

Current Breeding Programs to Develop Winter Cereal Cultivars for Animal Feeds Production in Korea

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Abstract

We reviewed the winter cereal crops breeding program and their utilization after a variety release in Korea. Current trend on food consumption in Korea has showed that consumption of meat, “Hanwoo” which has a high preference would be increasing, whereas that rice consumption as a staple food be continuously decreasing. Therefore, one of major national agricultural policies should be focused on maintaining adequate level of national rice consumption per capita in a year as well as providing stable supply system of good quality forage feedstocks needed for high quality meat production.






Recently we introduce the concept of local feed and food miles in producing and transporting forage to end-users for animal feed at a national level, which means self-supply system in feeding and meat production. In addition, other measures would be in progress in order to substitute vast amount of imported forage like hay and raw grain stocks making for formulated animal feed stuffs from abroad with a variety of winter cereal crops for forage use developed by RDA’s winter cereal breeding team at the National institute of Crop Science (NICS), RDA.

To attain these goals and direct forward, by using diverse crop germplasm, especially winter cereals like barley, wheat, rye, triticale, and oat, we have developed a number of cultivars for forage use and animal feed to raise a Korean cattle, ‘Hanwoo’.

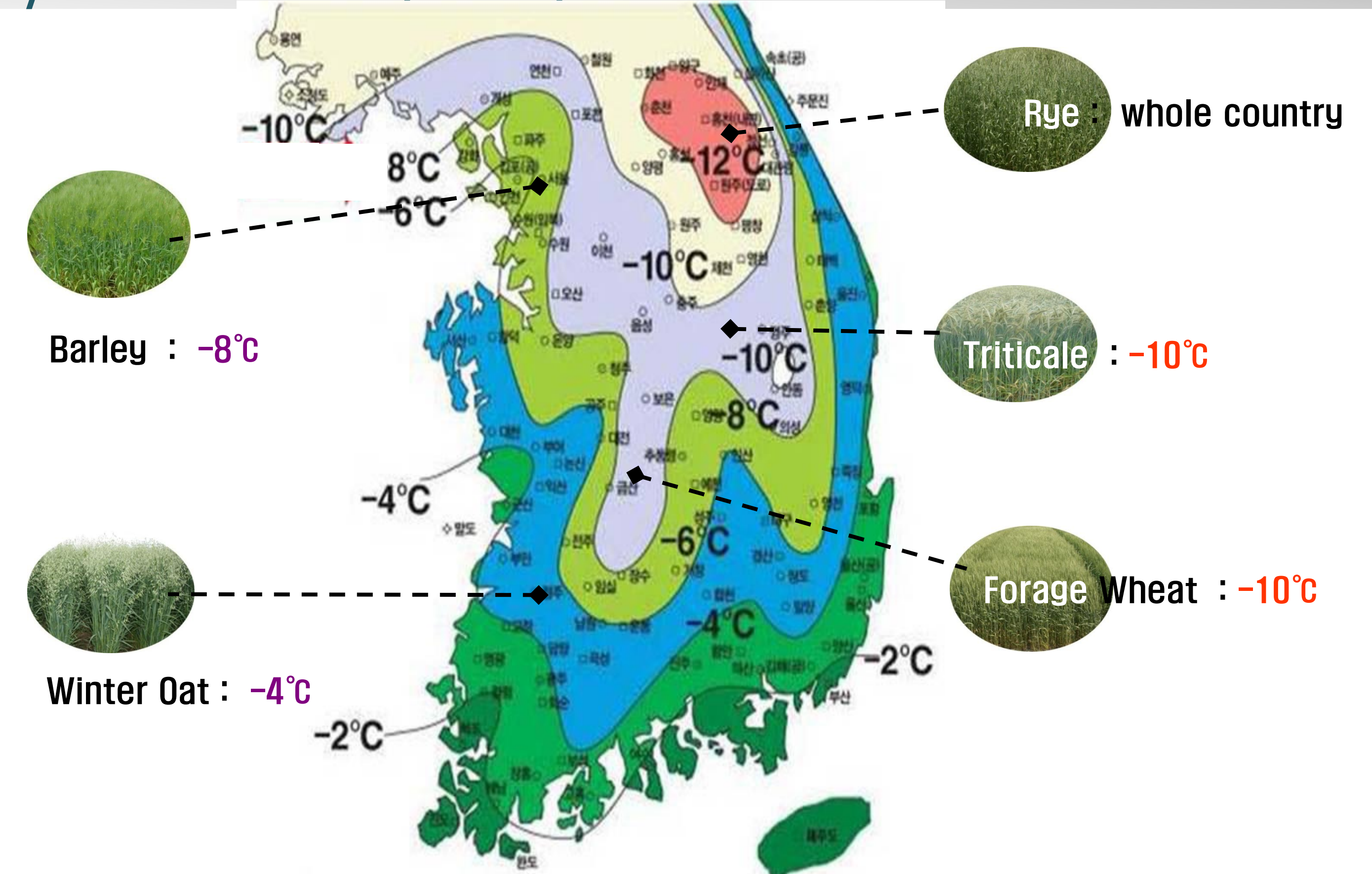
Also, I preview the desirable directions of winter cereal breeding programs for forage use in Korea which would be slightly different by the crops. So targeted traits to be improved by the crops would be as follows; early-maturing, winter hardiness, yellow rust resistance, and early seed-set after anthesis in **triticale**; early-elongating and maturing after overwintering, high-yielding at a dry base, lodging-tolerance and aphid resistance in **spring type oat**; early-emergence after sowing, good growth habit under low temperature, high-yielding at a dry base, and lodging-tolerance in **summer type oat**; early-maturing, high-yielding, early seed-set after anthesis, low fiber and low lignin in **rye**; and winter hardiness, stay green, a hood spike type, Scab(*Fusarium graminearum*) disease resistance, and multi-tillering in **whole crop winter type forage barley**.

General Information on Winter Cereal Breeding Programs for Whole Crop Forage as Animal Feeds

Current Breeding Targets by the Crops

Targeted Traits	Winter Cereal crops				
	Barley	Spring Oat	Triticale	Wheat	Rye
Dry Matter Yield(MT/ha)	11 → 13	13 → 15	14 → 15	11 → 13	8 → 10
Heading date	4.25 → 4.20	6.15 → 5.30 (maturing)	6.10 → 5.30 (maturing)	6.5 → 5.25 (maturing)	Early, mid, late type
Other Important Traits	Solid or fragile stem Hooded spike, Scab Resistance	Early-matured, high-yield, lodging tol., Aphid res.	Awnless type, early-matured, winter hardiness	Low lignin, lodging tolerance, ruminant palatability	Low lignin, lodging tolerance, High-yield
					

Potential Cultivation Areas based on the Isotherm of Daily Minimum Temperature in January during Winter Season



Recent Breeding Status by the Winter Cereals for Forage Use

Triticale Varieties with Highest Yield and Good Quality

- Widely adaptable under unfavorable conditions where other crops could be poorly adapted, and able to easily make a farm-based seed production.
- Since 1985, 6 cultivars have been developed and released for forage production in collaboration with CIMMYT Breeding Programs.
- Early-heading and early-matured Triticale cultivar, like ‘Joseong’ could be cultivated for double cropping systems at the rice paddies

Oats, Able to be cultivated twice in a year

- ❖ Two types of oat cultivars suitable for year-round forage production systems have been developed; winter type - and summer type - oats, respectively. A total of 16 cultivars were developed since 2000.
- ❖ So these varieties could be easily selected and adjusted by various cropping patterns and also cultivated areas due to short growth duration, such as 80-day growth.

Rye, Can be grown everywhere with strong winter hardiness, and high nutritive value

- ◆ Able to be cultivated and widely adapted under harsh conditions near northern areas in Korean Peninsula.
- ◆ Since 2000, a total of 15 rye cultivars have been released and
- ◆ Lately, early-heading and -matured rye cultivars recently developed could contribute to introduction of various cropping systems in line with regional needs in forage production.



Future Directions and Challenges to be tackled

- High biomass with good nutritive palatability, early maturity, and animal-preferred traits like hood, awnless, smooth type of spike and awn for whole crop silage production.
- Wide adaptability in association with various cropping patterns which could be utilized under various environmental and unfavorable conditions and broad spectrum in coordination with use and functionality.
- Even there are growing needs to expand the cultivation of winter cereals as animal feedstocks, some environmental factors would be limited to produce seeds nationwide in Korea.

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