Progressive Agriculture in Arizona

Volume XXIV, No. 6, November-December, 1972

We, too, are working on pollution!

In understanding the complex problems of environment, have you considered why the problems seem to have suddenly descended upon us?

Throughout history pollution has not been viewed as a widespread problem. Oh, it's true Londoners endured smog for more than a century. So did Los Angeles, Chicago, New York in recent decades. And, also recently, pollution problems have been reported from Hawaii.

Certain streams and lakes became subject to severe pollution on occasion. But when it happened, corrective measures were simple and effective. Until quite recently, most people were unalert to any general deterioration in the environment.

One reason for this lack of concern is that air, soil, and water have amazing capabilities for diluting pollutants. A large and rapid flowing river can take in and through biological activity purify limited quantities of waste matter. Pollutants in the air can be blown away by winds and the pollutants can be ultimately removed by rain.

Soil also serves to remove and change pollutants. As rain washes it from the air, soil microorganisms utilize pollutants as a form of nutrition. In this way soil acts as a mechanism for the removal of pollutants.

There are, however, limits to the absorptive and removal capacity of air and water. The absorptive capacity of air can be exceeded when man puts out wastes in large amounts from small areas.

Until a few years ago the amount of pollution in most parts of the U.S. did not exceed levels of the absorptive and removal capacities of air, soil and water. But this is no longer the case. During the past few decades an increase in pollutant levels in many areas have gone beyond the ability of nature to cope with the pollution.

As population density and pollution sources increase in certain areas the effects become more noticeable. As a result we need to give more attention to the complex interactions of pollution and people.

The College of Agriculture is attempting to find some of these solutions by establishing research projects which investigate the problems of pollution:

In Plant Pathology we have a project on air pollution in agriculture;

Our Agricultural Engineers are working out a problem of solid wastes;

Soil scientists are working on a technique of dissipating smoke in soil;

Entomologists are developing biological controls for insects;

The Community Pesticide Studies are concerned with the substitutes for DDT; and animal nutritionists are seeking a safe substitute for DES, the growth hormone. There are many others too numerous to crowd into this space.

Several states in the West, including Arizona, are working together on a project called Clean West. This project utilizes all of the disciplines as social, biological and physical sciences in the College of Agriculture.

The solution will not be immediate. It will require much effort, many dollars and a great deal of teamwork among the scientists.

We are confident, however, that many pollution problems will be solved in the future.

Harold E. Myers

Dean,
College of Agriculture, and
School of Home Economics

In this Issue . . .

Progressive Agriculture in Arizona

November-December, 1972, Volume XXIV, No. 6

Published Bi-Monthly by the College of Agriculture, including Agricultural Experiment Station, Cooperative Extension Service and Resident Instruction in the College of Agriculture and the School of Home Economics at the University of Arizona, Tucson, Arizona 85721. Harold E. Myers, Dean.

Second Class postage paid at Tucson, Arizona.

Articles and illustrations in this publication are provided by the faculty and staff of the College of Agriculture. Editorial use of information contained herein is encouraged. Photos or other illustrations will be furnished on request.

Editorial Board members are: G. J. Graham, Chairman, R. S. Firch, A. D. Halderman, A. W. Johnson, D. E. Manning, J. W. Stull, A. E. Thompson, L. N. Wright; and Ex-Officio, D. S. Metcalfe, and George Alstad, Editor.

THE COVER shows from left Mike Lindsey, Area Specialist-pest management, and Sam Stedman, Pinal county Agricultural Agent, Cooperative Extension Service, University of Arizona. Sam is calling in recheck results of a field insect survey to the grower of cotton. Story, page 6.

Arizona's Vegetable & Melon Industry: An Overview

*By C. Curtis Cable, Jr.**

This is the second article in a series concerned with the longrun outlook and prospects for vegetables and melons. The first article examined national trends in production and use of vegetables, and the implications of these trends. In this second article, the objective was to describe Arizona's vegetable and melon industry, and appraise its relationship to the U.S. vegetable and melon industry.

Commercial vegetables are an important source of agricultural income for Arizona. In recent years, cash received from sales of vegetables represented approximately 15 percent of total cash receipts from all Arizona farm commodities.

In addition to vegetables being an important source of income for the state, Arizona is an important U.S. source for fresh-market produce. Arizona ranks fourth — following California, Florida and Texas — in production and value of fresh-market vegetables and melons.

More than 99 percent of the state's acreage, tonnage and value of commerial vegetables and melons are grown for the fresh market. Obviously, Arizona is a low-ranking state in the production of processing vegetables.

Because of the fresh-market predominance, processing vegetables were not considered in this article. Data used herein were compiled from appropriate annual issues of *Agricultural Statistics*, published by the U.S. Department of Agriculture, and *Arizona Agricultural Statistics* published by Arizona Crop and Livestock Reporting Service.

Arizona's Volume Remains Stable

In the first article of this series it was shown that total U.S. production of fresh-market vegetables has held fairly stable at about 11 million tons annually since the mid-1950s. Arizona's yearly production has also remained stable at about 600,000 to 700,000 tons during the past 15 years (Chart 1). During the same period, production in Texas has remained fairly stable, and averaged roughly 1 million tons annually.

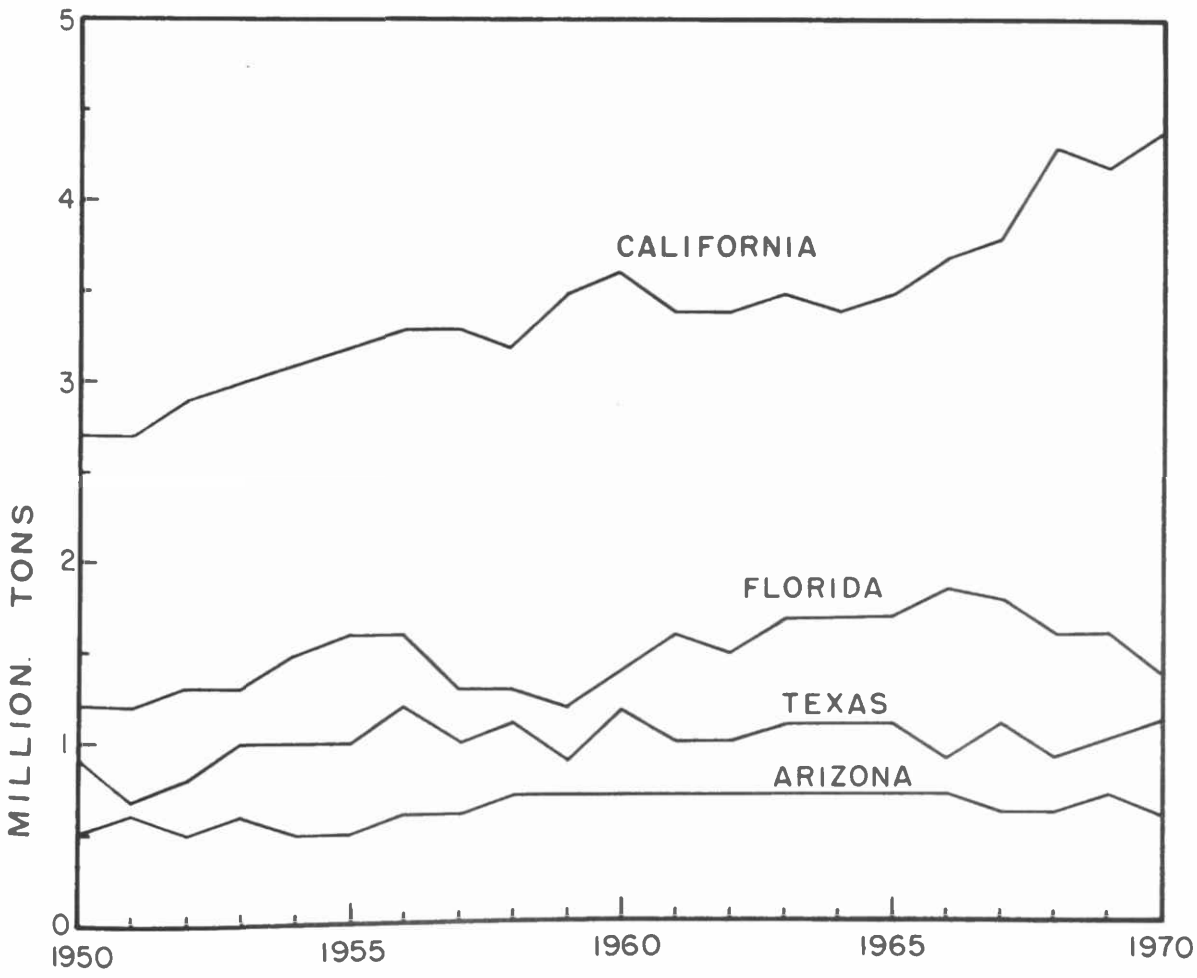
In contrast, California's annual production increased from 2.7 million tons in 1950 to 3.5 million tons in 1965. This was an increase of 800,000 tons in 15 years. During the next five years California's output increased another 900,000 tons to a high of 4.4 million tons in 1970.

There was a slight upward trend in Florida production during the past 15-20 years, and annual output reached a high of almost 1.9 million tons in 1966. Since then Florida's annual production has gradually declined to less than 1.5 million tons in 1970.

These trends indicate that California is becoming more important as a producer of fresh-market vegetables. The importance of Arizona and Texas has remained fairly constant, whereas the position of Florida as a market supplier has declined.

Although Arizona ranks fourth in fresh-market vegetables, it accounted for only about 5 percent of the nation's fresh vegetables in the late 1960s. In comparison California accounted for about 40 percent, Florida for 15 percent and Texas 10 percent.

Chart 1. Production of Fresh-Market Vegetables in Four Leading States

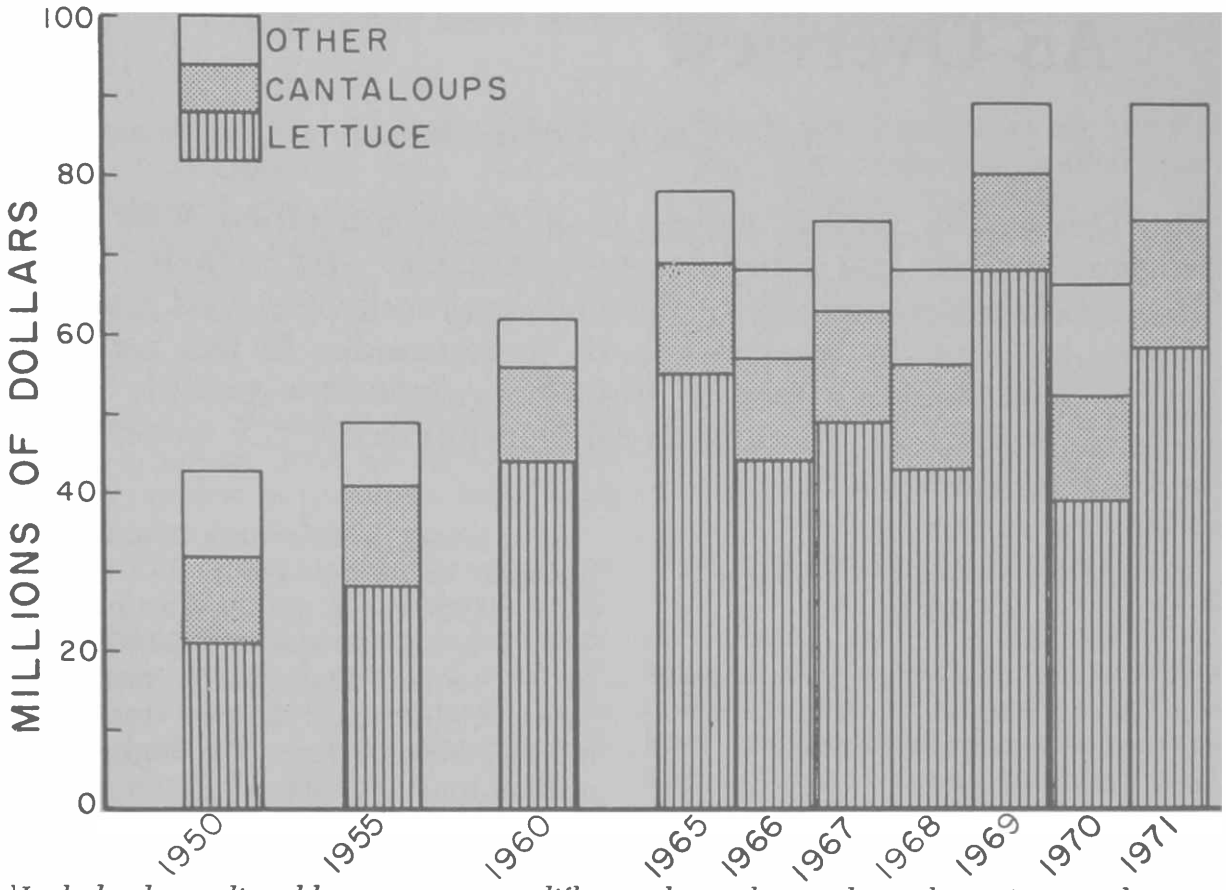


Lettuce — Arizona's Principal Vegetable

Lettuce has been Arizona's principal vegetable crop for several decades, and its relative importance to the state has been increasing in recent years. In the early 1950s, lettuce was a 20 million dollar crop and accounted for about half of the total value of the state's vegetable industry (Chart 2). By the late 1960s lettuce was a 50 to 60 million dollar crop representing about two-thirds of the value of the states fresh-market vegetables.

**Marketing Specialist, Cooperative Extension Service, University of Arizona.*

Chart 2. Value of Arizona Lettuce, Cantaloups & Other[1] Fresh Vegetables



[1]*Includes broccoli, cabbage, carrots, cauliflower, honeydew melons, dry onions, and watermelons.*

Although lettuce is the major vegetable crop in the state, Arizona's annual production usually accounts for less than 20 percent of the nation's output. In 1971, for example, approximately 8.5 million hundredweights of lettuce were produced in Arizona, which was 18 percent of the total U.S. production of 46.3 million hundredweights. In comparison, California's 31.7 million hundredweights accounted for 69 percent of the 1971 U.S. lettuce crop.

Other states in which lettuce is produced commercially, and quantities grown in 1971, are shown in Chart 3. Both New Mexico and Texas usually account for slightly more than 2 percent of total U.S. lettuce production.

Because of the importance of lettuce in Arizona's agricultural economy, trends in acreage, production, value and related data for the state will be the subject of a later article in this series.

Cantaloups Rank Second

Cantaloups are the second most important crop of the state's fresh vegetable and melon industry. For the past 20 years the annual value of this crop has fluctuated between $11 million and $17 million (Chart 2). During the mid and late 1960s, however, there was a pronounced downward trend in the state's annual cantaloup acreage, and a slight overall decline in yearly production.

California is the nation's top producer of cantaloups, with Arizona ranking second. In 1971, California's production of 7.6 million hundredweights accounted for 61 percent of the total U.S. crop (Chart 4). Arizona's 1971 output represented 15 percent of the U.S. total, and Texas for 12 percent.

Imports of 1.8 million hundredweights of cantaloups from Mexico in 1971 were almost equal to Arizona's production. Adding these imports to U.S. production, the U.S. market was supplied with about 14.2 million hundredweights of cantaloups in 1971.

This foreign competition for U.S. markets, coupled with the slight decline in Arizona production warrants further study. Are these imports the reason for the drop in Arizona production? Is production declining throughout the U.S. because of a decline in consumption? Are other U.S. growing areas gaining in production because of cost advantages? These and similar questions will be discussed in a later article.

Other Vegetables, Melons

In addition to lettuce and cantaloup, Arizona produces smaller quantities of other fresh-market vegetables. These include broccoli, cabbage, carrots, cauliflower, honeydew melons, dry onions and watermelons. The total value of the state's production of these seven vegetable and melon crops fluctuated between $6 million and $15 million annually from 1950 to 1971 (Chart 2). However, since 1964 there has been an upward trend in total value of these crops — from $6 million to $15 million.

Rising prices account for some of this upward trend in value, especially for broccoli, cauliflower, honeydew melons and watermelons (Table 1). In addition, there was an up-trend in production from 1964 to 1971 for broccoli, cauliflower, honeydew melons and carrots. However, for most of

Chart 3. Estimated Lettuce Production by States, 1971
(1,000 hundredweights)

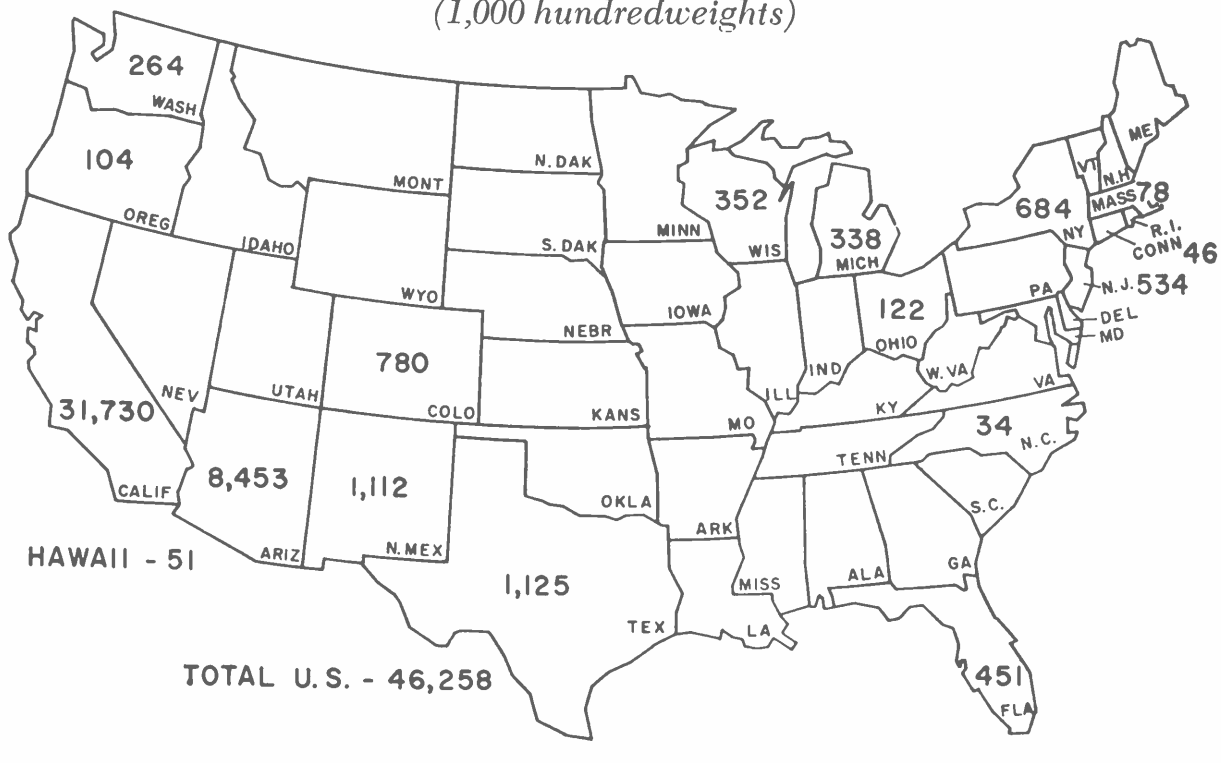
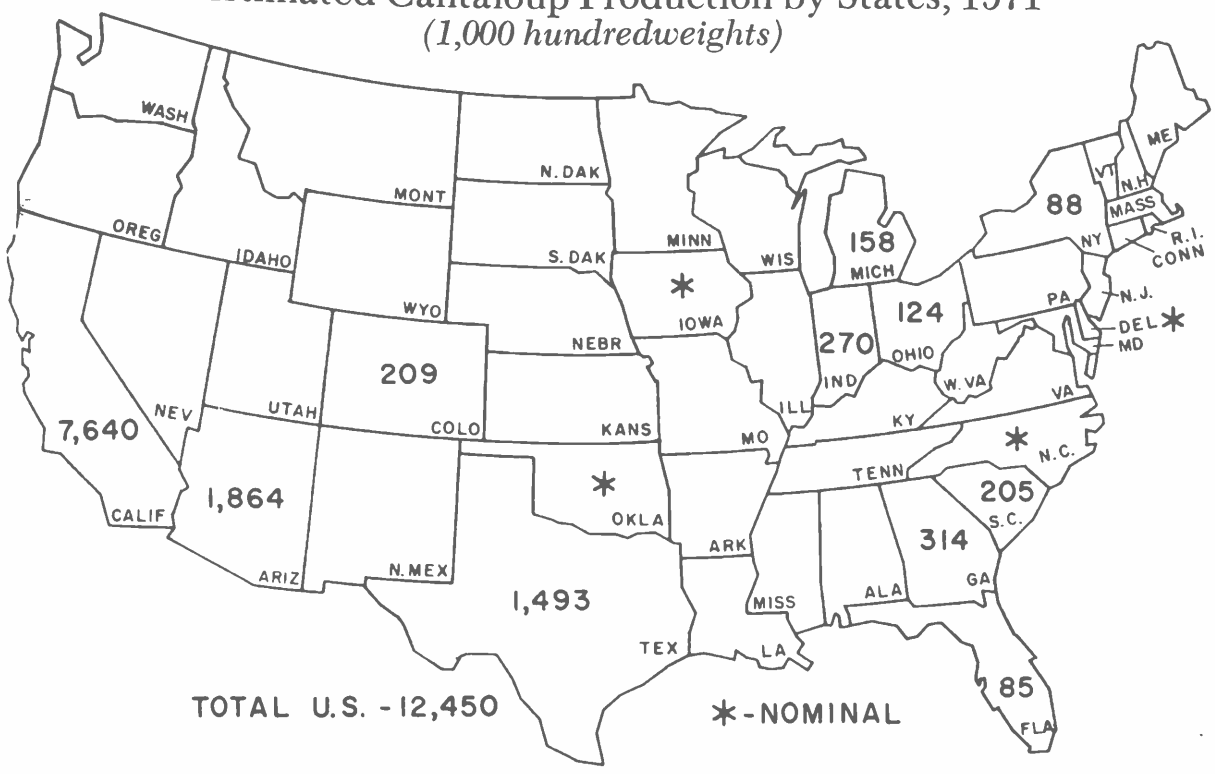


Chart 4. Estimated Cantaloup Production by States, 1971
(1,000 hundredweights)



these crops there are pronounced year-to-year changes in both production and prices, resulting in wide yearly fluctuations in crop value.

Broccoli is a winter crop in both Arizona and Texas, and each state produces 1-2 percent of the U.S. crop. In comparison, California grows and markets about 80 percent of the nation's broccoli — on a year-round basis. Oregon, ranking second in production, markets broccoli in the fall.

Cabbage is grown commercially throughout the U.S. The top five producing states are New York, Florida, Texas, California and Wisconsin. Each of these states produces 2-4 million hundredweights annually. In contrast, Arizona grows only about 200,000 hundredweights a year — during the winter and spring months. This production season coincides with the growing seasons in California, Florida, Louisiana and Texas, and in most years the combined output of these four states provides an ample winter market supply.

Carrots are grown commercially in many sections of the country, but California and Texas combined produce about two-thirds of the U.S. annual supply. Production and shipments are year-round operations in both of these states. Arizona carrots, which represent about 2-3 percent of the U.S. total, are a winter to early summer crop.

Cauliflower is a winter crop in Arizona and Texas, a fall, winter and spring crop in California, and a late summer and fall crop in Michigan, New York and Oregon. Approximately 75 percent of the nation's output is grown in California — Arizona produces about 2 percent.

Honeydew melons are a spring crop in Texas, an early summer crop in Arizona and a late summer crop in California. About 80 percent of the total U.S. production is grown in California, about 11 percent in Texas, and 9 percent in Arizona.

Dry onions are commercially grown in several sections of the U.S. The total of California, Texas, New York and Oregon production accounts for about two-thirds of the U.S. annual supply. Arizona's crop in late spring and early summer coincides with the production-marketing seasons in Texas and California.

Watermelons are primarily a late spring and summer crop in U.S. pro-

Please turn to page 14

Table 1. Acreage, Production, Price and Value of Selected Arizona Vegetables.

Vegetable and time period[1]	*Harvested Acres*	*Yield per Acre*	*Production*	*Average Price*	*Value of Production*
		cwt.	1,000 *cwt.*	\$/*Cwt.*	1,000 *Dol.*
Broccoli					
1960-64 ave.	590	67	38	13.10	500
1965-69 ave.	492	69	33	12.80	421
1970	800	65	52	15.90	827
1971	1,000	60	60	15.50	930
Cabbage					
1960-64 ave.	1,270	211	245	3.38	858
1965-69 ave.	1,540	153	234	4.05	906
1970	1,000	210	210	5.61	1,178
1971	1,400	125	175	4.02	704
Carrots					
1960-64 ave.	2,400	171	382	5.03	1,973
1965-69 ave.	3,120	182	565	5.17	2,929
1970	2,700	180	486	3.92	1,905
1971	2,600	190	494	8.23	4,066
Cauliflower					
1960-64 ave.	534	74	39	11.18	433
1965-69 ave	700	62	43	13.34	579
1970	800	75	60	15.60	936
1971	810	65	53	18.00	954
Honeydew melons					
1960-64 ave.	760	145	105	6.14	652
1965-69 ave.	1,010	125	128	6.81	829
1970	1,100	165	182	8.26	1,503
1971	1,200	165	198	8.39	1,661
Dry Onions					
1960-64 ave.	1,740	340	492	3.47	1,761
1965-69 ave.	2,260	381	857	3.85	3,134
1970	2,400	360	864	4.30	3,712
1971	1,500	380	570	3.27	1,864
Watermelons					
1960-64 ave.	4,400	156	692	2.23	1,544
1965-69 ave.	4,120	162	660	2.51	1,640
1970	4,300	160	688	3.25	2,236
1971	3,900	175	683	3.63	2.479

[1]*The 5-year averages are simple averages of annual figures.*

From left, Mike Lindsey, Area Specialist-Pest Management, and Sam Stedman, Pinal County Agricultural Agent, check field for signs of bollworm infestation. They work together in supervising the Pinal County Cotton Pest Management program.

SAM'S MOBIL *PARTY LINE*

*By George Alstad**

Pinal County Cotton Pest Management Program requires instant availability and communication between scouts, supervisors, entomologists and cotton growers participating in the program. To accomplish this each supervisor has a car radio for two-way communications while in the field.

The usual buzz of the car radio or telephone within the vehicle cannot be heard when one of the men is in the far end of a field making an insect survey. So, the equipment is adapted to sound the car horn when activated by a push button.

Naturally when one of the men is at the far end of the field someone calls. As they run through the field to take the call he arrives in time for the caller to hang up . . . or too out of breath to talk.

While the Cotton Insect Management program is three years old in Graham county and two years old in Pinal county, the installation of car telephones this year has greatly facilitated and speeded up the intercommunications between cotton growers, supervisors of the insect scouting program, entomologists from the University of Arizona, and the county agricultural agent.

The grower is first to know.

He is informed when his field is checked by the scout, and/or supervisor, and he is given backup information when necessary the next morning when the data collected from his fields has been run through the computer at the U of A. This information is updated daily with each new input of data.

The grower, and sometimes his neighbors, are cautioned when insect populations build up as revealed by computer printouts made from field collected data. Frequently a trend of insect populations can be anticipated for fields, and for areas, by the accumulation of statistics.

Leon Moore and other entomologists at the U of A decided on Pinal county for the Pest Management Program in 1971 since it was centrally located in Arizona's cotton growing area, had serious cotton insect problems and was within relatively easy reach of the university.

Sam Stedman put the proposition to the Pinal County Extension Advisory Board and the Cotton Committee. And, as is typical for Pinal county growers when a good idea is advanced, they said, "let's go!"

In order to get the program going in the county a grower Pest Management Committee composed of growers

**Editor, Progressive Agriculture in Arizona, Cooperative Extension Service, and Agricultural Experiment Station.*

from throughout the county was selected. The committee, chaired by Dalton Cole, Jr., of Coolidge is responsible for coordinating program activities.

"We signed up cotton growers with from four acres to three thousand acres of cotton," says Sam. "And they're located in all parts of the county.

"Last year," he adds, "the growers listened to the field survey reports, and while some followed the recommendations, many did not. This year they seem to pay much closer attention to the surveys."

During years prior to the program there was a strong desire among growers to "insure" their crop by applying insecticides on a timetable basis. Their confidence in the insect survey approach, especially since we have been using the boll cutting method to search for evidence of pink bollworm damage, has increased.

"It's a big responsibility," Sam adds, "enough to keep those of us in supervisory positions awake nights when we make a recommendation to a grower on whether or not to spray. It could mean thousands of dollars saved in insecticides, or if the judgment is wrong, it could mean thousands of dollars in losses to the crop.

"Were my estimates correct?"

"What happens if the growers loose several thousand dollars if I am wrong?"

Sometimes I wish the grower would go into the field and double-check our results, Sam told. "But he won't."

One grower who is very well trained to make insect surveys says, "when it is my field of cotton I become emotional and may see signs of insect damage when there are none."

Sam points out that growers want to rely on a distinterested party. They feel more confidence with the program scouts and supervisors who were trained by the entomologists in the Department of Entomology at the U of A than with their own judgment.

One example unfolded in a phone conversation with Sam. A grower who was on the program called to ask if someone could come out to double check his field for him. A scout was dispatched by radio. He inspected the field and told the grower that there was no need to spray the field. This relieved the grower of applying needless expense to his crop.

Another telephone interruption revealed that the car radio is somewhat like the old party telephone line. A man called to thank Sam for the advice he overheard Sam giving to a homemaker. He told Sam that the control for wasps worked very well.

Juan LeDezma, a cotton grower with a four acre allotment, is happy that again Mike Lindsey, area specialist-pest management program, was able to report no need for insect control. Many growers in Pinal county have had similar experiences of not making their first insecticide application until late in the season. This past season eleven per cent of the growers made their first insecticide application in August; two per cent in September.

But, back to the cotton insect program, the scouts go into each field of their area at least once a week. They sweep the tops of plants with their nets in each of the four corners of the field. From this beneficial and harmful insects are identified, counted and recorded. Then the scout obtains 100 cotton bolls from the plants throughout the field which are bagged and labeled. Later the scout opens each segment of each boll to determine the number of bolls that have been invaded by Pinkie, the pink bollworm. This information is also recorded.

If a population of a certain harmful insect appears in high enough numbers to require enactment of control measures, the grower is notified, as he is when no controls are needed.

If he wants a verification run on his fields the supervisor, or Sam Stedman, may be asked to do so. Whatever the outcome the grower is the deciding factor in determining whether or not to start controls.

The program, Sam feels, has paid for itself many times over in savings to the grower. It's the only way to go, he feels, as do participating growers.

While only a tool to facilitate the Pinal County Cotton Pest Management Program the radio telephone in his and the supervisor's cars also have paid their way, Sam says.

He points out that growers formerly complained constantly that he could never be reached because he was out running down calls. The growers understood, of course, but now they can get Sam, or any of the Supervisors immediately. And, they like it that way.

"At first I thought the phone would save time, mileage and work. But, that's not true! It creates a lot more work, takes up more time and makes me cover more ground than I used to," Sam says. The important thing is that they have helped us add efficiency to cotton pest control in Pinal county, and that's what it's all about.

After one particular busy day Sam arrived home late, drove into the carport, forget to disengage the horn button and went into the house to sleep. At 5 a.m. a Scout called, activating his automobile horn and aroused the entire neighborhood to a beautiful, but unwanted sunrise.

Rural Poverty in Arizona

*By Harry Ayer, Joe Weidman, and Terry Anderson**

A real concern about rural poverty is evident at all levels of government, within research, education, and extension institutions, and among at least part of the citizenry. In Arizona, many rural communities are attacking problems of low standards of living and several state institutions are focusing on these problems. Finally, new federal legislation will likely bring added revenues to Arizona and rural America to help abate the hardships of "the people left behind." Thus, it is important that we know something about the extent and nature of rural poverty in Arizona, and it is to the following questions that we focus attention:

1. How many rural poor are there and how poor are they?
2. Where do they live?
3. Do the rural poor live on welfare, or do they have other sources of income?
4. What are the family characteristics of the rural poor in terms of race, broken families, number of children, and age of head.
5. How poor is their housing?
6. Are they farmers or rural nonfarm people; what are the characteristics of low-income farms in Arizona?
7. How severe is unemployment among the rural poor?

Data to answer these questions is taken from the 1970 U.S. CENSUS OF POPULATION FOR ARIZONA and the 1969 CENSUS OF AGRICULTURE. Most of the relevant data are presented in Table 1 and for each characteristic of the rural poor both a state and county breakdown is presented. Information related specifically to low production farms is presented in Table 2.

A final section of the paper draws implications from the data for policy, extension, and research.

Number and Location of Rural[1] Poor

Several criteria might be used to establish that a person or family is "poor" or has a low standard of living. For simplicity, we use the Census definition of poverty whereby the average poverty threshold in 1969 for all nonfarm families of four headed by a male was $3,745.[2] (In a later section, we present data on another important gauge of a family's living standard — the condition of their housing.)

Rural poverty in Arizona is a significant problem. More than sixteen thousand rural families[3] plus nearly 9 thousand rural individuals had incomes below the poverty level in 1969. Almost half of the families in poverty had incomes less than 50 percent of the poverty threshold. The incidence of poverty was substantially greater in rural than urban Arizona — nearly one in five rural families was poor compared to one in ten of urban families. Approximately 33 percent of all poor in Arizona lived in rural areas and yet only 20 percent of the state's population was rural.

The largest numbers of rural poor were in Apache, Maricopa, and Navajo counties — each having over two thousand rural poor families. In

Table 1. Rural Poverty Statistics, Arizona Counties, 1970.

	Apache	*Cochise*	*Coc*
Number of Rural Poor and Severity of Poverty			
1. Number of Rural Poor Families	**2,800**	**734**	**1,**
2. Rural Poor Families as % of All Rural Families	**46.2**	**15.1**	**2**
3. Rural Poor Families as % of All Poor Families	**100.0**	**36.9**	**7**
4. Number of Rural Poor Individuals	**808**	**759**	**4**
5. % of Rural Poor Families With Income Less than ½ Poverty Level	**60.9**	**35.4**	**6**
Welfare Payments and Other Income of Rural Poor			
6. % of Rural Poor Families With Earnings	**53.2**	**66.3**	**5**
7. % on Welfare	**38.7**	**6.7**	**2**
8. % With Social Security or RR Retirement	**23.2**	**32.2**	**1**
Family Characteristics			
9. % of Rural Poor in Spanish-American Families	**5.2**	**48.1**	
10. % of Rural Poor in Indian Families	**92.5**	**.6**	**8**
11. % of Rural Poor Families Headed by Females	**22.9**	**18.0**	**2**
12. % of Rural Poor Children Not Living With Both Parents	**32.0**	**22.1**	**2**
13. Number of Children in Rural Poor Families	**9,142**	**1,239**	**4,1**
14. % of Rural Poor Family Heads Who Are Over 65	**18.3**	**25.2**	**1**
Housing			
15. % of Rural Poor Families in Substandard Housing	**59.0**	**16.5**	**52**
Farm, Nonfarm Status			
16. Number of Rural Poor Farm Families	**382**	**68**	**2**
17. Rural Poor Farm Families as % of All Rural Poor	**13.6**	**9.3**	**21**
Unemployment			
18. % of Rural Poor Male Labor Force Unemployed	**16.4**	**8.5**	**10**
19. % of Total Male Labor Force Unemployed (Civ.)	**11.4**	**3.8**	**5**

Source: 1970 U. S. Census of Population, General, Social and Economic Characteristics, Ariz *publication.*

**Respectively, Assistant Professor of Agricultural Economics, Graduate Student in Urban Planning, and former Graduate Student in Agricultural Economics.*

Apache and Navajo counties, more than 40 percent of all rural families were poor.

Welfare Payments and Other Income

Without regard to circumstances, poor people are often criticized for their dependence on welfare subsidies. For Arizona, the data indicate this criticism should be softened. Over 60 percent of the rural poor *earned* income while less than 25 percent of the rural poor received welfare payments.[4] The proportion of rural poor receiving welfare payments varied greatly among counties. Apache County had the highest proportion of families receiving welfare (38.7%) and Cochise had the lowest (6.7%).

Family Characteristics of Rural Poor

The problems of the rural poor and solutions to these problems are often dependent on characteristics of the family. In this section, we present data on the ethnic composition of the rural poor, broken homes and children living without both parents, the age of the family head, and the number of children living in poverty households.

Ethnic Composition

For the state, more than 20 percent of the rural poor families were classified as Spanish-Americans and over 58 percent as Indians. The severity of poverty within these ethnic groups is also evident. Approximately 25 percent of all rural Spanish American families were in poverty and some 61 percent of all rural Indian families had incomes below the poverty threshold.

Children Not Living With Both Parents

Broken homes may add to the problems of achieving an adequate standard of living and place additional burdens on children. In Arizona, one out of five rural poor families were headed by females,[5] and nearly 31 percent of the rural poor children were not living with both parents. With the exception of Greenlee county which had relatively few rural poor, the proportion of rural poor families with a female head did not vary greatly among counties.

Number of Children

In Arizona over 43,000 children were members of rural poor families.

Gila	*Graham*	*Greenlee*	*Maricopa*	*Mohave*	*Navajo*	*Pima*	*Pinal*	*Santa Cruz*	*Yavapai*	*Yuma*	*ARIZONA*
642	508	139	2,140	568	2,717	1,624	1,503	137	842	952	16,578
15.5	22.2	9.6	12.9	10.4	49.9	11.8	19.4	10.8	14.4	18.0	19.2
59.6	73.7	63.5	9.8	80.6	88.0	17.1	56.5	22.6	57.3	48.1	32.9
384	479	100	1,281	290	877	1,013	790	146	793	685	8,819
26.8	38.2	17.3	37.9	44.7	60.3	44.4	41.1	40.1	37.4	28.4	47.3
64.3	68.9	47.5	66.4	59.0	60.0	57.8	68.5	73.7	50.2	69.5	60.9
18.1	18.3	29.5	13.7	14.4	37.9	23.2	24.0	22.6	6.9	15.5	24.8
38.6	25.8	30.2	30.3	31.9	17.6	28.9	23.8	25.5	47.1	25.5	26.0
13.7	27.7	74.4	34.7	5.2	2.7	51.3	37.2	79.1	16.9	48.5	20.8
55.4	34.4	0	19.6	13.1	91.5	51.8	38.7	4.2	2.4	14.7	58.3
18.1	18.5	49.6	14.3	14.1	22.3	24.0	23.5	27.7	19.8	17.8	20.6
38.9	24.2	64.2	26.0	47.9	28.4	44.7	30.5	29.8	41.2	25.5	30.9
1,566	1,308	246	4,584	968	8,888	3,357	4,048	312	1,154	2,058	43,008
25.2	27.2	24.5	25.7	17.8	14.2	24.1	23.3	22.6	32.2	23.9	21.3
41.7	35.6	.4	22.2	9.0	61.6	50.1	38.5	21.2	10.8	20.4	41.3
32	148	16	299	20	636	159	387	18	55	84	2,574
5.0	29.1	11.5	14.0	3.5	23.4	9.8	25.8	13.1	6.5	8.8	15.5
10.6	7.0	0	5.7	13.4	14.1	3.2	5.6	8.7	2.2	2.4	9.0
2.7	3.5	2.4	3.6	5.1	6.4	3.5	4.2	4.4	4.2	4.1	3.8

computer tape of part of the 1970 *Census of the Population for Arizona. More precise definitions of each category are given in the* Census

Counties with large Indian populations — Apache, Coconino, Maricopa, Navajo, Pima, Pinal, and Yuma — each had over 2,000 rural children in poverty while Apache County had over 9,000.

AGE OF FAMILY HEAD

The heads of approximately 21 percent of the rural poor families were 65 years old or over and this proportion did not vary greatly among counties. The proportion of family heads over 65 corresponds closely to the proportion of rural poor who received social security and railroad retirement benefits.

Housing

In 1970, more than 40 percent of Arizona's rural poor lived in substandard housing — that is, their homes lacked one or more of the following facilities: hot water, bathtub (or shower), flush toilet, or piped water inside the house. The highest incidence of substandard housing was in Apache, Coconino, Gila, Navajo, Pima, and Pinal Counties — again, all counties in which a large portion of the rural poor are Indians.

Farm, Nonfarm Status

Rural poverty in Arizona is not primarily a farm problem. Of all rural poor, less than 16 percent were farm families. This is not to imply, however, that the incidence of poverty among farm families is low. On the contrary, some 25 to 50 percent of all farm families in Arizona[7] — over 2,500 families — have annual incomes less than the poverty threshold.

Characteristics or Arizona's low production farms (those selling less than $20,000 of agricultural produce) are given in Table 2. These have been classified as low-production farms because on average their net income is less than $2,000. In fact, for farms in classes 4 through 6, production expenses were greater than the value of farm products sold. More than 2,000 farms — nearly 51 percent of all Arizona farms — sold less than $20,000 worth of agricultural produce in 1969. Low-production units had considerably smaller acreages and value of land and buildings than the state average. A relatively large share of the low-production farms were livestock (other than poultry and dairy) and livestock ranches. Very few low-production farmers had farm-related income of more than $5,000 (custom work, recreational services, government farm program payments) but a substantial share supplemented their income with off-farm work.

Unemployment

Rate of unemployment among the rural poor male labor force was substantially higher than for the total male labor force. In 1970, unemployment reached 9 percent and in several counties, especially those with large numbers of Indians, the rate was above 10 percent.[6] However, in all counties, the majority of the poor are working but are not earning enough money to rise above the poverty level.

Please turn to page 14

Table 2. Characteristics of Low-Production Farms, Arizona, 1969.

	Class--1-6[a]	*Low-Production Farms*				
	Farms	*Class 3*[b]	*Class 4*[c]	*Class 5*[d]	*Class 6*[e]	*Total*
Number of Farms	4,495	582	649	813	243	2,287
Percent of All Farms[f]	100	13	14	18	5	51
Average Size of Farm (Acres)	3,826	2,640	1,747	1,147	213	1,598
Average Value of Land & Buildings/Farm ($1,000)	422	202	128	107	53	131
Average Value of Agricultural Products Sold/Farm ($)	132,221	14,326	7,075	2,814	844	6,749
Average Farm Production Expenses/Farm ($)	126,386	12,429	8,409	9,510	1,734	9,114
Percent of Farms by Type						
Cash Grain	5	6	3	5	2	4
Cotton	15	10	7	5	5	7
Other Field Crops	1	1	1	0	—	1
Vegetables	3	1	2	1	2	2
Fruit and Nut	11	17	16	14	5	15
Livestock Other than Poultry & Dairy	NA	16	25	24	NA	NA
Livestock Ranches	NA	34	31	23	NA	NA
No. of Farm Operators Reporting 100 or More Days Work Off Farm	1,390	211	351	454	0	1,016
Percent of Farm Operators Reporting 100 or More Days Work Off Farm[g]	31	36	54	56	0	44
No. of Farms with Farm Related Income Greater than $5,000	NA	68	23	12	NA	NA
Percent of Farms with Farm-Related Income Greater than $5,000	NA	12	4	1	NA	NA

Source: 1969 Census of Agriculture, Arizona.

a. Farms in Class 1 had $40,000 or more in farm product sales and those in Class 2 between $20,000 and $39,999. See below for sales for classes 3-6.

b. Class 3 farms had $10,000 to $19,999 of farm product sales.

c. Class 4 farms had $5,000 to $9,999 of farm product sales.

d. Class 5 farms had $2,500 to $4,999 of farm product sales.

e. Class 6 farms had $50 to $2,499 of farm product sales.

f. Includes Class 1-6, but not part-time, part-retirement, or abnormal farms. A more complete definition of each farm class and other definitional information is given in the Census of Agriculture.

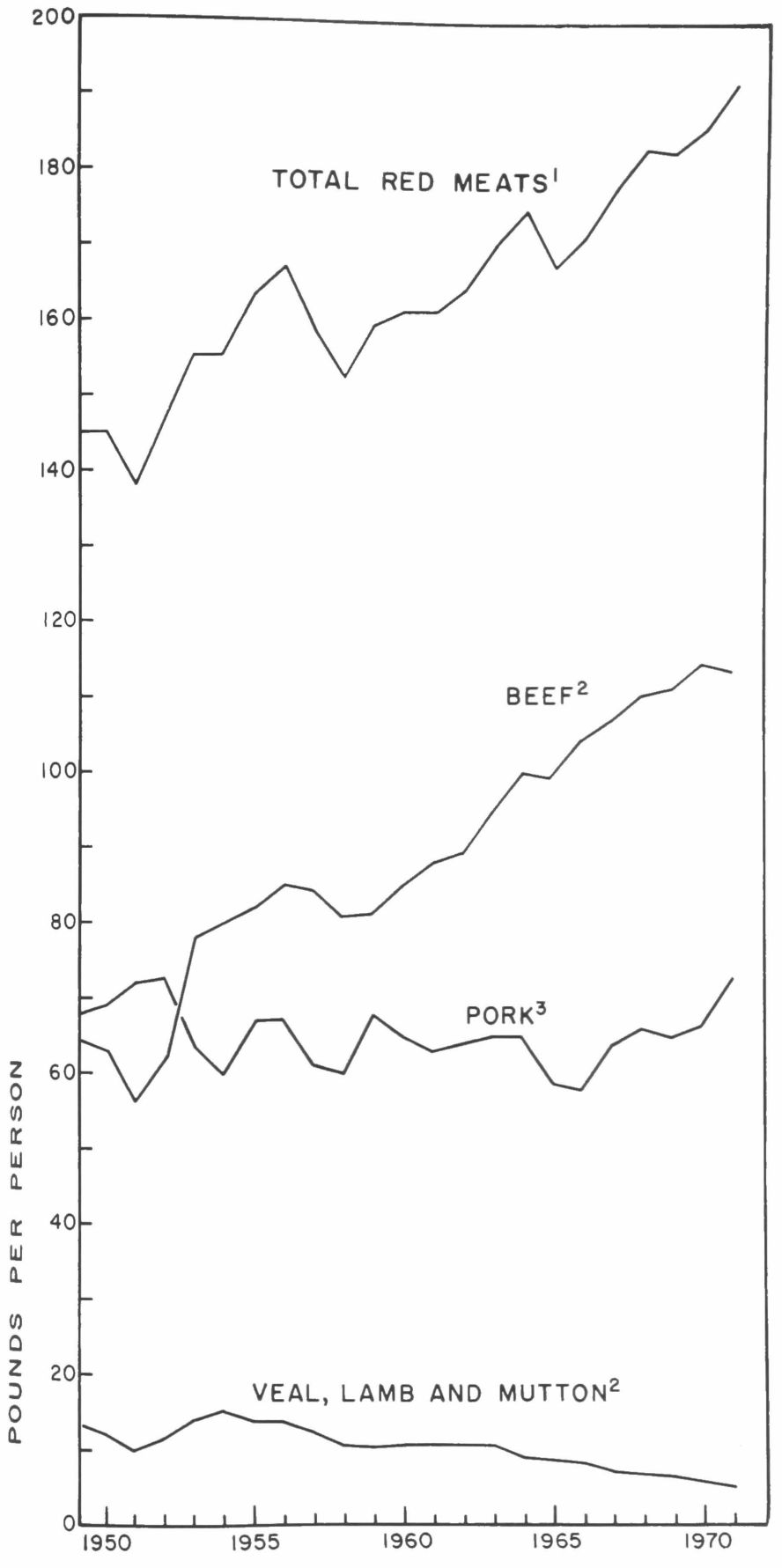
g. Computed by dividing number of farm operators reporting 100 or more days work off the farm by the number of farms in the class.

INFLATION & BEEF PRICES

*By Elmer L. Menzie and C. Curtis Cable, Jr.**

Prices for red meat, especially beef, have been the subject of concern to many people in recent months. Consumers have indicated displeasure with rising costs of meat in their budgets, and government officials have

Chart 1. U.S. Per Capita Consumption of Red Meats.



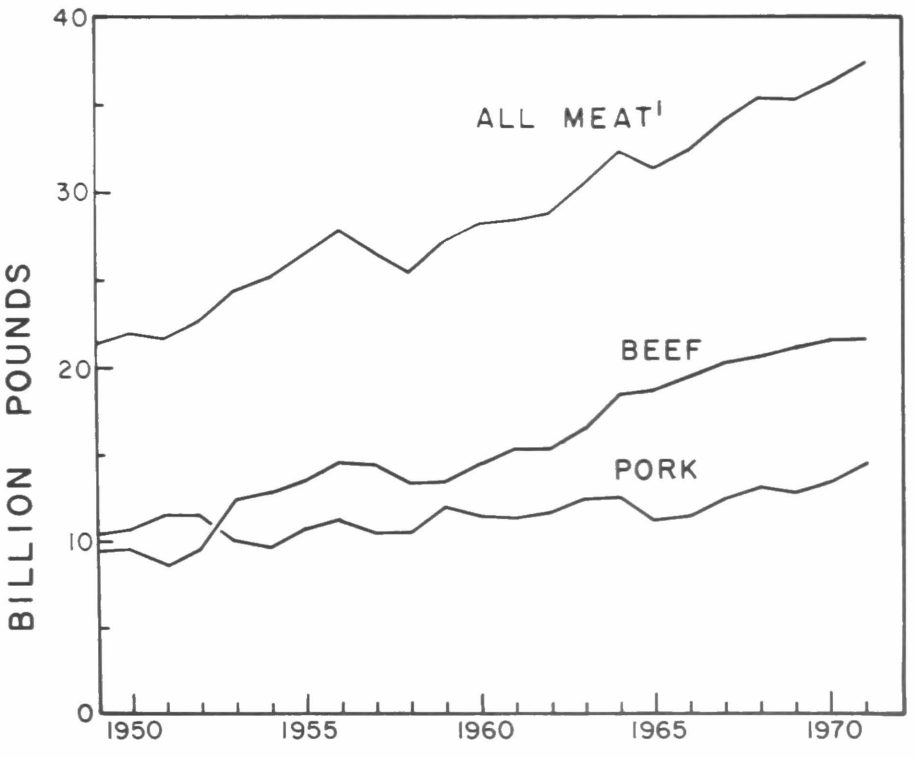
[1]*Includes beef, pork, veal, lamb and mutton; excludes poultry, game and pressed variety meats.*

[2]*Carcass weight equivalent, which is dressed weight for cattle, calves, sheep and lambs.*

[3]*Carcass weight equivalent less carcass fat rendered for lard.*

Source: Livestock and Meat Statistics, 1962. U.S. Dept. of Agriculture, Statistical Bulletin 333, July, 1963, and appropriate annual supplements.

Chart 2. U.S. Production of Red Meats, 1949-71.



[1]*In addition to beef and pork, includes lamb and mutton (from 0.5 to 1.0 billion pounds annually) and veal (1.0 to 1.5 billion pounds annually from 1949-65, and 0.5 to 1.0 billion pounds annually from 1966-71). Excludes poultry, game and processed variety meats.*

Source: Livestock and Meat Statistics, 1962. U.S. Dept. of Agriculture, Statistical Bulletin 333, July, 1963, and appropriate annual supplements.

**Professor, Department of Agricultural Economics, and Marketing Specialist, Cooperative Extension Service, University of Arizona.*

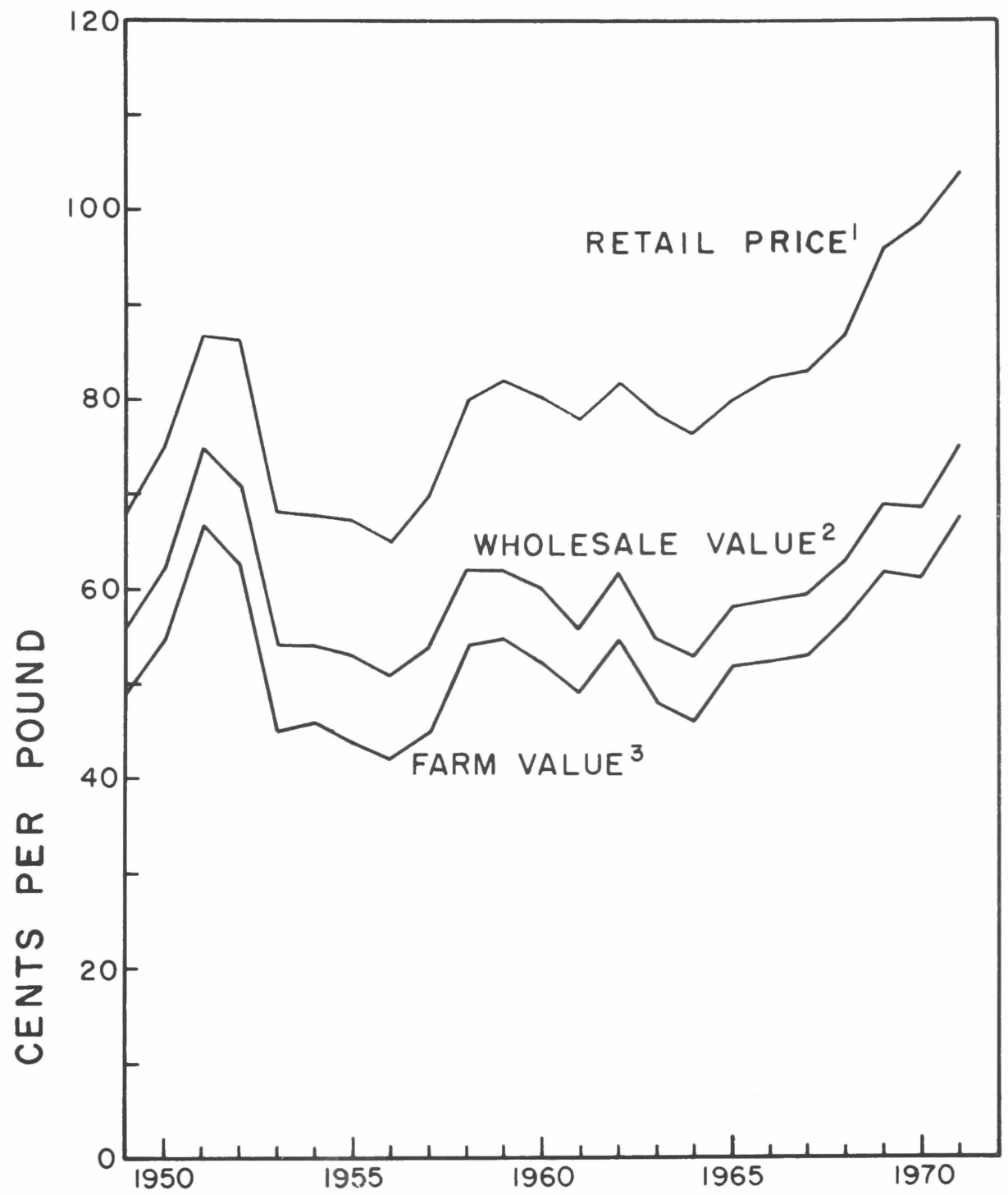
expressed concern in relation to attempts to reduce inflation in the economy generally. This article attempts to explain some of the changes which have occurred in the beef situation in recent months.

Rising Beef Consumption and Production

Total red meat consumption reached a record high of 191 pounds per person in 1971 (Chart 1). Beef consumption at 113 pounds per person made up 59 percent of the total. Pork was next in importance, with 73 pounds. Beef consumption per capita has nearly doubled in the past twenty years while pork has remained at a relatively constant level.

In order to satisfy the growing demand for beef, U.S. production increased from less than 10 billion pounds in the early 1950s to 21.5 billion pounds in 1971 (Chart 2). Pork production increased also but at a much slower rate. Meat imports, largely beef, increased from an annual average of 722 million pounds for 1959-63 to 1,097 million pounds for 1968-71. Beef imports in recent years have amounted to 5 to 8 percent of domestic supplies.

Chart 3. Retail Price, and Wholesale and Farm Values for one Pound of Choice Beef, U.S., 1949-71.



[1]*Weighted average price of retail cuts.*

[2]*Wholesale value of quantity of Choice carcass equivalent to one pound of retail cuts sold to consumers. This was 1.32 pounds during 1949-51, then gradually increased to 1.41 pounds from 1962 up to the present.*

[3]*Gross farm value less allowance for by-products.*

Source: Scott and Badger. Farm-Retail Spreads for Food Products. Including appropriate supplements to Livestock and Meat Statistics.

Rising Retail Prices for Beef

During this period of rapid growth in production and demand for beef, some changes have occurred in beef prices. During the Korean War in the early 1950s, the average retail price of Choice beef soared to a record high to that date of between 86 and 87 cents per pound (Chart 3). Following cessation of hostilities, the retail price of Choice beef declined to 65 cents in 1956. From 1956 to 1958 it rose to 80 cents and remained near this level until 1964. From 1964-71, a period of general inflation, the retail price of Choice beef rose steadily to $1.04 per pound. By July, 1972 the average monthly retail price had increased to $1.17 per pound.

Thus, prices have climbed about 45 percent in the past 15 years, almost all of which occurred since 1964. During this period the general price level increased at nearly the same rate. Retail beef prices, then, have not increased at a faster rate than other items in the economy. This is a remarkable fact, in face of the rapid growth in demand and the improvements in the product and its form, as well as significant increases in consumer services provided.

Changes in Farm Value of Beef

In the late 1950s and early 1960s, the average annual U.S. farm price for Choice slaughter steers fluctuated above and below the 25 cents per pound level. However, beginning about the mid-1960s, this price has risen fairly steadily — to the 32 cent level in 1971, and to a peak of almost 39 cents in the summer of 1972.

This increase in slaughter cattle prices is reflected in the 1964-71 increase in farm value of one pound of retail beef cuts sold to consumers — from 46 cents to 68 cents per pound (Chart 3). These farm value figures are higher than live cattle prices, because it requires approximately 2¼ pounds of live steer to yield 1 pound of retail beef cuts.

Although the farm value of beef has increased appreciably since the mid-1960s, it has accounted for about 65 percent of the consumer's retail beef dollar in the last decade. This ratio, commonly referred to as the farmer's share, is significantly higher for beef than for most agricultural products.

Fluctuations in Wholesale Charges

During the five years 1953-1957 the farm to wholesale price spread ranged from 7.7 to 8.9 cents per pound (Chart 4). This spread represents the wholesale charges for slaughtering beef and distributing it to retailers. This charge declined to an average of 6.4 cents per pound for the six years 1965-1970. As a percent of retail prices, this represents an appreciable decrease from the mid-1950 charges. However, wholesale charges increased to 7.7 cents per pound in 1971, apparently reflecting the impact of inflation on wholesaler costs.

Wholesale-Retail Spread Grows

The wholesale to retail spread increased fairly rapidly in the 1950s — from 12.7 cents per pound in 1951 to 19.9 cents per pound in 1959. This increased from 14.5 to 24 percent of the respective retail prices. Since then, there was a further increase in the wholesale to retail spread to 28.7 cents per pound in 1971, and to higher levels in 1972. For 1971 this spread amounted to 27.5 percent of the retail price. Thus, retailer margins have been rising both absolutely and relatively, taking a larger share of the consumer's dollar. Much of this increase is a reflection of increased costs of labor, transportation, packaging and other materials.

Conclusions

Relatively high retail prices for beef in recent months is a reflection of a number of factors. First, inflation has extended to raise costs and to push up prices generally. Second, a strong demand for beef associated with rising incomes has put a strain on the industry to meet consumer needs. Also, to provide an adequate supply of beef, the industry has had to hold back heifers for breeding stock. This has added to the stress on supplies in the short run.

Additionally, pork supplies in 1972 have been at a relatively low level following the disastrous low prices of late 1970 and 1971. As a result, pork prices have been relatively high in recent months. Pork supplies are beginning to increase, and prices should drop in the coming months which should reduce some of the pressure on beef markets.

Consumers should keep in mind that much of the upward pressure on beef prices comes from their continuous desire for more and better beef as well as increased services. It should be remembered also that the cattle industry cannot gear up to meet the consumer's needs by adding another shift as is possible in most nonfarming industries. Animal production is biologcally limited in growth and major increases take considerable time. Furthermore, the industry tends to go through price cycles which affect herd buildups. Current high prices are undoubtedly influencing producer's decisions to produce more beef animals. This should help to increase the flow of future supplies of beef, which in turn will help to maintain price stability if not to reduce present retail price levels.

Chart 4. Farm-Wholesale-Retail Price Spreads for One Pound of Choice Beef, U.S., 1949-71.

[1]*Difference between farm value and retail price in Chart 3.*
[2]*Difference between wholesale value and retail price in Chart 3.*
[3]*Difference between farm value and wholesale value in Chart 3.*

Vegetables & Melons

(From page 5)

duction areas. Winter and spring market supplies of about 1 million hundredweights are imported from Mexico. Florida, Texas, Georgia and California are major producing states, and in 1971 the combined output of these states accounted for about 65 percent of the 27.3 million hundredweights grown in the U.S. Arizona produces 2-3 percent of the U.S. crop.

Arizona's Market Position

Except for lettuce, cantaloup and honeydew melons, Arizona is not a major producing region for any of the nation's "most popular" fresh-market vegetables and melons. In some cases the shipping seasons for Arizona vegetables coincide with or comes at the end of seasons in other producing areas. For others, harvesting begins in Arizona only a week or so before harvesting gets underway in one or more of the large volume growing areas.

Arizona, then, is primarily a "fill-in" supplier for many fresh-market vegetables. That is, many Arizona vegetables are utilized to fill the short time "market gaps" immediately preceding or following shipping seasons of other larger-volume areas. Arizona's vegetable industry has taken advantage of this market opportunity, and this "fill-in" role is vital in providing a year-round supply of fresh produce for U.S. consumers.

It is also evident, however, that the short time "market gaps" for numerous vegetables has been and is vital to the Arizona vegetable industry. Apparently Arizona does not have a big production-marketing advantage for any one crop to the extent that California has for several crops, and that Florida and Texas have for one or more crops.

If this is the case, Arizona's fresh vegetable industry should remain constantly alert for new market gaps for crops which could be but are not presently produced in the state.

Also, the state's vegetable interest should strive for improved effiency and lower costs in producing and shipping vegetables and melons which are well adapted to the state's soils and growing seasons. This could make Arizona more competitive, in terms of costs and volume, with other producing areas.

Finally, the possibilities of growing vegetables for processing should be appraised periodically. As noted in the first article of this series, U.S. per capita consumption of processed vegetables is increasing, whereas it is declining for almost all fresh vegetables. If these two trends continue, the required volume of fresh-market vegetables will continue to decline relatively to the requirements for processing vegetables.

Rural Poverty

(From page 10)

Rural Poverty Deserves More Attention

The data indicate that rural poverty in Arizona directly effects a substantial number of people and a significant proportion of the total rural population. The problem, therefore, deserves the attention of policymakers, extension personnel, and researchers. If numbers count then special efforts need to be directed toward both the Indian and Spanish-American segments of the rural poor. This will require an understanding of their cultures and the role of economic development within their cultures. Rural poor who farm comprise a small portion of all rural poor, and consequently, warrant a smaller share of total development efforts. At the same time, it should be recognized that the incidence of poverty among farm families is higher than for the rural population in general, and one means of alleviating farm poverty would be to help farm breadwinners find off-farm employment. In fact, the incidence of unemployment and underemployment among the rural poor in general is relatively high and programs to increase their employment and raise their productivity may pay handsome rewards.

In the long run, the authors are skeptical that this should be done by pouring money into the industrialization of rural areas or by providing stop-gap funds to improve the deteriorated public facilities of small communities. The costs, relative to the benefits, may be far too great. Rather, at the local and state level, government officials might increase the standard of living of the rural poor by providing carefully selected education and training opportunities, as well as providing information on job vacancies and living conditions *wherever* they may exist. The Federal government might redirect some of its development funds to provide a subsidy for relocation of those "trapped" in rural poverty areas. These funds may also support education and training programs and an improved job information network. The extension service may help the rural poor by providing information on educational and training programs, job opportunities and about the more general social environment such as housing accomodations and schools in communities where jobs exist. In addition, the extension service can assist rural communities by providing information on the most efficient way to provide public service (hospitals, water systems, waste disposal systems, etc.) to rural people. Research may help determine which jobs exist where, the most efficient way of retraining the unemployed and underemployed rural poor. The most efficient ways of communicating employment opportunity information, the costs and benefits of various systems of rural public facilities, and the costs and benefits of migration of the rural poor to more metropolitan areas or growth centers.

Footnotes

[1]*Rural people are those living in towns or places of 2,500 people or less.*

[2]*The poverty income threshold provides a range of cutoffs adjusted by such factors as family, sex of the family head, number of children under 18 years old, and farm and nonfarm residence. The proverty threshold for farm families is 85 percent that of nonfarm families.*

[3]*This is approximately 3,000 fewer rural poor families than in 1960. See Terry Anderson,* Components and Causes of Rural Poverty in Arizona, *M.S. Thesis, Department of Agricultural Economics, University of Arizona, 1972, pp. 22-23 for data used in making this estimate.*

[4]*Welfare payments do not include food subsidies.*

[5]*A small proportion, less than 10 percent, of these families have children under 6 years of age.*

[6]*The* Census *data on Indian unemployment is substantially different from other information on unemployment on the reservations. For example, information from the U.S. Department of the Interior indicates that unemployment on Arizona's reservations averaged 35 percent in 1970.*

[7]*The wide range in the data indicating the proportion of farm families in poverty is due to the difference in the definitions of a farm as given in the Census of Population versus that used in the Census of Agriculture.*

Cotton Pest & Predator Reservoirs in Avra Valley

By R. E. Fye[1]

Table 1. Representative pest and predator populations on weeds and crops in the Avra Valley 1970-72.

			Pest and preditator[1] *populations in thousands:*						
			Pests			*Active Predators*			
Plant host	*Date*	*Acreage*	Lygus	*Flea-hoppers*	*Lepi-dop-tera*	*Beetles*	*Hemip-tera*	*Chry-sopa*	*Spi-ders*
London rocket, *Sisymbrium Irio L.*									
	Jan. 28	**17**	**395**	**46**		**15**	**395**	**15**	
	Feb. 24		**66**			**18**	**12**		
	Mar. 9		**24**			**3**			
do[2]	**Mar. 7**	**<1**	**14**	**<1**		**1**	**<1**		**<1**
Globe mallow, *Sphaeralcea* spp.[2]									
	Mar. 9	**19**	**574**	**13**		**3**	**43**		**13**
do	**Mar. 9**	**1000**[3]	**2450**				**1050**		**350**
Wheat-barley									
	Mar. 13	**210**		**402**		**1216**	**137**		**27**
	Apr. 21		**14**	**—**		**513**	**538**	**5**	**97**
Alfalfa									
	May 5	**300**	**3150**	**280**		**490**	**3010**		**420**
	June 2		**11165**	**70**		**2030**	**5915**		**1365**
Cotton									
	May 20	**113**				**371**	**168**		**371**
	June 17		**79**	**57**	**1**	**961**	**791**	**102**	**203**
	July 13		**520**	**689**	**102**	**2667**	**3712**		**486**
	Aug. 16		**203**		**3978**	**371**			**102**
Grain sorghum (early)									
	June 8	**100**	**—**	**—**	**—**	**10755**	**131**	**66**	
	July 8		**—**	**—**	**—**	**53125**	**492**	**49**	**1278**
Grain sorghum (late)									
	July 16	**20**	**—**	**—**	**—**	**1968**	**21**	**21**	**36**
	Aug. 19		**—**	**—**	**—**	**14**	**—**	**—**	**214**
	Sept. 2		**—**	**—**	**143**	**14**	**—**	**—**	**670**
Careless weed or pigweed *Amaranthus* spp.									
	Aug. 18	**10**	**—**	**—**	**147**		**NO DATA**		
	Sept. 1		**—**	**—**	**49**		**NO DATA**		

[1]*Fleahoppers — Nymphs and adults of* Pseudatomoscelis seriatus (*Reuter*), Spanogonicus albofasciatus *(Reuter),* Rhinacloa forticornis *(Reuter).*
Lepidoptera — Larvae of bollworms, Heliothis zea (*Boddie*), *cabbage looper,* Trichoplusia ni (*Hübner*), *and beet armyworm,* Spodoptera exigua (*Hübner*).
Beetles — Adults of Hippodamia convergens *Guérin-Méneville,* Collops *spp.*
Hemiptera — Adults and nymphs of Geocoris *spp.,* Nabis *spp.,* Orius *spp.,* Sinea *spp.,* Zelus *spp.*
Miscellaneous — Chrysopa *spp. larvae.*
[2]*Major plant in combinations with other lesser species.*
[3]*An area of 1000 acres is employed to demonstrate the potential of this reservoir. Several thousand acres are present in the Avra Valley.*

The eventual management of naturally occurring populations of insect predators may be dependent upon knowledge of the sequencing of winter weeds and crops that provides natural hosts for food for the predator species. The following data were accumulated during surveys of the Avra Valley and its immediate environs from 1970 to 1972.

Some data were collected with a sweep net. In that case, projections of the numbers of insects captured in the sweep net were made by assuming that each sweep of the net covered 5 square ft. of the weed or crop being swept. With weeds, which ordinarily do not provide a continuous cover, the sweeps were continued over the bare areas so the projections would take into account the inconsistency of the weed stand. Other data were taken with a 0.5-m^2 quadrat by placing a metal quadrat frame down in the weeds or crop and counting the insects within the boundaries. Then the projections to the per acre and total area estimates were made by utilizing the proper conversion factor. Other data were taken in row crops by counting the insects on individual plants. Projections were made to acre estimates by determining the number of plants per acre.

Selected representative data are presented in table 1 arranged chronologically so the importance of the plant sequence through the year is apparent.

Probably the most important winter weed in the Avra Valley is London rocket, a weed that grows in disturbed areas and in neglected fallow fields where it may cover a large percentage of the surface. In fallow fields and

[1]*Research Entomologist USDA and Associate Entomologist, Department of Entomology, University of Arizona.*

road ditches, London rocket harbors large numbers of both *Lygus* and predator species. In the winter of 1971-72, the lush growth dried early because of lack of rainfall, but in normal years, the weed may grow well until early April. The March 7 data demonstrate the relatively large numbers of *Lygus* harbored in small roadside patches of the weed.

At the same time the London rocket reaches its peak growth, globe mallow initiates rapid growth, and in moist situations lush plants harbor large numbers of *Lygus* and predators (table 1). Globe mallow may also grow sparsely over large areas of desert rangeland. In 1972, though the growth was limited because of lack of moisture, large numbers of *Lygus* and predators were found on the weed in the desert areas of the Avra Valley.

As the mallow matures, the predators shift to the small grain crops or to alfalfa. Those predators that inhabit the small grains feed on the greenbug, *Schizaphis graminum* (Rodani), and the populations may become large and shift to young cotton when the wheat and barley mature.

Alfalfa which is grown on a relatively small acreage in the Avra Valley, is well-known as an overwintering and nurse crop for large numbers of lygus bugs and predators. The preference of lygus bugs for alfalfa is the basis for the use of strip cutting of alfalfa in some areas of California as a method of preventing the shift of lygus bugs to cotton (Stern et al. 1967). Without strip cutting large numbers of predators as well as lygus bugs may shift from early alfalfa to the young squaring cotton or to early grain sorghum after the second cutting of alfalfa.

Early grain sorghum may support large numbers of Biotype C of the greenbug (Fye 1971), which serves as food for large populations of predators that subsequently move to cotton during the heavy fruiting period. The cotton may sustain large populations of predators during the months of July and early August, but these populations decline (Bryan et al 1973) in late August and early September at the same time that large populations of bollworms, *Heliothis zea* (Boddie), cabbage loopers, *Trichoplusia ni* (Hübner), and pink bollworms, *Pectinophora gossypiella* (Saunders), may develop.

Seasonal thunderstorms in July and August trigger the growth of careless weed or pigweed over large areas of disturbed soil. This weed sustains large populations of beet armyworms, cabbage loopers, and numerous other nonpest Lepidoptera and predators. More than 20% of the populations of the pest Lepidoptera may be parasitized by common parasites of cotton pests. In lettuce-growing areas the beet armyworms and cabbage loopers may attack fall lettuce.

A few bollworms are also found on the pigweed. However, the major fall buildup of bollworms occurs in the late grain sorghum which may also harbor limited numbers of predators. The bollworm population commonly has a large segment (8-24%) parasitized by *Microplitis croceipes* (Cresson), a major parasite of the bollworm in Pima County.

Examination of the overall data indicates that weed populations may harbor large populations of both pests and predators. Alfalfa is also a constant breeding ground for large numbers of pests and predators. The winter weeds and the alfalfa provide cover for the overwintering populations of predators that commonly feed on numerous species of aphids and soft-bodied stages of other insects. From these weeds they shift to the grain where they are sustained by the greenbug or to alfalfa where the pea aphid, *Acyrthosiphon pisum* (Harris), provides a large portion of the food supply. The corn leaf aphid, *Rhopalosiphum maidis* (Fitch) apparently moves in to grain sorghum from the early Johnson grass, *Sorghum halepense* (L.) Pers., and the predators feed on the early aphid progeny. Later the corn leaf aphid is supplanted by Biotype C of the greenbug, which may provide copious amounts of food for the predators. Cotton provides a sustaining supply of soft-bodied insects and eggs for the predator population as does late grain sorghum. In addition, careless weed harbors many lepidopteran larvae and a large complex of aphids and other soft-bodied insects on which the predators may feed. Apparently a major food source for the predator complex throughout the season is the family Aphididae.

It is interesting that the current farm crop production sequence is favorable for the production of large populations of predators when insecticides are not used. Apparently a potential exists for the manipulation of the crops to enhance the numbers and activity of predator species. The large numbers of predators observed may indicate that only minor adjustments in the timing of the cropping sequence are needed to accomplish a much more effective usage of naturally occurring predator populations.

REFERENCES CITED

Bryan, D. E., R. E. Fye, C. G. Jackson, and R. Patana, 1973. Releases of *Bracon kirkpatricki* (Wilkinson) and *Chelonus blackburni* Cameron for pink bollworm control in Arizona. USDA Prod. Res. Rep. (In press).

Fye, R. E. 1971. Grain sorghum — a source of insect predators for insects on cotton. Prog. Agric. Ariz. 33: 12-13.

Stern, V. M., R. van den Bosch, T. F. Leigh, O. D. McCutcheon, W. R. Sallee, C. E. Houston, and M. J. Garber, 1967. *Lygus* control by strip cutting alfalfa. Univ. Calif. Agric. Ext. Serv. Bull. AXT-241. 13 pp.