COCHISE COUNTY

DAIRY RELOCATION STUDY

The University of Arizona

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COLLEGE OF AGRICULTURE
UNIVERSITY OF ARIZONA

Arizona Dairy Relocation Study

For

Cochise County, Arizona

Fall of 1985

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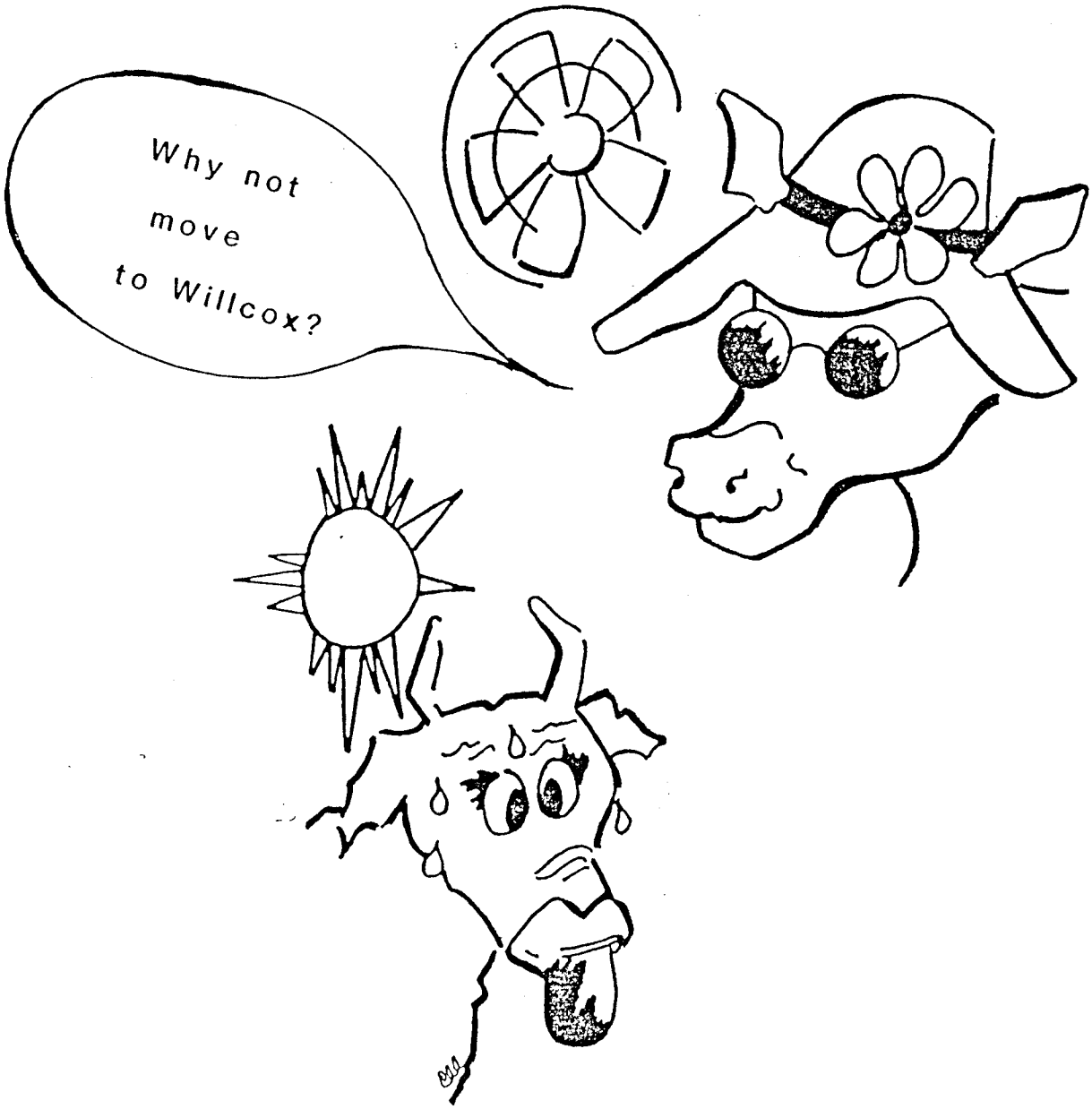
Why not
move
to Willcox?

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Arizona Dairy Relocation Study

For Cochise County

Overview

Approximately 90% of Arizona's dry-lot dairy operations are located within 60 miles of Phoenix. Due to continuing urbanization of the area these dairy operators systematically plan to relocate every 15 to 20 years.

This is a well established pattern which allows major adjustments to be financed primarily by land appreciation. Replacement of worn and/or obsolete facilities, equipment and expansion adjustments, and other changes are easily made when "starting from scratch", which this relocation makes possible.

Many community leaders in Cochise County feel that their area offers distinct advantages for dairy operators. Therefore they wish to take positive steps to encourage Arizona dairymen to locate in Cochise County when faced with the necessity of moving their operations.

As the basis for positive action a "Dairy Relocation Feasibility Study" was commissioned for the fall of 1985. The purpose of this study was:

1) to identify the major factors that would encourage dairymen to relocate in Cochise County; and

2) to develop recommendations to ensure that such relocation would be permanent and mutually desirable for the dairy operators and the residents of Cochise County.

Arizona Dairy Relocation Study

For Cochise County

Conclusions

A. A minimum of 5,000 dairy cows would be desirable to provide a sound economic base for a dairy community in Sulphur Springs Valley.

   This number of cows would give a base of operations for specialized services unique to a modern dairy operation, such as dairy veterinarian, production testing (DHIA), milking machine and equipment etc.

B. The economic impact of locating 5,000 dairy cows and associated replacement heifers would be:

   1. Five million three hundred thousand dollars ($5,300,000) of feed requiring approximately 10,000 acres of crop land would be utilized locally per year. See Table 1.

   2. Five thousand cows would provide the potential for 65 to 100 on-farm dairy employees.

   3. Gross annual income from 5,000 cows would approximate 11.2 million dollars ($11,200,000).

   4. Taxes collected; goods and services purchased; and sale of bull calves, cull dairy cows and manure are other items having positive economic significance for the area.

C. Dairy farmers, faced with relocation due to urban encroachment in the Salt River Valley, should be encouraged to investigate the advantages offered by the Sulphur Springs Valley area. These advantages are:

   1. They and their families would be welcomed as FIRST CLASS CITIZENS.

   2. Abundant dairy feed stuffs (alfalfa, corn silage, barley, grain sorghum, cottonseed and oat hay) of the highest quality can be purchased at competitive prices if sound businesslike agreements are established. Elimination of transportation costs presently incurred in marketing feed in the Phoenix, Tucson or El Paso areas would provide a margin of profit that could be shared with local dairymen. Harvesting and utilization as silage, green chop and high moisture grains could also reduce harvesting and marketing costs. In the case of alfalfa,

(Conclusions cont'd.)

it could make an extra cutting possible. Also local cottonseed is aflatoxin free.

3. Land prices in the Sulphur Springs Valley are extremely attractive at $400 to $1000 per acre compared to $1000 to $3000 in the Maricopa-Casa Grande-Coolidge area. This is the area that most Salt River Valley dairymen seem to be giving serious consideration as a relocation site. Recent sales of dairy real estate for urban development in the Chandler area have been in the $50,000 to $80,000 range.

   These attractive land prices coupled with abundant feed production potential, moderate climate and all weather roads make several locations attractive as potential dairy sites.

   These areas are: Stewart-Bonita, Kansas Settlement, Cochise-Sunsites, Sunizona and Elfrida-McNeal

   Farm real estate prices are depressed at this time due to the general overproduction of all agricultural commodities and near collapse of the Farm Credit System in many agricultural areas of the United States.

   Another contributing factor is the relatively higher electrical costs for pumping irrigation water when compared to many other farming areas in Arizona.

   Both water and power supplies exist in abundance, both in the short and long term. The local "water problem" is one of comparative costs. Electrical power is generated locally by the Sulphur Springs Electric Co-op, Inc. located near Cochise, and agriculture is its main customer. This plant has a significant reserve capacity which can assure dairymen of an adequate power supply. However, this excess capacity does contribute to the necessary cost of electricity at present. The comparatively higher cost difference with areas such as Phoenix and Casa Grande will tend to disappear in the near future, however. These areas are due to renegotiate power supply contracts with the Boulder Dam Authority and will share in the cost of bringing the Palo Verde Nuclear Plant "on-line". Significant rate increases are anticipated.

4. Heat stress becomes more threatening and costly as cows are bred and managed to produce more and more milk.

   Thus the option of moving and/or operating in a moderate, heat stress free climate becomes more desirable

(Conclusions cont'd.)

and, cost effective. Moderate climate, as exists in the Sulphur Springs Valley, would eliminate most of the costly heat stress imposed on dairy cows in the Salt River Valley and Casa Grande areas ($500-$550 annually per cow). The resulting increased production and reproduction efficiency would return more than the increased cost of transporting milk to the Salt River Valley area. Investments to provide for wind and freeze protection would be more than offset by eliminating the need for much of the heat stress protection now utilized by modern dairy operations. Fortunately the windy months of March and April are two of the dryest months of the year, reducing the possibility of cold stress.

5. Dairy families relocating in Cochise County will have the opportunity to live in a genuine rural environment. They will have an excellent opportunity to develop a sense of identity, permanence, community and leadership, while conducting their daily lives and dairy business in a less stressful environment.

6. Dairymen located in the Sulphur Springs Valley would have the Willcox Livestock Auction (largest volume in the state) available to them for marketing cull and/or surplus dairy stock. Also the Willcox Packing House would be available for local slaughtering and processing needs.

7. Competition for local labor supplies would be favorable as alternative employment tends to be limited to agriculture and service industries.

8. The Sulphur Springs Valley is about equidistant from Phoenix and El Paso, which could present alternative marketing possibilities.

9. Schools, churches and family services are very adequate. Outdoor recreation opportunities are excellent. "Big City" and University of Arizona access and activities are an easy 90 minute drive on Interstate 10 to Tucson.

Table 1: Annual Feed Requirement In Tons, Acres and Dollar Value For 5,000 Dairy Cows and Replacement Heifers.*

FEED TYPE	TONS ANNUALLY	ACRES REQUIRED	DOLLAR VALUE
	(Tons)	(Acres)	($)
Alfalfa hay	18,144	2,593	$1,814,400
Corn silage	44,307	1,477	1,107,675
Oat hay	3,600	1,200	306,000
Grain	12,610	3,602	1,544,812
Cottonseed (cotton)	4,549	1,000** (9,098)	523,135
TOTALS	83,210 Tons	9,872 Acres	$5,296,022 Dollars

* Based on "1985 Arizona Field Crop Budgets for Cochise County; January 1985; University of Arizona and "1983 Dry-lot Dairy Budgets; February 1983: University of Arizona. See Appendix Tables; 1; 2; 3; 4; 5; for details.

** Cottonseed production credited with 1,000 acres.

Recommendations

The Willcox Chamber of Commerce and Agriculture should initiate a "Five Year Dairy Awareness Campaign" to relocate dairymen with a minimum of 5,000 cows in the Sulphur Springs Valley area.

This campaign should be designed for two distinct audiences:

- The dairymen and their families in the Salt River Valley.

- The farmers and allied industry people in the Sul- Springs Valley.

Information presented in this study could form the basis for such a campaign.

The campaign should include:

A. Propectus and/or brochures developed to tell the following stories:

   1. What the Sulphur Springs Valley has to offer dairymen.

   2. What a dairy community with 5,000 to 10,000 dairy cows has to offer the Sulphur Springs Valley and what special needs and demands they would place on the area.

B. Key committee members, business persons and outstanding farmers committed to making person to person contacts with prospective dairymen. The objective is to personalize the basic messages developed in the brochures.

C. Organized tours of appropriate points of interest for prospective dairymen, their families and allied industry people.

D. 35 mm color slide and/or video tape versions of the two basic brochures for use and display at meetings, field days, fairs, service clubs, etc.

E. A small Dairy Campaign "Action Committee" with a dynamic chairman, serving as a clearing house for inquiries, ideas and needed follow-through actions.

F. Feature story(s) in United Dairyman of Arizona magazine plus monthly advertisement for a selected three to six month promotional period. A feature story is in the Arizona Farmer Stockman would also be desirable.

Understanding Arizona's Dairy Industry*

Arizona has approximately 155 commercial dairy operations or what might be termed individual physical facilities. Dairy statistics are sometimes confusing as they refer to the number of individual dairymen holding permits or membership in a marketing organization. Many dairy sites or operations have more than one dairyman using the facilities which accounts for most of the confusion concerning dairy numbers.

For purposes of this report references are made to individual physical dairy facilities. For approximate distribution and location of Arizona dairy operations see Figures 1 and 2.

The average dairy operation has a mature dairy herd of approximately 550 cows and approximately the same number of replacement heifers, ranging in age from birth to 26 months, when they calve for the first time.

The U.S. Livestock and Crop Reporting Service estimates that Arizona has a state dairy cow population of 87,000 cows as of October, 1985.

These dairy operations grossed $175 million in 1984, shipping 22,905 pounds of milk daily per operation. They supply most of Arizona's fresh milk and dairy product needs, much of the hard cheese, 25% of the butter and some cultured dairy products. Eighty-five percent of the dairies are located within 50 miles of Phoenix in the Salt River Valley. Holsteins make up 90% of the state dairy herds; Guernseys, Jerseys, Brown Swiss and Milking Shorthorns make up the remainder. Eleven percent of the cows are registered.

Capital Investment Requirements

The typical investment of a 500-cow unit might be:

500 cows at $1,200/cow	$ 600,000
Milk base: 54 pounds of daily milk base per milking cow (420 cows) @ $20 per pound	453,600
Milking facilities and equipment @ $1,800/cow	900,000
500 replacement heifers and calves: average $725/hd.	362,500
6-month hay supply, 3 tons/cow @ 120/ton	180,000
30 acres of land @ $2,000/acre	60,000
Total Investment	$2,556,100
Average Investment Per Cow	$ 5,011

Milking Facilities

The most common arrangement consists of a herringbone parlor, low-level milk line, bulk milk tank, jet cow washers in the holding pen and milking machine detachers. Twenty-five percent of the cows are milked three times a day. Corrals are constructed of steel cable and posts, with 50-150-cow groupings. They are equipped with metal sun shades, perimeter feeding and lock-in stanchions. Evaporatively-cooled shades and foggers are used on about 20% of the state's dairies. Holding pen cooling has been added to approximately 30% of the dairy farms since 1983.

Average Dairy Herd Improvement Association

There are 57,000 cows enrolled in the Arizona DHIA, Inc. Arizona ranks 1st in the nation for cows on DHIA with 73% on test with a rolling 12-month average of 16,841 lbs. of milk and 628 obs. of fat. Arizona ranks third in the nation in production per cow.

Co-op Marketing

Ninety percent of Arizona's dairymen are members of the United Dairymen of Arizona. This cooperative operates a quota program which encourages members to adjust production to market needs. A supply-management plant enables the co-op to hold reserve milk so day-to-day fluctuations in demand by processors can be met. The market is cleared of excess milk by converting it into cheese or butter and milk powder. A new cheese plant was built in 1984. Cheese whey is processed inro protein powder, milk sugar and liquid feed.

Federal Milk Marketing Order

Ninety-six percent of the milk produced in the state is regulated by Federal Marketing Order 131. A major purpose of the order is to insure Arizona consumers an adequate supply of milk. USDA-supervised "hearings" or bargaining procedures are arranged between dairymen and milk handlers. The prime objective is to establish minimum classified prices which handlers must pay dairymen to encourage an adequate supply of milk, but not a burdensome surplus. The federal order has no control over retail milk prices.

Milk Prices and Utilization

Federal Milk Marketing Order Class I, II, III and uniform prices for September 1985 were $13.62, $11.12, $11.12 and $2.59 per hundredweight, respectively. Class I utilization averaged 58.6%. Retail supermarket prices range from $.92 to $1.10 per half gallon.

Figure 1: Distribution of commercial Dairy Operations
in Arizona
September 1985

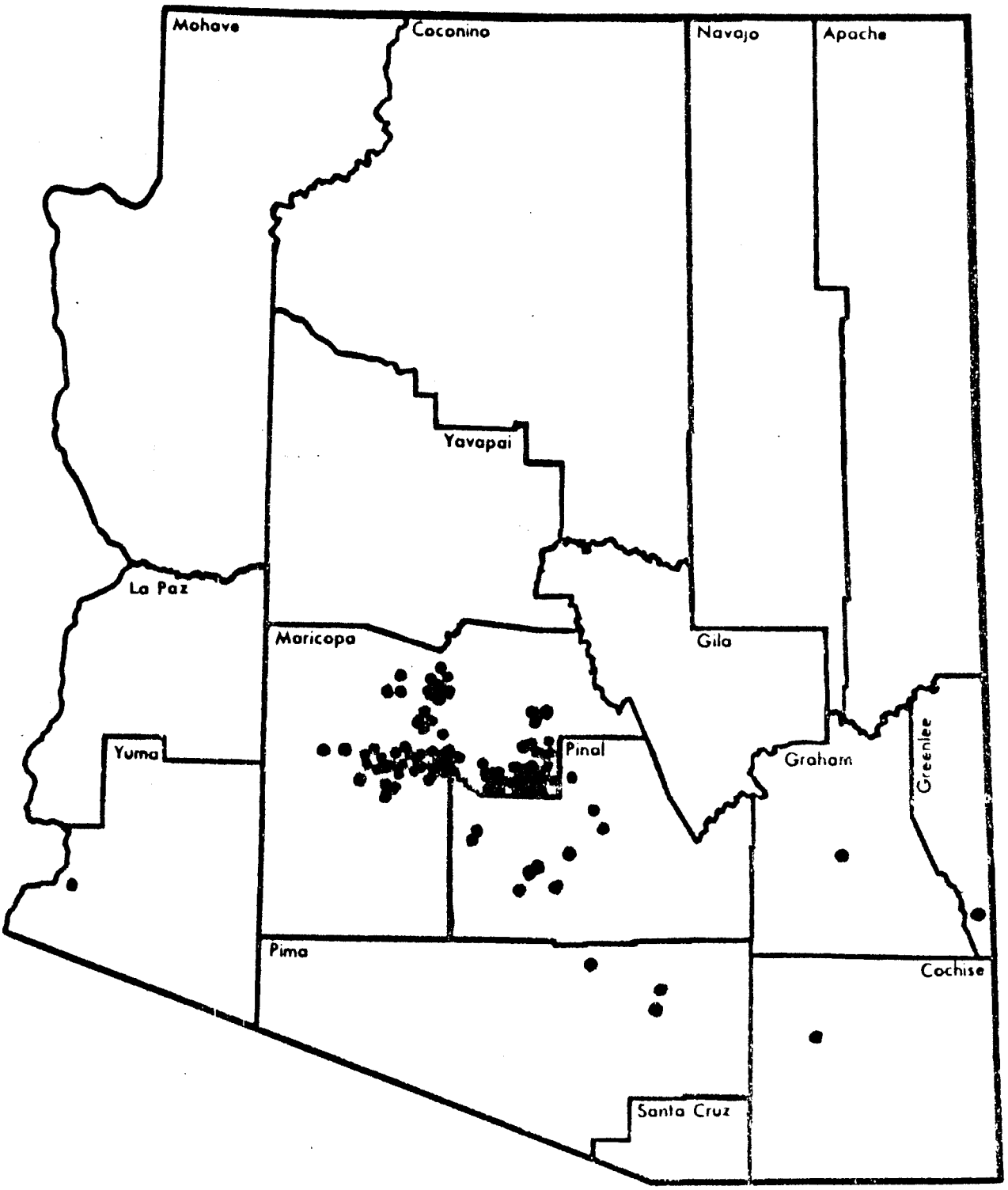
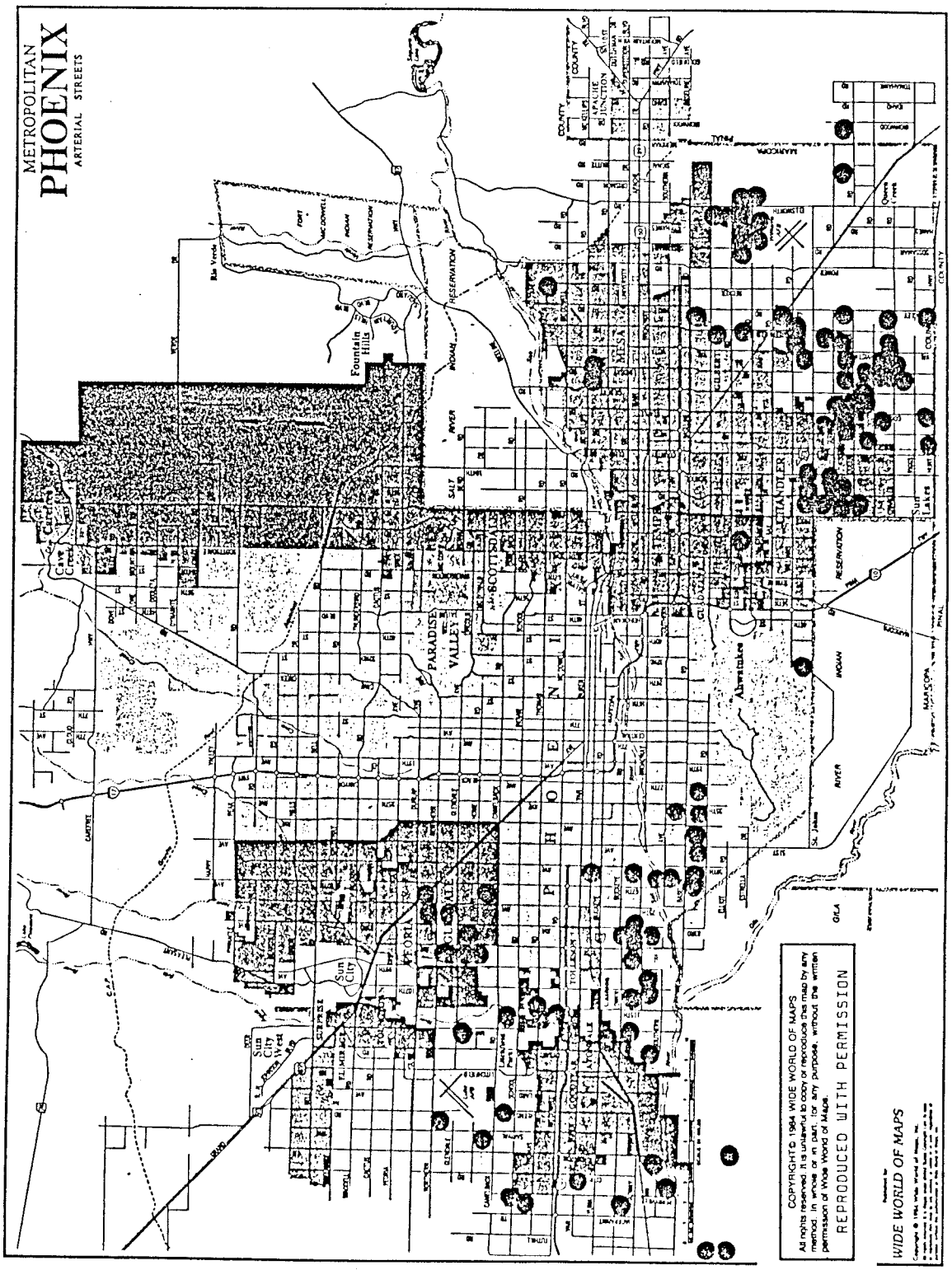


Figure 2: Arizona Dairy Farms with Relocation Potential



Description and Needs of A Modern, Mid-sized, Dry-lot Dairy

To work successfully with dairymen it is necessary to have a basic understanding of their unique needs. Much of this knowledge can be acquired by studying:

A. The locational needs

B. The organizational structure

C. The physical structure, and

D. The financial structure of a modern dry-lot dairy.

A. Dairy Location Characteristics Desired

1. Immediate access to all-weather roads

2. Well drained site with moderate natural slope (3 to 5%)

3. Close proximity (1 to 5 miles) to feed crops; alfalfa, corn silage, grain, etc.

4. Ample good quality water with less than 1000 parts per million total soluble salts (1500 ppm. maximum).

5. Access to main electric power hook-up.

B. Organizational Efficiency Is Based On Job Priorities

A specialized dairy organization tends to operate 24 hours a day, especially if cows are milked 3 times a day, which is a growing trend. See Table 2. Jobs are specialized and compete for time and space. Making one task easy to accomplish generally complicates another, so priorities must be established.

For example, milking and milk handling take precedent over herdsmans' work (breeding, doctoring, etc.), which in turn, takes precedent over feeding, which takes precedent over manure clean-out, etc.

Table 2: ARIZONA DAIRY HERD IMPROVEMENT SUMMARY

ROLLING HERD AVERAGE OF OFFICIAL HERDS ABOVE 625 LBS FAT

July 1985

HERD NAME	COWS IN HERD	BREED	MILK	% FAT	FAT	AVERAGE DAYS IN MILK
*Stotz Dairy	734	GH	21,999	3.71	817	211
*T. A. Burgeson,Jr.	249	RH	20,270	3.77	763	207
Roeloffs Dairy	886	GH	19,658	3.77	742	179
*Mesquite Dairy	596	GH	19,509	3.77	735	224
*deJong Dairy (Mesa)	298	GH	19,856	3.69	734	157
*Arizona Dairy Co. #1	973	GH	20,804	3.49	725	219
*Ed Boschma	568	GH	19,658	3.69	725	243
*A & H Dairy	543	GH	19,281	3.76	724	199
*Desert Crest Dairy	481	GH	19,841	3.62	718	203
*Rijlaarsdam Dairy	868	GH	19,168	3.67	703	201
Del Rio Dairy	194	GH	18,721	3.74	701	227
Butler Dairy	302	RH	17,886	3.90	697	223
*Arizona Dairy Co. #4	807	GH	18,954	3.67	696	167
*Milky Way Dairy	672	GH	19,508	3.56	695	174
*Arizona Dairy Co. #2	1007	GH	19,496	3.56	694	227
*Smith-Lunt Dairy	774	GH	17,874	3.86	689	189
Lyreedale Dairy Farm	443	RH	18,502	3.72	688	202
Martha Linda Dairy	1319	GH	18,722	3.67	687	187
*Richard Anglin	639	GH	18,263	3.68	672	162
*Schuburg Dairy	574	GH	17,073	3.92	669	210
Barie Enterprises	849	GH	17,632	3.76	663	209
Happy Acres Holstein	127	GH	17,589	3.76	661	165
*Arizona Dairy Co. #3	1054	GH	18.619	3.53	658	209
*Feestra Dairy	557	RJ	13,325	4.94	658	203
P & W Dairy	507	GH	16,947	3.82	647	194
Triple G Dairy	1258	GH	17,273	3.74	646	176
*Sun Country	948	GH	17,607	3.64	641	210
Pete J. Treguboff	310	RH	17,255	3.71	640	227
Rezzonico Ranches	572	GH	17,100	3.74	639	191
C & B Dairy	730	GH	17,069	3.73	636	191
*R G B Dairy	288	GH	17,057	3.69	629	240
Stanley Boschma	615	GH	16,486	3.81	629	185
*Happy Acres Brown Swiss	57	RBS	15,428	4.07	627	152
Shamrock Hill Farm	3362	GH	17,384	3.60	627	192
Phil Greer	398	GH	17,076	3.66	626	209

* 3 X's a day milking

C. Physical Layout of a Modern Dry-lot Dairy

The Milking Center (See Figure 3.)

The Milking parlor, holding pen, milk room, machinery room and office are housed in one centrally located building. This is placed at the high point of the entire dairy layout and must have all-weather driveways connected to the main paved highway. These driveways must accomodate 6,000 gallon, semi-trailer tractor rigs for milk pick up and hauling.

Corrals

Milk cow corrals, with 100 to 150 cow capacity each are situated along a central cow lane leading from the holding pen. This concrete-surfaced cow lane is graded to slope a minimum of 1½% away from the holding pen. Corrals are graded to slope 3% from the outside perimier feeding platform to the central cow lane. This lane thus serves the dual role of moving cows to and from the parlor and moving any run-off water from the parlor and corrals to a waste water holding pond at the rear of the dairy layout.

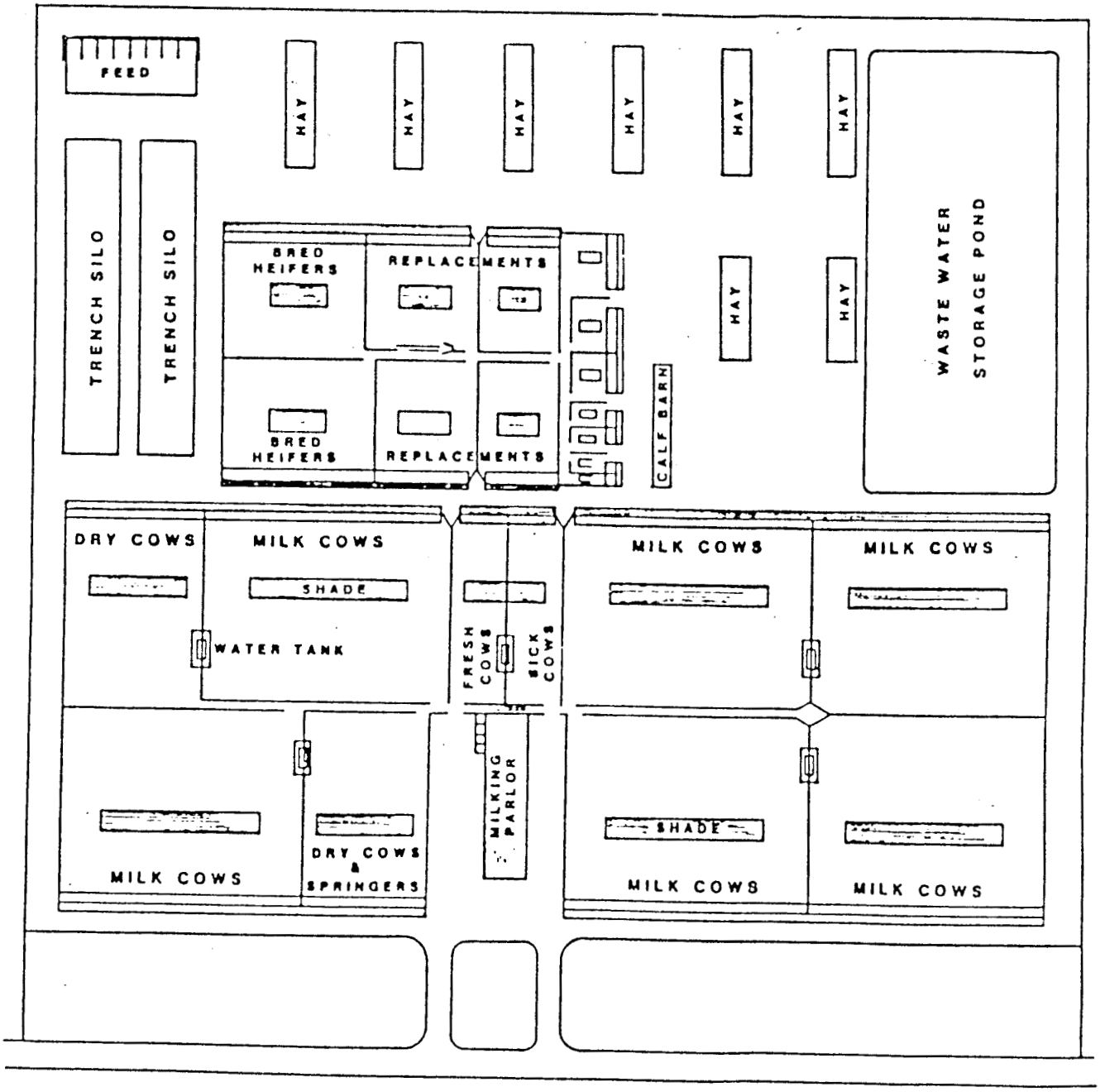
Corrals should contain a minimum of 750 square feet per cow along the perimeter feeding platform. The feeding space should be equipped with a lock-in, lock-out type stanchion (self-locking type preferred). This is where most herdsman type work is done; i.e., artificial breeding, routine doctoring, pregnancy checking, etc.

Each corral should be equipped with a sun-rain-wind shelter providing 40-50 sq.ft. per cow.

Corral Maintenance

The corral surface under the shelter should be crowned, 12 to 18 inches higher than the surrounding area. It is important that the shelter be constructed so that wet material can be removed easily and replaced with sun-dried manure mulch. A similar routine is needed to maintain the area behind the feeding platform. The entire corral surface should be mulched with a drag-harrow type implement once or twice a week as needed to maintain dry corral conditions.

Figure 3. Typical Drylot Dairy Layout



Cows free of moisture are less subject to wind chill, which is the chief cause of cold stress. Also, dry corral surfaces keep cows clean, resulting in faster milking, less mastitis and thus higher quality milk.

Other Facilities

Calf barns, replacement heifer pens, feed storage structures and other facilities are conveniently located. See figure __, page __; Schematic of a Modery Dry-lot Dairy Layout.

Feeding

A grain mixture is fed in the milking parlor through a mechanical dripple system free choice, except for the late lactation cows that are tending to get over-conditioned or fat.

Cows are grouped in corrals according to: (1) breeding or reproductive status, (2) production level and (3) need for special attention. Outside rations of grain, roughage and a vitamin-mineral-protein pellet are then formulated to fit each corral-group's needs. They are fed on the perimeter feeding platform using a feeder-mixer truck equipped with electronic load cells.

Dry roughage and/or green chop is generally fed separately. Grains, protein meal and by-product feeds are typically mixed with silage which serves as an excellent "carrier".

Prepared grains, meals, etc. are stored in a cubicle or commodities shed. They are out-loaded as needed with a front-end loader and placed in the feeder-mixer truck in amounts specified by the particular ration being prepared.

Water

Ample, high quality water free of contamination and low in total soluble salts (less than 1,000 p.p.m. desirable, 1,500 p.p.m. maximum) is a must. Total requirements average approximately 150 gallons per day per milking cow unit.

Ample heat from compressors and manifolds, can be made available through heat exchange units for warming cow wash water, providing hot water for equipment washing and clean-up and for other uses.

The cooling of milk, from cow body temperature of 101°F to a storage temperature of 34±F is an abundant heat source if it is captured and utilized.

Waste Water Disposal

The most desirable disposal method is to mix dairy waste water with irrigation water. If this is not an option a leaching field must be provided. In either case, waste water is stored in a waste pond and pumped as dictated by the irrigation schedule or accumulation level if a leach field is being used.

The leach field is ideally managed and utilized as a small irrigated pasture and/or orchard.

Family Housing Location

It is desirable to locate family housing upwind from the dairy. In most Sulphur Springs Valley locations this would be west or southwest of the dairy operation. With this orientation odors, dust and flies tend to be carried away from human living quarters.

D. Financial Structure of a Modern Dry-lot Dairy

The following "700 Lactating Cow Budget" breaks out the major new cost investment items that make up a modern dry-lot dairy.

In the judgment of the author, these data are valid for purposes of this study. However they should be updated if used for actual dairy enterprise planning. For complete details see: "1983 Dry-lot Dairy Budgets"; Western Regional Publications 66.1 and 66.3; University of Arizona Cooperative Extension Service.

Table 3: 700 LACTATING COW INVESTMENT BUDGET

NEW INVESTMENT ITEM	TOTAL	PER LACTATING COW UNIT
A. Parlor building	$ 110,000	$ 157
B. Milking stalls	38,150	55
C. Parlor machinery	176,600	252
D. Calf barn	38,500	55
E. Calf barn equipment	6,700	10
F. Corrals	431,220	616
G. Storage facilities	66,000	94
H. Wells, water supply and waste systems	112,043	160
I. Machinery and equipment	136,987	197
J. Cattle	1,681,750	2,403
K. Feed inventory	138,270	198
L. Milk marketing base	1,020,425	1,458
M. Land and excavation	95,200	136
Grand Total	$4,051,845	$5,788

Discussion of the 700 LACTATING COW BUDGET[1/]

A double 10 herringbone parlor with automatic detachers and feed bowl covers is budgeted to operate at 90 cows per hour including corral changes. Two 8 1/2 hour shifts including 45 minutes for clean-up and set-up will be required. Tube coolers, a cooling tower, ice bank and plate cooler are included with sufficient storage in silo bulk tanks for every other day pickup. All equipment is budgeted a new price.

A total of 838 lactating and dry cows and 8 clean-up bulls are included in the budget along with appropriate numbers of young stock. Corral sizes are matched to space requirements. A treatment and maternity area is included.

Parlor feed storage of 15 tons and 50 foot platform scale are included. A self unloading feeder mixer truck and 125 HP tractor with loader are used for feeding.

Forty-six acres are budgeted for the parlor, corrals, trench silos, waste ponds and waste absorption area. A scraper type separator is included. A total of 11 workers (including the owner operator) are budgeted with the opportunity cost of the owner operator and salary of the herdsman reflecting the level of responsibility. An assistant herdsman is included.

Table 4 is the companion Operating Budget for the "700 Lactating Cow Investment Budget" above. It gives total dollar amounts; dollars per hundredweight of milk sold; percent of total revenue, and costs and revenue per cow (lactating and dry) for each item.

TABLE: 4 :

OPERATING BUDGET

700 MILKING COWS (838 MILKING AND DRY COWS) WITH REPLACEMENTS

	AMOUNT	$ PER CWT MILK	PERCENT OF TOTAL COSTS & REVENUE	PER COW LACTATING AND DRY
REVENUE				
MILK SALES	1948182	14.53	77.82	2324
CO-OP DIVIDENDS	33520	0.25	1.34	40
CALVES & HEIFERS SOLD	86612	0.65	3.46	103
NON-CASH REVENUE FOR REPLACEMENT HEIFERS RAISED	435000	3.24	17.38	519
TOTAL	$ 2503314	18.67	100.00	2987
COSTS				
HERD REPLACEMENT RAISED	264206	1.97	11.48	315
DEPRECIATION	66236	0.49	2.88	79
PROPERTY TAXES	22973	0.17	1.00	27
INSURANCE	15272	0.11	0.66	18
REPAIRS & MAINTENANCE	39020	0.29	1.70	46
FUEL AND OIL	29006	0.22	1.26	34
FEED	1419002	10.58	61.65	1693
WAGES & SALARIES*	204340	1.52	8.88	243
HAULING	44246	0.33	1.92	52
CO-OP FEES**	44246	0.33	1.92	52
UTILITIES	36872	0.27	1.60	44
SUPPLIES	54470	0.41	2.37	65
BREEDING	22626	0.17	0.98	27
PRODUCTION TESTING	10554	0.08	0.46	12
VETERINARY	7542	0.06	0.33	9
MISCELLANEOUS	20950	0.16	0.91	25
TOTAL	$2301566	17.17	100.0	2756
REVENUE	$ 2503314	18.67	108.77	2987
- COSTS	-$ 2301566	-$17.17	-$100.00	-$2746
***NET REVENUE	201748	1.50	8.77	241

*Includes opportunity cost of owner's labor and management.
**Includes capital retains.

***Pretax return to total capital (investment and operating), does not include interest on borrowed capital or opportunity cost of (interest on) net worth.

What Arizona Dairymen Should Know About the Sulphur Springs Valley

Agriculture has consistently been the leading industry in the Sulphur Springs Valley although mining and railroading have enjoyed brief periods of notoriety in the past.

With this dominance of agriculture, dairymen and their families could be given an warm and sincere welcome and assisted into the local socio-economic fabric of the community.

1. Dairymen Welcomed As First Class Citizens

   Dairymen should be convinced by the Sulphur Springs Valley citizens and communities that they will be FIRST CLASS CITIZENS if they relocate in the area. The reasons are simple and straightforward; they will be agriculture people in an agriculture community, and their presence would contribute increased stability by providing steady markets for locally grown feed crops. They need to be told this by local people.

   Also expressions of interest and willingness, by local merchants, to make available the service and supplies unique to dairy operations would help encourage prospective dairymen.

2. Abundant, High Quality Dairy Feed Available

   The Sulphur Springs Valley is noted for its productive soils. Four tons of sorghum and barley grains per acre are grown using adapted varieties and good management practices.

   Five tons of corn grain per acre is not uncommon, with verified yields of 6 tons (12,000#) per acre. Because of the high grain content excellent corn silage can be produced.

   Alfalfa hay yields of 6 to 7 tons per acre are grown by good farm managers.

   Excellent dairy hay can be produced, however summer cuttings (July & August) can receive some field damage by frequent summer rain showers. Green chop and/or alfalfa silage programs could minimize this rain damage while allowing farmers to produce at least one extra cutting of alfalfa per year.

Cottonseed produced at this 4,000 foot elevation area is free of aflatoxin.

Excellent oat hay, for dry cow feeding, can be produced.

With the exception of local swine and ranching operations, locally produced forages and grains must be transported some 100 to 250 miles to be utilized by dairy and cattle feeding operations.

Principle marketing options are Tucson - Phoenix - Casa Grande - Maricopa and the Las Cruces-El Paso areas.

The feedstuffs must be in low moisture form to transport and market in these distant areas.

If these feedstuffs could be marketed to dairymen located in the immediate area, most of the transportation and some of the water removal costs could be eliminated. Utilization as green chop, silage and high-moisture grain are possibilities for reducing drying time and costs.

These methods of feed utilization will require educational efforts and experience on the part of buyers and sellers to develop workable marketing methods. Buying and selling on a dry-matter basis is recommended.

For more detail on Cochise County agriculture see pages _____.

3. Sulphur Springs Valley Climate Will Eliminate Heat Stress

The climate in the Sulphur Springs Valley will eliminate the major heat stress experienced by dairy cattle in the Salt River Valley.

During the summer months of June, July, August and September the average maximum temperature at 5 locations in the Sulphur Springs Valley is 92°F. Comparable temperature in the Chandler Heights-Sacaton-Casa Grande area of the Salt and Gila River Valleys is 102°F.

Minimum temperatures for these two areas during the four summer months are 61°F and 70°F respectively. Mean temperatures for the year are 61°F and 69°F.

See Figures 5 and 6.

This 10°F lower summer temperature in the Sulphur Springs Valley should allow dairy cows to cool down and regain their normal body temperature during the night. This does not happen on most summer nights in the Salt River Valley unless the cows are environmentally cooled.

Figure 4

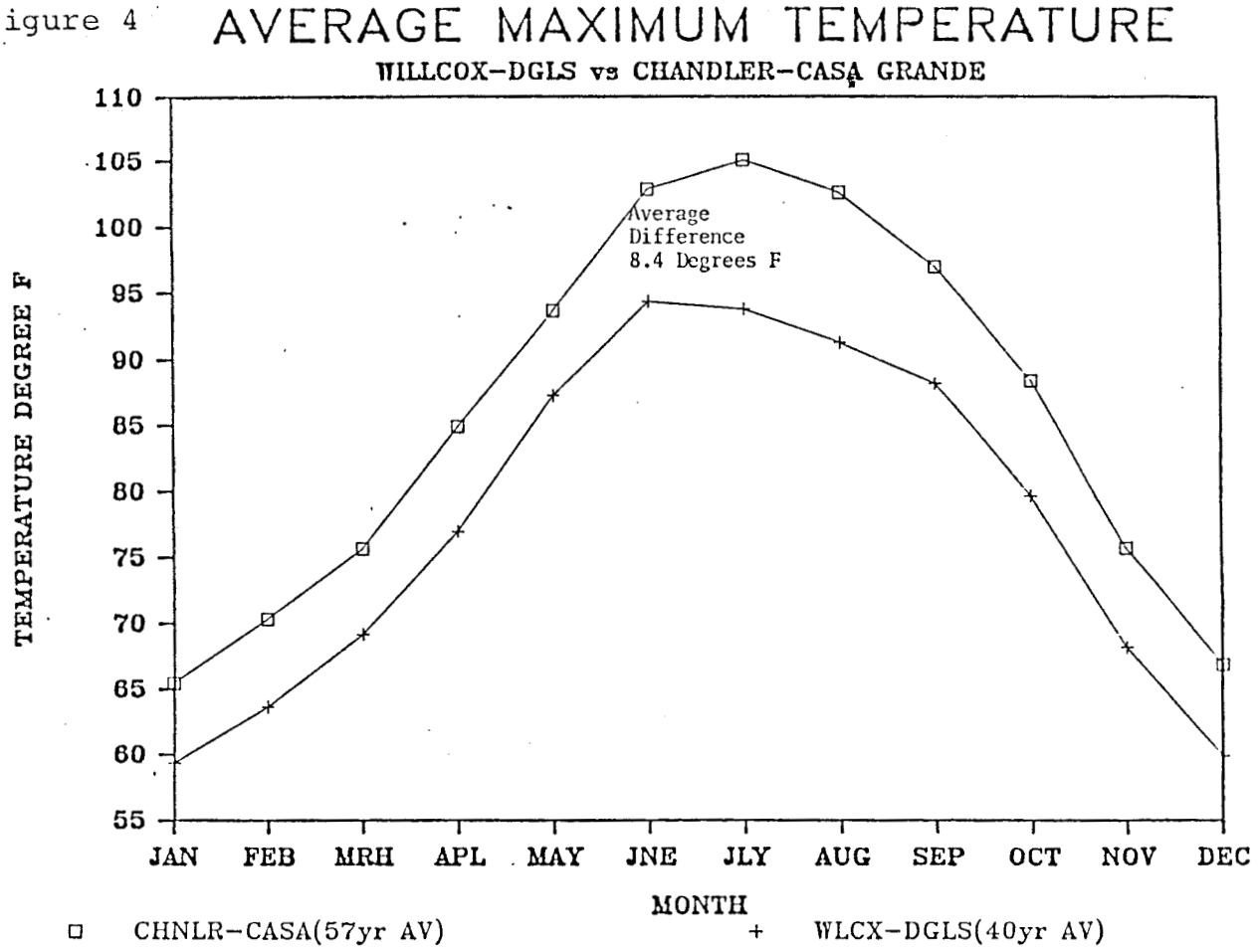
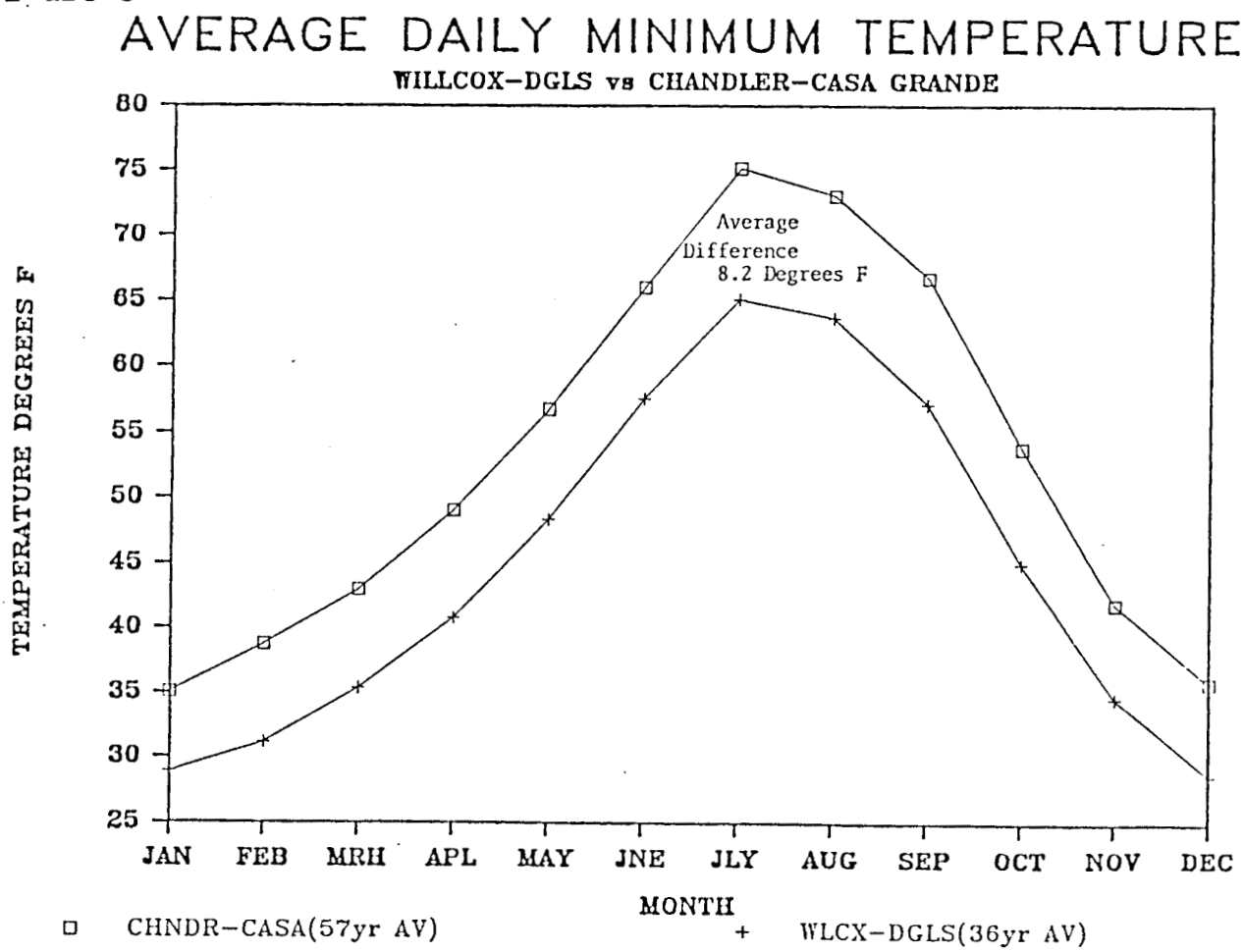


Figure 5



Heat stress is produced by a combination of heat and humidity. Figure 7 shows annual precipitation averages by month for the two areas being compared. Note the similar rainfall patterns throughout the year. The additional rainfall in the Sulphur Springs Valley plus the relative humidity data presented in Figure 8 indicate that average summer humidity is somewhat higher (7%) in the Willcox area. This would reduce the effective cooling potential.

Figure 9 shows the Temperature-Humidity Comfort Index for Dairy Cattle using the available mean summer temperature-humidity data for Willcox and Phoenix.

This data indicates that the Willcox environment stays below the heat stress zone for dairy cows imposed by combinations of temperature and humidity.

Another indication of how dairy cows will produce in the Sulphur Springs Valley is presented in Figure 10. Average daily milk production for Arizona cows is compared to production of cows in the Las Cruces-El Paso area (Mesilla Valley). This area has a climate quite similar to the Sulphur Springs Valley. See Figures 11 and 12 for temperature and rainfall comparisons.

Note the similarity of daily production per cow with the exception of the summer months. The New Mexico cows do not drop as severely. They out produce Arizona cows by approximately 15% during the summer and fall period.

A similar production pattern would be anticipated in the Sulphur Springs Valley.

Wind and winter cold protection would be costs not incurred in the Salt River Valley. Freeze protection for water and other essential liquids would be necessary while wind protection for cattle would be desirable.

The alleged "wind problem" is a commonly held belief of visitors to the Willcox area. Most residents view wind as troublesome only in that it is usually visible due to the dust picked up from the large Willcox Dry Lake (Playa). This lake bed is the low spot in the Sulphur Springs Valley into which rain run-off drains. The northern edge is located about 3 miles south of Willcox and extends approximately 11 miles north to south and 9 miles east to west. During rainy periods it may be covered with a shallow layer of water which eliminates the dust problem.

The available wind velocity data presented in Figure 13 was compiled by the Willcox official weather observer. The low average wind velocity may be due to relatively short periods of gusty, high velocity winds offset by long periods of relative calm.

Figure 6

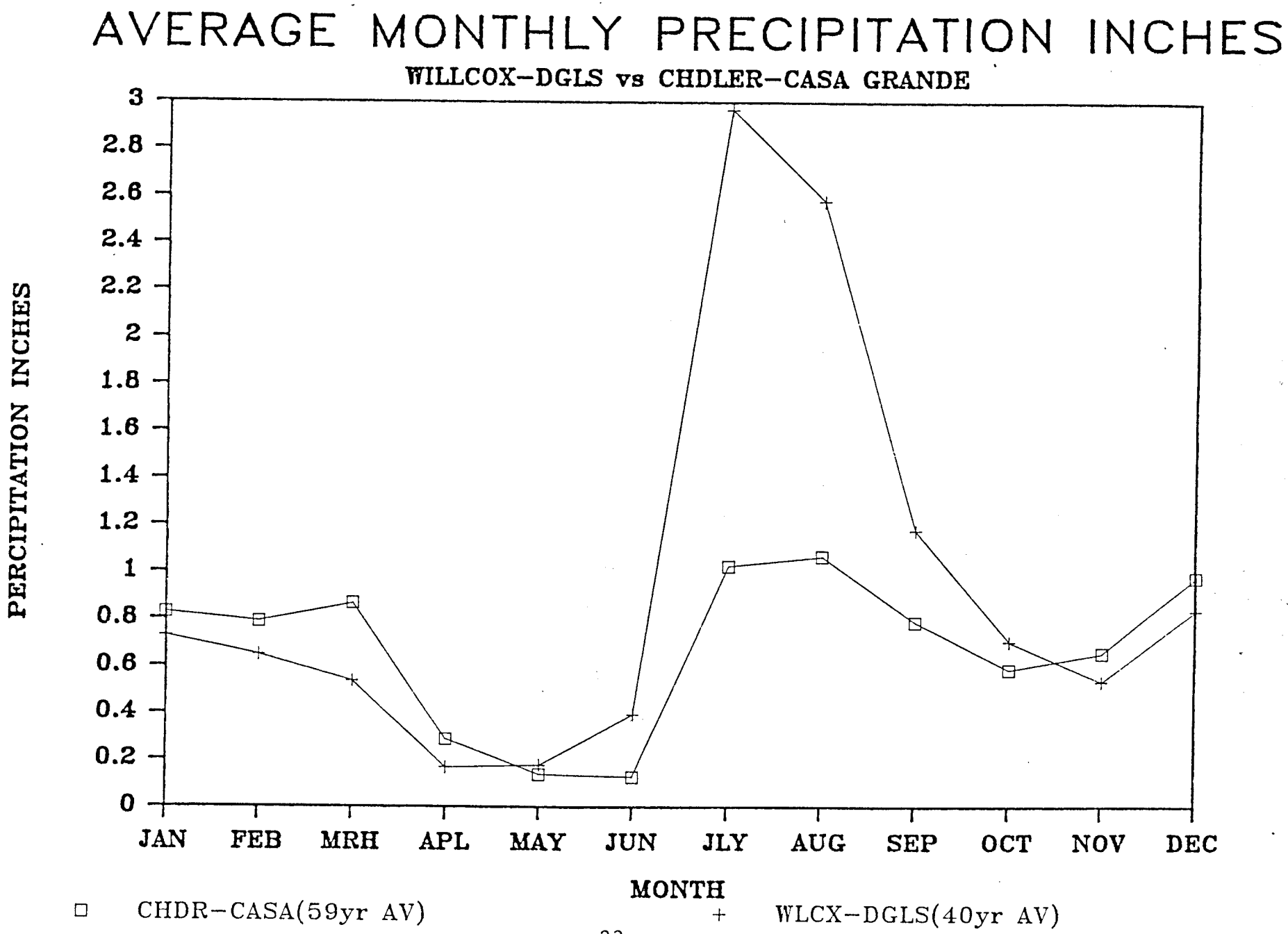

AVERAGE MONTHLY PRECIPITATION INCHES
WILLCOX-DGLS vs CHDLER-CASA GRANDE
PERCIPITATION INCHES
3
2.8
2.6
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
JAN
FEB
MRH
APL
MAY
JUN
JLY
AUG
SEP
OCT
NOV
DEC
MONTH
CHDR-CASA(59yr AV)
WLCX-DGLS(40yr AV)

FIGURE 7

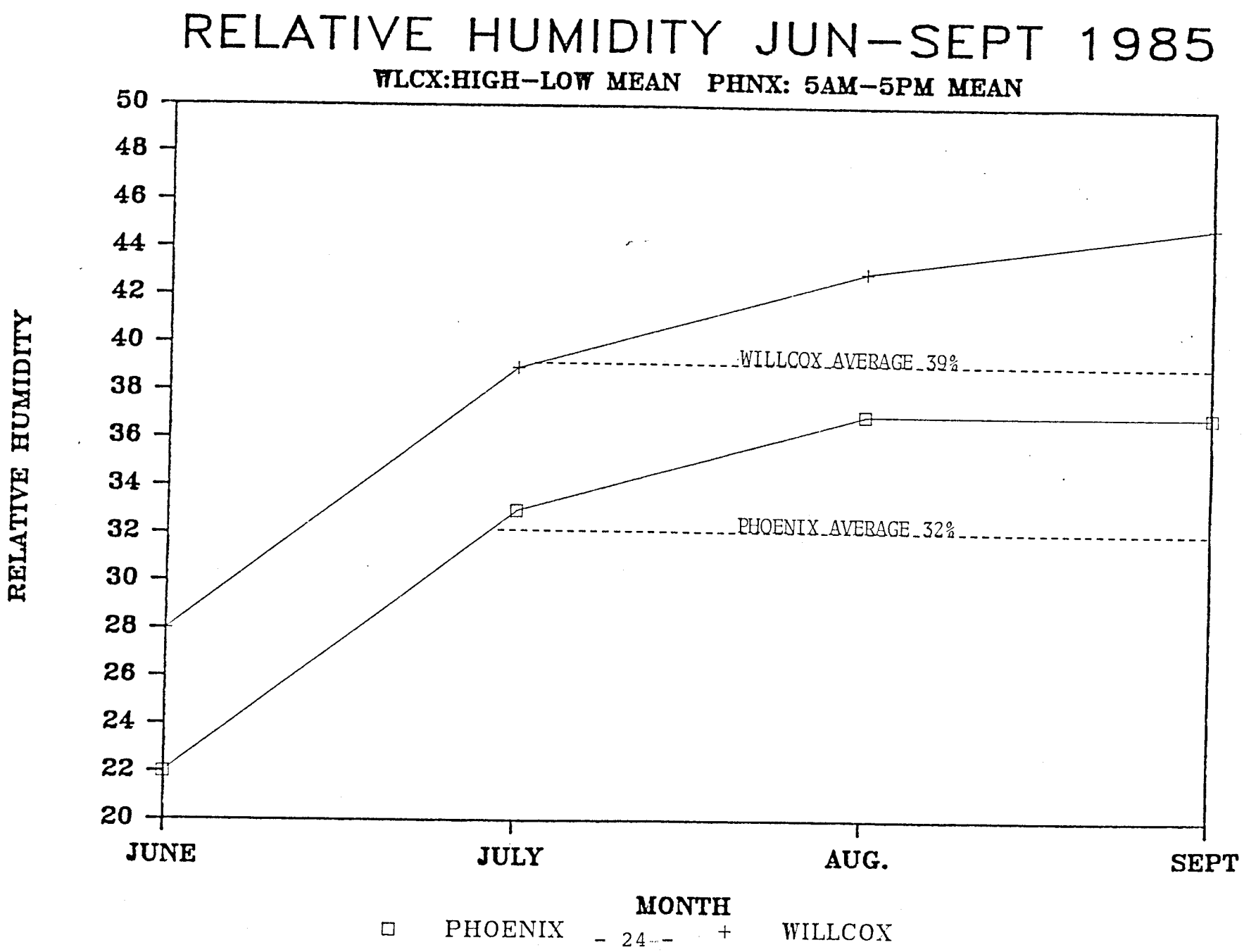

RELATIVE HUMIDITY JUN–SEPT 1985
WLCX:HIGH–LOW MEAN PHNX: 5AM–5PM MEAN
RELATIVE HUMIDITY
50
48
46
44
42
40
38
36
34
32
30
28
26
24
22
20
WILLCOX AVERAGE 39%
PHOENIX AVERAGE 32%
JUNE
JULY
AUG.
SEPT
MONTH
PHOENIX
WILLCOX

FIGURE 8

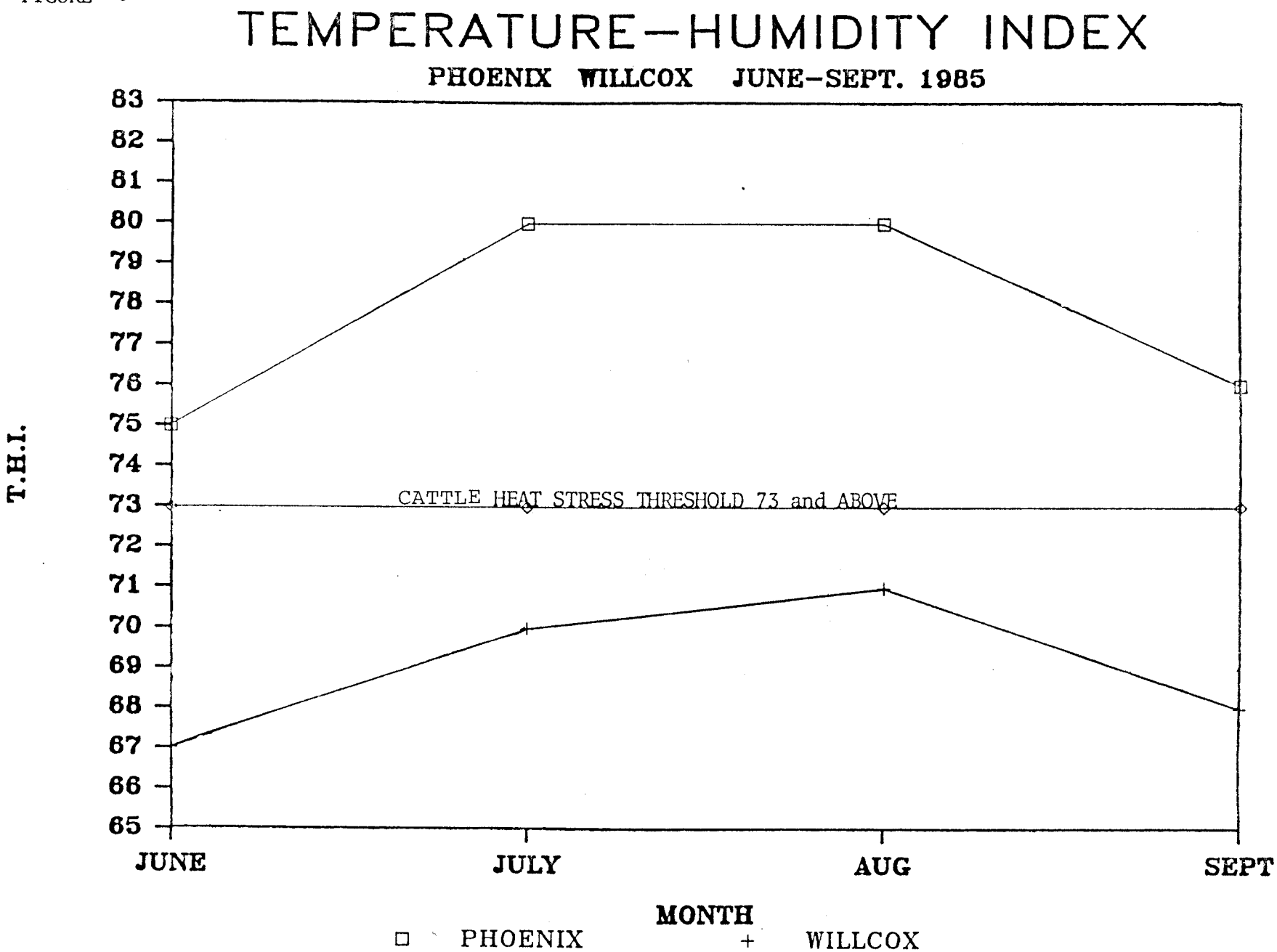

TEMPERATURE—HUMIDITY INDEX
PHOENIX WILLCOX JUNE-SEPT. 1985
T.H.I.
83
82
81
80
79
78
77
76
75
74
73
72
71
70
69
68
67
66
65
CATTLE HEAT STRESS THRESHOLD 73 and ABOVE
JUNE
JULY
AUG
SEPT
MONTH
PHOENIX
WILLCOX

Figure 9

SEASONAL VARIATION IN MILK FLOW

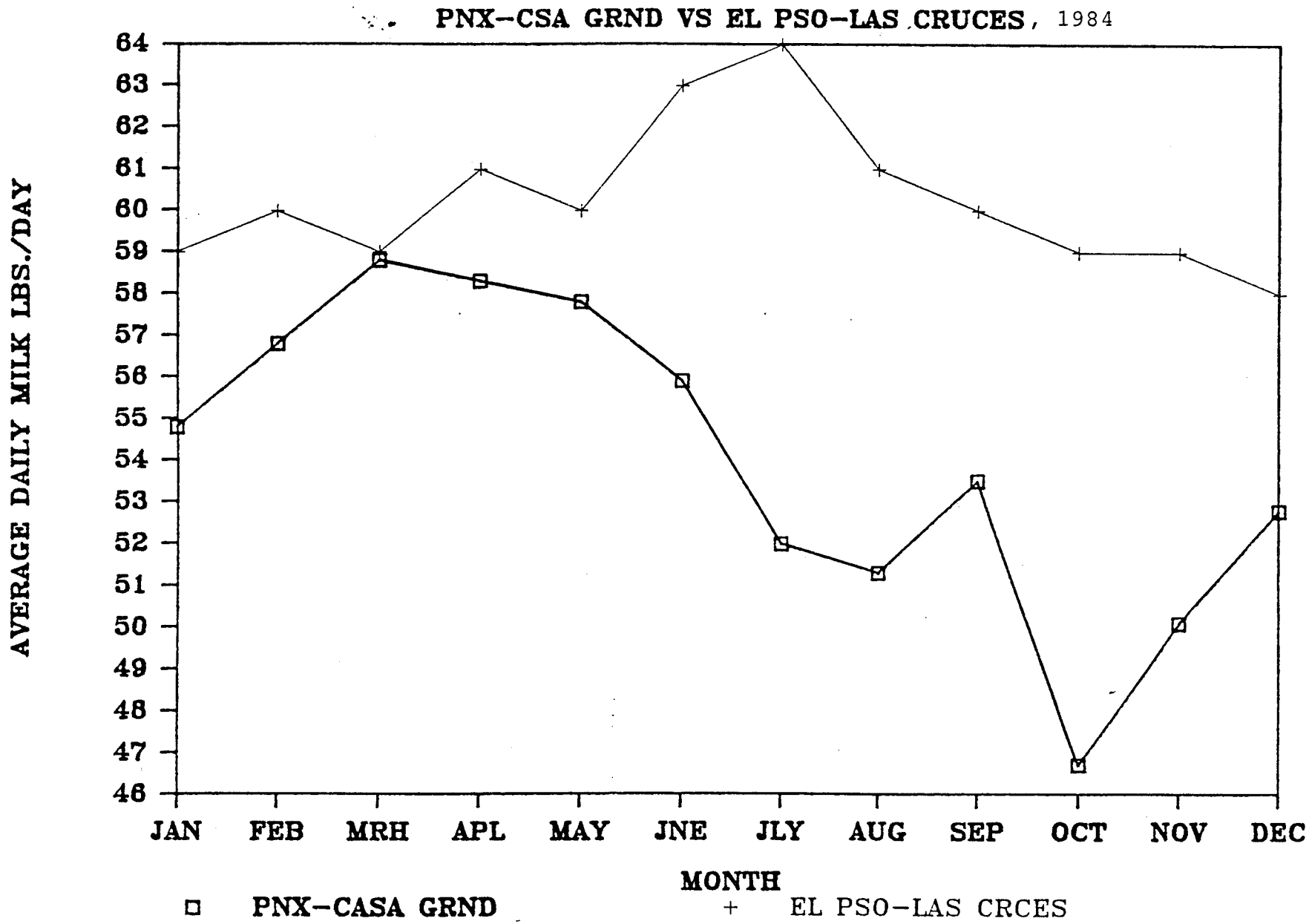
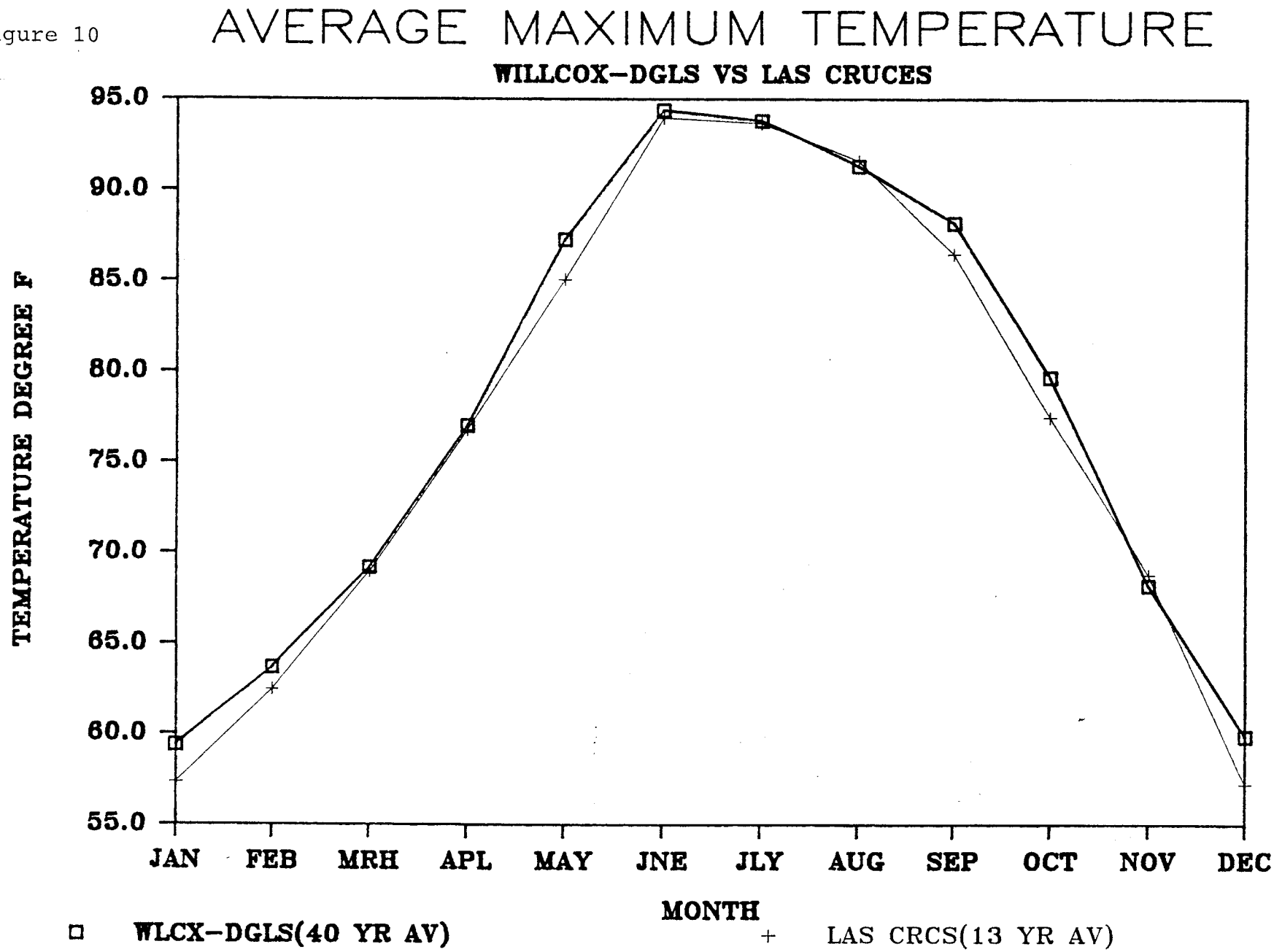


Figure 10


AVERAGE MAXIMUM TEMPERATURE
WILLCOX-DGLS VS LAS CRUCES
TEMPERATURE DEGREE F
95.0
90.0
85.0
80.0
75.0
70.0
65.0
60.0
55.0
JAN
FEB
MRH
APL
MAY
JNE
JLY
AUG
SEP
OCT
NOV
DEC
MONTH
WLCX-DGLS(40 YR AV)
LAS CRCS(13 YR AV)

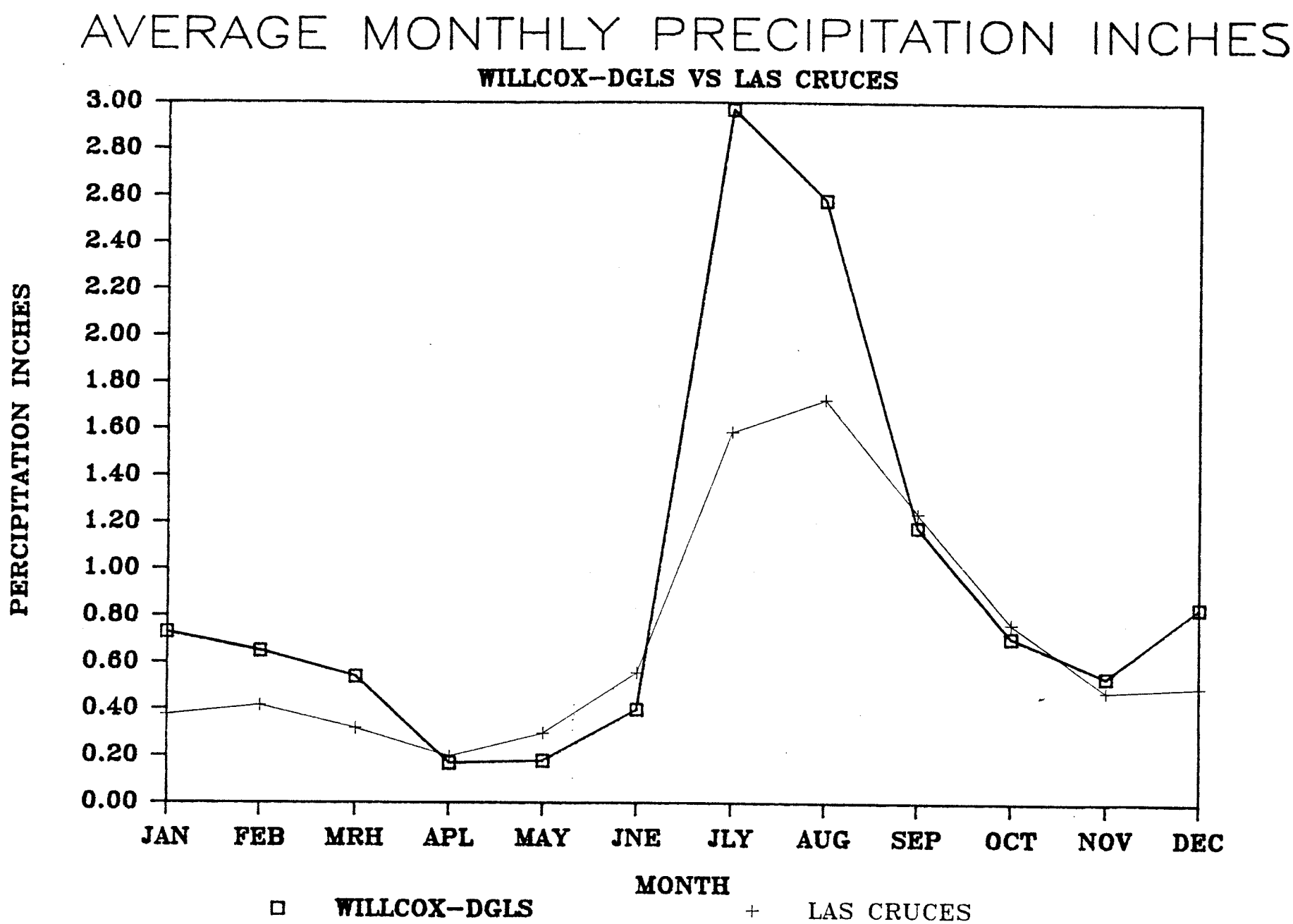
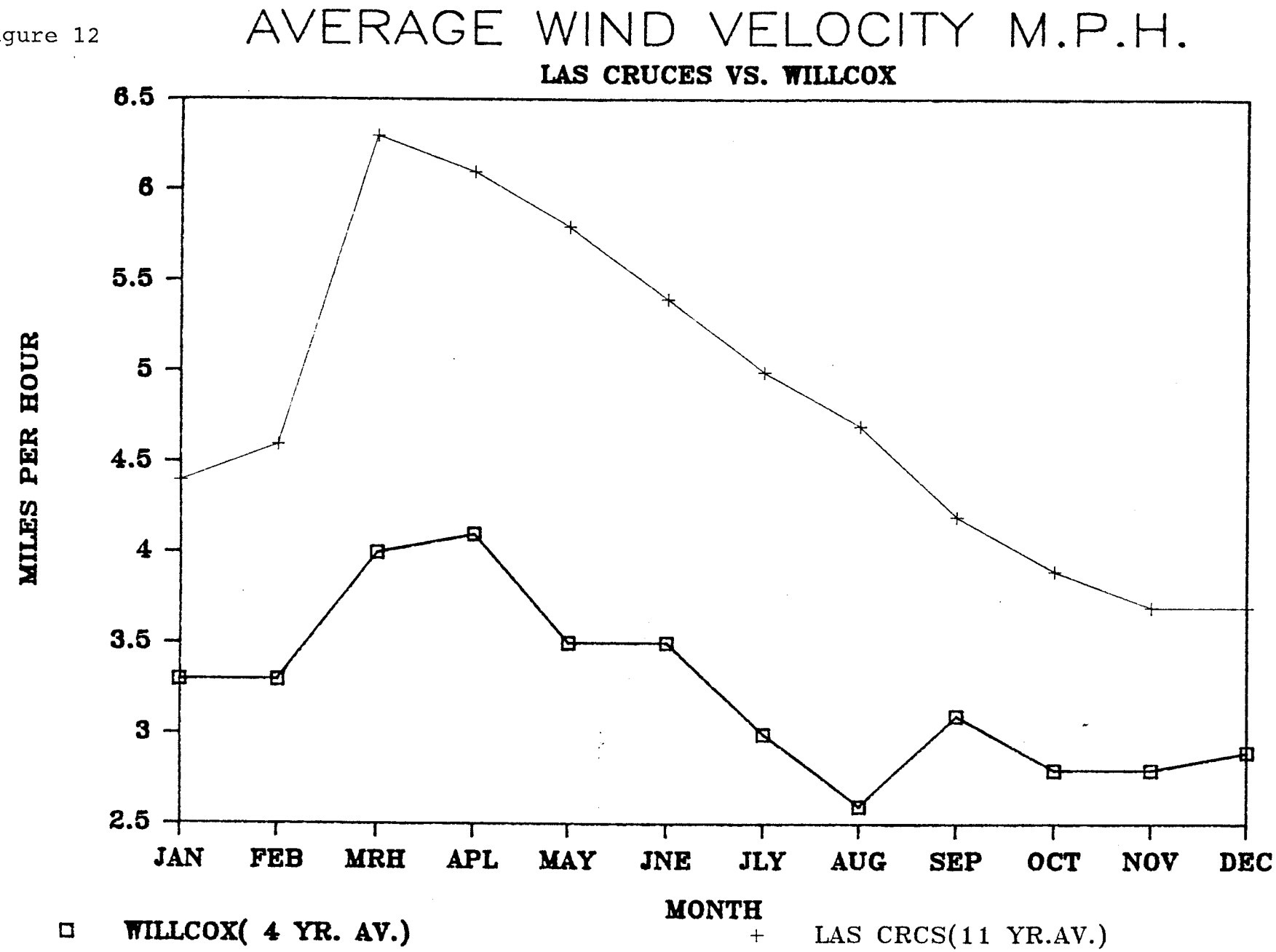

AVERAGE MONTHLY PRECIPITATION INCHES
WILLCOX-DGLS VS LAS CRUCES
PERCIPITATION INCHES
3.00
2.80
2.60
2.40
2.20
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
JAN
FEB
MRH
APL
MAY
JNE
JLY
AUG
SEP
OCT
NOV
DEC
MONTH
WILLCOX-DGLS
LAS CRUCES

Figure 11

Figure 12


AVERAGE WIND VELOCITY M.P.H.
LAS CRUCES VS. WILLCOX
MILES PER HOUR
6.5
6
5.5
5
4.5
4
3.5
3
2.5
JAN
FEB
MRH
APL
MAY
JNE
JLY
AUG
SEP
OCT
NOV
DEC
MONTH
WILLCOX(4 YR. AV.)
LAS CRCS(11 YR.AV.)

4. <u>The Value of Eliminating Heat Stress in Dairy Cows by Moving Dairy Herds to the Sulphur Springs Valley</u>.

The value of eliminating heat stress by moving dairy herds from the Salt River Valley to the Sulphur Springs Valley is best calculated by examining dairy cooling studies conducted by the University of Arizona.

Most recent estimates of costs and returns of cooling dairy cows by U of A researchers was presented at the 1985 U of A Dairy Day (10/11/85).

Equipping a dairy operation with corral shade coolers and parlor holding pen cooling would have an estimated annual investment and operating cost of $130 per cow. The resulting net benefits from increased productin and reporduction is calculated to be in excess of $415 per cow per year.

This would indicate that a move to the Sulphur Springs Valley could have a gross heat stress elimination effect of almost $550 per cow annually. The animal cooling costs of $130 would be eliminated while the $415 benefit of reduced heat stress could be anticipated ($130 + $415 = $545).

Heat stress is one of the most costly conditions dairymen have to combat in the Central Arizona milkshed. University of Arizona summer cooling trials demonstrate minimum heat stress production losses of 8 to 10 pounds of milk per cow per day for 120 days (June through September). This is a loss of 1000 to 1200 pounds of milk per cow. At the 1985 average price of $12.50 per hundredweight, the dollar loss ranges from $125 to $150 per cow per year.

The cost in reproduction and genetic improvement is considered to be twice as high as the production loss.

Breeding successes on first service drop from about 55% during cooler months to about 15% during the summer period. Because of this drastic decline some dairymen do not attemp to breed cows during the summer period. Those that do usually use "cow freshner" bulls and/or "cheap" artificial insemination semen. The effort is to get the cow to conceive as economically as possible under heat stress conditions. The potential for genetic improvement during the heat stress period is effectively lost.

5. Land Prices Should Appeal to Dairymen

The severely depressed farm real estate market in the Sulphur Springs Valley presents a grave situation for local crop farmers. However it can be viewed as an unusually good opportunity for dairy farmers being "forced" to relocate due to high real estate price offers near urban centers in the Salt River Valley.

Local real estate agents reported that irrigated farm land in the Sulphur Springs Valley could be purchased for $400 to $1,000 per acre. Meanwhile dairymen in the Chandler area of the Salt River Valley have recently sold their land for prices ranging from $50,000 to as high as a reported $80,000 per acre. See Appendix Table .

At present most Salt River Valley dairymen are looking at the Maricopa-Casa Grande-Coolidge areas of Pinal County as potential relocation sites. However urban speculation is also driving up land prices in these areas. Casa Grande real estate agents report irrigated farm land in the area selling for $1,000 to $3,000 per acre. Se Appendix Table .

Low electric power rates make these areas attractive in addition to closeness to the milk market. However they are due to renegotiate their Boulder Dam electric contracts within the next few months. When this happens, power rates in these areas are expected to raise near those in the Sulphur Springs Valley.

With all things considered and given this type of dollar disparity for desirable dairy real estate, this would seem to be the ideal time to convince Salt River Valley dairymen to relocate in the Sulphur Springs Valley.

As in most agricultural areas, farm real estate prices in the Sulphur Springs Valley are severely depressed due to the general overproduction of nearly all agricultural commodities in the United States as well as world wide.

Resulting low farm commodity prices for several years in a row have caused general default on farm loan payments until the U.S. Farm Credit System is near collapse. This has added greatly to the overall "farm problem".

6. Selected Areas With Dairy Location Potential

Several areas in the Sulphur Springs Valley meet the locational needs for dairy operations as listed on page 15. In brief they are; all-weather roads, well drained site, close proximity to feed crops, ample good quality water and access to electric power hook-up.

Using the City of Willcox as a reference point, the areas given major consideration in this study are: See Figure 4.

A. Stewart-Bonita area located 5 to 15 miles northwest of Willcox

B. Kansas Settlement area located 12 to 20 miles south-southeast of Willcox.

C. Cochise-Sunsites area located along Highway 666, 12 to 20 miles southwest of Willcox.

D. Sunizona area located along Highway 181, 30 to 35 miles south-southeast of Willcox.

E. Elfrida-McNeal area located along Highway 666, 35 to 50 miles south of Willcox.

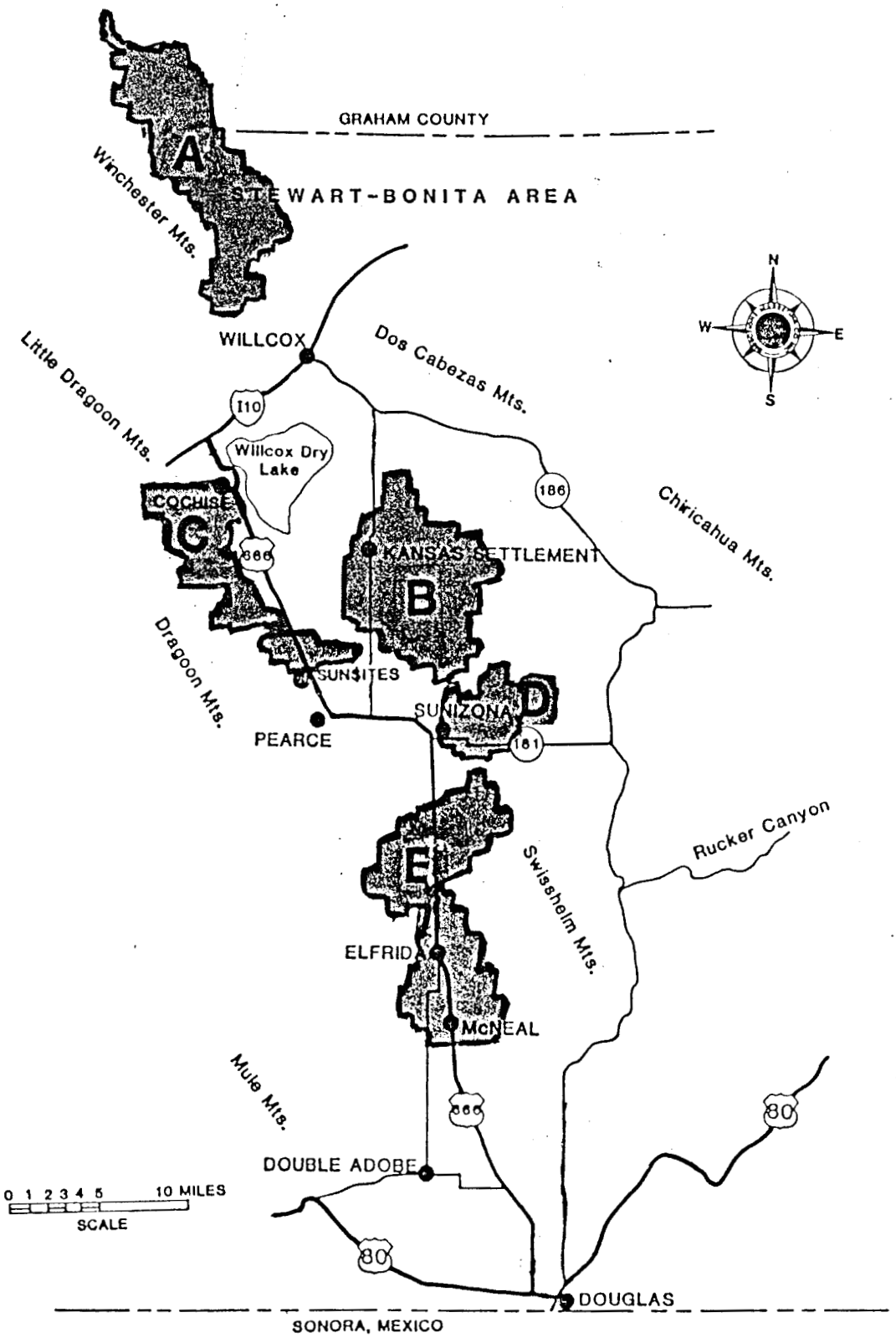
7. Labor Availability

Dairy operators will have to compete with local ranchers, service industries and other employers for workers.

Willcox High School graduates an average of 135 seniors annually. Some continue their education but many seek employment in local businesses. This is the greatest source of future resident workers.

Of real significance is the fact that Mexico is about 40 miles from the center of the Sulphur Springs Valley while it is approximately 125 miles from the center of the Salt River Valley.

Figure 13: Selected Areas With Dairy Relocation Potential In The Sulphur Springs Valley



SULPHUR SPRINGS VALLEY

Cochise County Agriculture in Brief

A brief background of Cochise County agriculture would be helpful to prospective dairy clients.

Field crops predominate in the county. Cash receipts from crop production exceeded $35 million in 1984. Vegetable production has fluctuated greatly. For example, over 7,000 acres of spring and fall lettuce were planted in 1958; acreage fell to 5,000 acres in 1961 and to 2,000 acres in 1984. Lettuce and chili remain the principal vegetable crops. Other vegetables produced on limited acreages include onions, beans, squash, pumpkins, potatoes, cauliflower, cabbage, and carrots.

In 1972, cotton and grain sorghum were the most profitable field crops in the area. Presently, Cochise County farmers are finding it hard to compete with cotton growers in other counties who have a longer growing season and less expensive water. Grain sorghum has been replaced with field corn. Growers in Cochise and Graham Counties have the highest corn yields in the state. More than 1,000 acres of popcorn were planted in 1984. Small grain and alfalfa acreages have decreased in recent years.

The greatest increase in new crop acreage has been in tree crops --apples, pecans, pistachios, and peaches. Commercial fruit production is limited to areas with good air drainage to protect against late spring frosts.

Table 5 : Main Crops in Cochise County, Estimated Acerage*

CROP	1961[a]	1985[b]
Alfalfa & forage	19,000	8,000
Corn, field	na	10,000
Sorghum grain	31,000	1,000
Cotton, short staple	15,000	16,000
Cotton, long staple	na	2,000
Chili	na	800
Lettuce spring and fall	5,000	3,000
Vegetables, other	na	2,500
Popcorn	na	3,000
Apple	na	4,200
Peach	na	700
Pecan	na	3,200
Pistachio	na	2,000
TOTALS	70,000	56,000

*Estimates are based on information from the Cochise County Agricultural Stabilization and Conservation Service, Farm Labor Offices, and Cooperative Extension Service. Estimates include acreages in the Bonita area of southern Graham County adjacent to the Stewart District.

Table 6 : Estimated Irrigated Acreage in Cochise County (1953-1985).

Year	No. of acres x 1000
1953	59
1956	79
1958	89
1961	99
1970	118
1976	171
1980	92
1981	56
1982	67
1983	55
1984	61
1985	56

Climate and Weather

Cochise County has a semi-arid or arid climate except in the higher elevations where more humid conditions prevail. The low, variable precipitation limits farming to the irrigable areas and restricts the rangeland to cattle production. Climatic conditions, and therefore agricultural production, varies with altitude and exposure.

Precipitation occurs in two distinct periods; a primary period during the summer months from early July through September and a secondary period from December through March. (Figure 7)

Fall and late spring months are usually dry so the principal growing season coincides with the summer rainy period. Summer precipitation occurs largely as severe thunder showers of varying duration and distribution. Winter and spring precipitation falls in cyclonic storms of low intensity and relatively long duration in comparison with summer storms. In the broad intermountain valleys, winter precipitation is in the form of rain, but in the oak woodland and conifer forests of the higher mountains, snow is the prevailing form. Prolonged drouth periods are not uncommon at low elevations and result in diminished range production. Yearly fluctuations of as much as 100 percent from the long-time average occur in the intermountain valleys.

Lowest annual rainfall for the county is recorded at San Simon (7.54) and the highest (30-35 inches) in the Chiricahua Mountains. Record of precipitation from 10 to 15 inches are obtained at most of the stations in the centrally located Sulphur Springs Valley and along the San Pedro Drainage (Table 13).

In the intermountain valleys, maximum temperatures of 100 degrees or more are not unusual from May through September. Minimum termperatures during the winter months often fall below freezing. In the lower portions of the valleys the frost-free period ranges from 184 to 230 days. The San Pedro and San Simon Valleys have longer frost-free periods than does the Sulphur Springs Valley.

Within any single valley or watershed, the higher elevations often have longer growing seasons than areas near the low center of the valley. The explanation is simple. Most late spring and early fall frosts are due to air cooling after the sun goes down. The air at and near the ground surface is heated when the sun is shining. After the sun goes down, the cold air being heavier than warm air, descends to the ground and flows to the lowest parts of the valleys. Thus frosts may occur near Douglas or Double Adobe and not at Bisbee or Fort Huachuca. The location of any farm or garden with relation to these frost controlling factors will have a definite bearing on successful planting dates, particularly with vegetable, tree fruit, and other crops that are damaged by frosts.

Table 7 Weather data from thirteen stations in Cochise County, Arizona

Station	Elevation Feet	TEMPERATURE Highest	Lowest	Mean Maximum	Mean Minimum	Mean	Last Spring Frost	First Fall Frost	Average Length of Growing Season	Precipitation Days with 0.01 inch or more	Normal Annual	Prevailing Wind
Benson	3585	113	5	80.7	44.7	64.2	Mar.27	Nov.8	226	40	10.42	W
Bisbee	5350	106	8	74.0	48.8	61.3	Mar.25	Nov.22	242	65	18.00	SW
Bowie	3756	116	10	81.1	47.6	63.7	Mar.26	Nov. 8	227	32	10.04	W
Cochise	4219	113	-4	76.8	43.4	61.2	Apr. 3	Nov. 7	218	38	11.65	W
Cochise Stronghold	4950	105	8	75.7	44.3	60.0	Apr.15	Nov.3	202	55	18.21	S
Douglas Smelter	3973	111	-7	78.9	46.1	62.5	Apr. 8	Nov. 6	216	55	12.22	SW
Ft. Huachuca	5100	105	0	74.8	48.0	61.9	Mar.30	Nov.17	232	49	16.85	SE
Paradise	5436	104	-6	70.3	40.0	55.2	Apr.25	Oct.20	178	55	18.99	SW
Portal	5000	102	-4	77.5	45.7	60.2	Apr.23	Oct.28	188	53	17.16	SW
San Simon	3608	113	-5	79.5	44.4	64.7	Apr. 3	Nov. 9	216	34	7.84	W
Steven's Ranch	4000	100	11	NA	NA	57.9	Apr. 8	Nov.15	221	40	12.55	SW
Tombstone	4540	110	9	76.7	49.0	62.8	Mar.28	Nov.21	239	51	14.12	SW
Willcox	4167	111	-2	76.0	40.6	59.6	Apr.27	Oct.28	184	46	11.36	W

Table 8 10 Year (1974-83) Average Monthly Heat Unit Accumulations Using 55°F Base and 86°F Maximum Temperature at Willcox.

Month	Mean Heat Units
Jan	40
Feb	75
Mar	134
Apr	248
May	382
June	550
July	688
Aug	647
Sept	500
Oct	291
Nov	119
Dec	55

Topography

Cochise County, which is the only Arizona county named for an individual Indian, was cut from eastern Pima County in 1881. It is approximately 80 miles square and contains 4,003,840 acres. The county is located in the southeastern corner of Arizona, bounded on the east by New Mexico and on the south by the Republic of Mexico.

The area is characterized by mountain-valley topography. Parallel mountain ranges and range complexes of 6,000 to 9,000 feet altitude separate alluvial filled valleys which average 3,600 to 5,000 feet in elevation. There are three of these broad intermountain valleys in Cochise County. They are the San Pedro, Sulphur Springs and San Simon Valleys. The San Pedro and the San Simon Valleys drain northward into the Gila River. The Sulphur Springs Valley, which is the largest and forms the central portion of the county, is partially drained by Whitewater Draw into the Rio Yaqui of Mexico, and subsequently into the Gulf of California. The larger portion of Sulphur Springs Valley has no drainage outlet and drains toward the Willcox Playa, the largest undrained basin in Arizona. Except for a portion of the San Pedro River, the principal drainages of these basins are intermittent.

The natural vegetation of Cochise County includes forest, grassland and desert. Douglas fir and Ponderosa pine, the most important economic forest type in Arizona, are found in high mountain forests (6,000-9,000 feet elevation). Stands of pinon and juniper occur between 5,000 and 7,000 feet elevations. Chaparral (4,000-5,000 elevation) is composed of a heterogenous association of shrubs including sumac, scrub oak, and manzanita.

Grasslands (3,200-6,000 feet elevation) are the southern-most extension of the Grat Plains. Homesteaders in the Sulphur Springs Valley broke up excellent grazing sod in order to produce field ceops. In 1952, the largest solid areas of grass belt in Arizona were found in Cochise County where the valley floors between the mountains are high. The grass cover was a rolling, unbroken sea of grass. The grass cover contains a large number of species, many of which are excellent range grasses such as the gramas. The prominent trees and shrubs in the drainage washes are desert hackberry, desert willow, and mesquite. Yucca and cholla are scattered over the mesa land in the grasslands.

Sonoran desert vegetation is found at elevations below 3500 feet, such as the lower San Pedro Valley. Palo verde, cholla, prickly pear, and ocotillo are found at these elevations.

The layout of the landscape has largely influenced settlement and land use. The importance of the United States Military in connection with Fort Huachuca, (worldwide communications center and electronic proving grounds), retirement communities and tourism have become important sources of income in recent years. Agriculture, livestock, military, and tourism are the main sources of income in the county.

Soils

The majority of the soils in the alluvial valleys are classified by the Soil Conservation Service as Class IV or better. It is estimated that there are 1,500,000 acres in the county of Class IV or better that could be farmed if ample irrigation water were available. 2.6% is estimated as Class I, 21.5% as Class II, 34.5% as Class III, and 41.4% as class IV. Of the land suitable for farming about 6%, or 92,000 acres is now under irrigation.

Soil surveys have been completed or northern Cochise County. Surveys are in progress for the southern part of the county. These surveys are available from the Soil Conservation Service office.

In general Cochise County soils are fairly light in color because of low organic matter content and somewhat reddish brown because of high degree of oxidation and lack of hydration of iron compounds.

The soild are rich in the relatively soluble mineral compounds, such as lime carbonate and gypsum.

Some of the soild are saline or alkaline in character; they may contain injurious quantities of the ordinary soluble salts found in the area. Micronutrient deficiencies of zinc and iron are found in some crops.

Water and Irrigation

Irrigated agriculture occured in the county as early as 1915. Insufficient rainfall makes irrigation necessary for farming, which takes place in the alluvial valleys near the available sources of underground water. Wells supply most of the water used for irrigation. There are some permanent pastures which are irrigated from the San Pedro River near Benson and St. David. Nearly all the power for pumping is supplied by electricity and natural gas.

Water quality, in general, is good to excellent for agricultural and domestic use. Localized areas have a high fluoride content, which may cause problems for children and older residents. Shallow aquifers exist near the playas and along the San Pedro River which have a high salt content.

Irrigation methods employed in the county include conventional gravity methods with concrete ditches and tailwater systems (60%), sprinkler systems--small lateral move sprinklers and center pivot (30%) and drip systems (10%). Gravity systems are used for cotton and field crop production; water is applied to alfalfa, corn, and other grain crops via sprinkler systems; drip systems are employed to irrigate tree crops. In developing land, one should keep in mind the need of an average water flow of ten gallons per minute per acre to be irrigated. Requirements for sprinkler and drip irrigation are less.

The static water levels vary throughout the county--from an average of 220 feet in Bowie and San Simon to an average of 184 feet in the San Pedro River basin (Table). According to the USGS maps, the water table dropped an average of 2 feet per year from 1975-1980. This decline is less than in the previous five year period. Rates of decline are expected to be approximately one foot per year for the next ten years. Reduction in water table decline is due to reduced acreage, increased water application efficiencies, and a shift to less water intensive crops.

Arizona's groundwater law affects this county in several ways. The law has created an "Irrigation Non-expansion Area" (INEA) in the Whitewater Draw drainage due to its low groundwater recharge rate and high pumpage. No new irrigation wells are permitted in the INEA, affecting farming areas near Elfrida and McNeal. Wells not used for irrigation between 1975 and 1980 can no longer be used for irrigation. Water flow measuring devices were required in January 1984. Annual reports of the amount of water used are required (as of March 1985) by the Department of Water Resources. Exempt wells, which pump less than 35 gallons per minute or irrigate less than two acres, do not have to report. Further information can be obtained from the Department of Water Resources (see Information Sources).

Wells throughout the area have been registered as part of the empahsis on groundwater monitoring. New wells, which can be established in areas outside the INEA, are required to be registered.

Several areas of the state have been declared "Active Management Areas" (AMA). Water allocation per pump will go into effect in AMA's. These areas are located where competition for groundwater is great, especially near metropolitan centers. None are located in Cochise County.

Table 9 Range in Depth to Static Water Level (feet)

area	range in depth to static water level (feet)	
	1961	1982
Kansas Settlement	20 - 260[1]	40 - 340[2]
Bowie	270 - 340	270 - 470
San Simon	30 - 100	50 - 200
Stewart	20 - 130	100 - 150
Elfrida,McNeal Douglas	40 - 130	60 - 200
Cochise, Pearce	25 - 240	30 - 250
Upper San Pedro basin	25 - 300	20 - 490

Table 10. Seasonal Consumptive Water Use for Various Crops in Cochise County.

Crop	Total inches per year	Crop	Total inches per year
Alfalfa	41.6	Pecan (medium)	39.6
Apple	35.6	Pecan (large)	47.9
Barley	11.2	Pinto beans, May planting	20.8
Corn, silage	23.0	Pinto beans, July planting	16.8
Cotton	24.2	Pistachio	31.3
Grape, wine with cover crop	40.0	Potato	21.5
Grape, wine without cover crop	25.0	Small grains	14.6
Lettuce, fall	10.5	Sorghum, May planting	26.7
Lettuce, spring	8.0	Sorghum, July planting	17.7
Onion	26.5	Wheat	15.5

Note: Consumptive use is defined as the unit amount of water used on a given area in transpiration, building plant tissues, and evaporation from adjacent soil. Studies were conducted on University of Arizona Experiment station farms near Tempe and Mesa; values were calculated from Soil Conservation Technical Release No. 21.

Land Ownership and Use

The land in Cochise County is 45% privately owned, 35% state owned and 20% federally owned.

The land policies of Arizona and the federal government encourage private ownership of land. Therefore, privately owned farm lands in Arizona tend to be those lands whose topography, fertility, and water-availability are most suitable for agricultural development.

In general, federally owned lands lie in the more rugged terrain unsuited for agriculture except for grazing. Federal lands usually consist of relatively large contiguous areas. In the northeastern corner of the county we find a large tract of Taylor grazing land consisting of almost two-thirds of a million acres.

Adjoining the Taylor grazing tract is the largest part of the Coronado National Forest found in the county, consisting of about one-third of a million acres. In the western half of the county there are four blocks of national forest land totaling about one-fourth million acres. Fort Huachuca, a military reservation covering nearly 50,000 acres, is in the southwestern part of the county.

The intermountain valleys are suited for range cattle. The higher mountain ranges have many areas of forest and woodland cover which are excellent for grazing. Cattle and horses graze on the range lands and in the national forest. Rough terrain makes about 92,000 acres of this mountainour area inaccessible to livestock grazing.

Table 11. Distribution of Total Acres in Cochise County Ranches, by Ownership

Ownership	No. of acres x 1000
State	1309
B.L.M.	408
Forest Service	282
Privately Owned[a]	95
Total	2094

[a]Private land included in B.L.M. and Forest Service allotments.

Agriculture in Cochise County is extremely diversified. In the intermountain valleys are grown such a diversity of field crops as cotton, corn, alfalfa, lettuce, chile, and other crops of lesser importance. Fruit and nut crops have become increasingly important. Cotton and grain continue to be the main crops; orchard acreage has increased in the eighties.

There is mining slong the bases of some of the larger mountain ranges. Significant metallic mineral deposits of gold (Dos Cabezas and Commonwealth mines), silver (Tombstone and Bronckow mines) and copper (Bisbee and Johnson mines) were discovered in the late 1800's. Copper is smelted at Douglas, although the future of this smelter is questionable.

Population

Population centers other than mining settlements are restricted to the valley floors where adequate water facilities were best developed. The leading cities, by 1982 population, are Sierra Vista (26,223), Douglas (13,127), Bisbee - the county seat (7,257), Benson (4,406), and Willcox (3,379). The population of the county has increased from 6,938 persons in 1890 to 85,686 in 1980 Table). By the year 2,000 the county is expected to have a population of 119,400.

Table 12. Population Growth in Cochise County.

Year	No. of people
1890	6,938
1900	9,251
1910	34,591
1920	46,465
1930	40,998
1940	34,627
1950	31,488
1960	55,039
1970	61,918
1980	85,686
1985	

Recreation

Numerous recreational opportunities exist in the county. The Chiricahua Mountains, near the New Mexico border, are part of Coronado National Forest. Attractions include the 18,000 acre Chiricahua Wilderness area and "Wonderland of Rocks" in the Chiricahua National Monument. The mountain canyons attract birdwatchers each year as does the Willcox Playa, where sandhill cranes nest every winter. Game hunting opportunities abound.

The 2,834 acre Coronado National Memorial lies on the international border with Mexico. This park commenorates the first significant explorations by Europeans into the southwest.

Fort Bowie National Historic Site was created as a military post in 1862. Located in Apache Pass, the fort was the center of operations during the campaign against the famed Apache Cochise. Cochise Stronghold Memorial Park is located in the Dragoon Mountains. Another point of interest is Skeleton Canyon, the site of Geronimo's final surrender to General A. Nelson A. Miles, ending the Apache wars.

Table 13. Historic Sites on the National Register of Historic Places.

Coronado National Monument
Double Adobe Site
Douglas Municipal Airport
Fort Bowie
Garden Canyon Archaeological Site
Garden Canyon Petroglyphs
Lehner Mammoth-Kill Site
Old Fort Huachuca
Dodge General Office Building, Bisbee
Quiburi
St. Paul's Episcopal Church, Tombstone
San Bernadino Ranch
Stafford Cabin
Tombstone City Hall
Tombstone Courthouse (Cochise County Courthouse)
Tombstone Historic District

Information Sources

Agricultural Stabilization and
Conservation Service
P.O. Box 880
Willcox, Arizona 85644
Phone - 602-384-3588

Arizona Commission of Agriculture
and Horticulture
515 South Haskell
Willcox, Arizona 85643
Phone - 602-384-2665

Arizona Crop and Livestock
Reporting Service
3001 Federal Building
Phoenix, Arizona 85025
Phone - 602-264-3264

Cochise Community College
Douglas, Arizona 85607
Phone - 602-364-7943

Cochise County Courthouse
Bisbee, Arizona 85603
Phone - 602-432-5703

Cooperative Extension Service
450 South Haskell
Willcox, Arizona 85643
Phone - 602-384-3594

Farmers Home Administration
153 West Wasson
Willcox, Arizona 85643
Phone - 602-384-3529

National Park Service
R.R. 1 Box 126
Hereford, Arizona 85615
Phone - 602-366-5515

Production Credit Association
P.O. Box 506
Willcox, Arizona 85644
Phone - 602-384-2211

Soil Conservation Service
1118 Nineteenth Street
Douglas, Arizona 85607
Phone - 602-364-2001

Soil Conservation Service
247 South Curtis
Willcox, Arizona 85643
Phone - 602-384-2229

State Land Department
1624 West Adams
Phoenix, Arizona 85007
Phone - 602-255-4621

State of Arizona Department
of Water Resources
99 East Virginia Avenue
Phoenix, Arizona 85004
Phone - 602-255-1566

U.S. Bureau of Land Management
425 East 4th Street
Safford, Arizona 85546
Phone - 602-428-4040

U.S. Forest Service
Post Office Building
Safford, Arizona 85546
Phone - 602-428-4150

Willcox Chamber of Commerce
and Agriculture
1500 North Circle I Road
Willcox, Arizona 85643
Phone - 602-384-2272

Appendix
Table 1:

Annual Feed Requirements for
5000 Dairy Cows and Replacement
Heifers (Tons, Acres & Dollar Value)

ALFALFA HAY

No. Dairy Animals	Alfalfa Hay Requirements	Tons Annually	Acres @ 7T/A	Selling Price @ 100/Ton
4200 (cows in milk)	17# x 305 da / 2000#	10,889	1,556	1,088,900
800 cows (dry)	None	-	-	-
48 Bulls (clean-up)	10# x 365 da / 2000#	88	13	8,800
2778 heifers (0-6 months)	3.3# x 183 da / 2000#	839	120	83,900
2778 heifers (6-12 months)	6# x 183 da / 2000#	1,525	218	152,500
2632 heifers (12-24 months)	10# x 365 da / 2000#	4,803	686	480,300
TOTAL ANNUAL ALFALFA HAY VALUES		18,144 TONS	2,593 ACRES	$1,814,400 DOLLARS

Annual Feed Requirements 5000 (cont'd.) Page 2

CORN SILAGE

No. Dairy Animals	Corn Silage Requirements	Tons Annually	Acres @ 30 T/A	Selling Price $25/T
4200 cows (in milk)	32# x 305 da / 2000#	20,496	683	$ 512,400
800 cows (dry)	30# x 60 da / 2000#	720	24	18,000
48 Bulls ("clean-up")	30# x 365 da / 2000#	263	9	6,575
2778 heifers (0-6 months)	None	-	-	-
2778 heifers (6-12 months)	18# x 183 da / 2000#	4,575	153	114,375
2632 heifers (12-24 months)	38# x 365 da / 2000#	18,253	608	456,325
TOTAL ANNUAL CORN SILAGE VALUES		44,307 TONS	1,477 ACRES	$1,107,675 DOLLARS

OAT HAY

No. Dairy Animals	Oat Hay Requirements	Tons Annually	Acres @ 3 T/A	Selling Price $85/T
800 cows (dry)	15# x 60 da / 2000#	3,600	1,200	$ 306,000

Appendix Table 3: C

Annual Feed Requirements 5000 (cont.d.) Page 3

GRAIN

No. Dairy Animals	Barley/Grain Sorghum Requirements	Tons Annually	Acres @ 3.5 T/A	Selling Price $112 Ton
4200 cows (in milk)	18# x 305 da / 2000#	11,529	3,294	$1,291,248
800 cows (dry)	6# x 15 da / 2000#	36	10	4,032
48 Bulls (clean-up)	15# x 365 da / 2000#	131	37	147,168
2778 heifers	4.7# x 140 da / 2000#	914	261	102,364
2778 heifers (6-12 months)	None	-	-	-
2632 heifers (12-24 months)	None	-	-	-
TOTAL ANNUAL GRAIN REQUIREMENT		12,610 TONS	3,602 ACRES	$1,544,812 DOLLARS

Annual Feed Requirements 5000 (cont'd.) Page 4

COTTONSEED

No. Dairy Animals	Cottonseed Requirements	Tons Annually	Selling Price $115 Ton
4200 cows (in milk)	7# x 305 da / 2000#	4,484	$515,660
800 cows	3.5 x 15 da	21	2,415
48 bulls (clean-up)	5# x 365 da / 2000#	44	5,060
TOTAL ANNUAL COTTONSEED VALUES		4,549 TONS	$523,235 DOLLARS

Note of caution:

No cottonseed should be fed to young dairy heifers under 6 months of age to avoid possible gossypol poisoning.

- END -

WELL NO 4 ELECTRIC POWER 575 FOOT LIFT

PINAL COUNTY---CASA GRANDE AREA

SPECIFICATIONS AND ASSUMPTIONS

1. WELL IS DRILLED AND CASED WITH 16 INCH CASING TO 1500 FEET
2. WELL PUMPS 1050 GPM AND 836 ACRE FEET ANNUALLY
3. DEPRECIATE WELL ..... 25 YEARS WITH 0 PERCENT SALVAGE
4. DEPRECIATE PUMP ASSEMBLY ... 15 YEARS WITH 3 PERCENT SALVAGE
5. DEPRECIATE POWER UNIT ..... 25 YEARS WITH 3 PERCENT SALVAGE
6. DEPRECIATE BOWLS ..... 03 YEARS WITH 0 PERCENT SALVAGE
7. COMPUTE INTEREST ON AVERAGE INVESTMENT AT 13.00 PERCENT
8. COMPUTE TAXES ON 16.00 PERCENT OF AVERAGE INVESTMENT USING A TAX RATE OF $12.53 PER $100 ASSESSED VALUATION
9. COMPUTE INSURANCE ON AVERAGE INVESTMENT IN POWER ASSEMBLY (ITEMS 5-7 BELOW) AT $4.77 PER $100 VALUE

PRICE QUOTATIONS (INCLUDING 5.0 PERCENT SALES TAX) --- 11/10/84

1.	DRILLING COST AND CASING INSTALLATION	45000.
2.	CASING, FOUNDATION AND TEST PUMPING	32060.
3.	PUMP ASSEMBLY (8 INCH COLUMN)	21633.
4.	12 INCH BOWLS (12 STAGES)	6103.
5.	POWER UNIT--- 250 HP MOTOR	7202.
6.	STARTER WITH COMPENSATOR AND SECONDARY POWER STATION WITH SAFETY SWITCH	10080.
7.	INSTALLATION LABOR AND SITE COSTS	2160.
	TOTAL COST OF WELL	124437.

ANNUAL FIXED COSTS

DEPRECIATION	7283.
INTEREST	8169.
TAXES	1260.
FIRE AND LIGHTNING INSURANCE	478.
TOTAL	17190.

WATER COST PER ACRE FOOT

1.	FIXED COST	= 17190./ 836. AF	= 20.56
2.	ENERGY COST	= (1.024 * 575)/.540 * .02500	= 27.26
3.	REPAIRS	= .012010 * 575	= 6.91
4.	PUMP TAX		= .50
5.	TOTAL COST		= 55.23

WHERE 1.024 = KWH TO LIFT 1 AF OF WATER 1 FOOT AT 100 PERCENT OVERALL EFFICIENCY
575 = FEET OF LIFT
.540 = OVERALL EFFICIENCY STATED AS A DECIMAL
.02500 = POWER COST PER KWH INCLUDING SALES TAX
.012010 = COST OF PLANT REPAIRS, MAINTENANCE, LUBRICATION AND ATTENDANCE PER FOOT OF LIFT

KWH OF ELECTRICITY USED TO PUMP 1 AF = 1090.37 836 AF = 911550.

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*1985 Arizona Field Crops Budgets Pinal County, University of Arizona College of Agriculture

WELL NO. 1 ELECTRIC POWER 440 FOOT LIFT

COCHISE COUNTY---KANSAS SETTLEMENT AREA

SPECIFICATIONS AND ASSUMPTIONS

1. WELL IS DRILLED AND CASED WITH 16 INCH CASING TO 600 FEET
2. WELL PUMPS 800 GPM AND 530 ACRE FEET ANNUALLY
3. DEPRECIATE WELL ..... 25 YEARS WITH 0 PERCENT SALVAGE
4. DEPRECIATE PUMP ASSEMBLY ... 15 YEARS WITH 3 PERCENT SALVAGE
5. DEPRECIATE POWER UNIT ..... 25 YEARS WITH 3 PERCENT SALVAGE
6. DEPRECIATE BOWLS ..... 03 YEARS WITH 0 PERCENT SALVAGE
7. COMPUTE INTEREST ON AVERAGE INVESTMENT AT 13.00 PERCENT
8. COMPUTE TAXES ON 16.00 PERCENT OF AVERAGE INVESTMENT USING A TAX RATE OF $ 9.16 PER $100 ASSESSED VALUATION
9. COMPUTE INSURANCE ON AVERAGE INVESTMENT IN POWER ASSEMBLY (ITEMS 5-7 BELOW) AT $ .64 PER $100 VALUE

PRICE QUOTATIONS (INCLUDING 5.0 PERCENT SALES TAX) --- 11/10/84

1.	DRILLING COST AND CASING INSTALLATION	10200.
2.	CASING, FOUNDATION AND TEST PUMPING	10957.
3.	PUMP ASSEMBLY (8 INCH COLUMN)	18537.
4.	10 INCH BOWLS (11 STAGES)	4438.
5.	POWER UNIT--- 150 HP MOTOR	5468.
6.	STARTER WITH COMPENSATOR AND SECONDARY POWER STATION WITH SAFETY SWITCH	5347.
7.	INSTALLATION LABOR AND SITE COSTS	625.
	TOTAL COST OF WELL	55572.

ANNUAL FIXED COSTS

DEPRECIATION	3966.
INTEREST	3671.
TAXES	414.
FIRE AND LIGHTNING INSURANCE	38.
TOTAL	8091.

WATER COST PER ACRE FOOT

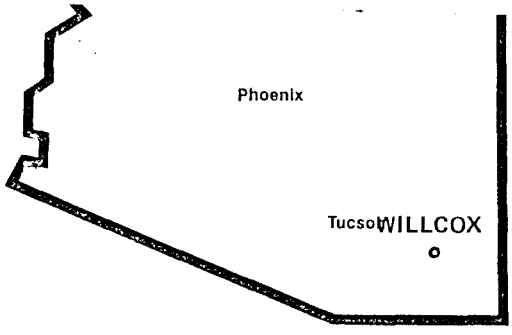
1.	FIXED COST	=	8091./ 530. AF	=	15.27
2.	ENERGY COST	=	(1.024 * 440/.540 * .08772	=	73.19
3.	REPAIRS	=	.012010 * 440	=	5.28
4.	PUMP TAX			=	.00
5.	TOTAL COST			=	93.74

WHERE	1.024	=	KWH TO LIFT 1 AF OF WATER 1 FOOT AT 100 PERCENT OVERALL EFFICIENCY
	440	=	FEET OF LIFT
	.540	=	OVERALL EFFICIENCY STATED AS A DECIMAL
	.08772	=	POWER COST PER KWH INCLUDING SALES TAX
	.012010	=	COST OF PLANT REPAIRS, MAINTENANCE, LUBRICATION AND ATTENDANCE PER FOOT OF LIFT

KWH OF ELECTRICITY USED TO PUMP 1 AF = 834.37 530 AF = 442216

*1985 FIELD CROP BUDGETS, COCHISE COUNTY, UNIVERSITY OF ARIZONA COLLEGE OF AGRICULTURE

Appendix Table 7:



Willcox
Arizona Community Profile

INTRODUCTION

Willcox at an elevation of 4,167 feet, was established in 1880 and is located in the northern part of the Sulphur Springs Valley in Cochise County. The Sulphur Springs Valley cuts through Cochise County for nearly 100 miles, and averages over 15 miles in width. Willcox serves as the major trade and service center for agriculture. The City of Willcox was incorporated in 1915.

WEATHER

Month	Average Temperature (° F) Daily Max.	Daily Min.	Average Total Precipitation (Inches)
January	58.3	24.8	0.78
February	63.1	26.5	0.57
March	68.2	30.7	0.59
April	77.6	36.5	0.27
May	86.4	43.1	0.13
June	95.0	52.3	0.43
July	95.4	62.7	2.60
August	92.2	60.4	2.66
September	89.5	53.3	1.18
October	80.1	40.9	0.59
November	67.8	29.7	0.39
December	59.3	24.8	1.00
Year	77.7	40.5	11.19

Average Total Snow, Sleet and Hail Annually: 4.0 inches
Based on a thirty year average.

PRINCIPAL WILLCOX ECONOMIC ACTIVITIES

With the establishment of the railroad, Willcox became and has remained a major southwestern cattle shipping point. Some of the largest cattle ranches in Arizona are located in the vast grazing lands in the surrounding area. Corn, cotton, hay, grain, and produce such as lettuce are important income crops of the Sulphur Springs Valley. Apples and other fruits, pistachios and pecans are a very successful new crop. Tourists attracted by the area's historic sites, as well as those passing through the city on I-10, have an important effect on the city's economy. Willcox has also developed a diversity of support industries, such as finance, utilities, schools, government, communications and a hospital.

POPULATION

	1980	1982	1980-1982 Compounded Percentage Change
Willcox*	3,243	3,379	+2.1%
Cochise County	85,686	89,800	+2.4
Arizona	2,718,215	2,886,600	+3.1

*The 1982 trade area population for Willcox was estimated to be 15,000.

Sources: Arizona Department of Economic Security
U.S. Bureau of the Census

WILLCOX AREA EMPLOYMENT STRUCTURE

	Percent of Total
Agriculture & Mining	1.8
Construction	4.1
Manufacturing	2.2
Transportation, Communication & Public Utilities	12.3
Wholesale & Retail Trade	38.1
Finance, Insurance & Real Estate	4.3
Services	30.2
Public Administration	7.1

Source: Arizona Office of Economic Planning & Development, 1977

WILLCOX LABOR FORCE DATA

	1980	1982
Civilian Labor Force	1,206	1,253
Employed	1,128	1,144
Unemployed	78	109
Unemployment Rate	6.5%	8.7%

Source: Arizona Department of Economic Security

GROWTH INDICATORS

	1981	1982	1983
Taxable Sales ($)	19,879,902	19,436,743	19,924,550
Postal Receipts ($)	294,305	331,332	334,869
Building Permits	94	19	105
Median Family Income ($)	18,160	18,165	N/A
School Enrollment	1,408	1,349	1,198
Net Assessed Valuation ($)	5,378,445	6,958,330	7,381,991

PROPERTY TAX RATE PER $100 ASSESSED VALUATION

	1981	1982	1983
Unified School	$5.71	$5.71	$3.38
Community College	1.35	1.41	1.50
Cochise County	2.92	2.95	3.99
State of Arizona	.95	.75	.75
Total Outside City	10.93	10.82	9.62
City of Willcox	1.30	1.28	1.28
Total	12.23	12.10	10.90

Source: Arizona Tax Research Association

OFFICE OF THE GOVERNOR
ARIZONA OFFICE OF
ECONOMIC PLANNING AND DEVELOPMENT
1700 WEST WASHINGTON • ROOM [illegible] • PHOENIX, ARIZONA [illegible]

FINANCE

Union Bank:	1 office
Valley National Bank:	1 office
Desert Finance House:	1 office
Production Credit Association:	1 office
Farmers Home Administration:	1 office

TRANSPORTATION

Highways:	I-10, U.S. 666, Arizona 86 and 186
Railroad:	Southern Pacific
Truck:	Pacific Motor Transport, Bestway, Antelope, United Parcel Service (interstate); Whitefield (intrastate), Jenney Freight Lines (Intra & Interstate)
Bus:	Continental Trailways, Greyhound
Airport:	Cochise County Airport; one lighted, paved, 6,100-foot runway; UNICOM radio, fuel and maintenance

COMMUNICATIONS

Newspapers:	Weekly:	Arizona Range News TV Guide
	Daily:	Arizona Republic (Phoenix) Arizona Daily Star (Tucson) Tucson Citizen (Tucson)
Radio:	KHIL (5,000 watts), KWCX-FM	
Television:	4 Tucson channels via antenna, 18 stations available via cable from Jim R. Smith & Co., Inc.	

UTILITIES

Electricity:	Sulphur Springs Valley Electric Cooperative
Natural Gas:	Municipal, Arizona Public Service Company
Butane:	Cal-Gas
Telephone:	Valley Telephone Cooperative, Inc. Mountain Bell
Water:	Municipal
Sewer:	Municipal

MEDICAL FACILITIES

Hospital:	1 (24 beds)
Nursing Home:	2 (with 24 beds, 24 bed extended care and 2 private homes with 9 beds)
Physicians:	6
Dentists:	3
Chiropractors:	2
Optometrist:	1
Veterinarians:	3

GOVERNMENT SERVICES

Local Government:	Mayor, 6 councilmembers, city manager
Police Department:	1 chief, 7 officers, 5 dispatchers, 1 part-time clerical, 1 humane officer
Sheriff's Department:	4 deputies, 1 humane officer, 1 dispatcher
Dept. of Pub. Safety:	4 officers
Border Patrol:	4 patrolmen
Fire Department:	1 chief, 17 volunteers
Underwriters Rating:	Grade 6

EDUCATIONAL FACILITIES

	No.	Faculty	Enrollment
Public Elementary	1	25	437
Middle School	1	30	380
Public High School	1	26	381

The Willcox High School campus serves as an extension campus for Cochise College, where an Associate Arts degree can be earned.

CHURCHES

Catholic:	1
Latter Day Saints:	1
Protestant and Other:	15

COMMUNITY FACILITIES

Library:	1
Parks:	5 - ramada, playground equipment
Pool:	1 olympic-size
Golf Courses:	2 (9-hole)
Tennis Courts:	8 (3 lighted)
Athletic Facilities:	6 lighted baseball/softball fields, 1 soccer field
Bowling Alley:	1
Miniature Golf Course:	1
Art Center:	1

Community Center with meeting facilities.

Museum of the Southwest (adjacent to I-10): Historic display including Rex Allen memorabilia, Willcox Cowboy Hall of Fame and a Heritage Park.

ANNUAL EVENTS

Willcox, home of the famous TV, movie and radio personality Rex Allen, annually celebrates "Rex Allen Days." The event, held the second weekend of October, includes a parade, country fair, air show, PRCA rodeo and a Rex Allen, Jr. concert.

SCENIC ATTRACTIONS

Cochise County, located in the southeastern corner of Arizona, is unparalleled in it's historical, cultural, scenic and recreational features. From the rugged Dos Cabezas Peaks and the Chiricahua Mountains to Cochise Stronghold in Dragoon Mountains, part of the Coronado National Forest, the dramatic changes in scenery and wildlife will both delight and amaze visitors. These awe inspiring mountains and mystifying deserts were once the homeland of the Chiricahua Apache Indians, and it is from the great Apache Indian Chief, Cochise, that the county gets it's name.

Fort Bowie, 22 miles east of Willcox was the focal point of military operations against the Chiricahua Apaches, and affords a fascinating journey back into history.

Within a one-hour drive of Willcox visitors can enjoy ghost towns living among the ruins of yesterday, rich in history and western lore. A short 36 miles from Willcox is the Chiricahua National Monument. The Apaches called this place "Say-Yahdesut" meaning point of rocks. The visitor center has exhibits that graphically describe the history of the area and aids the traveler in understanding what will be seen during scenic walks and drives along the trails. The Chamber of Commerce operates the Museum of the Southwest and a full information center. The Amerind Foundation, an excellent museum of Indian artifacts and culture, is a half hour south of Willcox on I-10 west.

LODGING AND MEETING FACILITIES

Motels:	14 with 309 rooms
Meeting Facilities:	Numerous facilities with seating for up to 300 persons
Mobile Home & Trailer Parks:	8 with 188 spaces

This profile was prepared in cooperation with the Willcox Chamber of Commerce and Agriculture.

For Further Information, contact:

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