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University of Arizona, College of Agriculture
EXTENSION SERVICE

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How To Improve Standard Farm Crops in Cochise County

By
A. L. PASCHALL
County Agricultural Agent



Cochise County Crop of Pink Beans, Cleaned and Ready for Shipment.

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*Drafted for military service.

HOW TO IMPROVE STANDARD FARM CROPS OF COCHISE COUNTY

Were it not for the fact that somebody had taken the pains, study and work to improve our crops we would still be producing ten bushels or less of corn instead of 100 bushels or more per acre!

Good soil, moisture, best time and method of seeding, good cultivation, are all necessary in order to obtain best results, but with all of these observed, if seed of poor parentage or weak vitality is planted there will be poor results and the costly work and attention may be wasted. As an example of this, several years ago the Arizona Experiment Station carried on tests with about twenty samples of corn, including almost as many varieties, which were sent to the plant breeder by farmers in different parts of the State. These samples were planted on the Station grounds, given similar treatment and care. The yields ranged from fifteen bushels per acre to 105 bushels. This difference in yields was due to the variety, adaptation, quality or breeding of the seed.

According to Cornell University Experiment Station (Bul. 41), "Farmers recognize the importance of stockbreeding and on all stock farms more or less careful attention is given to the matter of breeding and improving the strain raised. To every farmer the field of breeding, whether in plants or animals, furnishes an interesting and profitable diversion. Plant-breeding should become a farmer's fad. Few can afford to breed animals in the extensive way necessary to secure important results, owing to the expense. No farmer, however, is so poor but that he can have his breeding patch of corn, wheat, potatoes or other field crops. Indeed, if they but knew it, they can ill afford not to have such a breeding patch to furnish seed for their own planting."

The Secretary of Agriculture in Yearbook for 1916 (page 35) states: "The extent to which the productiveness of such a crop as corn can be improved through continued selection is illustrated strikingly by the results of work done by the department specialists. For 14 seasons the yields of 10-acre fields of corn, planted in a 3000-acre farm in Ohio with seed selected from the department cooperative improvement plots on the farm, have been contrasted with the farm yields of the same variety of corn less rigidly selected and grown under identical cultural conditions. During the first seven-year period the fields planted with department seed yielded 13.3 bushels per acre *more* than the farm fields,

while for the second seven-year period the increase averaged 21.8 bushels per acre."

In Cochise county on the same farm an acre planted with seed of selected and bred-up corn yielded 68.4 bushels, while in an adjoining acre of similar soil, seed of local but unselected seed of the same variety was planted and given the same treatment and yielded only 35 bushels.

All of our best cultivated crops came from very much inferior wild types of plants. Through rigid and systematic seed selection and breeding these crops have been constantly improved and the limit has not yet been reached with any of them. When Indian corn or maize reached the production of 80 to 100 bushels per acre some people seemed inclined to think that the limit had been reached, but the production has reached 234 bushels on one acre. Of course other things entered in to make this big yield, such as fertile soil, proper planting and cultural methods, but the kind of seed had an important part in this phenomenal yield.

The improved or bred-up qualities or characteristics in these high-yielding strains are what are sometimes termed artificial or unstable, so that when selection is discontinued the variety reverts to the strongest or predominating characteristic, which is the old inferior type—just the same as the highest bred type of hogs will revert to the long-nose "razor-back" if selective breeding and careful handling is discontinued.

Local Adaptation

For best results with some crops, especially corn, the variety must be adapted to local climatic, moisture and soil conditions. So, a variety of corn which will yield well in New York, Iowa or some other state, may not be the one to plant in Cochise county. The farmer is quite often enticed to abandon a good yielding variety which is already adapted, and send away for high-priced seed of a variety which is highly advertised. Sometimes these new varieties are planted along with the one already on the place and thus a mixture results in which both varieties are ruined. With some other crops, especially potatoes, it is best to import northern-grown seed every few years, as seed grown in our warm climate will gradually deteriorate to such an extent that best results will not be secured. In the case of potatoes, however, if rigid selection of the best yielding hills for seed is practiced the seed will improve for a few years even in warm regions, especially if the potatoes for seed are dug before the tubers are fully matured.

Weed Out the Scrub Plants

With the farmers who do select seed the practice of field selection is the most common one. In this field-wide selection the influence of the male plant is often lost sight of. The best ears from the best plants are selected. The next crop may not produce the kind of seed which was selected and planted for that crop. In this case the improvement through selection is less than half done. Animal breeders give most attention to the male parent and improvement in herds is accomplished by the improved male. The plant which produces the pollen and pollinizes the ear or flower of another plant is the male parent. While the plant which produces the fruit, seed or ear is the mother parent. The best appearing seed from the best plants may be selected, but this seed may have been pollinized from a very poor male plant, in which case the progeny would be a cross between the good and the poor plants, and since the poor characteristics are the stronger the progeny is very likely to be poorer than the average of the two parents. However, even field-wide selection improves the crop, for it is not always that the better plants are pollinized by the poor ones. Thus it is easily seen that if a seed-breeding plot or acre is planted separately and the poor plants are pulled out before pollen is produced, all of the seed must then be pollinized from the good male plants.

Standardization

The first step in improving a given crop is that of standardization. There is a certain type in each crop which is called a standard. It is working toward this high standard that crops are improved. Unless a standard is set to work towards, there will be no permanent improvement. In practically all fields of crops there will be certain plants and seed which measure up to our ideal of what such should be for best results. There may be only a few plants or seed of this kind in a field, but by selecting these and planting them in a small seed plot and weeding out the undesirable plants from year to year thus the crop will be rapidly improved. Of course, in order to do this we must have clearly in mind the type towards which we are working, and such a type must be that which will be the best for greatest returns. Even in what is termed a pure strain of variety there will be dissimilarities. These must be discarded in saving for seed.

Keep Varieties Pure

In order to produce a standard and to maintain that standard the variety must be kept pure. This is one reason why farmers in a com-

munity should decide upon one variety of such crops as corn, mulo, kafir, feterita and the other sorghums, and all plant that one kind so that no mixing will take place. After the variety is agreed upon—which should be done after fair tests have been made so that the best yielding variety and best suited to the purpose can be determined upon—farmers should agree upon the type within this variety so that all may select towards this type and produce a community standard.

If in each large farming district there were an expert seed producer for each kind of crop so that sufficient seed of the standard crops would be produced by the seed producer for the whole community, then the crops could be more easily standardized. It is far better that a farmer pay a good price for improved seed than to plant unselected seed. However, many farmers plant their home-grown seed whether selected or not—and often such seed is better than that which is shipped in and is not acclimated, especially is this true with corn. It becomes very important then that farmers decide on a type and select toward this type on a community basis, that the standard may be reached and the variety kept pure.

It is not the purpose of this brief circular to give a general treatise on seed selection and testing, for there are many excellent publications on this subject which farmers can secure free of charge from the U. S. Department of Agriculture and State Experiment Stations. The purpose of this publication is to simply give a brief outline of methods for the farmers to follow in order to improve the standard crops of Cochise County. Enclosed is given an outline form for the farmers who desire to co-operate in this important work to sign, in order that the County Agricultural Agent may know who is interested and can be depended upon for this kind of work, which will be for the direct benefit of the farmers who carry the methods into practice. There is a big demand for better seed of higher yielding crops and the farmer who will produce such will literally have a path made to his door by farmers who are anxious to secure the better seed. Farmers have long realized the value of good, pure and clean seed and are willing to pay good prices for same. For example: One farmer in the county who has been simply selecting seed of the best stalks of corn for several years has been selling seed corn for five cents per pound on the ear, when at the same time ordinary corn was selling at 2 1-4 to 2 1-2 cents per pound, shelled. Farmers can afford and will pay a far greater difference in price than this in order to get good seed of higher yielding strains.

Farmers signifying their desire and intention of carrying out the

plans as outlined in this Circular will kindly sign and return the enclosed card to the County Agricultural Agent, that he may know who to co-operate with and whom to count upon for good seed.

Corn

Select the best known variety for the locality, or the best variety most commonly grown. The highest yields in the valleys have been secured from the Sacaton June variety, which variety is an improved strain of the Standard Mexican June. Hickory King seems to be the best for the higher elevations such as the mountain valleys. The Sacaton June also has the very desirable quality of producing a large amount of close-fitting husk, which to a large extent excludes smut and ear worms.

Go through the field from which seed is to be selected and pull out all ill-shaped, weak and otherwise undesirable stalks as soon as such stalks can be detected and before pollen appears. (The feeding value of such stalks will more than offset the labor expense of weeding them out). Be sure that this weeding out of the undesirables is rigidly done in the seed-breeding patch. If seed is to be selected from a part of the general field, then at least pull out the undesirable stalks in the portion of field from which seed is to be selected, extending this to at least ten or twelve rows further than from where seed is to be selected. Select seed from the windward side of the field.



Fig. 1. Farmers who intend to select seed or plant seed from their own fields should go through the field and tie a large white string on stalks which are desired while the plants are still green and about when the ears are beginning the glaze or harden.

For producing good seed, as well as the best yield of grain, be sure that the rows are not too close. Rows 44 to 48 inches apart with two stalks in hills 32 inches apart is a good distance for the average field under irrigation. Or, it would be well to place the rows about 70 inches apart, putting the hills two feet apart in the rows, and then plant a row of cowpeas between each row of corn, as has been proven to be the best way to get the best returns from the field. The corn will usually yield fully as much (and in the test the patch so planted yielded more corn than the one planted the usual way) and the cowpeas will also produce a good yield.

Select seed from well shaped and proportioned stalks of medium height with two well developed ears placed about half way up the stalk. Select ears which have plenty of tight fitting husks which fill out well over the grains at tip, and those which have sufficiently long stems so that the ears will tip slightly downward when nearly dry—over-long stems should be avoided. Do not select ears from diseased plants.

Go through the field or seed patch and tie a white string on each plant from which seed is to be selected. This should be done about the time the ears have just passed the roasting-ear stage.

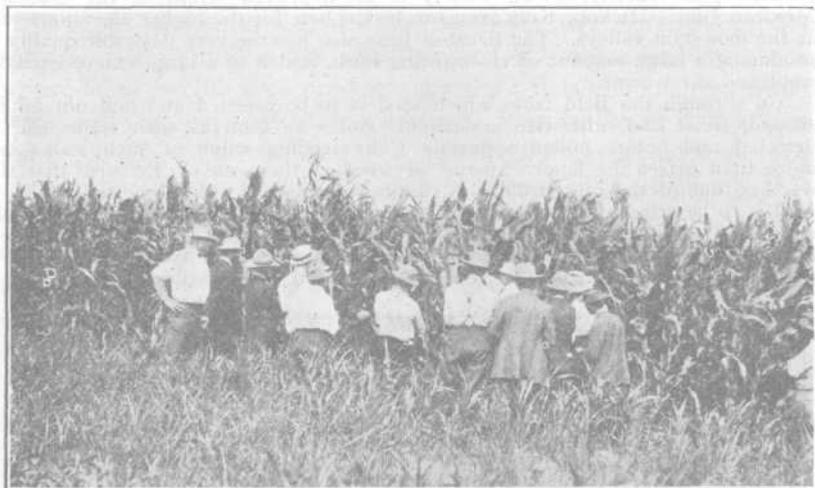


Fig. 2. Seed selection demonstration. A group of farmers studying the types of corn and reasons for field selection. Whitewater, Cochise County.

Let the seed plants stand until the ears are dry, then harvest, husk and hang the seed ears in a dry place away from danger of rats and mice. The ears should not be put away in a heap, which often cause heating and moulding which destroys the germinating power, or vitality. Ready-made seed corn hangers may be bought cheaply, or the farmer can quickly and inexpensively make good hangers by driving some small-headed long nails into boards and then sticking an ear on each of these; or, a good plan is to simply use twine or baling wire weaving back and forth, to hold the seed ears in strings. Not only will the ears dry better this way, but the farmer can also better compare the ears and thus be able to better choose those which are similar in every respect.

Sort out the uniform ears which come as near to the standard as can be found. Such ears should contain straight rows of kernels, kernels tight and firm on cob, well filled at tips so that there will be no space between rows. The ears should be almost cylindrical, slightly tapering towards the tip, the grains of uniform color and shape.

The ears of the Sacaton June should contain 16 rows of grain, while those of the Hickory King should contain 8 rows. Select for seed only those which have the same number of rows to the ear.

During the winter months or before planting time, again look over the seed ears, picking several grains from each ear—from different parts of each ear, and compare them. Select for the seed patch only those ears which contain good, well proportioned kernels, kernels with large germ centers, just slightly tapering so as to fit well and closely on the cobs. For the June corn the length of grains should be about one-half the diameter of the cob; for Hickory King the grains should be about two-thirds the diameter of the cob. Or, the grains should be

as long as possible, so that there will be a compact ear, the cob of which is not weakened by being too small. See that the tip of the grains come together at the cob. (Two ears which outwardly looked alike; one produced one-third less shelled corn than the other, because the first mentioned one had spaces between grains at cob).

Before planting time pick off 6 kernels from each ear—from the ends and near middle of ears, and make germination tests. Number each ear to correspond to the number of the tests. Discard all ears from which the grains do not show good strong germs.

The above outline of requirements for improving the corn crop may seem to many farmers to be too long and expensive, but as a matter of fact it requires but little time, which time is more of a recreation than work. As for the returns or profits: Forty-five ear-tests in Iowa gave an increase of $19\frac{1}{2}$ bushels per acre. One man can select and test in two days' time enough corn to plant 20 acres. Counting 12 hours a day's work and valuing corn at \$1 per bushel the man would be paid \$15.80 per hour for his work with the seed corn. Does it pay?

There is an excellent circular on the testing of seed corn put out by Prof. P. G. Holden, International Harvester Co., Chicago. This booklet is fully illustrated and the farmer can easily see just how to best make the seed tests. These will probably be furnished free to farmers who write for same.



Fig. 3. A uniform field of dwarf Milo; late planting, grown under irrigation in the San Simon Valley, Cochise County. Even in a field which produces so well as this did, and where the heads all look alike when seen as a field, yet if examined closely, much difference will be observed. Select those which are compact, large and well filled to the tips, of uniform size and shape, of both heads and stalks. Those with straight necks should be selected.

Sorghums

Sorghum crops include milo, kafir, feterita, dorso, shallu, kowliang and higari, which are termed the non-saccharine grain sorghums; Sudan grass and Johnson grass, which are the non-saccharine hay sorghums (the former or grain sorghums are also commonly used for hay; amber (black, red and white), sumac or red-top, orange, honey and Texas seeded ribbon, which are the saccharine or sweet sorghums. (Also used for hay, but especially for silage). The outline for improving all of these is practically the same, and the principle is practically the same as that for corn. The proper type of each should be kept well in mind

and seed selected to set this type. When the type is set or the variety is absolutely pure the further improvement can then gradually be made.

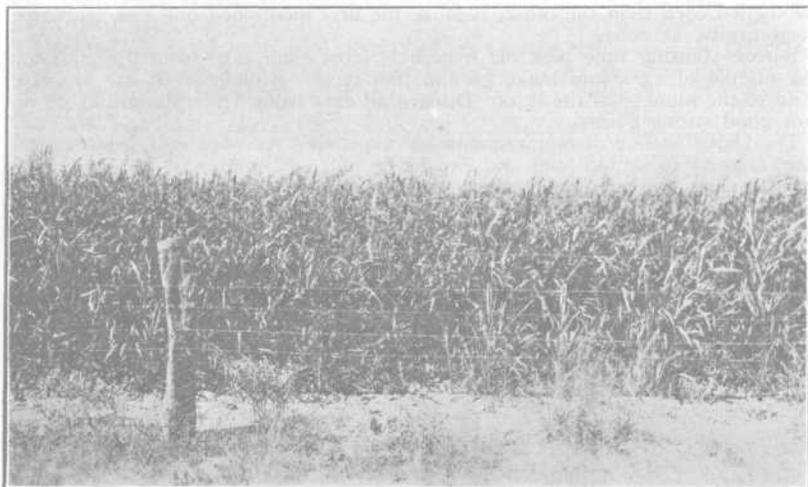


Fig. 4. Sudan is one of the best hay crops for the county. It can also be greatly improved through field selection of seed. Be sure that it is kept pure. It mixes readily with other sorghums.

The grain sorghums, except shallu and kowliang, should have compact and somewhat cylindrical heads. Selections of heads of uniform height, maturity and



Fig. 5. An excellent field of uniform Feterita, grown under dry-farming methods near Benson. This is one of the very best grain crops for the county. The field is large and the quality of the grain excellent. Feterita mixes readily with milo, kafir and the other sorghums. For good results it is necessary that the variety be kept pure. Select seed in the field for compactness of head and for large heads and plants uniform in height. Be careful not to select seed near any mixed head or near another field of other variety of sorghum.

shape should be made. Even if a sorghum crop is to be harvested for silage or for hay it is better to have all the plants mature at the same time than to have them maturing at different times, for there is a certain stage of maturity at which the plants are best for hay or for silage and if some of the plants are older and some are more immature the maximum feeding value will not be secured.

All of the sorghums mix and intermix very readily, so it is very important that these are not planted near each other. They will sometimes mix for a half mile or more, if there is level land without tall-growing crop between. With the sorghums, as with corn, the farmers of the community must agree upon a certain variety and this variety be grown, or at least no other variety which will produce pollen at the same time be grown near it. There are several varieties which usually produce about the same in most localities such as milo and feterita, so only one of these could be selected and planted.



Fig. 6. A fine and heavy-yielding field of kafir, grown in the McAlister district under dry-farming conditions with the addition of a little flood water. Notice the tall mixtures which have small and open heads. Such "rogues" or mixtures will pollinate a large percentage of the kafir and thus render the seed undesirable for planting.

For early planting, especially in dry-farming regions where land has been plowed in winter and the winter moisture stored and where it is advisable to put in an early crop to make use of this early moisture and also a crop which will stand a long drought, the Dwarf Blackhulled White kafir is the best crop to plant. This is also one of the best feed, grain and silage crops for irrigated farms. For late or rainy-season planting milo and feterita are planted.

Test the seed of all the sorghums the same as for corn.

Beans

In rows of beans of regular stand and similar conditions there will often be found plants which are larger and which produce more beans than other plants on either side. These plants will usually be found to be those without runners. Have small stakes, preferably white color, and go through the bean field before the leaves drop, about when the first pods are getting dry, and put a stake at each one of these seed plants. At this time the plants which should be selected for seed can better be seen than later and the stakes will show later just where the selected plants are.

The seed plants can be harvested along with other harvesting, if the plants are pulled by hand. If harvesting is to be done with a bean harvester then the seed plants must be pulled separately by hand.

In pulling the seed bean plants in the field carry along an extra sack in which to put pods. From the seed plants select pods which are well matured, of uniform color—which indicates uniform maturity, of five to six plump beans. Shell these pods separately and put them in a safe, dry place. These are to be used for the seed patch for the next year. The remainder of the seed from the selected plants will be used for general field planting the next year. This process should be continued each year.

With field selection and then seed selection from the seed patch as above outlined the improvement in beans can be carried on even more rapidly than with corn, for the reason that beans do not mix or cross-pollinate as do corn plants.

The above method of crop improvement through seed selection can be carried on with all the bush or field varieties of beans. The yield and quality of all kinds of beans can be greatly improved by such selection.

Other grain crops grown in Cochise county can be improved through seed selection similarly.

Vegetables

With garden vegetables and truck crops the same thing applies as does with the field crops. Many times we hear that certain vegetable seeds have "run out," that is they no longer produce what we expect them to, they revert to old and inferior types. This is caused by climate, mixtures or lack of seed selection. Vegetable seeds which some farmers in the county had bought and intended to plant were tested and the germination was found to be as low as 10% in some of these. The failure of many gardens is traceable to planting poor seed. It will, of course, be understood that for vegetable crops such as Irish potatoes grown from vegetative parts of the plant rather than from true seed that dangers of mixing through cross-pollination can be entirely disregarded.

Cooperation and Assistance

Special outlines and field demonstrations will be given to cooperators who so desire this assistance. All surplus seed resulting from such seed selection or cooperative seed breeding will be recommended to those who wish to buy seed of those varieties.

Winter grains, which do so very well in Cochise county, can also be greatly improved through seed selection. Special outlines and directions for improving crops and vegetables which have not been mentioned will be given to those farmers who desire to cooperate in carrying out such improvements on their farms.

One of the greatest needs in farming, not only in this county but in all farming regions, is better seed of better crops. This is just as necessary as the need of better livestock.

Farmers who desire to do their part in improving crops in Cochise county and who will cooperate with the Agricultural Extension Service and State Experiment Station in carrying out the foregoing directions for improving those crops outlined, or who will carry out special directions given for other crops or vegetables will please indicate the crop and variety on the enclosed card, give other data requested, sign and return the card to the County Agricultural Agent, Willcox, Arizona.