National Academy of Sciences of Ukraine
Institute of Plant Physiology and Genetics

«DYNAMICS AND PROSPECTS OF WHEAT, CORN AND BARLEY GRAIN PRODUCTION: IMPLEMENTATION OF INNOVATIVE TECHNOLOGIES FOR EFFECTIVE CULTIVATION OF GRAIN CROPS IN VARIOUS SOIL-CLIMATE CONDITIONS OF UKRAINE»

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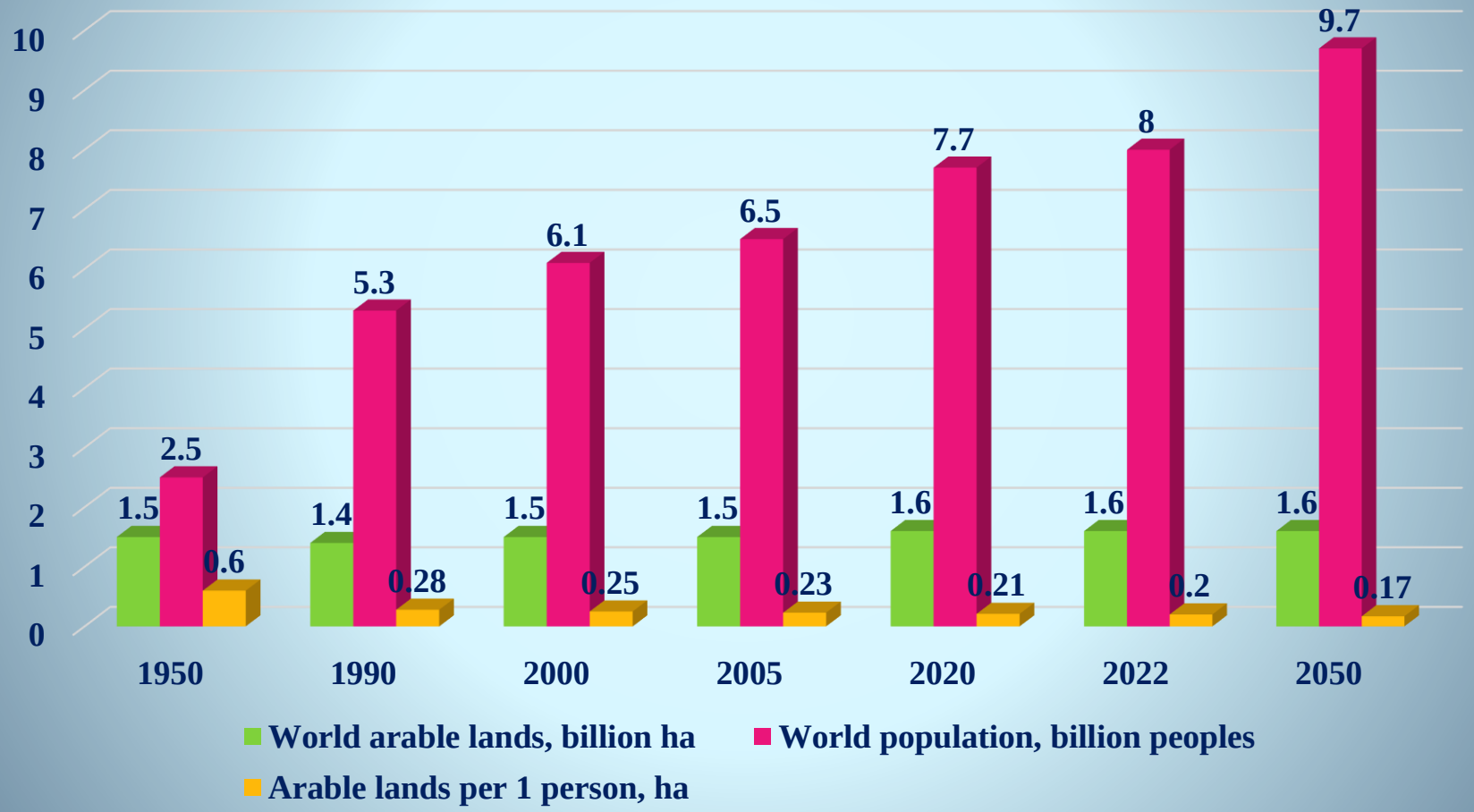
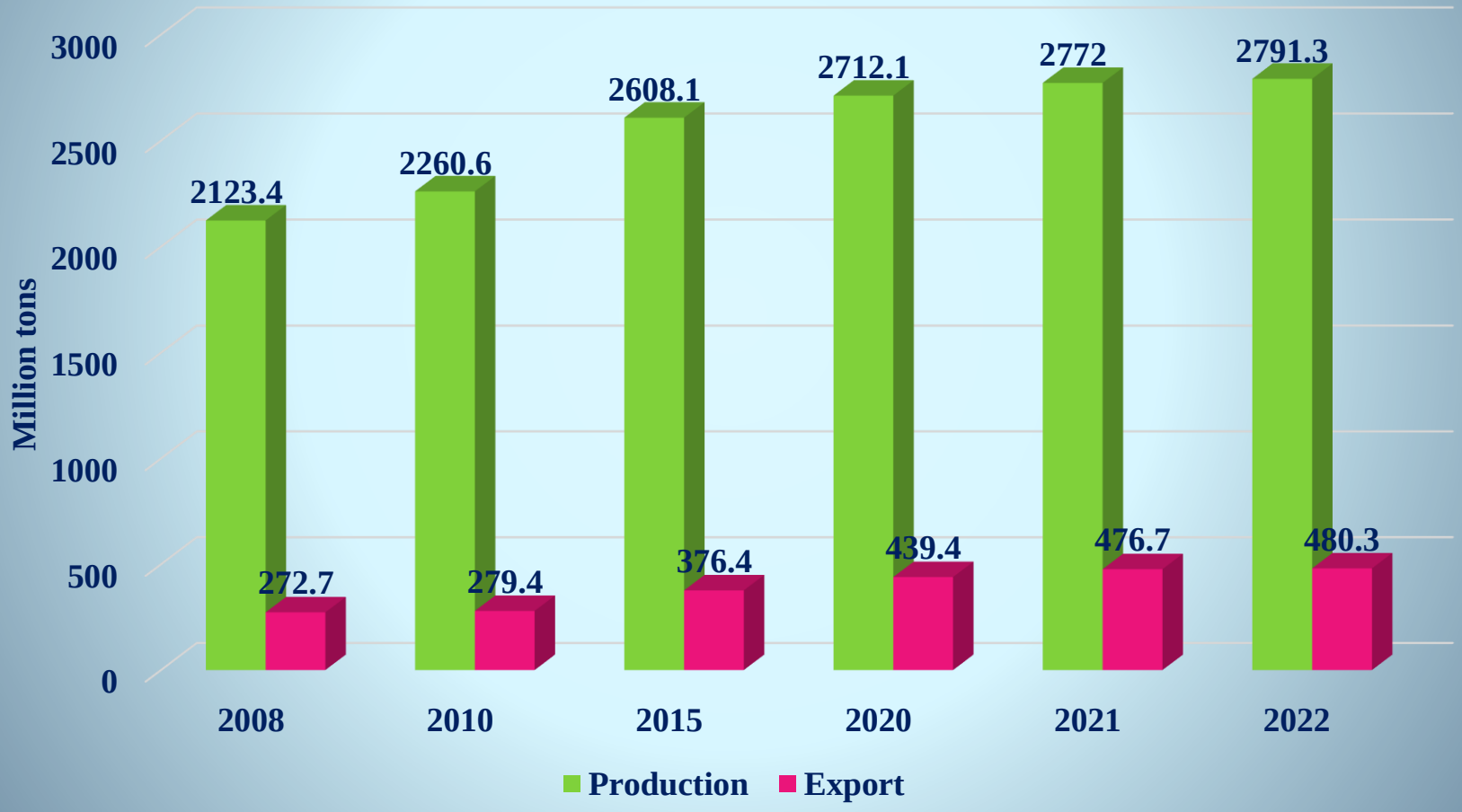
DYNAMICS OF PROVIDING THE WORLD POPULATION WITH ARABLE LAND, 1950–2050

Source: Own design based on the data from the United Nations and the Food and Agriculture Organization of the United Nations



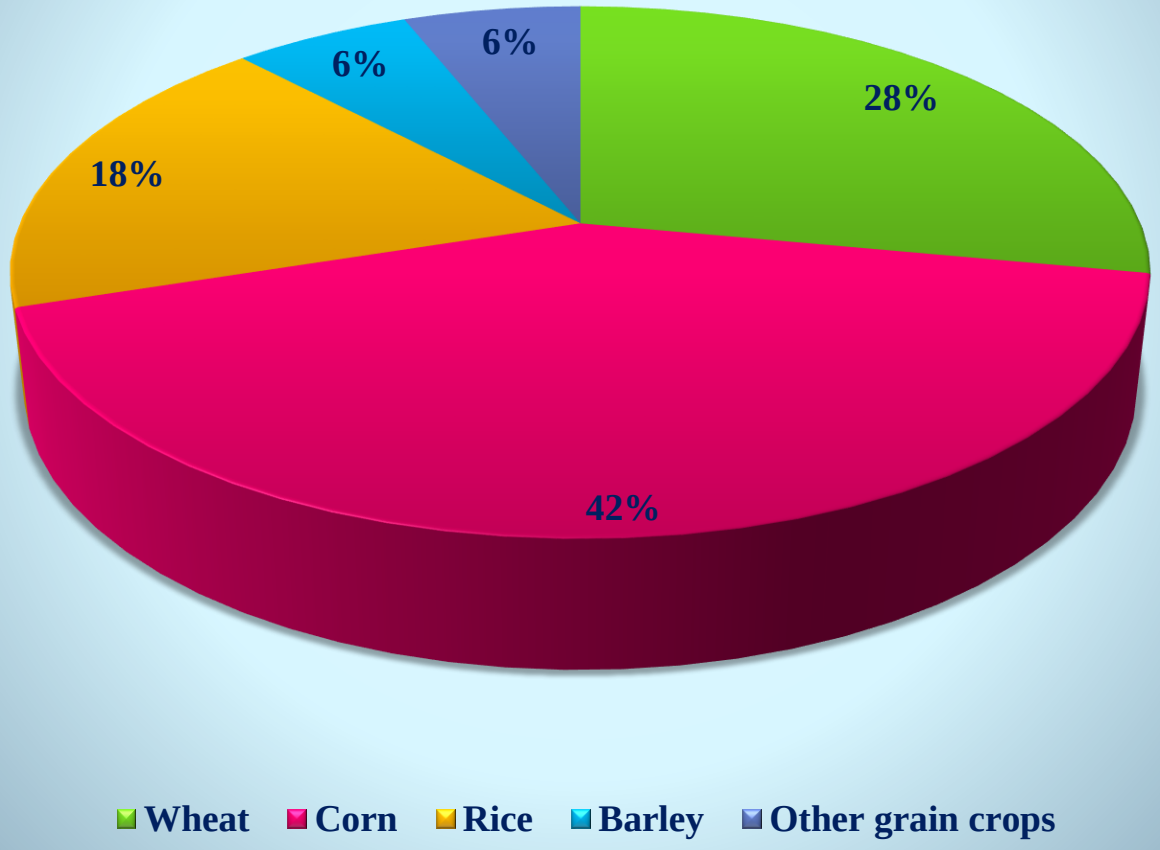
DYNAMICS OF WORLD GRAIN PRODUCTION AND EXPORT, 2008–2022

Source: Own design based on the data from the Food and Agriculture Organization of the United Nations and the United States Department of Agriculture



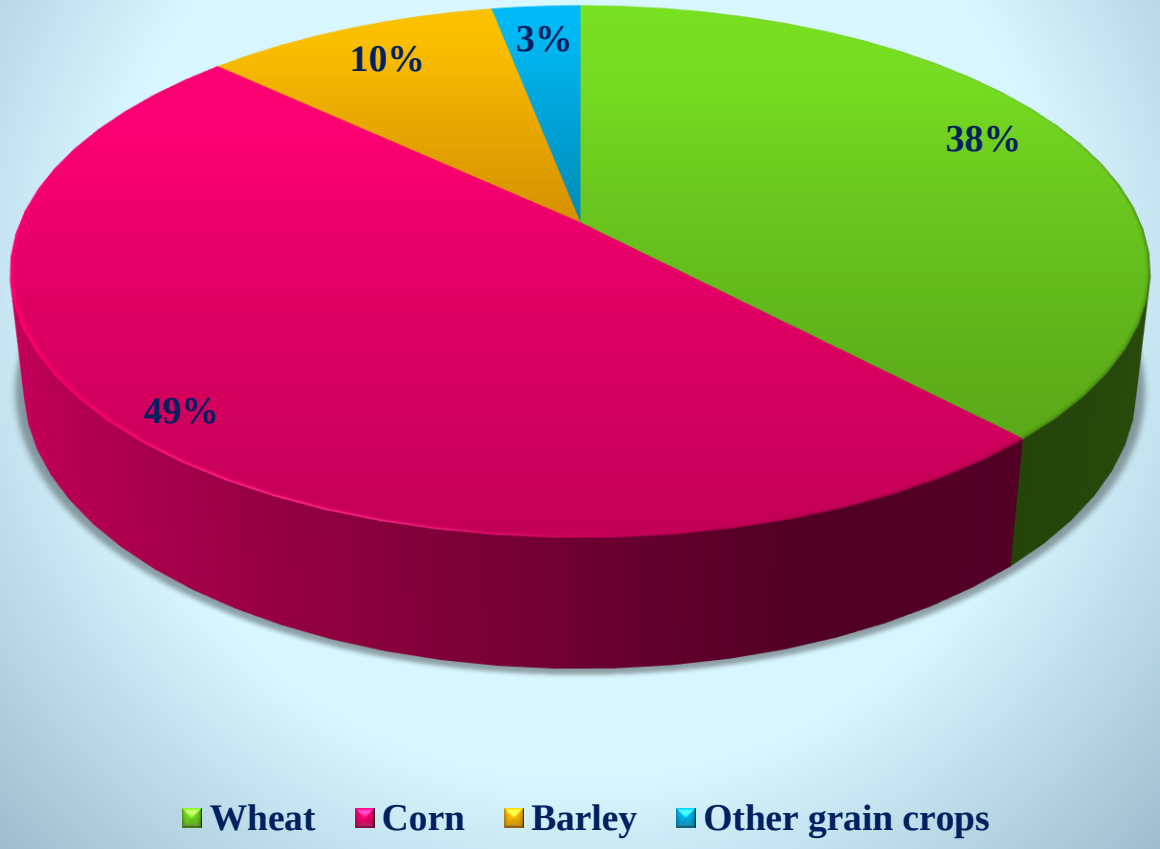
THE STRUCTURE OF WORLD GRAIN PRODUCTION, 2022

Source: Own design based on the data from the Food and Agriculture Organization of the United Nations



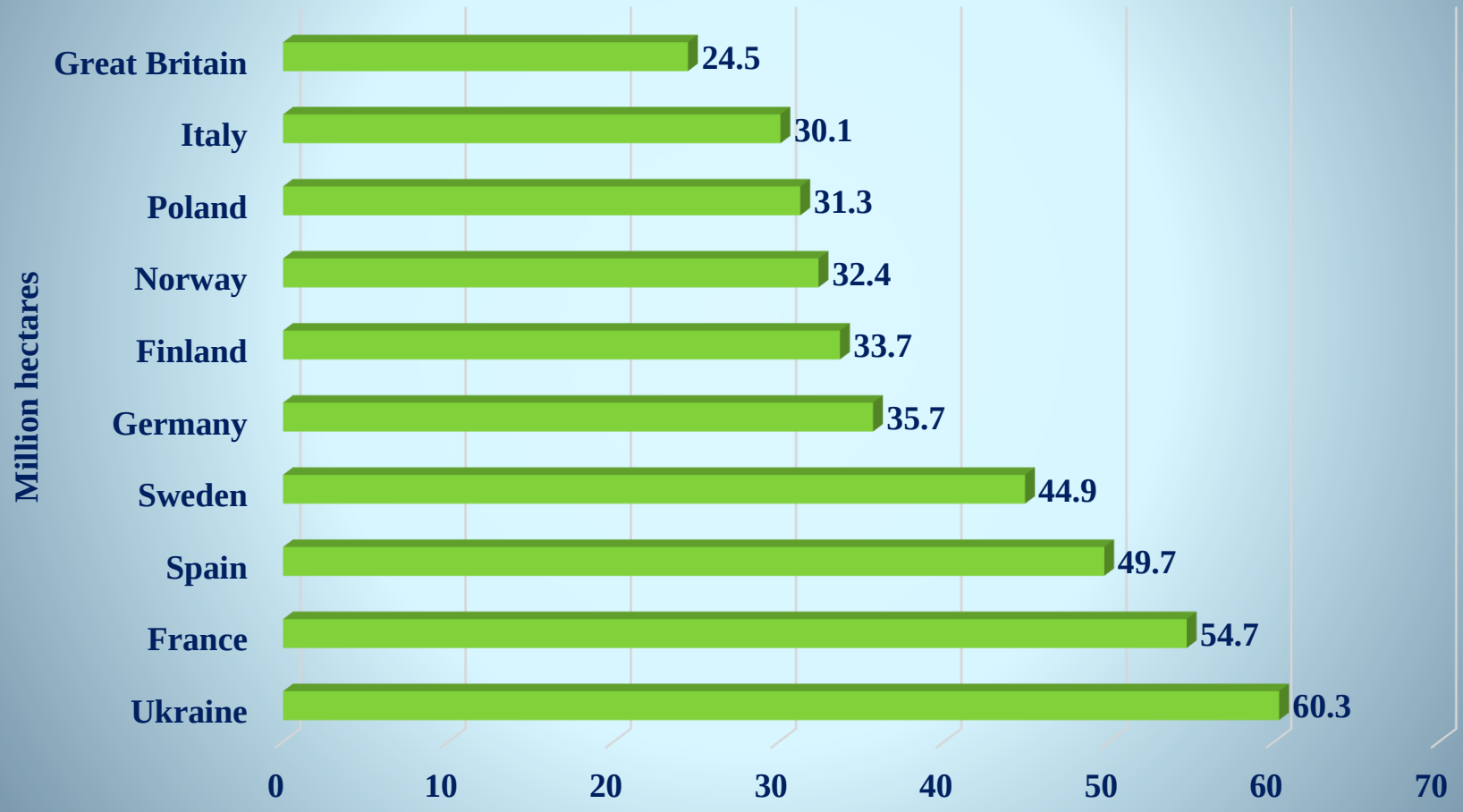
THE STRUCTURE OF GRAIN PRODUCTION IN UKRAINE, 2022

Source: Own design based on the data from the State Statistics Service of Ukraine



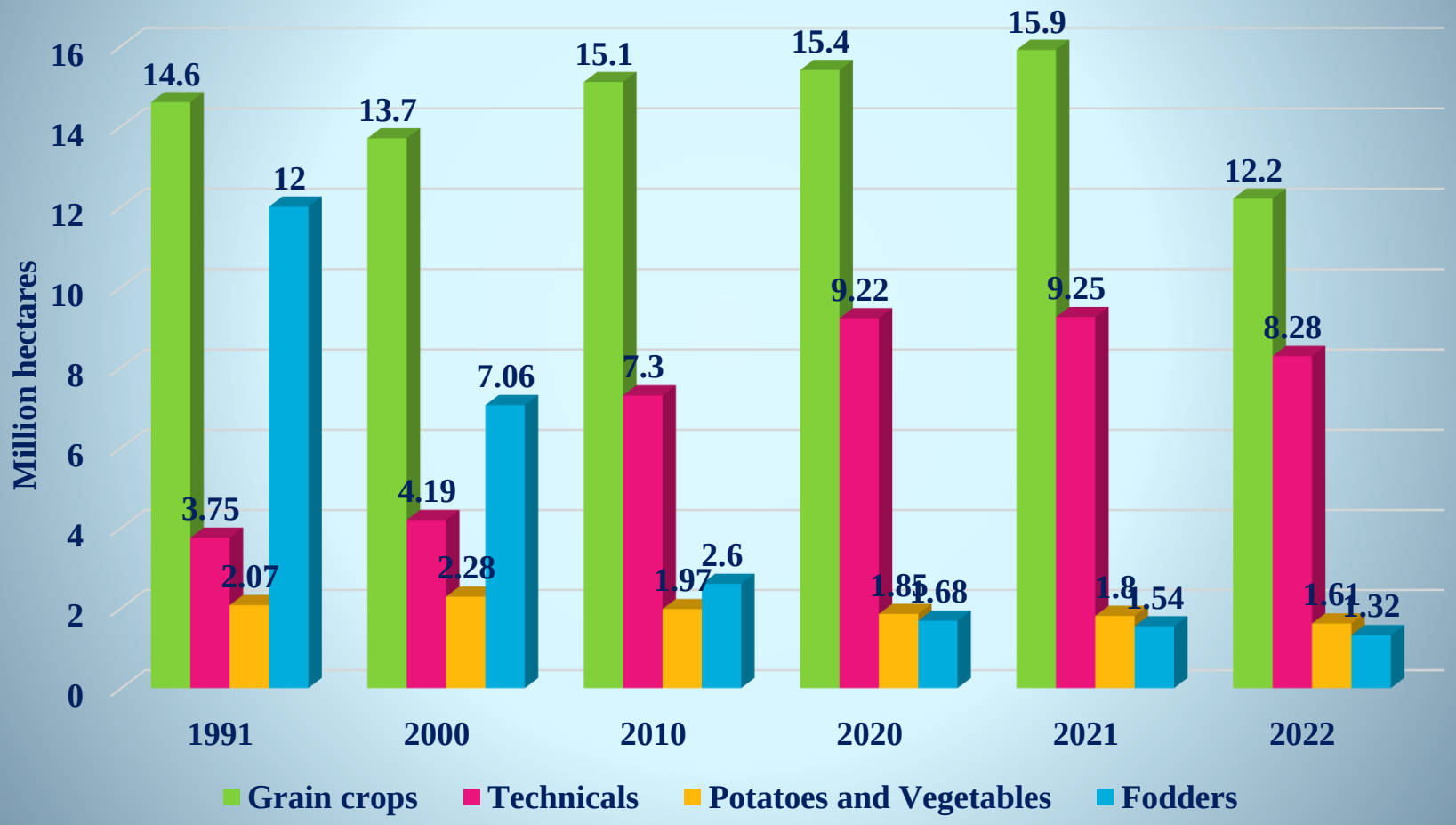
EUROPEAN COUNTRIES WITH THE LARGEST AREAS OF TERRITORY, 2021

Source: Own design based on the data from the National Scientific Center «Institute of Agrarian Economics of the NAAS», 2021



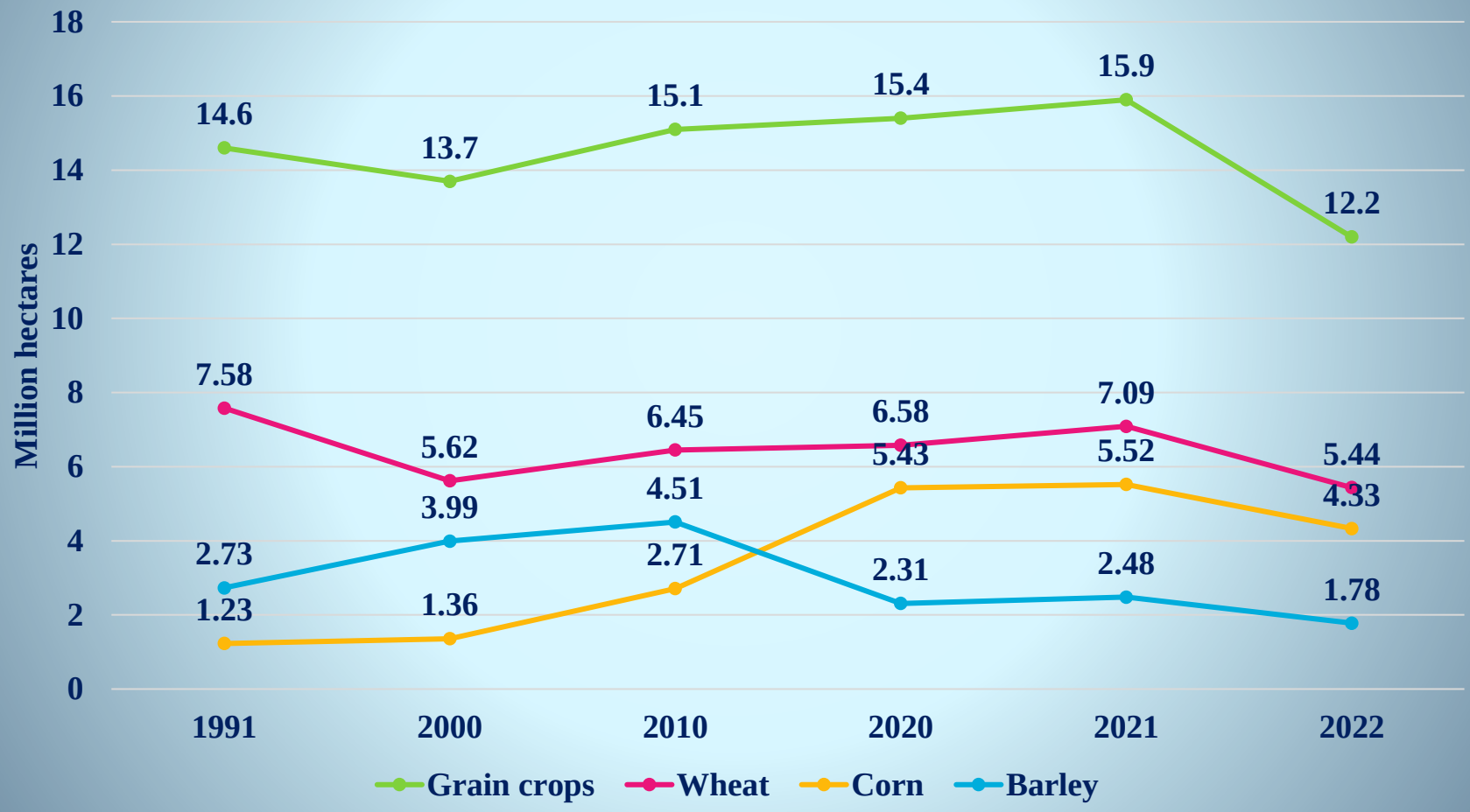
DYNAMICS OF SOWN AREAS OF AGRICULTURAL CROPS IN UKRANE, 1991–2022

Source: Own design based on the data from the State Statistics Service of Ukraine



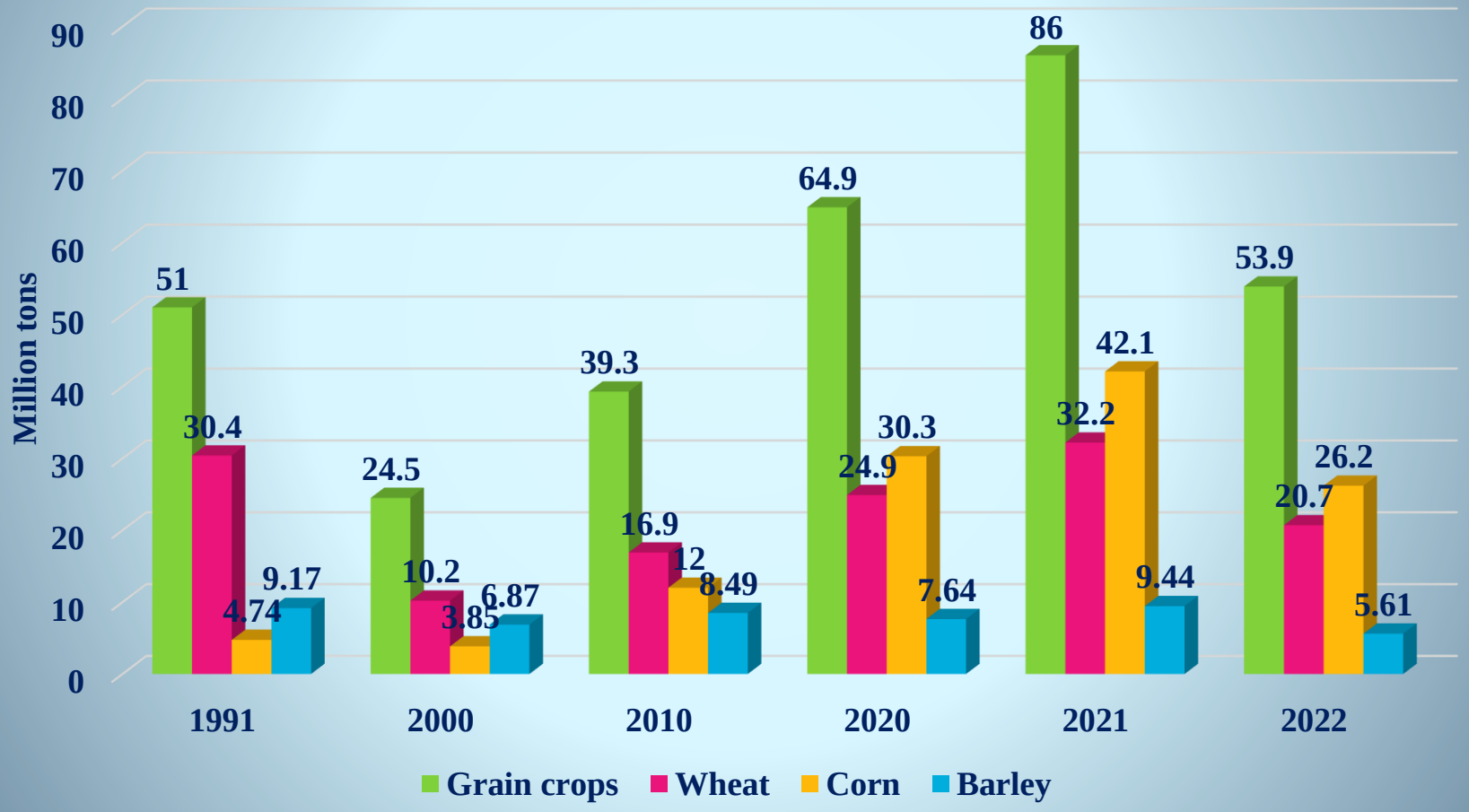
DYNAMICS OF SOWN AREAS OF LEADING GRAIN CROPS IN UKRAINE, 1991–2022

Source: Own design based on the data from the State Statistics Service of Ukraine



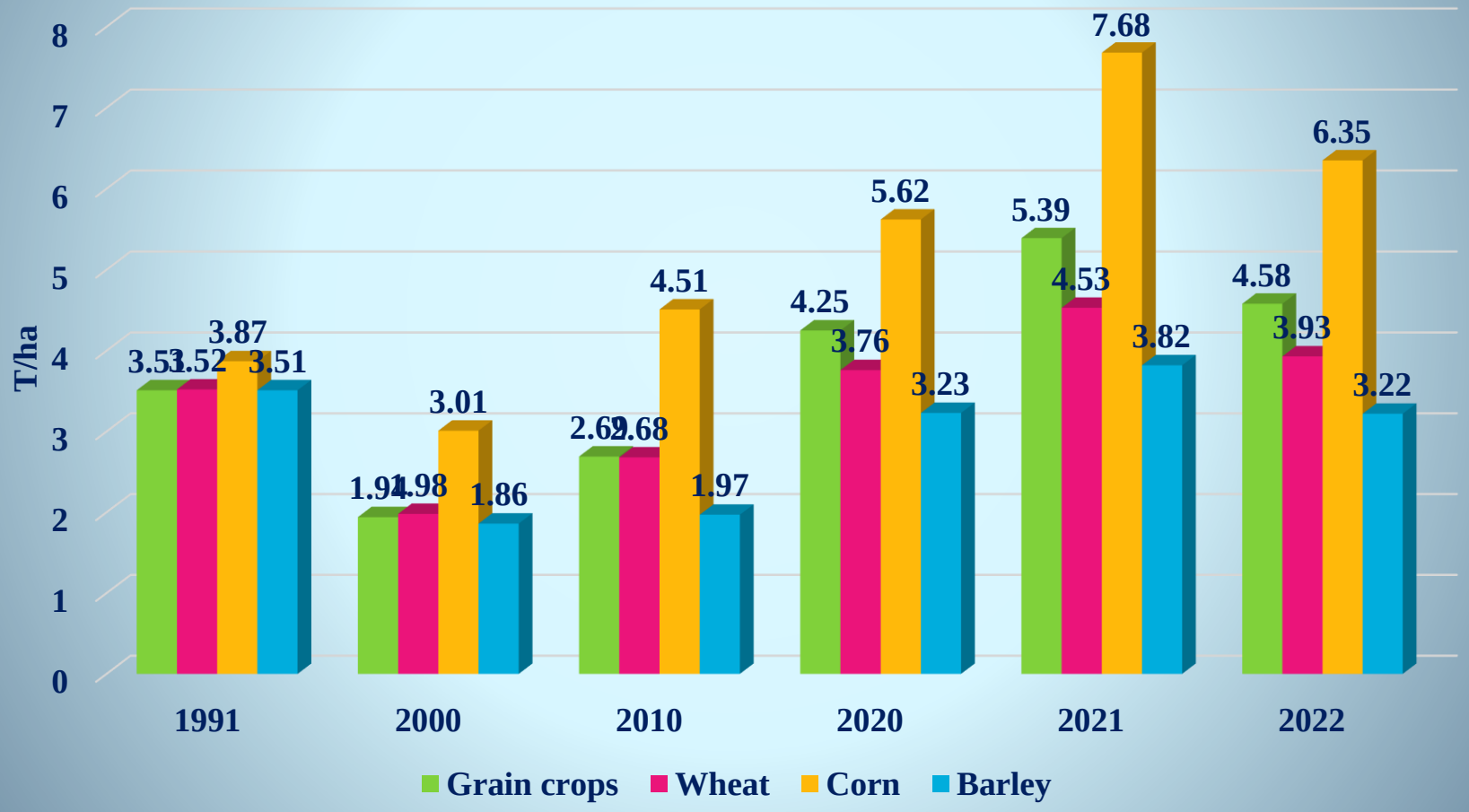
DYNAMICS OF PRODUCTION OF LEADING GRAIN CROPS IN UKRAINE, 1991–2022

Source: Own design based on the data from the State Statistics Service of Ukraine



DYNAMICS OF YIELD OF LEADING GRAIN CROPS IN UKRAINE, 1991–2022

Source: Own design based on the data from the State Statistics Service of Ukraine



ELEMENTS OF INNOVATIVE TECHNOLOGIES FOR EFFICIENT CULTIVATION OF GRAIN CROPS

– the use of modern varieties and hybrids of grain crops with high genetic potential for yield and quality, stable resistance to weeds, diseases, pests and other negative environmental factors;
– optimization of the structure of sown areas and scientifically based seed crop rotations with the cultivation of traditional and rare crops;
– the use of effective predecessors of agricultural crops and periods of their return to the previous place of cultivation in crop rotations;
– introduction of organic and mineral fertilizers, which ensure regulation of the water and nutrient regime of the soil;
– introduction of biological means of plant protection against weeds, diseases and pests;
– implementation of protective soil tillage, which contributes to the accumulation, preservation and rational use of soil moisture;
– sideration and mulching;
– irrigation systems;
– productive use of the natural mass of plant residues – straw of grain crops, stalks and tops of corn and sunflower, husks of root crops;
– the use of modern biodestructors to transform plant residues into organic matter intended for soil nutrition and increasing its fertility.

HIGH-PRODUCT VARIETIES OF WINTER WHEAT SELECTED BY THE INSTITUTE OF PLANT PHYSIOLOGY AND GENETICS OF THE NATIONAL ACADEMY OF SCIENCES OF UKRAINE

Source: Compiled according to the data: V.V. Morhun, V.V. Shvartau, D.V. Konovalov, L.M. Mykhalska & V.O. Skryplov, 2022

1) A group of varieties of high intensity type:

- **well-known varieties: Astarta, Zolotokolosa, Perlyna Podillya, Smuglyanka;**
- **new varieties: Horodnytsia, Novosmuglyanka, Kyivska 19, Sicheslava, Sofia Kyivska, Stepova krynytsia;**
- **the leader of the group is the national standard – Smuglyanka.**

2) A group of varieties of the intensive type of universal use:

- **well-known varieties: Bohdana, Boriya, Darynka Kyivska, Zoloto Ukrainy, Malynivka, Podolyanka, Shchedrivka Kyivska;**
- **new varieties: Jamala, Zdoba Kyiyska, Kyivska 17, Krasnopilka;**
- **the leader of the group is the national standard – Podolyanka.**

A subgroup of specialized varieties in the group of varieties of the intensive type of universal use:

- **Zymoyarka, which combines the genes of winter and spring;**
- **Donor Kyivskyi, which belongs to extra-strong wheat and provides high-quality flour.**

IMPLEMENTATION OF HIGH-PRODUCT VARIETIES OF WINTER WHEAT SELECTED BY THE INSTITUTE OF PLANT PHYSIOLOGY AND GENETICS OF THE NATIONAL ACADEMY OF SCIENCES OF UKRAINE IN DIFFERENT SOIL-CLIMATE CONDITIONS OF UKRAINE

Source: Compiled according to the data: V.V. Morhun, V.V. Shvartau, D.V. Konovalov, L.M. Mykhalska & V.O. Skryplov, 2022

– in the Steppe: Astarta, Bohdana, Boriya, Horodnytsia, Jamala, Donor Kyivskyi, Zdoba Kyivska, Zymoyarka, Zoloto Ukrainy, Zolotokolosa, Kyivska 19, Krasnopilka, Malynivka, Novosmuglianka, Podolyanka, Sicheslava, Smuglyanka, Sofia Kyivska, Stepova krynytsia, Shchedrivka Kyivska;

– in the Forest-Steppe: Astarta, Bohdana, Boriya, Horodnytsia, Darynka Kyivska, Jamala, Donor Kyivskyi, Zdoba Kyivska, Zymoyarka, Zoloto Ukrainy, Zolotokolosa, Kyivska 17, Kyivska 19, Krasnopilka, Malynivka, Novosmuglyanka, Perlyna Podillya, Podolyanka, Sicheslava, Smuglyanka, Sofia Kyivska, Stepova krynytsia, Shchedrivka Kyivska;

– in the Polissia: Boriya, Horodnytsia, Darynka Kyivska, Zymoyarka, Kyivska 17, Kyivska 19, Perlyna Podillia, Sofia Kyivska, Stepova krynytsia, Shchedrivka Kyivska.

OPTIMUM SATURATION AND RATIO OF AGRICULTURAL CROPS IN SCIENTIFICALLY BASED CROP ROTATIONS FOR DIFFERENT SOIL-CLIMATIC CONDITIONS OF UKRAINE

Source: Compiled according to the data: N.P. Kovalenko, 2014; Ye.O. Yurkevych, P.I. Boiko, N.P. Kovalenko & N.O. Valentiuk, 2021

Crops	Optimum saturation and ratio of cultures, %			
	Southern Steppe	Northern Steppe	Forest-Steppe	Polissia
Grain and leguminous	40–82	45–80	29–95	35–80
Technical	5–35	10–30	5–30	3–25
including:				
rapeseed	5–10	10	3–5	0,5–4,0
sunflower	12–15	10	5–9	0,5
Potatoes and vegetables	5–20	5–20	3–5	8–25
Fodders	10–60	10–60	10–75	20–60
including:				
perennial grasses	10–25	10–16	10–50	5–20
Black par	18–20	5–14	–	–

SCIENTIFICALLY BASED PERIODS OF RETURN OF AGRICULTURAL CROPS TO THE PREVIOUS PLACE OF CULTIVATION IN CROP ROTATIONS

Source: Compiled according to the data: N.P. Kovalenko, 2014; O.V. Demydenko, P.I. Boiko, M.I. Blaschuk, I.S. Shapoval & N.P. Kovalenko, 2019

Crops	Return period
Winter rye and barley, spring barley, oats, buckwheat	not less than 1 year later
Winter wheat, millet, potatoes	not less than 2 years later
Corn in crop rotation or on a field temporarily removed from crop rotation	the possibility of cultivation for 2–3 years in a row
Perennial legumes grasses, leguminous crops (except lupine), sugar and fodder beets, winter and spring rapeseed	not less than 3 years later
Flax	not less than 5 years later
Lupine, cabbage	not less than 6 years later
Sunflower	not less than 7 years later
Medicinal plants (depending on biological properties)	not less than 1–10 years later

PROSPECTIVE IMPLEMENTATION OF SCIENTIFICLY BASED SEED CROP ROTATIONS IN DIFFERENT SOIL-CLIMATE CONDITIONS OF THE STEPPE OF UKRAINE

– in the Southern Steppe (non-irrigated lands): 1 – black par, 2 – winter wheat, 3 – winter barley, 4 – peas, 5 – winter wheat; 1 – black par, 2 – winter wheat, 3 – winter rapeseed, 4 – winter wheat, 5 – barley, 6 – sunflower; 1 – black par, 2 – winter wheat, 3 – corn for grain, 4 – barley and corn for green fodder with alfalfa under seeding, 5 – alfalfa, 6 – alfalfa, 7 – winter wheat, 8 – winter and spring crops for green fodder, 9 – winter wheat, 10 – sunflower;

– in the Southern Steppe (irrigated lands): 1 – soybeans, 2 – winter wheat + post-harvest crops, 3 – corn for grain; 1 – safflower, 2 – winter wheat, 3 – winter barley, 4 – soybean, 5 – barley with safflower seeding; 1 – soybean, 2 – winter wheat, 3 – winter rapeseed, 4 – winter wheat;

– in the Central and Northern Steppe: 1 – black par, 2 – winter wheat, 3 – corn for grain, 4 – soybean, 5 – winter wheat, 6 – sunflower; 1 – black par, 2 – winter wheat, 3 – barley with safflower seeding, 4 – safflower, 5 – winter wheat, 6 – sunflower; 1 – black par, 2 – winter wheat, 3 – sugar beets, 4 – corn for grain, 5 – soybeans, 6 – winter wheat, 7 – winter rapeseed, 8 – winter wheat, 9 – sunflower; 1 – black par, 2 – winter wheat, 3 – sugar beets, 4 – peas, annual grasses for green fodder, corn for silage, 5 – winter wheat, 6 – corn for grain or silage, 7 – barley, oats + perennial grasses, 8 – perennial grasses for green fodder, 9 – winter wheat, 10 – sunflower.

PROSPECTIVE IMPLEMENTATION OF SCIENTIFICLY BASED SEED CROP ROTATIONS IN DIFFERENT SOIL-CLIMATE CONDITIONS OF THE FOREST-STEPPE AND POLISSIA OF UKRAINE

– in the Forest-Steppe: 1 – perennial grasses for 1 cutting, annual grasses for green fodder, 2 – winter wheat, 3 – sugar beets, 4 – corn for grain, 5 – peas, vetch, 6 – winter wheat, 7 – sugar beets, potatoes, 8 – corn for grain, silage, 9 – winter wheat, 10 – spring cereals crops with perennial grasses; 1 – peas, 2 – winter wheat, 3 – sugar beets, 4 – corn for grain, 5 – barley; 1 – alfalfa, 2 – winter wheat, 3 – sugar beets, 4 – corn for grain, 5 – corn for silage, 6 – peas, 7 – winter wheat, 8 – corn for silage, 9 – barley, millet with perennial grasses;

– in the Polissia: 1 – clover, 2 – winter wheat, 3 – flax, lupine for grain or silage, 4 – winter rye, 5 – corn for green fodder or silage, 6 – winter wheat, 7 – potatoes, 8 – spring cereals with clover sowing; 1 – winter rapeseed, 2 – winter wheat, 3 – corn for silage, 4 – winter wheat, 5 – soybean; 1 – clover, 2 – winter wheat, 3 – flax + post-harvest crops or annual grasses, 4 – barley or winter rye, 5 – lupine, corn for silage or green fodder, 6 – winter rye + post-harvest crops, 7 – potatoes, 8 – barley with clover seeding.

Thank you for your attention!