utback

xed costs associated with invest-ents in gins and other marketing fa-lities. Unlike total variable cost, tal fixed cost remains unchanged nce it is established for the season, ven if the facility is not used. Thus, ne greater the volume processed or andled, the lower the fixed cost per ale. Conversely, as the volume han-led declines, fixed cost per bale in-reases because there are fewer bales absorb the total fixed cost.

Although all business firms should ntinually strive for greater effi-ency, the problem of maintaining olume is currently more critical than perating efficiency for firms provid-g cotton marketing services in Ari-na. With prospects of an annual olume down 40 percent from the cent peak production in 1962, al-rnatives confronting these firms are) accept sharply lower profit mar-ns, (2) substantially increase their arges to producers, (3) temporarily se down, or dispose of some of eir facilities and thereby reduce the ntity of services provided, (4) ne combination of any or all of the st three choices, and (5) go out of siness. None of these alternatives e mutually attractive to producers, nners, warehousemen, and other in-vidual segments of the cotton trade. us, the final choice for individual ms will be difficult.

Forced to Face Problem

During the past decade many firms ve already faced up to these oices, because of increases in in-stments in gins and other facilities, d almost continuous increases in it costs of variable inputs for op-ating them. In many cases, these ms partially counteracted rising in-stment and input costs by improv-; their operating efficiency, and/or reasing their charges to producers. For example average charges for ning Arizona upland cotton in-ased fairly steadily from about 50 per bale in 1950 to $18.79 in 65 (See Graph). This increase in arges is equivalent to a reduction almost 2 cents per pound in the ce producers receive for cotton.

Charges for warehousing services, ept for receiving, also went up dur-this 16-year period. The charges bale for compression in Arizona nt up from $1.40 to $1.76 for stand-density, and from $1.50 to $1.96 for high density. Monthly charges per bale for insured storage increased from 30 cents in 1950 to 51 cents in 1965. Receiving charges, which averaged $1 per bale from 1952 to 1961, were 52 cents per bale in 1965.

Drastic Cut in Volume

Production of cotton in Arizona exceeded 700,000 bales annually during this period of rising charges to growers. With production in 1966 expected to drop to the lowest level since 1950, the problem of reversing or at least checking the upward trend in marketing costs and charges becomes increasingly difficult.

For the past seven ginning seasons, for example, there were approximately 135 to 140 gins in Arizona. Their average annual volume ranged from a low of about 5,250 bales in 1959, to a high of about 6,700 bales in 1962. To even maintain the 1959 average, less than 100 gins would be required to handle the estimated production of 523,000 bales in 1966. And, apparently, average volumes as great as 6,000-7,000 bales are insufficient to appreciably offset rising costs and to reverse the upward trend in ginning charges.

The problems resulting from the reduction in volume as summarized here not only deserve the attention of the immediate firms involved, but are equally important to all other sectors of Arizona's cotton economy.

Multiplier Effect Of Decreased Acreage On Arizona Economy

By William E. Martin and Leonard Bower

The 1966 upland cotton crop is being grown according to a new set of government regulations intended to reduce acreage and production of this surplus crop. To receive price supports for the cotton grown, producers were required to reduce plantings at least 12.5 percent from the maximum set by their allotment (small farms were excluded).

In addition, growers were encouraged to divert another 22.5 percent of their effective allotment, for which they would receive government payments. Thus, cotton producers were able to divert up to a total of 35 percent of their effective allotment in 1966 and receive payments for doing so.

Arizona upland cotton farmers have diverted acreage at close to the 35 percent maximum for which government payments will be made. Table 1 shows the breakdown by county of acreage planted and diverted out of the current allotments. Of Arizona's 2,749 cotton farms, 2,610 have signed up for participation in the 1966-67 program. Our purpose is to assess the impact on the entire Arizona economy resulting from the large decrease in cotton production which is taking place between 1965 and 1966. Effects on income and labor and water use will all be considered.

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Input-Output Analysis

The method of analysis is input-output, already quite familiar to economists and rapidly finding wider usage outside of strictly academic problems. Input-output analysis is an analytical tool blending together theoretical, mathematical, and statistical aspects of the field of economics. Essentially, it is a method of output accounting which takes advantage of the relatively stable pattern of the flow of goods and services among the sectors of our economy.

We have constructed a 25-sector input-output model for Arizona which relates each of Arizona's producing sectors to every other producing sector in the state. This model enables us to assess the impact of a change in any one sector on all other sectors. In this particular case, cotton is un-

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dergoing a substantial decrease in production. Using our model, the total impact on the other 24 sectors of the Arizona economy can be assessed along with the effects on the cotton industry itself.

In column one of Table 2 are the estimated decreases in production for each of the 25 interdependent Arizona sectors as a result of the decrease in cotton production from 1965 to 1966. The figures are dollar values of output expressed in terms of 1965 prices. The $35 million figure for the cotton sector is not hard to understand. With the decrease of about 34 percent in acres planted, the expected result is a substantial decrease in value of production. The other entries in column one are direct *and indirect* results of the decreased need for productive inputs in the cotton sector.

Many Are Affected

Cotton farmers buy part of their fertilizer, machinery, services, and other supplies from Arizona industry. When cotton acreage is cut back, the amount of inputs required from these other Arizona producing sectors is also reduced. A study of cotton production reveals that this sector makes direct purchases from only 10 of the 24 other sectors listed. However, when indirect effects are taken into account, a decrease in cotton production has an effect on 22 of the other Arizona sectors.

Chemicals and fertilizers (sector 16) is an example of a sector from which cotton directly purchases inputs for its own production. Cotton does not make any direct purchases from the mining sector but still affects mining. Part of the explanation is that cotton buys inputs from fabricated metals and machinery (sector 18) which in turn buys some inputs from mining. Another example is meat animals and products (sector 1) from which cotton makes no direct purchases of inputs. However, chemicals and fertilizers (sector 16) purchases inputs from meat and poultry processing (sector 12) which in turn purchases inputs from the meat animals and products sector.

A complete evaluation of the economic effects of the decrease in cotton production must take into account all of these circular indirect effects as well as the direct effects. One of the advantages of input-output analysis is that it makes possible this complete analysis. The most affected of the other agricultural sectors is miscellaneous agriculture (sector 10), which is composed in part of cotton ginning, a service that will be needed much less in 1966.

Table 1. Arizona Participation in the 1966-67 Upland Cotton Program.

County	*Acres Allotted*	*Acres Planted*	*Acres Diverted*	*Percent of Acres Diverted*
Cochise	13,649	9,730	3,919	28.7
Gila	37	24	13	35.1
Graham	8,768	6,077	2,691	30.7
Greenlee	1,700	1,274	426	25.0
Maricopa	124,672	80,635	44,037	35.3
Mohave	406	264	142	35.0
Pima	21,447	13,976	7,471	34.8
Pinal	128,514	83,812	44,702	34.8
Santa Cruz	478	311	167	34.9
Yavapai	12	8	4	33.3
Yuma	29,942	21,766	8,176	27.3
All Arizona	329,625	217,877	111,748	33.9

Source: United States Department of Agriculture, Agricultural Stabilization and Conservation Service, Arizona State Office, Phoenix, Arizona, June 1966.

Table 2. Decreases in Gross Output, Employment, and Water Intake Anticipated in Arizona Economic Sectors as a Result of the Increased Cotton Acreage Diverted from 1965 to 1966.[a]

	Sector	*Decrease In*		
		Value of Gross Output	*Labor Requirements*	*Water Intake Required*
		Dollar	Man-Hours	Acre-Feet
1	Meat Animals & Products	5,260	385	2.06
2	Poultry & Eggs[b]			
3	Farm Dairy Products	3,557	764	.90
4	Food & Feed Grains	36,962	10,069	2,841.63
5	Cotton	35,264,839	2,846,014	470,857.90
6	Vegetables[b]			
7	Fruit & Tree Nuts	42	10	.37
8	Citrus	42	10	.41
9	Forage	274,166	38,431	11,806.16
10	Miscellaneous Agriculture	3,750,300	631,891	23,334.03
11	Grain Mill Products	12,171	544	.22
12	Meat & Poultry Processing	9,007	314	.11
13	Dairy Products	8,256	511	.07
14	Canning, Preserving & Freezing	803	100	.04
15	Miscellaneous Agric. Processing	21,082	2,311	.41
16	Chemicals & Fertilizers	716,534	44,842	20.42
17	Petroleum	24,532	1,012	.52
18	Fabricated Metals	139,309	21,541	.41
19	Aircraft & Parts	21,646	4,508	.07
20	Primary Metals	32,791	1,716	5.32
21	Other Manufacturing	135,924	17,797	1.16
22	Mining	12,498	1,031	1.50
23	Utilities	566,165	82,028	112.18
24	Services	3,136,309	327,942	27.84
25	Trade & Transportation	292,921	82,655	2.66
	Total All Arizona	44,465,116	4,116,426	509,016.40

[a] All decreases are from the 1965 levels in the 25 Arizona sectors.
[b] The blank entries indicate that cotton is not related, either directly or indirectly, for inputs to this sector.

Among the nonagricultural sectors,

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chemicals and fertilizers, utilities, and services experience the greatest adverse effects from the decreased level of cotton production. The total effect on gross domestic products in Arizona for 1966 is estimated by the model to be nearly $44.5 million.

By comparing the total effects on the Arizona economy with the direct effect on cotton, we derive an income multiplier for the cotton sector. The value of this multiplier is 1.26. This means that for every dollar decrease in production in the cotton sector the total decrease in the entire Arizona economy will be $1.26. This value is somewhat smaller than the majority of the multipliers in the Arizona economy; 18 of the 25 sectors have larger multipliers.

Cotton occupies a rather unique place in the economic structure of Arizona. All of the cotton output is sold to places outside of Arizona and is, in the context of the input-output model, produced for final demand. Cotton does not serve as an input for any other Arizona producing sector but affects, directly or indirectly, nearly every other sector by its own input purchases.

How About Other Crops

The decreases in production in the Arizona sectors could be offset if some other crop (or crops) were being grown on the acres diverted from cotton. However, the government program was designed to reduce surpluses and, therefore, prohibits farmers from taking their land out of cotton, for which they receive government payment, and planting some other surplus crop. There are a few minor crops which could be planted on the diverted acreage, but these do not appear to have any significance.

In the long run, over the next one to five years, it is possible that cotton growers will release part of their allotments and shift some of their acres into alternative crops. This is not taking place in the current year, thus there is little offset to the decreased cotton acreage planted.

Although cotton production is expected to decrease in value by more than $35 million, cotton farmers will not fare as badly as may appear at first glance. Arizona cotton farmers are receiving payments for taking acres out of production in 1966. These payments are based on the expected production which would have occurred had the land actually been planted. On this basis, Arizona cotton farmers should receive about $12.7 million in direct government payments for taking their land out of production.

The question of the welfare of the cotton farmer depends on what happens to his net income per acre on the diverted acres in 1966 as compared with what might have occurred had he not diverted. Arizona cotton budgets show a top return per bale of $64.62 before fixed costs and a low return of $46.22 per bale before fixed costs. (Fixed costs are those costs which occur whether or not a crop is grown, for example taxes.) The difference in the return per bale depends largely on the cost of water needed for irrigation. The scale of government payments on diverted acres will yield a net return of about $52.50 per bale before fixed costs. Thus, even though the value of cotton production will be greatly reduced in 1966, and in turn the level of economic activity in the entire state will be affected, the net income of cotton farmers will not be altered much.

Seriously Affects Labor

Another way to measure the impact of the 1966 decrease in cotton production is to look at its effect on labor in the state economy. In order to produce cotton, labor is required as one of the productive factors. To supply the other material inputs which cotton buys from other Arizona sectors, labor is also required. Thus, the initial decrease in cotton production will decrease its own demand for labor but will also cause decreased labor demands in all other Arizona sectors which directly or indirectly supply inputs for cotton production. These effects are shown in column two of Table 2. The values in column two depend on the labor intensity of the various sectors and also the extent to which they provide inputs for the cotton sector. Miscellaneous agriculture, utilities, trade and transportation, and services, along with cotton, have the largest decrease in man-hour labor requirements. In the entire State economy, the estimated reduction in labor demand is about 4.1 million man-hours.

The 1966 decrease in cotton production will also affect Arizona's scarce primary resource, water. Each producing sector has some requirements for water as an input. The size of this requirement varies greatly between the 25 Arizona sectors. Column three of Table 2 gives the decrease in water requirements for each sector as a result of the decrease in cotton production. Diverting acreage from cotton production saves nearly 471,000 acre-feet of water in that sector alone; another 38,000 acre-feet is saved in the other sectors because of the reduced levels of output required.

Nearly all of the decreases in water requirements occur in the agricultural sectors (1 through 10) because of their large water intake per dollar of output. The manufacturing, trade and service industries use relatively small amounts of water per dollar of production. The 509,000 acre-foot decrease in water requirements represents roughly seven percent of Arizona's annual water usage.

Conclusions which emerge from this input-output study of the 1966 decrease in cotton production are:

1. **There will be large decreases in gross output and labor requirements in the cotton sector and those other producing sectors which, directly or indirectly, provide inputs to cotton growers.**
2. **The net income position of cotton growers should not be greatly affected by the 1966 program because of the payments received for diverting acres.**
3. **Water requirements in the Arizona economy, particularly in agriculture, will show a substantial decrease.**

Barley Cross Is Released as Breeding Stock

The Agricultural Experiment Stations of The University of Arizona and Cornell University, and the Crops Research Division, ARS, U.S. Department of Agriculture, announce release as a breeding stock of the Composite Cross XXVII of world winter barleys.

This cross is the result of cooperative efforts of members of the Agronomy Department, University of Arizona; the Department of Plant Breeding, Cornell University; and the Crops Research Division, ARS, U.S. Department of Agriculture. Work here was done by Dr. R. T. Ramage, ARS and UA barley geneticist, and R. K. Thompson, research associate in agronomy.

Composite Cross XXVII is the result of harvesting naturally pollinated male sterile segregates in a bulk planting of the F_2 generation of the original composite cross of world winter barleys, which was released to plant breeders in 1964. Seed from

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