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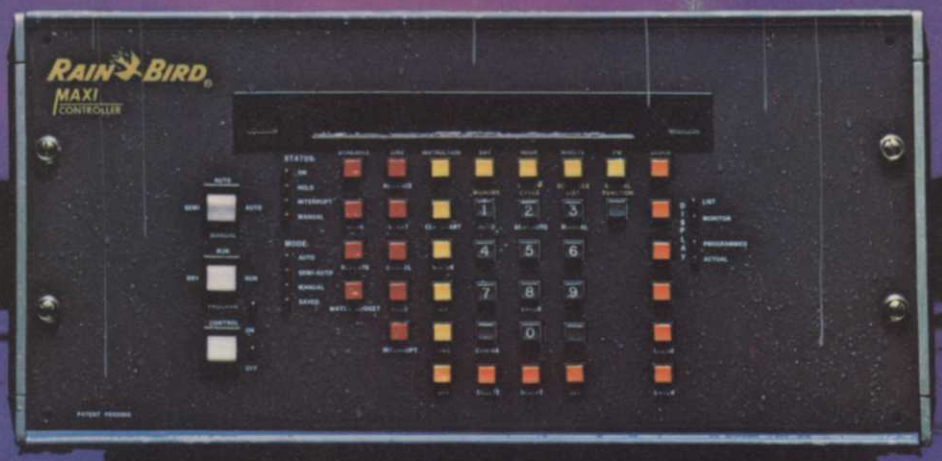

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SEED PRODUCTION

6. *Spot spraying in the spring. The spray is a combination of Roundup and a red dye so one can tell what has been sprayed.*

5. *Fields are sprayed with selective herbicide in the fall to control broad-leaf weeds. Each swath of the sprayer is 40 feet wide.*

4. *Fields in early spring. Taller plants are volunteer ryegrass and will be spot sprayed in the spring*

Fescues

There is currently a great deal of effort on fescue improvement and development. A number of companies are working to serve the transition zone with an improved tall fescue. Hard fescues are also being studied and two have been released.

There are five types of fescue used for turf; creeping red, chewings, tall, hard and sheep.

Creeping red fescue, *Festuca rubra*, is a fine leaved fescue which is often used in mixtures with Kentucky bluegrass and perennial ryegrass. It germinates more rapidly than bluegrass, but not as rapidly as perennial ryegrass. Fescues tolerate drought and infertile soil better than both Kentucky bluegrass and perennial ryegrass. Under dry periods on clay soils, the fescue may dominate the stand.

Much of the improvement in creeping red fescues has taken place in Europe. D.J. van der Have of the Netherlands developed Ruby and the Sports Turf Research Institute in Bingley, England developed Dawson. Both of these are marketed in the U.S. by Northrup King. International Seeds Inc. markets Ensylva. In 1954, Pennsylvania State released Pennlawn. Prior to that, Oregon State released Illahee. Pickseed markets Agram from the Netherlands.

A chewings fescue is one that doesn't creep. Chewings fescue, *Festuca rubra* var. *commutata*, originated in Europe, but much of the original production took place in New Zealand. In the 30's, much of the chewings fescue on the market came from New Zealand and suffered from poor germination. Rhode Island, Michigan, and New Jersey (Rutgers) experiment stations contributed to the improvement of chewings fescues. Rutgers developed Banner which is marketed by Burlingham. Rhode Island developed Jamestown from material found by Richard Skogley on an abandoned green in Jamaica, NY. Jamestown is marketed by Lofts. Wintergreen was developed at Michigan State from material from the Netherlands. Northrup King markets Wintergreen, and the European variety Atlanta. Turf Seed released Shadow chewings fescue in 1980. International Seeds markets Highlight, developed by Van Engelen of the Netherlands as a chewings type red fescue. Other well-known chewings fescues are Golfrood from the Netherlands and Cascade developed at Oregon State University in 1964.

Tall fescue, *Festuca arundinacea*, is a coarse fescue with a bunch type growth habit. However, it has a deep root system and survives on infertile, salty, low maintenance areas such as roadsides and parks.

The primary varieties are Kentucky 31 developed by E.N. Fergus at the University of Kentucky in the late 40's, and Alta, developed in 1947 by Harry Schoth, an agronomist with USDA in Corvallis, OR. Fred Grau assisted in getting Alta planted on a number of highways to prove its advantages. Alta is not a preferred grazing grass for cattle.

C. Reed Funk

The first full-time turfgrass breeder in the U.S. serving the New Jersey Agricultural Experiment Station at Rutgers. Funk was the first to develop hybridization techniques for Kentucky bluegrasses.

Kentucky 31 is often used for turf in the transition zone due to its ability to withstand hot humid summers and acid soil. To provide turf managers in the transition zone with finer-bladed tall fescue, Loft has released Rebel tall fescue and Burlingham has released Falcon, developed in cooperation with Bill Meyer at Turf Seed.

For similar reasons, hard fescue, *Festuca ovina* var. *duriuscula* L. Koch, has received attention. In addition to good drought tolerance, it exhibits good shade tolerance. Northrup King markets Scaldis and Scotts markets Biljart developed in the Netherlands. Pickseed markets Tournament from the Netherlands.

Sheep fescue, *Festuca ovina* L., has fine leaf texture and exists on acid, coarse soils. It has good shade and drought tolerance but appears bunchy.

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SEED PRODUCTION

7. *Fields are cut and windrowed while seed is still green and less prone to shatter.*

8. *Whirlwinds can pick up the windrowed grass and carry it up to a mile contaminating nearby fields of other seed types. Whirlwinds and rain can seriously damage the crop in its last days of production.*

9. *Combines mechanically separate the seed from the straw by a series of rub bars incorporated in the thrashing machine.*

Perennial Ryegrass

Next to Kentucky bluegrass, perennial ryegrass, *Lolium perenne*, has received the most attention from breeders and developers. This attention, however, wasn't attracted until the late 60's when new material from Rutgers and Penn State reached the market.

In the mid-60's, production of perennial ryegrasses rarely exceeded 150,000 pounds. Manhattan, Pennfine and a whole new series of perennial ryegrasses made turfgrass seed buyers take note, and in 1980 growers expect a crop of nearly 25 million pounds.

Bob Russell of Adikes is credited for the acceptance of perennial ryegrasses by northeastern golf course superintendents, sod producers and landscape contractors with his NK100 mixtures. The southern overseeding market was first broken by Northrup King and the other members of the Seed Production and Introduction Corp. (SPIC). Lofts, Turf Seed, Pickseed West, and International Seeds have southern overseeding mixtures available also.

Perennial ryegrasses are sexually propagated by crossing and polycrossing. This is similar to bentgrasses in that various parents are grown together in the seed field and crosspollinate to produce the variety of seed.

In the mid-60's, the New Jersey Agricultural Experiment Station (Rutgers) turfgrass breeding program was led by C. Reed Funk. Jerry Pepin was Funk's student at the time. These two men at Rutgers and Joe Duich at Penn State started a revolution with improved ryegrasses.

Pennfine was released by Duich in 1968, after Manhattan had been released from Rutgers. It was a three-clone variety, with two parents originally from Pennsylvania golf courses and one from a grass tennis court. Duich made the decision to hold off marketing Pennfine until the expected Plant Variety Protection Act was passed (1970). Today, Pennfine is succesfully marketed by SPIC.

Manhattan, however, was released prior to the Plant Variety Protection Act and did experience problems early in its marketing. It was first marketed in 1968 by Bill Rose of Turf Seed who had taken six pounds of breeder seed and gotten production started. Today, Manhattan is marketed by Turf Seed and Whitney Dickinson as agents to the Manhattan Ryegrass Growers Association.

Rutgers has taken part in some way with an amazing number of perennial ryegrasses. They include: Blazer, Dasher, and Fiesta from Pickseed West; Belle from Burlingham; Derby from International Seeds; Goalie, Delray and NK-100 from Northrup King; Omega from Turf Seed; Pennant from Agricultural Services; Diplomat, Yorktown and Yorktown II from Lofts; and Regal from North American Plant Breeders.

Turf Seed developed Birdie and Citation. Northrup King has developed Eton, Epic, and NK-200. International Seeds has developed Clipper and Scotts has developed Caravelle.

European material includes Loretta from Scotts and Hunter and Elka from International Seeds.

One use of perennial ryegrasses that is receiving a great deal of attention is as a transition grass for the south. It is overseeded in large quantities to keep greens colorful and soft in the winter. Turf Seed has developed a annual/perennial ryegrass for overseeding, called Dragreen.

Jerry Pepin

A student of Reed Funk's in the 60's, Pepin has carried perennial ryegrass improvement from Rutgers to Rudy Patrick and now to International Seeds Inc. of Halsey, Oregon. He is the breeder of Derby, Regal and a number of other improved turfgrasses.

Crownvetch

Crownvetch, *Coronilla varia L.*, is not a grass or monocotyledon. It is a perennial, dicotyledon herbaceous plant with pinkish blossoms that serves to cover and stabilize roadsides and slopes due to its spreading ability and deep root system. Stanford and Turf Seed market Penngift Crownvetch, which was discovered, produced, and promoted by Fred Grau of Penn State. Grasslyn Farms, managed by Fred Grau Jr., produces much of the seed for Stanford to market.

An odd situation with Penngift was when Grasslyn was the only producer of the seed, the Highway Department would not buy from it because it was a monopoly. This led to the development of Chemung and Emerald Crownvetch by the Soil Conservation Service in the early 60's.

Grau discovered the legume on a Pennsylvania farm in 1935. In 1947, he had produced seed on his farm and gave demonstrations of the cover across the state. Burt Musser suggested Grau scarify the seed to improve germination in 1951. Due to the problem with the Highway Department, Grau had to assist in setting up his competition.

WARM SEASON GRASSES

Bahiagrass

Bahiagrass, *Paspalum notatum* Flugge, was brought to the U.S. from Brazil as a low maintenance turf for semitropical areas. Argentine and Pensacola are varieties developed by the Florida Agricultural Experiment Station in the late 40's.

Hugh Whiting, a private turf breeder in California has developed Adalayd, *Paspalum vaginatum*, to improve the species.

Bermudagrass

Bermudagrass *Cynodon dactylon*, is the most important warm-season turfgrass in the U.S. It is propagated mainly vegetatively.

Many states have been involved in improving bermudagrass, including Florida, Kansas, Texas, California, South Carolina, Oklahoma, Arkansas, Alabama, Georgia and Maryland. However, their work is overshadowed by the developments of Glenn Burton with the USDA in Tifton, Georgia.

Burton began his work on the "Tif" series in 1946 after being encouraged by Fred Grau and Olaf Aamodt from USDA Beltsville. He collected dwarf pasture bermudagrasses and crossed them with selections from golf greens. Golfers were complaining that bermuda greens were too coarse. From these hybrids, Burton selected one released as Tiflawn in 1952. But Tiflawn was still too coarse for greens. A finer turf was required.

Bill Meyer

Director of Pure Seed Testing in Hubbard, Oregon, and leading turfgrass specialist in the area of stem rust. Meyer is finishing development work on an improved Merion and an improved Manhattan.

Burton got hold of a bermudagrass from Africa, *Cynodon transvaalensis*, a softer, finer variety. He bred the African bermuda with a dense selection of *Cynodon dactylon*. The result was a sterile, but improved variety which he called Tiffine. It was released in 1953. But the bermuda was sterile and improvement stopped at that point for that turfgrass.

Burton went back to his collection for another *C. dactylon* to breed with *C. transvaalensis*. He selected a bermuda from Charlott Country Club in North Carolina. The cross produced another sterile bermuda which he called Tifgreen. It was released in 1956 and made a much improved bermuda for greens.

Looking for better frost tolerance, Burton made a third cross with *C. transvaalensis*. He got what he wanted but it was stiffer than Tifgreen. This bermuda was released in 1960 as Tifway.

Fortunately, Tifgreen produced a vegetative mutant with finer stems, smaller and darker leaves. Burton

SEED PRODUCTION

10. *Field burning to stimulate the plants for next year's production, remove straw residue from the fields, and disease and insect control.*

11. *Experimental field burning machines were tried to control the volume of burning but they were dropped as too expensive and unreliable.*

Photos courtesy of Harry Stalford, International Seeds Inc.

released Tifdwarf in 1965.

Since 1965, Burton has experimented with ways to cause mutations of the sterile bermudas he has produced. In 1970, he first used radiation to produce mutants and was successful.

This space-age technology has produced more than 150 mutants for evaluation. Burton says he expects to release one or more of the mutants within the next year.

In more conventional methods of selection, good varieties of *C. dactylon* have been developed. U-3 was one of the first selected from material supplied to USDA in Arlington and later Beltsville by Lester Hall. Hall found the bermuda on his golf course in Savannah, Georgia. It was released as U-3 in 1947. Ormond from Florida, Royal Cape from California, Texturf from Texas,and Tufcote from Maryland are selections of *C. dactylon*.

Other crosses of C. dactylon and *C. transvaalensis* have been accomplished by Florida (Everglades), Kansas (Midway), and South Carolina (Pee Dee).

Uganda is a natural selection of *C. Transvaalensis.*

Centipedegrass

Centipedegrass *Eremochloa ophiuroides*, originated from China. It exhibits poor wear tolerance, but provides an adequate turf in warm regions without great care. It exhibits extremely tough resistance to insects and disease which may cause a closer evaluation in the future. It may serve for lower traffic areas on fairways and roughs.

Kikuyugrass

Kikuyugrass, *Pennisetum clandestinum* is another turfgrass brought from Africa for use in the U.S. It is a tough turfgrass which tolerates high temperatures, low cutting, wear, and some shade. Extended cold weather will damage it however.

St. Augustine

St. Augustine *Stenotaphrum secundatum*, is second to bermudagrass for warm season turfgrass use. It is an aggressive, low-growing, heat tolerant, blue-green turfgrass. Like Kikuyugrass, it will not tolerate extended cold temperature. It forms a good sod and can tolerate some shade. Overfertilization can create severe thatch buildup. Floratine is a variety developed by Florida Agricultural Experiment Station specialists.

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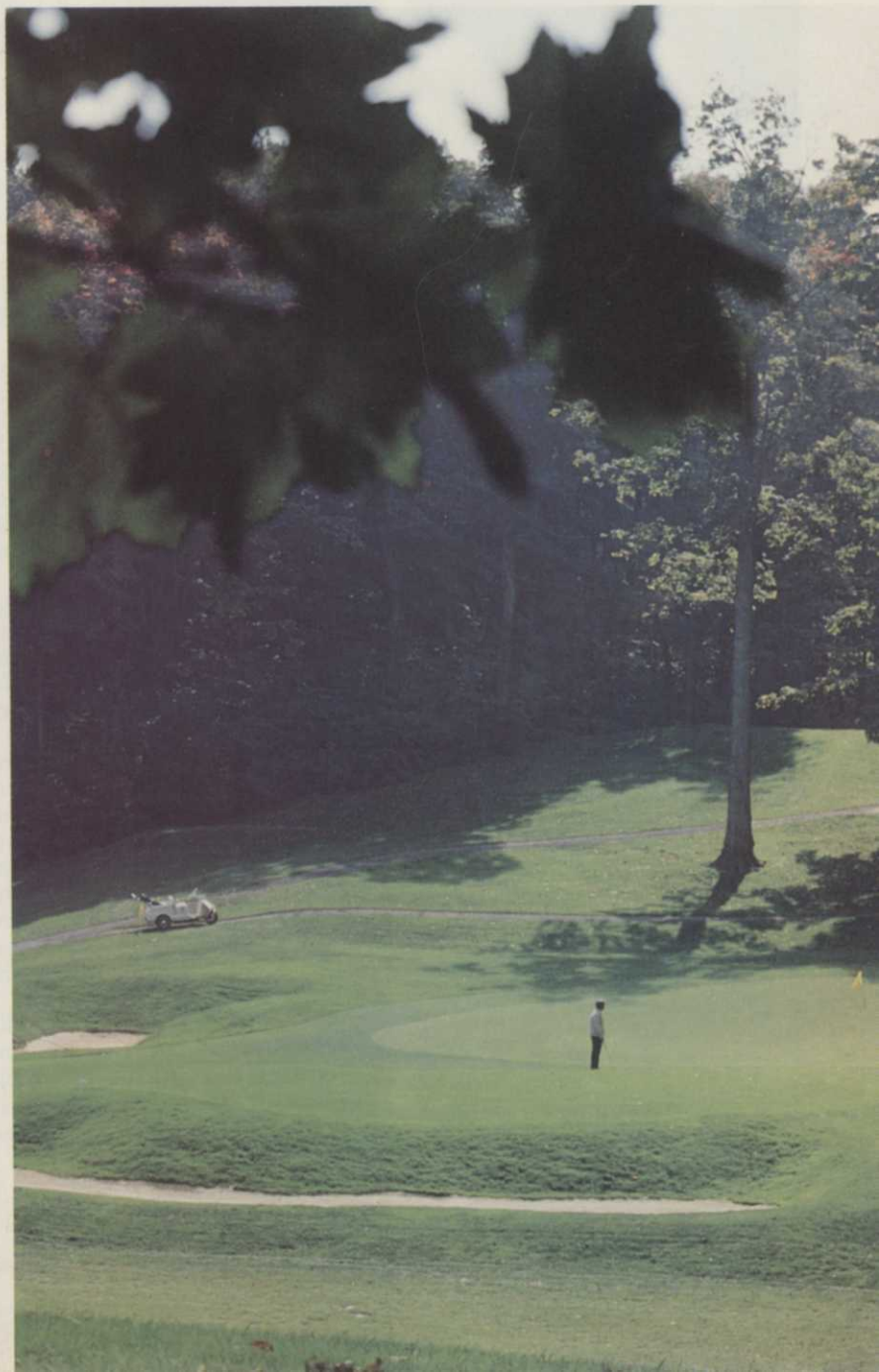

THE GROWER

The grower turns the hopeful findings of the breeder into reality. He is an agronomist, an engineer, a speculator. If a crop fails, he is responsible for the loss.

In the history of improved turf seed production, there have been three types of growers. The first is the old Midwestern farmer who agreed to keep his cattle off a field of common bluegrass so that the stripping crew could harvest the seed in summer.

The second is the farmer in the Northwest, driven by curiosity and financial temptation, trying something new. Otto Bohnert, Howard Wagner and the Geary brothers are this type of grower. Their curiosity motivated them to enter the turfgrass seed business in the 40's and 50's. Today, there are many more farmers in the Northwest who could grow other seed or vegetable crops, but instead grow turfgrass seed.

The third is the owner/grower. He is more than a supplier to a marketing agency. He owns the land, grows the seed crop, owns the cleaning plant, and has large impact on marketing decisions. The Jacklin family were notably the first. More recently, Bill Rose of Turf Seed and Willard McLagan of International Seeds Inc. wear a number of hats during the year.

These men must contend with things like unpredictable volcanoes, summer rains, environmental regulations about field burning, collecting from distributors, construction and depreciation of large cleaning plants, and how universities are rating their product. Their load of responsibility is tremendous. They have more to lose and they try harder as a result. Without their constant pushing the market may not have progressed as it has.

The ability to control production of a new turfgrass seed has pushed them toward a new dimension, their own breeding programs. Today, a grower can manage seed production from the development of the cultivar to the bag on the loading dock.

The grower has quality standards which he must meet. State seed certification regulations require constant sampling of seed for offtypes and inert matter. Bentgrass or *Poa annua* in bluegrass is disastrous and the grower must constantly prove his product is labelled properly. To a degree, there is a bit of the buyer beware in the seed market. Reading the seed tag is the only way to know what you're buying. Certified seed is your only assurance of that.

The grower is the key link in the production and distribution of turf seed. If he has a bad year, seed prices go up and every turf manager pays. If you buy certified seed, the grower will provide you with a reliable, high quality product on which you can stake your professional reputation on daily.