

ARIZONA STA. BUL. 25.

EIGHTH ANN. REP.

UNIVERSITY OF ARIZONA.

Arizona  
Agricultural \* Experiment  
Station.

BULLETIN NO. 25.

Eighth Annual Report

BY  
WM. STOWE DEVOL,  
DIRECTOR.

Tucson, Arizona, June, 1897.

# Arizona Agricultural Experiment Station.

*Appointed by the Governor of the Territory.*

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JAMES W. TOUMBEY, B. S.....	Botanist and Entomologist
ROBERT H. FORBES, B. S.....	Chemist

MARK WALKER, JR.....	Assistant in Chemical Laboratory	} Station No. 1, Tucson
HARRY G. WOLFGANG.....	Florist and Assistant Horticulturist	
G. M. GILLETT.....	Assistant Meteorologist	
LEE LACHANCE.....	Stenographer	
FELIX G. HAVENS.....	Foreman	
N. H. CLAFLIN, M. D.....	Foreman Station No. 2, Phoenix	

*The Bulletins of the Station are sent to all residents of Arizona applying for them.*

The Experiment Station respectfully solicits suggestions relating to the important work it is attempting to accomplish in the development of the agricultural resources of the Territory.

Questions upon subjects within the scope of the Station work will be cheerfully answered whenever possible.

Address all communications to

DIRECTOR EXPERIMENT STATION,  
TUCSON, ARIZONA.

## FINANCIAL REPORT

*For the Fiscal Year Ending June 30th, 1897. Agricultural Experiment  
Station of the University of Arizona, in account with*

## THE UNITED STATES APPROPRIATION, 1896-7.

DR.		
To receipts from the Treasurer of the United States as per appropriation for fiscal year ending June 30, 1897, as per Act of Congress approved March 2, 1887.....		\$ 15000.00
CR.		
	Abstract	
By Salaries.....	1.	\$ 6734.14
Labo.....	2.	4687.43
Publications.....	3.	530.98
Postage and stationery.....	4.	153.15
Freight and express.....	5.	100.66
Heat, light and water.....	6.	49.56
Chemical supplies.....	7.	204.32
Seeds, plants and sundry supplies.....	8.	180.91
Fertilizers.....	9.	369.75
Feeding stuffs.....	10.	242.91
Library.....	11.	17.34
Tools, implements and machinery.....	12.	182.39
Furniture and fixtures.....	13.	41.74
Scientific apparatus.....	14.	247.18
Live stock.....	15.	
Traveling expenses.....	16.	447.95
Contingent expenses.....	17.	378.85
Building and repairs.....	18.	424.09
Balance.....		.65
Totals.....		\$ 15000.00

We, the undersigned, duly appointed auditors for the corporation, do hereby certify that we have examined the books and accounts of the Experiment Station of the University of Arizona, for the fiscal year ending June 30th, 1897; that we have found the same well kept and correctly classified as above, and that the receipts for the time named are shown to have been \$15,000.00, and the corresponding disbursements \$14,999.35, for all of which proper vouchers are on file and have been by us examined and found correct, thus leaving \$0.65

HOWARD BILLMAN,  
SELIM M. FRANKLIN,

Auditing Committee of the Board of Regents.

I hereby certify that the foregoing statement of account, to which this is attached, is a true statement from the books of account of the institution named.

[SEAL]

SELIM M. FRANKLIN,  
Treasurer.

We, the undersigned, do hereby certify that the above is the signature of Selim M. Franklin, treasurer of the Agricultural Experiment Station of the University of Arizona, and that the above is the seal of said institution.

JOHN H. MARTIN,  
Secretary Agricultural Experiment Station,  
University of Arizona.

WM. SCOWE DEYOL,  
Director of the Experiment Station

## List of Bulletins

PUBLISHED BY THE ARIZONA AGRICULTURAL EXPERIMENT  
STATION TO JUNE 30TH, 1897.

- 1—Arizona Experiment Station, 4 pages.
- \* 2—Part I, Notes on Some of the Range Grasses of Arizona ( 11  
Part II, Overstocking the Range. ) pages.
- \* 3—Irrigation in Arizona, 14 pages.
- \* 4—Waters and Water Analysis, 16 pages.
- 5—Canaigre, 5 pages.
- 6—Soils and Waters, 8 pages.
- 7—Canaigre, 40 pages.
- \* 8—Cattle Feeding, 10 pages.
- \* 9—Insects and Insecticides, 10 pages.
- 10—Experimental Work at Wilcox, 16 pages.
- 11—Agricultural Development in Southwestern Arizona, 8 pages.
- 12—Preliminary Report of Observations on the Crown-Knot, 11  
pages.
- 13—The Mesquite Tree: Its Products and Uses, 13 pages.
- \*14—Notes on Scale Insects in Arizona, 28 pages.
- 15—List of Varieties of Fruits, 19 pages.
- \*16—Notes on Apricots at Phoenix Station, 15 pages.
- 17—Agricultural Convention. Part I, 30 pages.
- 18—Agricultural Convention. Part II, 24 pages.
- 19—Sixth Annual Report, 8 pages.
- \*20—Arizona Weather, 38 pages.
- 21—Canaigre, 35 pages.
- 22—Something About Weeds, 32 pages.
- \*23—Sugar Beets, 44 pages.
- 24—Seventh Annual Report, 10 pages.
- 25—Eighth Annual Report, 9 pages.

The supply of bulletin marked thus (\*) is exhausted. Copies of all others will be sent free to applicants so long as the supply lasts. Address

DIRECTOR EXPERIMENT STATION,  
Tucson, Arizona.

## REPORT OF THE DIRECTOR.

HOWARD BILLMAN, *President University of Arizona.*

DEAR SIR:—I have the honor to submit herewith the Eighth Annual Report of the Arizona Agricultural Experiment Station. In compliance with the request of the Director of the Office of Experiment Stations, United States Department of Agriculture, Washington, D. C., the date of issuing the annual report is changed from December 31st to June 30th in order that the operations reported upon may correspond with the financial statement for the fiscal year. This report, therefore, covers operations for six months only from January 1st to June 30th, 1897.

The Experiment Station has done more work, both of practical and scientific nature, during the past six months than for any similar period in its history, and I am pleased to note that the character of work is steadily improving in quality. The energies of the Director have been given more to furthering experiments with sugar beets than in any other direction. I have visited all the valleys under irrigation containing a sufficient area of land for the culture of the sugar beet to warrant the trial of this crop in the several localities, and sugar beet seed was distributed to those farmers who would agree to undertake growing beets therefrom and keep a record of all operations performed in the experiment. These and others throughout the Territory receiving seeds make a total of about 300 individuals. Since the seed was planted the Director has again visited all the larger valleys for the purpose of inspecting the growing crop and give such instructions as might be found necessary to secure the best results from the experiments. For the purpose of undertaking this work in as thorough a manner as possible the station purchased 175 pounds of sugar beet seed and in addition thereto received a donation from the Chino Valley Beet Sugar Factory, of Chino, California, of 150 pounds of seed, and from the United States Department of Agriculture 200 pounds of seed. Although a number of failures are already recorded among those who are trying sugar beets, there is a sufficient number having good success in the experiment to warrant the belief that the results will be most satisfactory. For the purpose of making a still more careful examination of the sugar beet in this Territory about two and one half acres of ground was planted to beets at the Phoenix Station and nearly as much upon the grounds leased for the use of the Station at Tucson. Additional ground has also been obtained for the sugar beet and tobacco work. In addition to the sugar beet seed quite a quantity of seeds of tobacco, of Australian salt bush and of ramie have been distributed throughout the Territory.

The experiments with canaigre have been prosecuted with vigor at both the Phoenix and Tucson Stations and the crop is now being harvested, with indications that it will be larger than was anticipated.

The experiments with grasses and forage plants suited to arid regions have been continued upon the Phoenix Station. In addition to

those planted last year there have been sown about one hundred other varieties of seeds of grass and forage plants, as follows, each being sown in four different ways:

*Atriplex canescens* (white sage), *A. Australis* (old man salt bush), *A. Halmoides*, *A. Letocarpa*, *A. Numularia* (New Zealand salt bush), *A. Truncata* (Utah salt bush), *Poa Arachnifera* (Texas bluegrass), *P. Pratensis* (Kentucky blue grass), *P. Nemoralis* (Northern blue grass), *P. Fertilis*, *P. Compressa*, *P. Buckleyana*, *P. Trivialis* (roughish meadow grass), *Phalaris Carolinica* (Carolina timothy), *Agropyrum divergens* (bunch grass of Oregon), *A. Acutum Europe*, *A. Richardsonii* (bunch wheat grass), *A. pseudorepens*, *A. Repens* (quack grass), *A. Spicatum* western (wheat grass), *A. Tenerum* (slender wheat grass), *Bromus inermis* (Hungarian brome grass), *B. Advensis*, *B. Carinatus*, *B. Ciliatus*, *B. Giganteus*, *B. Mollis*, *B. Pratensis*, *B. Purgans*, *B. Tectorum* L., *Phleum pratense* (timothy), *Melilotus alba* (Bokhara clover), *Medicago sativa* (alfalfa), *M. Lupulina*, *M. Media*, *Trifolium hybridum* (Alsike clover), *T. Incarnatum* (crimson clover), *T. Pratense* (red clover), *T. Repens* (white clover), *T. Longipes* (Rocky Mountain clover), *T. Beckwithii*, *Lathyrus sylvestris* (flat pea), *Anthyllus vulneraria* (horn pod clover), *Vicia villosa* (hairy vetch), *Gozsia pungens* (Korean lawn grass), *Lolium perenne* (English rye), *L. pterenne tenue*, *L. Italicum*, *Sporobolus Wrightii* (Saccatone), Kooma seed from mountains of Persia, *Avena elatior* (tall oat grass), *Festuca Augustifolia*, *F. arundinacea*, *F. Fenas*, *F. heterophylla*, *F. fluitans*, *F. ovina Arizonica*, *F. Ovina Var*, *F. ovina durinscula*, *F. ovina Var* (Montana sheeps fescue), *F. ovina*, *F. ovina sulcata*, *F. pratensis*, *F. Ruhra glaucescens* (Tennessee fescue), *Agropogon cannum* (Bearded wheat grass), *Panicularia aquaticus*, *Panicum colonum*, *P. Crusgalli*, *P. frumentescum*, *P. Virgatum* (switch grass), *Paspalum pubiflorum glabrum*, *Phalaris arundinacea* (reed canary grass), *Hilaria cenchroides*, *H. Jamesii*, *H. Rigida*, *Hordeum adscendens*, *H. bulbosum*, *H. Chilense*, *H. pratense*, *Becmania erucaeformis* (water timothy), *Bouteloua micrastachya* (six weeks gamma), *Bigelovia graveolens albucaulis*, *Aira flexuosa*, *A. cespitosa*, *Agrostis stolonifera* (broad leaved creeping bent grass), *A. capilaris*, *Paspalum dilatatum* (hairy flowered paspalum), *Stipa robusta*, *Soja hispida* (Soja bean), *Astragalus crassicaerpus* (Buffalo pea), *Housukia purshiana*.

Experiments with Australian salt bush have been continued and the results are confirmatory of the opinion expressed some time since, to the effect that it may prove a valuable forage plant for this region. A larger area has been set to tobacco than was planted last year, although a smaller number of varieties are growing this year. The experiments with ramie this season show that the plant still continues making satisfactory growth and it will apparently prove a valuable crop for this region should satisfactory decorticating machinery be devised.

Early frosts have been very disastrous with some varieties of fruit more so this season than usual. The almond crop is entirely destroyed

and most of the peaches as well. The apricot crop though small is very good.

But a part of the time of the florist has been given to greenhouse work though a very large number of tobacco plants have been propagated and experiments have been conducted in the growing of Australian salt bush plants, and in the production of tomatoes under glass. This latter experiment has been very interesting indeed and a large crop of tomatoes has been grown; the quality has been superior. Care has been given to the preparation of the soil of the proper character for these experiments resulting in a mixture which is found to be very friable, easily worked and yet sufficiently compact to hold moisture well and sufficiently rich to give a vigorous and healthy growth.

During the past six months the following bulletins have been issued:

No. 22 "Something about Weeds" by James W. Toumey, Botanist and Entomologist, 32 pages;

No. 23 "Sugar Beets" by Wm. Stowe Devol, *Director*, Agriculturist and Horticulturist, assisted by the other members of the station staff, 44 pages;

No. 24 Seventh Annual Report, by the Director, 10 pages;

No. 25 Eighth Annual Report, by the Director and other members of the Station staff, 9 pages.

The Director has also prepared and distributed press bulletins Nos. 10, 11, 12, 13. These press bulletins have been published very generally by the news papers of the Territory who have also been very liberal in publishing other matters respecting the Experiment Station and its work.

There have been some changes in the working force of the Experiment Station. Mr. Felix G. Havens has been secured as foreman of the Station and University grounds at Tucson. Mr. H. G. Wolfgang has been made Florist and Assistant Horticulturist. Mr. E. M. Boggs has been granted a leave of absence for the ensuing year.

There have been some additions to the equipment of the agricultural and horticultural departments. None, however, have entailed the expenditure of a very large sum of money. The following are the most important items:

September, 1896, 1 breaking plow.....	\$14.75.
October, " 1 small plow.....	7.00.
May, 1897, 1 canaigre digger.....	7.30.
" " 1 California cultivator.....	18.00.

In addition thereto hand tools have been purchased to the amount of \$24.00. We have also received from D. M. Osborne, San Francisco, California, one Flexible Reversible disk harrow in exchange for the wooden frame harrow which we were using. This is a very valuable implement as we find it well suited for throwing soil to or from fruit trees, also a convenient implement for cleaning out shallow irrigation ditches as well as for stirring the soil, for which purpose it was designed.

Following may be found the reports of the other members of the station staff as transmitted to me.

Very respectfully submitted,  
Your obedient servant,  
WM. STOWE DEVOL,  
*Director.*

TUCSON, ARIZONA, June 2, 1897.

PROFESSOR W. S. DEVOL, *Director.*

DEAR SIR:—The financial statement of this department for the past eighteen months is as follows:

Jan. 23, 1896, Paper for herbarium use.....	\$14.10.
“ Sterilizer.....	30.00.
June 26, 1896, Microscopical apparatus.....	109.55.
“ Bacteriological.....	99.87.

Two bulletins have been issued:

No. 14, Notes on Scale insects in Arizona.

No. 22, Something about Weeds.

Estimated material needed until October, 1897 is now in the hands of President Billman.

The work of the department for the past eighteen months has been covered by monthly reports

Respectfully submitted,  
J. W. TOUMEY,  
*Botanist and Entomologist.*

TUCSON, ARIZONA, June 1st, 1897.

DIRECTOR W. S. DEVOL, *Experiment Station, Tucson, Arizona.*

DEAR SIR:—Concerning the work of the chemical department of the Arizona Experiment Station for the past six months I have to report that the time of the assistant has been occupied chiefly in the analysis of a collection of representative soils from the Salt River Valley. This work which has been under way for the better part of a year is now nearing completion and through it a fair idea of the character of the soils of this important agricultural region has been obtained. It is thought that the data obtained will have important suggestions for the fertilization of the orchards and other crops which are being attempted in this region. It is hoped that a bulletin embodying the results obtained may be gotten ready early in the fall.

The time of the chemist has been largely occupied by additional investigations of canaigre. A complete proximate analysis of this material has been successfully carried through and a number of additional substances determined and discovered; the relation of composition to the commercial properties of the plant, such as color, sugar, tanning materials and others, determined; and through the knowledge obtained an improved method of analysis has been perfected. The material embodied in Bulletin 21 has been rewritten and additions made to it along the



lines of work just mentioned, keeping our information on this subject up to date and giving a considerable quantity of material which is available at any time for bulletins and technical articles.

In addition to these lines of investigation the chemists have done such minor work from time to time as was submitted to them. A considerable number of water samples have been examined at the request of various residents of the Territory and analyses of canaigre and canaigre extract have been made for occasional parties desiring the same. The chemist has also had occasion to visit the two creameries of the Salt River Valley for the purpose of testing their methods of milk examination and advising as to the same.

During the past eighteen months the equipment of the laboratory has been maintained and added to from time to time according to current needs. The laboratory has been fortunate in securing most of the apparatus and supplies required and has been able to prosecute its work to good advantage because of this fact.

A brief list of the articles added to the equipment is submitted. The chief needs of the laboratory in the immediate future will be some rasping machinery for the beet sugar work and various other minor articles which can only be specified as the need for them arises.

Respectfully submitted,

ROBERT H. FORBES,

*Chemist.*

Jan. 1,	"	Filters, flasks, ether.....	29.00
"	4, 1896,	Blast lamp, bellows and rubber.....	\$ 10.00
Apr. 15,	"	Reagent bottles.....	10.30
Feb. 1897.		Extr. Apparatus.....	4.00
"		Burners, batteries, rubber goods, sample jars, beakers, and flasks.....	100.00
			\$153.30



