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Barley Growing in New Zealand

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In New Zealand malting barley is an important crop in those districts which have been proved by experience to be suitable for its production. Following the introduction of a protected market, a minimum price schedule and grading standards, the acreage has risen from between 20 and 25 thousand acres a few years ago, to 45 thousand acres in 1942.

New Zealand is now self supporting as far as the production of malting barley is concerned but there is still need to import large quantities of feed barley for the pig industry. In the South Island barley rejected for malting is used for pig feed and any surplus is sold to the North Island, but the main supply of feed barley for the North Island farmers is imported. Barley is also used to some extent as a green feed for both cows and sheep. It is one of the quickest growing of the green feed crops and can be used with advantage to forestall an anticipated shortage of forage. The Cape and Black Skinless varieties are to be preferred for this purpose and will provide grazing within six weeks of sowing under good soil conditions. These two varieties are also good feed barleys.

This bulletin deals more particularly with the production of barley for malting for which purpose a high standard of quality is required. After stating the characteristics of a good malting barley the process of malting is outlined, the need for high quality is stressed and the methods by which this high quality can be attained are discussed.

Quality in Malting Barley

Barley to be accepted as suitable for malting must be dry, plump, bright, sound, clean and free from other seeds. Certain standards to

meet these requirements have been set up and agreed upon. For top grade No. 1 malting barley they are as follows (after passing over a 6a screen)—

	%
Flinty grain	under 10
Foreign matter	under .5
Wild Oats	under .5
Skinned and broken grain	under 2.0
Tares and round seeds	under 5.0
Sprouted grain	Nil
Moisture	under 15
Bushel weight	52lbs.
Disease	Trace

There are four grades of malting barley with decreasing minimum prices for decreasing set standards. If a line fails to reach the standard of Grade 4 it may be rejected for malting and can be sold only as feed barley at a much lower price. Appeals against the grading can be made through the Department of Agriculture on the advance of a fee of 10/-.

The Malting Process

Over 800,000 bushels of barley are required each year for conversion into malt, which is used for the manufacture of ales, beer and other alcoholic beverages as well as for yeast, malt extract, malted milk and vinegar. Barley is more suitable than other cereals for this purpose as it contains a high percentage of starch and a low percentage of undesirable nitrogenous substances and the kernel is enclosed in a fibrous coat which aids in filtering the soluble extract. In the process of malting the grain is first soaked in water for 40-60 hours when it absorbs sufficient moisture to start germination. This must be quick and even. The grain is thinly spread out on the germinating floor and growth allowed to

continue until the shoot grows about as long as the grain. This takes from 8-12 days according to the variety, the condition of the grain and the temperature. During this period enzymes are activated and part of the starch is transformed to soluble sugars. A small quantity of sugar is used up by the growing seed. The objective is to allow germination to proceed until all the enzymes are activated but not so long that too great a proportion of soluble sugar is used in the growth of the grain. When this stage is reached the germination process is stopped by drying the germinated grain in kilns. The dried product has the roots and shoots rubbed off and is known as malt.

A good malting barley absorbs water evenly, germinates rapidly and evenly, grows quickly and produces a high proportion of soluble extract. Cracked, broken, and skinned grains absorb water more quickly than whole and unskinned grains, germinates unevenly and will develop moulds while it is on the germinating floor. An uneven line of barley absorbs water unevenly—some grains get over-soaked and go rotten; some are under-soaked and grow slowly on the germinating floor. Other crop seeds or weed seeds will produce undesirable flavours or an uneven product. Grain with a high nitrogen content is generally associated with a high percentage of flinty grains, with the production of a cloudy extract and with a lower percentage extraction. These are some of the reasons why the maltster requires high quality in his barley and the standards set for No. 1 grade meet these requirements to a high degree.

Soil and Climate

We have already indicated that the growing of malting barley is confined to certain localities, the most important of which are the Blenheim district in Marlborough, the Dunsandel, Lincoln, Ellesmere and Ashburton districts in Canterbury and parts of central Otago and Southland. The most suitable soils for barley are uniform free working loams with a high percentage of sand and a fair state of fertility. High yields may be secured on heavy soils but the ripening on these soils may be too uneven or prolonged, resulting in a high percentage of "flinty" grains. On the other hand light soils may dry out prematurely and the crop

dries off rather than ripens. Barley requires an adequate supply of moisture during October and November while making maximum vegetative growth and a cool dry summer for ripening. These conditions, a combination of suitable soil and climate, have been found by experience to occur in the districts mentioned above and maltsters endeavour to secure the bulk of their barley from these areas. It is highly probable that other "new" barley areas will be located in the drive for increased production.

Varieties

Barley varieties may be grouped into two classes: Those suitable for malting and those not suitable for malting. The latter are the Cape and Black Skinless varieties which have already been mentioned as being suitable for green-feed or feed barley. The chief varieties of malting barley grown in New Zealand are:—

1. Plumage Archer:

This is the most widely grown variety being suited to the heavier soil types. It is a broad eared hybrid variety produced by Dr. E. S. Beaven of Warminster in 1905. It was introduced into New Zealand in 1927. The straw is short and erect, and the heads tend to break off at the neck more than some other varieties but it is a high yielder and does not readily lodge. It is suitable for heavy land but not for light land.

2. Chevalier:

This is one of the oldest varieties of malting barley and is of extremely high quality. The strain grown in New Zealand is Kinvers Chevalier. It produces good crops on the light to medium soils. The straw is long and the neck droops when ripe.

3. Spratt Archer:

This is another hybrid variety produced by Dr. H. Hunter in 1908, and introduced into New Zealand in 1923. It is a high quality malting barley with a short strong straw and a drooping head which stands well against wind. It is a good yielder and is commonly grown on heavy land. It is necessary to sow early to get good yields from this variety.

4. Goldthorpe-Spratt:

This variety was introduced into New Zealand in 1924. It is a high

quality malting barley and is proving to be useful in Marlborough and Southland. It is a good variety for medium land but it lodges on heavy land.

The above are the chief varieties of malting barley and their relative importance in New Zealand is indicated by the following percentage area of each.

Plumage Archer	27%
Chevalier	26%
Spratt Archer	20%
Goldthorpe-Spratt	8%
Feed Barleys:	
Cape	10%
Black Skinless	6%

Growing the Crop

Two characteristics of barley, namely its relatively rapid growth and its surface rooting, added to its inability to compete successfully with weeds, determine its place in a rotation. It is normally a spring sown crop and can be sown on a firm fine dry tilth after a cleaning crop such as roots or potatoes, or it can be sown after grass or after another cereal. Barley demands a neutral or slightly alkaline soil and an application of lime is beneficial. The seed is sown at the rate of 1 1-3 to 2 bushels per acre according to the condition of the soil and the time of seeding with 1cwt. of superphosphate in August or early September. Occasionally autumn sowing is practised on the lighter and drier areas, and judging from results during the past four years this practice has much to recommend it.

Harvesting the Crop

It is important that barley should be fully ripe before it is cut. The straw must be free from any sign of greenness and the grain must be hard and the skin finely wrinkled. With older varieties it was necessary to cut before the grain was fully ripe because the heads broke off readily at the neck when ripe. The newer varieties have tougher necks and can be left with reasonable safety until the crop is fully ripe.

The crop may be windrowed and threshed from the windrow with a pick-up attachment fitted to a "header." It is expected that there will be an increase in this method of harvesting barley, and good quality can be secured with careful handling of the crop and intelligent use of the "headers." At present

the grower receives 3½d per bushel less for header-threshed than for stook-threshed grain. The latter is the more common method of handling the crop. It is cut with a binder and stooked for 7-14 days or longer according to the weather condition. There is a premium of 4d. per bushel for stack-threshed over stook-threshed grain, the reason for this being that during the time in the stack the grain completes its maturation and during the sweating process the moisture content evens up so that the grain germinates readily and evenly when malted. In order to obtain these results it is necessary for the sheaves to be dry when stacked, the stack well built and thatched, and the crop to remain in stack for three months—six weeks being too short a period.

Threshing

It has been found necessary in recent years to draw attention to the losses and damage that is done to malting barley during the threshing process. In many cases the germ is removed completely from the grain or damaged to such an extent that the germinating capacity of the line is seriously lowered. When grain is injured to this extent, some will also be cracked or broken and some will be skinned to a greater or lesser degree. The effect of this damaged grain in the manufacture of malt has already been discussed. Such damage is caused by the speed of the drum or the close setting of the concave or by both. In general, barley should be threshed with a drum speed considerably slower than that required for wheat. This is the main secret of successful threshing of barley. The drum should run as slowly as possible consistent with efficient threshing of the grain. It is better to lose a few grains in the straw than to spoil the sample by skinning. While the drum is set at a relatively slow speed it is desirable that the speed of the shakers should if possible be increased so as to assist in the separation of the grain from the straw. The ease of threshing barley varies throughout the day with changes in temperature and humidity of the atmosphere and a constant watch must be kept on the grain sample to see that it is not being injured and on the straw to see that threshing is complete. Several adjustments of drum speed or concave setting may be necessary. Regular feeding is im-

portant; and if the hummeler is used it should be set to leave $\frac{1}{4}$ to $\frac{1}{2}$ an inch of awn on the grain rather than to break the awn off close to produce a "heavy" sample, in which case a considerable amount of skinning will occur.

The screening of the sample may also be responsible for the rejection of an otherwise good line of barley. A maximum of 15 per cent of screenings is allowed but the merchant is permitted to deduct $\frac{1}{4}$ d. per bushel for every 2 per cent above 5 per cent, that is, a line with 15 per cent of screenings (quantity passing through a 6A screen) would be valued at $2\frac{1}{4}$ d. per bushel less than a line with only 5 per cent of screenings.

Conclusion

Barley growing is restricted to

certain districts in New Zealand where the soil and climate have proved suitable for the production of good quality malting barley. There are only four varieties of malting barley of any importance, namely, Plumage Archer, Chevalier, Spratt Archer, Goldthorpe-Spratt in that order of popularity. Approximately 45,000 acres were grown last year of which 82 per cent was used for malting, the balance being used for feed barley. Barley for malting must be of good quality, dry, plump, bright, sound, clean and free from other seeds. Care is necessary in harvesting, particularly in threshing to attain malting standards. Windrowing, stook threshing and stacking are practised. Most barley is grown on contract to merchants. A minimum price and grading standards have been fixed for the different grades.

Copies of this Bulletin may be obtained from the Secretary, Canterbury Chamber of Commerce, P.O. Box 187, Christchurch.