *Clostridium spp.*, hardware disease and poisoning were also found. In order to help and solve the above mentioned problems, Northeastern Regional Veterinary Reasearch and Diagnostic Center has been closely coordinating with the above Provincial Livestock Offices in laying out training program, observation of disease outbreak, diagnosis and follow-up on animal health situation. Basic information relating to health and production of the cow was also part of the activity. The findings were in-put onto DairyCHAMP program for further study and analysis.

Keywords : Health problem Solving DairyCHAMP

Study on Health and Productivity of Holstein Friesian from Australia in the Northeast of Thailand 2. Respiratory Diseases in Imported Dairy Cows

Niyomsak Upatoom Somchai Srihakim
Worawit Wara-asavapati Satis Pholpark

During June to September 1991, the imported Holstein Fresian dairy cows between 2 to 4 years of age in Khon Kaen, Udornthani and Nakornrachasima showed respiratory signs in both acute and chronic form. Atypical interstitial pneumonia (acute bovine pulmonary edema and emphysema, ABPEE) without specific causes and mycotic pneumonia (granulomatous inflammation) were diagnosed by pathological examination. 17 animals from total 89 cows died from the acute respiratory signs. Many species of bacteria such as *Clostridium spp.*, *Pasteurella multocida*, *E. coli*, *Streptococcus spp.*, *Staphylococcus spp.* and *Salmonella spp.* and blood parasites (*Anaplasma marginale* and *Anplasma centrale*) were found in some case as secondary causes. The diagnosis of infectious bovine rhinotracheitis, parainfluenza-III and mucosal disease gave negative result. Mycotic pneumonia was found in two animals between 2-3 years of age as chronic cases.

Keywords : ABPEE Mycotic pneumonia Dairy cows

5. Parasitic Infestation in Imported Australian Holstein Fresien in Khon Kaen Province

Manvika Pholpark Thongsuk Surakan Kittikorn Janepaiboon
Wallapa Wara-aswapati Somchai Srihakim

During April to June 1992, blood and feces of 917 imported Australian HFs were examined. The animals were brought to be reared in Muang and Nampong District since July 1991. Results were shown as the following table.

Parasites	no. of samples	no. of pos.	% pos.
1.blood parasite	193	115	59.59
Theileria spp.	193	51	26.42
A.marginale	193	25	12.95
B.bigemina	193	1	0.51
A.marginale & *Theileria spp.*	193	38	19.68
2.Helminths	917	192	20.93
Paramphistomum spp.	917	111	12.10
Fasciola spp.	917	21	2.92
GI nematode	917	72	7.85
3.*Eimeria spp.*	917	1	0.11

It was evident that parasitic disease is one of the most important problems in dairy cattle. The conduction of effective prophylaxis and control programs is strongly recommended for a profitable return.

Keywords : imported Australian HF Khon Kaen blood parasite helminths Eimeria spp.

Screening of Bovine Paratuberculosis in Thailand

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Prateep Pemayodhin Monaya Ekgatat
Chira Kongkrong Yodyot Meepuch
Prapit Klainin Masaharu Kanameda

Paratuberculosis was investigated in Thailand between 1987 to 1991. A total of 17,655 sera from cattle was tested on a complement fixation test and 602 (3.4%) animals were detected. The positive reactors were found in all of the four Regions.

Johnin intradermal skin test was performed on a total of some 7,851 cattle in central part and showed 0.50% positive reaction.

A total of 109 isolates of Mycobacterium paratuberculosis out of 189 samples was obtained from fecal samples of suspected animals. The study convinced that the organism is widely present the country.

Post mortem examination was performed on 6 suspected cattle. Although three of them had distinct change of paratuberculosis, the rest failed to show any sign of the disease.

Keywords : Paratuberculosis bovine

4. Use of Dairy Champ Program in Monitoring Health and Productivity of Imported Holstein in Khon Kaen

Satis Pholpark Jaray Udomying Thogsuk Surakan
Apirom Chareonchai Somchai Srihakim

Data on health and productivity of about 150 imported Australian HF raised in one village in Nampong District, Khon Kaen, was collected and analyzed between July 1991 - July 1992 by the Dairy Champ program. The advantages of this program are rapid and informative analysis for health and productivity problems of either an individual or a whole herd. Therefore, the Dairy Champ program is very useful for monitoring health and productivity performance of dairy cattle, especially on small-scale farming in northeast Thailand

Keywords : monitoring health and productivity Australian HF Dairy Champ

3. Study on Biochemical Values Relating to Health of Imported Holstein in Khon Kaen

Satis Pholpark Siripan Wapakpetch
Apirom Chareonchai Somchai Srihakim

Blood was collected twice, in January and April 1992, from 143 imported Australian HF raised in one village in Nampong District, Khon Kaen, for biochemical tests. Comparisons of biochemical results between the two surveys showed statistically significant on body score, body weight levels of Mg, P, Ca, Creatinine, Bilirubin, Total protein, Na, K, ($p<0.01$); and Se, Glucose, Urea, Albumin ($p<0.05$). But GOT, vitamin A, Hct, Hb, MCHC and WBC count showed no significantly difference. Heat stress was supposed to be one of the major influences. Gradually, the cows were able to adapt themselves to the climate.

Keywords : health biochemical values Australian HF Khon Kaen

Application of Enzyme-linked Immunosorbent Assay for Detection of Tuberculosis in Dairy Cattle

Chaivat Vitoorakool Itipol Chaichanapunpol
Suchart Chuenprasert Seksan Chaiyasert

The enayme-linked immunosorbent assay (ELISA) was evaluated for its routine application as screen test to diagnosis of tuberculosis in datry cattle. The Tuberculin PPD bovine (Mycobacterium bovis. strain AN5) was used as an ELISA antigen. Percent of agreement and disagreement were 98.48 and 1.52 and percent sensitivity and specificity were 100 and 98.38 when compared with caudal fold tuberculin test. Both tests were tested with 1,118 dairy cattle in northern part. The ELISA could be used as screen test for tuberculosis diagnostic.

Keywords : ELISA

The Efficiency of Deep Frozen Mobile Production Unit

Parishat Sukhato Mukda Ratanapaskon
Vichai Chanathinart Chirut Ratanatheb

Deep Frozen Mobile Production Unit was adapted from simple equipment ie. household refrigerator as cooling cabinet for reducing the temperature and preserving semen in the equlibration period, the automobile electric pump as suction for filling of the French ministraws and the 1 X 1.5 X 1 ft^3 foam box as the freezing chamber. This mobile unit (1) is used to produce the deep frozen semen comparing with those produced by the standard laboratory equipments (2) The percentage of living sperm after thawing of frozen semen produced by equipment 1 and 2 are 40.50 and 50.00 % respectively. The percentage of living sperm 5 hre. after thawing are 21.0 and 28.0 % respectively. The quality of deep frozen semen produced by these two types of equipments are different but both can be used for Artificial Insemination.

Keywords : deep frozen semen mobile production unit

Effect of Environment Temperature and Moisture on Conception Rate in Dairy Crossbreed Cows

Amnat Ketmai Panya Sridech Suvit Bunprong
Kanlaya Bunyanuwat

337 records of AI service environmental temperature and moisture at Tabkwang Livestock Breeding and Research Center in 1991 were used in this study. The average conception rate was 60.83 percent. The effect of sire season environmental temperature and moisture on conception rate was highly significant (P<0. 01). The conception rate was 80.23 percent at low temperature (<25 ° C.) and 31.11 percent at high temperature (>35 °) (P<0.01). The conception rate was 86.41, 67.74 and 60.72 percent at moisture at 60-70, > 80 and < 60 percent respectively (P<0.01). The relationship between conception rate and temperature and moisture could make the equation as conception rate = 0.028 (temp) + 0.021 (moist) - 0.001 (temp * moist)

Additive Heterosis and Maternal Effect on Fertility Traits of Crossbreed Dairy Cows

Kanlaya Bunyanuwat Chantra Konanta Udomsri Intrarachote

686 records of fertility traits of crossbreed dairy cows from 1984 - 1991 at Tabkwang Livestock Breeding and Research Center. The result showed that the average of AI service per conception rate was 1.42±0.97. The effect of breed, age of cows, year were highly significant to AI service per conception rate ($P<0.01$). Additive effect was highly significant to AI service per conception rate. Holstein friesian cows had highest additive effect of AI service per conception rate. Native cows had lowest additive effect of AI service per conception rate. Heterosis effect was highly significant to AI service per conception rate ($P<0.01$). The heterosis effect of Holstein-native cows was highest. The heterosis effect of Holstein-A.I.S. cows was lowest Maternal effect was highly significant to AI service per conception rate ($P<0.01$). Native cows had highest maternal effect of AI service per conception rate. Holstein friesian cows had lowest maternal effect of AI service per conception rate.

附属資料 15. 長期調査員収集資料リスト

1. Agricultural Satatics of Thailand Crop Year 1990/1991
2. Stastical Profile of Livestock Development in Asia-Pacific Region 1980-90
3. Selected Indicators of food & Agriculture Development in Asia-Pacific
4. Region,1981-91

   Dairy Cattle Development Project Foreign Hybrid Dairy promotion DLD
5. Abstruct of Animal Science, Animal Production and Health Conference 11th,1992
6. Establishment of Certified Semen Collection Center
7. 地図
8. 設計図（搾乳牛舎、乾草収納庫、農業機械庫ほか）