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The IIASA/LUC Project Georeferenced Database for the former U.S.S.R. Volume 6: Agricultural Regionalization.

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Contents

Abstract

The IIASA/LUC georeferenced database for the former U.S.S.R. was created within the framework of the project "Modeling Land Use and Land Cover Changes in Europe and Northern Asia" (LUC). For Russia, essential information on relief, soil, vegetation, land cover and use, etc., for routine environmental analysis was lacking when the LUC project started developing the database. In addition, the environmental data on the former U.S.S.R. which was available occurred in formats (papers, tables, etc.) that in general could not be used with modern information technology, and in particular in model building. In creating the LUC project database, we have established a threefold task:

1) to obtain the relevant information for the LUC project modeling exercises;
2) to develop data which is applicable to modern information technology;
3) to contribute a series of digital databases which could be applied for a number of other specific analyses by the national and international scientific community.

In defining the tasks it was agreed to create a set of digital databases which could be handled by geographic information systems (GIS). The full set of georeferenced digital databases was combined into the LUC project's GIS, using ARC/INFO. However, each individual item (physiography, soil, vegetation, etc.) was created as a unique specific digital database, allowing each item to be used separately, depending on users' needs.

The complete series of the unique georeferenced digital databases for the territory of the former U.S.S.R. is described in the IIASA/LUC volumes:

Volume 1: Physiography (landforms, slope conditions, elevations).
Volume 2: Soil.
Volume 3: Soil degradation status (Russia).
Volume 4: Vegetation.
Volume 5: Land categories.
Volume 6: Agricultural regionalization.

Acknowledgments

The georeferenced digital database presented in this paper was established on the basis of the *Map of Agricultural Regionalization of the U.S.S.R* at scale 1:4 M. The map was compiled at the Faculty of Geography, Moscow State University, and published in 1989. The work related to compiling the map was carried out by specialists from the Laboratory of Land Funds, the Department of Economic Geography and the Laboratory of Complex Mapping and Atlases. To co-ordinate the joint work and to elaborate the unified system of data on agricultural regionalization, a special editorial board was established. It included Prof. L.M. Zaltsman, Dr. V.G. Kryuchkov, Dr. A.N. Rakitnikov, Dr. S.I. Polovenko, Dr. T.A. Solovtsova from the Moscow State University, and Prof. Dr. A.K. Iliechev from the All-Union Academy of Agricultural Sciences.

We express our gratitude to all those who contributed to the tremendous task of compiling the map. Special thanks are to be extended to Dr. A.N. Rakitnikov as editor in chief. We would also like to thank the local organizations who compiled numerous regional maps from where statistical data were obtained for major regions of the Soviet Union.

Authors

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Introduction

The map of *Agricultural Regionalization of the former U.S.S.R.* reflects the spatial distribution of land patterns including all forms of land uses for the production of biotic commodities, both from plants or animals. In general, these patterns are closely, but not completely, related to the frequently used terms "*agro-ecosystem*", "*major land use*", "*land-use system*", "*land-utilization type*", "*agricultural region*" and similar concepts. The glossary of land use terms, which was agreed upon in 1993 [Glossary of Land Use Terms, 1993], defines an agro-ecosystem as "*an ecological system modified by human beings to produce food, fiber and other agricultural products*"; major land use or kinds of land use as "*a major subdivision of rural land use, such as rainfed agriculture, irrigated agriculture, range management, forestry, recreation*"; land-use system as "*a specified land utilization type or land use, practiced on a given land unit, and associated with inputs, outputs, and possibility of land improvements*"; land utilization type as "*a kind of land use described or defined in a degree of detail greater than that of a major kind of land use. In the context of rainfed agriculture, land utilization type refers to a crop, crop combination or cropping system within a specified technical and socio-economic setting*"; agricultural region as "*any geographical area in which there is a clearly defined and predominant agricultural structure producing broadly similar types of farming, such as Mediterranean region, the prairies provinces of Canada, and areas of wet-rice cultivation in South-East Asia*".

There is no need to extend this long list of definitions. Analysis of these terms clearly shows that they are very similar to each other. The details by which they differ can not be defined precisely. This conclusion corresponds well to the observation made by Fresco et al. [4,5] that "*...no unified descriptors of land use are agreed upon. Moreover, there is currently no basis to compare land use in different regions or to extrapolate from one region to another*" [5, p.8]. The database presented here has been created on the basis of well-defined attributes rather than with reference to broad imprecise classes.

This report presents the IIASA-LUC project georeferenced digital database of agricultural regionalization for the territory of the former U.S.S.R. which was created to

consistently and accurately describe attributes of agricultural activity over the vast region. The Map of Agricultural Regionalization of the U.S.S.R. complements another georeferenced digital database developed by the IIASA-LUC project, namely the *Map of Land Categories of the U.S.S.R.* (Yanvareva et al., 1989; Stolbovoi et al., 1997). Such quantitative description is needed not only for the modeling of land-use/cover changes, but can also be applied to various other purposes such as resources analysis, agro-ecological zoning, etc.

Description of the Source Map and Projection Parameters

Principles of Agricultural Regionalization

Agricultural regionalization is based on the classification of agricultural production. Data on individual collective farms represent the finest spatial unit. However, "agricultural regions" or "agriculture types", are not homogenous in the sense of having only one single production type. For this reason the agricultural regions are defined as areas characterized by specific and regular combinations of individual types of cropping or livestock farms.

The types of agriculture are identified by several aspects. The first characteristic refers to social features. Crop and livestock production in the agricultural sector of the former U.S.S.R. was concentrated in collective farms. The social sector is the main factor for differences between regions depending on the predominant role played by government, co-operative enterprises and private farms. Apart from prime agricultural regions, characterized by intensive development of agriculture, there are many areas, where agriculture is not much developed. In these regions crop and cattle husbandry are practically absent or have only local importance. For instance, in the extreme north of the country, farming is constrained by climatic conditions. Agriculture is mainly restricted to individual farms of industrial enterprises or to private vegetable gardens and subsistence farming, which are owned by people engaged in the forest industry, fishery and hunting. For these territories, mixed agricultural regions are indicated, for e.g., "*hunting-agricultural*" or "*cattle-crop husbandry*". Usually, local food resources of such regions are poorly developed and are sparsely populated.

The second aspect taken into account to describe different types of agricultural regions, distinguishes functions and contributions of agriculture to the national economy.

The third aspect is management practices and technologies, the mode of exploitation, and impacts on the environment and natural processes. The selection of different crops and management systems as well as livestock rearing is motivated by economic reasons based on comparison of input-output relationships.

Statistical data on farming and land use give a clear picture of the specific proportions of cropland, forests, pastures and other land categories not only in any agricultural region but also for the smaller territory of a collective farm.

For the classification of different types of farming it is also essential to include data on management practices. There are several technological characteristics included in the

database, such as irrigation, drainage, erosion control, accumulation of nutrients in the soil, improvement of soil structure, as well as fertilizer application, crop rotations, liming practices, fallow periods for rehabilitation of soil fertility, etc.

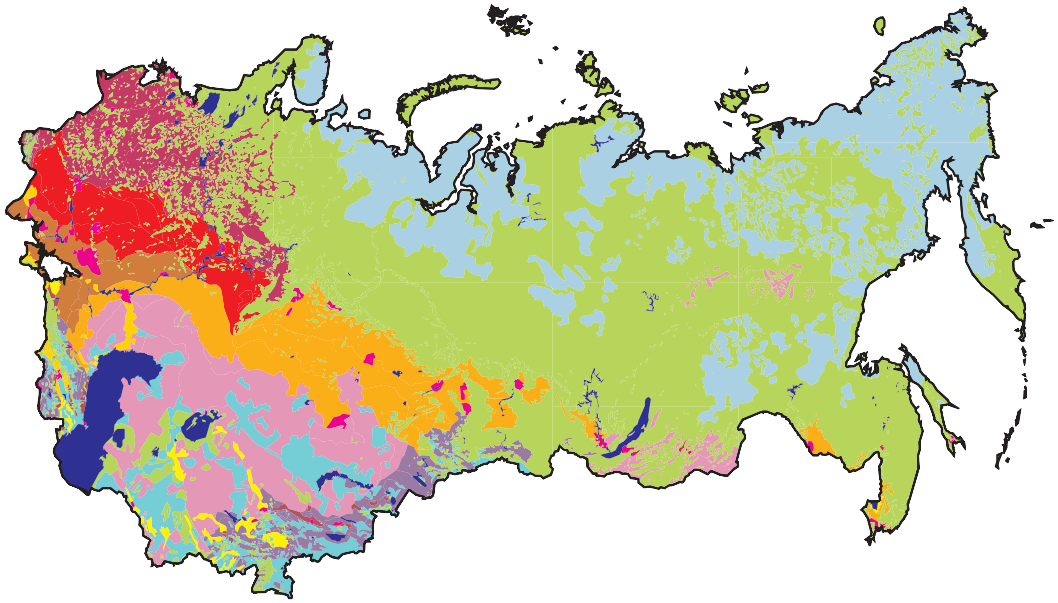
Within one type of farming system, when various crops are grown in sequence over several years, it is possible to describe the crop rotation types. In a temperate climate belt the main elements of the rotation are: 1) tilled crops, 2) non-tilled cereal and technical crops, 3) annual grasses occupying fields in a specific vegetation period, 4) perennial grasses, 5) bare fallow. When several crops are grown on the same area within the vegetation period it is necessary to distinguish crop rotations seasonally within a year.

Management practices are also significant in cattle husbandry. It is important to account for livestock types and the conditions of husbandry. The latter helps to establish production relationships between cropping systems and cattle husbandry.

Based on the considerations mentioned above, 92 different classes of agricultural regions have been distinguished. In the map legend these were combined into 12 groups according to similarity of cropping systems and cattle husbandry, showing specific features and effects of agriculture upon environmental conditions.

A generalized version of the map is shown in Figure 1. A complete description of the map legend is given in Appendix 1.

AGROREGIONS of the former USSR



CROP AND LIVESTOCK PRODUCTION
- Crop and livestock production
- Intensive crop and livestock prod.
- Irrigated crop and livestock prod.
- Extensive crop and livestock prod.
- Perennial crops and horticulture
- Crop and livestock prod. (mountain)

LIVESTOCK PRODUCTION
- Intensive livestock production
- Pastoral livestock production (plains)
- Pastoral livestock production (mountain)

SUBURBAN AGRICULTURE
- Intens. agric. around cities

SEMI-NATURAL-AGRICULTURE
- Reindeer production
- Seasonal pastures
- Unused agricultural land

- Water bodies

LUC IIASA

Projection Parameters

Digitizing was done in Cartesian coordinates using sheet frames as the reference grid and subsequent calculation of projection parameters.

Projection parameters were calculated:

- Standard parallels 65.0 and 52.0
- Central meridian 100
- Meridian scale factor 1:1.022

Description of the Database Attributes

List of Attributes

The consideration of several types of attributes makes the classes of the map legend fairly complex. This is due to limitations, which are common to all paper maps. Disaggregation of the classes will lead to increasing numbers of elements and makes a map difficult to read. The intention willingness to show more detailed and specific information on the paper map is countered by requirements for its generalization. A digital database, on the other hand, can readily include a variety of attributes. Thus, the transformation of the map legend to a digital database leads to better definition of attributes. The finest elements that resulted from such legend disaggregation are listed below:

I. Agricultural development (only for types of agricultural regions)

1. Highly intensive
2. Intensive
3. Little use
4. Very limited crop farming
5. Seasonal pastures
6. Unused

II. Types of husbandry (only for types of agricultural regions)

1. Highly intensive (suburb)
2. Intensive cattle rearing
3. Intensive crop and cattle rearing
4. Relatively extensive crop and cattle rearing
5. Crop and cattle rearing
6. Crop husbandry including cultivation of fruit crops
7. Crop and crop-cattle rearing based on irrigation
8. Pastoral and cattle rearing on plains
9. Pastoral and cattle rearing in mountains
10. Crop and cattle rearing in mountains
11. Reindeer herding
12. Hunting and trapping

III. Predominant crops

1. Grain crops
2. Tilled crops
3. Technical crops
4. Perennial grasses
5. Improved hay-and grassland
6. Forage production
7. Meadowland
8. Early-mature vegetable
9. Vegetables
10. Potatoes
11. Beets
12. Flax
13. Sunflowers
14. Soybean
15. Rice
16. Fruit
17. Viticulture
18. Tobacco
19. Tea plantations
20. Melon fields
21. Cotton
22. Silkworm rearing
23. Subtropical fruit crops
24. Subtropical technical crops
25. Subsistence farming

IV. Crop rotations

1. Grain-grass-tilled crops
2. Grass-grain-tilled crops
3. Green manuring-grain-tilled crops
4. Grain-grass-fallow
5. Grain crop-fallow
6. Grain-tilled crops
7. Grain-fallow-tilled crops
8. Cropped fallow
9. Bare fallow

V. Reclamation

1. Drainage
2. Irrigation
3. Rainfed farming
4. Soil-protective measures
5. Water accumulation in soil

VI. Cropland improvement

1. Liming
2. Large doses of organic and mineral fertilizers
3. Considerable doses of organic fertilizer
4. Increased doses of fertilizers
5. Relatively small doses of organic fertilizers
6. Small doses of organic fertilizer

VII. Livestock types

1. Dairy cattle
2. Dairy-beef cattle
3. Beef-dairy cattle
4. Beef cattle
5. Pigs
6. Cattle fattening
7. Poultry
8. Sheep
9. Pedigree sheep
10. Pedigree fine-fleeced sheep
11. Pastoral sheep
12. Stall-pastoral sheep
13. Astrakhan sheep
14. Camel
15. Horse
16. Maral
17. Reindeer

VIII. Additional characteristics of cattle rearing

1. Cattle rearing based on fodder production
2. Cattle rearing based on mainly natural pastures and hayland
3. Cattle rearing based on imported forage
4. Cattle rearing using improved pastures and hayland
5. Cattle rearing mainly combined with summer grazing on piedmont and mountain pastures
6. Winter grazing is applied for cattle rearing
7. Grazing during the whole year
8. Different ways to keep cattle

Definition of Attributes[1]

I. Agricultural development

1. Highly intensive use (cropland accounts for 75-95% of areas used in agriculture)
2. Intensive use (less than 75% of areas used in agriculture)
3. Limited use (for instance, milk cattle rearing combined with fodder crops and vegetable production in glasshouses)
4. Very limited crop farming (fodder crops and early-maturing vegetables in open field conditions, sometimes winter cereals)
5. Seasonal pastures
6. Unused (local types of agricultural use possible under marginal natural conditions):
   - tundra (limited hunting, fishing and reindeer-rearing);
   - wet forests and bogs (exploitation for industrial purposes, reserves; agricultural use is limited to small plots allocated near settlements)

II. Types of husbandry[2]

1. Highly intensive (suburb): situated around big cities, not further than 100 km from the city. Cultivation of vegetables, potatoes, berries and fruits, as well as dairy production. Agro-industrial complexes are well developed and include agricultural production, manufacturing, waste utilization from the food industry; a great diversity of types of agriculture.
2. Intensive cattle rearing: rotations of different crops, including fodder to enrich the soil; high proportion of fodder crops (35-50%), especially perennial grasses (20-35%), and some cereals. Considerable fraction of natural and improved hayland and pastures (0.2-0.4 ha per 1 ha of cropland). Sometimes bare fallow.
3. Intensive crop and cattle rearing: a type of agricultural use which occupies large areas. The proportion of natural grassland does not exceed 5-20%. Tilled crops are required needing high expenditures per ha of cropland, high doses of fertilizers, complicated rotations; bare fallow can occur in some locations. The ratio between livestock and sown area is 0.3-1.0 animals per ha, fodder crops account for 25-35% of the areas under crops.
4. Extensive crop and cattle rearing: low degree of soil cultivation (especially non-tillage management), low input of fertilizers, various rotations. Cropland is mainly used for cereals (spring wheat, oats, barley). A considerable part of the cropland is left as bare fallow. Livestock production is based on natural grassland. The ratio between livestock and cropland is less than 0.3 animals per ha.
5. Crop and cattle rearing: the fraction of plowed land is very high, in the range of 75-95%. Fodder crops are cultivated both in summer and winter, comprising 20-

[1] Numbers correspond to the list of attributes

[2] The term *breeding* is used here to indicate that livestock activities are aimed at producing high-quality animal stocks. Livestock activities primarily aimed at utilization of livestock for production of meat, milk, hides, hair or other by-products are termed *rearing* or *raising* in the description.

30% of cropland. Farming practices are oriented towards accumulating water in the soil.

6. Crop husbandry, including cultivation of fruit crops: favorable conditions for the cultivation of perennial trees and shrubs: fruit crops, grapes, berries, and tea as well as melons and technical crops. Production costs and labor inputs per ha are high compared to most field crops. There are also high expenditures to improve soil through reclamation, and to protect the plants from pests and unfavorable weather conditions.
7. Crop and crop-cattle systems based on irrigation: high expenditures to maintain soil fertility. Careful attention is paid to the proportion of different land uses and different crops, rotation types, fertilizers and the selection of cattle for rearing.
8. Pastoral cattle rearing on plains: for long periods (8-9 months) sheep, cattle, goats, horses and camels are ranged. Conditions permit winter grazing. Husbandry is specialized on fine-fleeced sheep breeding, astrakhan sheep breeding, camel herding, etc. There is no cultivated land except for limited use of flood irrigation to cultivate fodder crops.
9. Pastoral cattle rearing in mountains: combination of pastoral cattle rearing and farming. Different crops and various types of cattle rearing occur in various vertical zones. For instance, cropland dominates in lower vertical zones, forests in middle zones, and meadows for summer grazing in high vertical zones. Farming is usually well developed.
10. Crop and cattle rearing in mountains: Typical land use in mountain and piedmont regions. Crop farming (rainfed or irrigated) is developed in the valleys. The most widespread crops are tobacco and sugar beet. Mountain meadows are used as pastures in summer.
11. Reindeer rearing: extensive type of husbandry: 150 ha of pasture per animal). Tundra and forest-tundra are used for summer grazing and taiga as winter pastures. Reindeer herds migrate hundreds of kilometers. Ecologically sound type of livestock rearing, because domesticated herds are similar in number and maintenance conditions to undomesticated herds.
12. Hunting and trapping: fishery, seal-trapping, hunting, reindeer herding, etc.

III. Predominant crops

1. Grain crops: wheat, rye, barley, oats, maize.
2. Tilled crops: maize, sunflower, sugar beet, potatoes.
3. Technical crops: sunflower, flax, sugar beet, cotton.
4. Perennial grasses: forage grass for green-cut fodder and hay, silage, etc. - clover, lucerne, esparto, timothy, red-tailed fescue, meadow grass, orchard grass.
5. Improved hay- and grassland: productivity of natural grassland increased by using technical, hydro-technical or agro-technical measures.
6. Forage production: crops cultivated for feeding, fodder grasses, root plants, melons, silage, grain-forage and grain legumes.
7. Meadowland: production of hay and green-cut forage in natural and improved hayland and pastures.
8. Early-mature vegetable growing.
9. Vegetables: cabbage, carrots, red beet, onions, tomatoes, cucumber, radish, garlic, vegetable marrow, aubergine, peppers.
10. Potatoes: management methods to cultivate potatoes of high quality.
11. Beets: management methods to cultivate sugar beets of high quality.

12. Flax: management methods to grow flax-fiber of high quality.
13. Sunflowers: management methods to obtain high yields.
14. Soybean: management methods to obtain high yields.
15. Rice: specialized in growing rice and fodder crops.
16. Fruits: cultivation of seed and stone fruits, and nuts.
17. Viticulture: cultivation of grapes for consumption and food processing.
18. Tobacco: cultivation of high quality tobacco.
19. Tea plantations: cultivation of high quality tea.
20. Melon fields: cultivation of cucurbitaceae crops - melons, watermelons, vegetable marrows, patissones.
21. Cotton: 65-70% of the cultivated area is occupied by cotton, the remainder by lucerne and maize.
22. Silkworm rearing: cultivation of mulberry trees and rearing of silkworms.
23. Subtropical fruit trees: orange, lemon, mandarin, grapefruit, pomegranate, fig, olive trees, almond, pistachio, nut trees.
24. Subtropical technical crops: eucalyptus, bamboo, bay trees, sugarcane, tea, cotton.
25. Subsistence farming: growing of crops mainly for own consumption.

IV. Crop rotations

1. Grain-grass-tilled crops rotation: cultivation of cereals, tilled crops and legumes. The proportion of cereals is not more than 50% of the cultivated areas. Crops of different groups are cultivated each year, for instance: 1- bare fallow, 2- winter wheat, 3- sugar beet, 4- spring cereals combined with grass, 5- perennial grasses, 6- winter wheat, 7- sugar beet, 8- grain-legumes, 9- winter wheat and rye, 10- grain maize, millet, pea. This rotation type is widely spread in non-Chernozem zones, in the forest-steppe regions of European Russia as well as in dry regions under irrigation.
2. Grass-grain-tilled crops rotation: this is similar to the previous rotation, but perennial grasses occupy more than 50% of cropland. Cultivation of cereals and tilled crops is interrupted by perennial grasses in two or more years out of ten.
3. Green manuring-grain-tilled crops rotation: similar to the previous rotation system, but several fields are occupied by cultivation of green manure crops.
4. Grain-grass-fallow rotation: similar to the third rotation system, but tilled crops are replaced by cropped fallow.
5. Grain crop-fallow rotation: mostly cultivation of cereals, left as bare fallow every 2-4 years, for example, 1-bare fallow, 2-spring wheat, 3-spring wheat, 4-oats + barley. This rotation is widespread in dry regions of northern Kazakhstan and in the steppe regions of Siberia.
6. Grain-tilled crops rotation: 50% and more of cropland are under cereals, in rotation with tilled crops every 1-3 years. For example, 1-tilled, 2-grain, 3-grain, 4-tilled, 5-grain crops. This rotation type is widely used in the northern Caucasus, in the central part of the Chernozem zone, and in forest steppe regions of the Ukraine.
7. Grain-fallow-tilled crops rotation: apart from cereals and bare fallow also tilled crops are cultivated. Cereals occupy 50-70% of the cropland, for instance, 1-bare fallow, 2-grain crops, 3-grain crops, 4-tilled crops, 5-grain crops. The rotation occurs widely in steppe and forest-steppe regions of Russia, Ukraine, Middle

and Lower trans-Volga region, in semi-arid regions of the northern Caucasus and southern Ural.

8. Cropped fallow: fallow field, used for early maturing crops in the first half of the summer; sometimes tilled crops are grown; inter-row tillage is implemented as a bare fallow.
9. Bare fallow: no seeding during the whole vegetation period. It is considered an efficient method for water accumulation and control against droughts in regions of rainfed farming.

V. Reclamation

1. Drainage: hydro-technical methods for draining out excessive water from the root layer of the soil and for improving soil aeration.
2. Irrigation: water supply to plants suffering from drought by increasing the water content in the root layer. Hydro-technical methods of supplying water to the plant root layer of the soil.
3. Rainfed farming: cultivation of agricultural crops based on precipitation without irrigation.
4. Soil-protective measures: agro-technical measures aimed at protecting soil from erosion, including cross-slope tillage, seeding of perennial grasses, terracing, etc.
5. Water accumulation in soil: various measures for maintaining sufficient water in the plant root layer, such as decreasing runoff, snow storage, fallow, etc.

VI. Cropland improvement

1. Liming: chemical reclamation of acid soils by adding lime to neutralize excessive soil acidity.
2. Large doses of organic and mineral fertilizers: organic (6-15 tons/ha) and mineral fertilization.
3. Considerable doses of organic (3-15 tons/ha) and mineral (50-170 kg/ha) fertilizers.
4. Increased doses of fertilizers.
5. Relatively small doses of organic fertilizers (3-6 tons/ha).
6. Small doses of organic fertilizers (<3 tons/ha).

VII. Livestock types

1. Dairy cattle: 2-3 kg of beef per 100 kg of milk; milking cows account for more than 60% of the cattle herd.
2. Dairy-beef cattle: 4-6 kg of beef per 100 kg of milk; milking cows account for 40-60% of the cattle herd.
3. Beef-dairy cattle: 7-11 kg of beef and more per 100 kg of milk; milking cows account for 35-40% of the cattle heard.
4. Beef: no milk, beef production only.
5. Pigs: livestock rearing, specialized in production of pork and pig by-products.
6. Cattle fattening: fattening combined with green forage, silage, and wastes of food industry.
7. Poultry: livestock enterprises specialized in production of poultry beef, eggs and poultry by-products.
8. Sheep: livestock rearing specialized in production of wool, lamb beef and hides.
9. Pedigree sheep breeding: husbandry dealing with pedigree sheep of high quality.

10. Fine-fleeced pedigree sheep breeding: specialized in breeding of pedigree sheep.
11. Pastoral sheep: sheep fattening on pastures all-year round.
12. Stall-pastoral sheep: in summer fattening on pastures located far from the farm, in winter kept in stables.
13. Astrakhan sheep breeding: specialized in breeding of pedigree sheep.
14. Camels: specialized in raising of camels.
15. Horses: rearing of horses on pastures all year round.
16. Marals: rearing of reindeers in natural conditions.
17. Reindeers: raising of domesticated reindeers.

VIII. Additional characteristics of cattle rearing

1. Cattle rearing based on fodder production.
2. Cattle rearing based mainly on natural pastures and hayland: fodder crops and forage from external sources play a minor role.
3. Cattle rearing based on forage produced in other regions.
4. Cattle rearing based on improved pastures and hayland: forage under irrigation.
5. Cattle rearing, mainly combined with summer grazing on piedmont and mountain pastures: natural grassland in different vertical zones.
6. Cattle rearing with winter grazing.
7. Grazing during the whole year.
8. Different ways to keep cattle.

Description of Database Structure

A thematic number (item CLASS) has been defined for each map polygon. All attribute information in the various data tables is linked to the polygons by using this thematic number in item CLASS.

List of files

All attribute files in the digital database are ARC/INFO tables.

S1	Land use and development
S2	Types of husbandry
S3	Predominant crops
S4	Crop rotations
S5	Reclamation
S6	Cropland development and improvement
S7	Livestock types
S8	Additional characteristics of cattle rearing

Description of Files

S1 - Land use and development

1	CLASS	Thematic number	<- A
2	CODE	Code of land use and development (see CODE with title=1)	-> B
3	LU_NAME	Land use and development	

S2 - Types of husbandry (only for types of agricultural regions)

1	CLASS	Thematic number	<- A
2	CODE	Code of types of husbandry (see CODE with title = 2)	-> B
3	HUSBAND	Types of husbandry	

S3 – Predominant crops (those occupying most of the cropland area)

1	CLASS	Thematic number	<- A
2	CODE	Code of predominant crops (see CODE with title = 3)	-> B
3	PRED_CROP	Predominant crops	

S4 – Crop rotations

1	CLASS	Thematic number	<- A
2	CODE	Code of crop rotations (see CODE with title = 4)	-> B
3	CROP_ROTAT	Crop rotations	

S5 - Reclamation

1	CLASS	Thematic number	<- A
2	CODE	Code of reclamation (see CODE with title = 5)	-> B
3	RECLAMAT	Reclamation	

S6 – Cropland development and improvement

1	CLASS	Thematic number	<- A
2	CODE	Code of cropland development (see CODE with title = 6)	-> B
3	CROPLAND	Cropland development	

S7 – Livestock types

1	CLASS	Thematic number	<- A
2	CODE	Code of livestock types (see CODE with title = 7)	-> B
3	CATTLE	Livestock types	

S8 – Additional characteristics of cattle rearing

1	CLASS	Thematic number	<- A
2	CODE	Code of additional characteristics (see CODE with title = 8)	-> B
3	CATTLE_ADD	Additional characteristics of cattle rearing	

CODE Files:

List of classifiers to describe regions (contours) in the Map of Agricultural Regionalization of the U.S.S.R., M 1:4 M

CODE 0 – list of feature types

1	TITLE	Feature type code	<- C
2	CODE_NAME	Feature type name	

CODE Feature List:

Contains the attribute values for each feature type.

Item TITLE defines feature type.

1	TITLE	Feature type code (the same as in file CODE 0)
2	CODE	Code of feature value <- B with defined TITLE
3	CODE_NAME	Name of feature value

References

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Appendix 1

The legend of the map “Agricultural regionalization of the U.S.S.R.”

I. Livestock intensive type

Crop production is mainly concentrated on forage, grown primarily on natural and improved pastures and hayland, and with drainage on wetland. Cropland structure and tillage practices are directed towards soil amelioration. Liming and large amounts of organic and mineral fertilizers are applied.

I_1 Dairy-beef cattle rearing, pig rearing, involves intensive types of agriculture, mainly forage production of cereals and grass crop rotations. A large part of the agricultural land is drained. On cultivated meadowland farming is developed. Organic and mineral fertilizers are applied in large quantities.

I_2 Dairy-beef cattle rearing, pig rearing, potato and flax farming. Mainly cereal-grass-arable rotations. Organic and mineral fertilizers are applied in large amounts. Considerable significance of natural and improved forage land.

I_3 Beef-dairy cattle rearing, pig rearing, potato farming. Rotations are grass-cereal-arable on drained peat soil and green-manure cereal-arable on loamy sands. Meliorated meadows. Organic and mineral fertilizers are applied in big amounts.

I_4 Dairy-beef cattle rearing, pig rearing, potato and flax farming. Mainly cereal-grass-arable rotations with flax and bastard fallow. Organic and mineral fertilizers are applied in big amounts. Stockrearing is based on field forage production with considerable significance of natural and improved pastures and hayland. Considerable amount of agricultural land is located on drained areas.

I_5 Dairy-beef cattle rearing, pig rearing, potato, beet and flax farming. Cereal-grass-arable rotations with flax and bastard fallow. Organic and mineral fertilizers are applied in big amounts. Considerable amount of agricultural land is located on drained areas. Stockrearing is based on field forage production with considerable significance of natural forage land.

I_6 Dairy-beef cattle rearing, flax farming. Cereal-grass-arable rotations with flax. Organic and mineral fertilizers are applied in considerable amounts. Considerable amount of agricultural land is located on drained areas. Foothills and mountain pastures are used for summer grazing of sheep and livestock.

I_7 Dairy-beef cattle rearing, potato farming. Cropland is mainly occupied by forage grass with considerable part of cereal crops. Considerable significance of marketable potato. An important part of agricultural land is on drained areas. Organic and mineral fertilizers are applied in large quantities.

I_8 Dairy-beef cattle rearing, flax farming. Rotations are mainly cereal-grass-fallow with flax, following perennial grasses, with bastard fallow. Organic and mineral fertilizers are applied in considerable amounts.

I_9 Stock rearing with strong emphasis on dairy, potato farming, isolated spots of developed vegetable farming. Cereal-grass-arable rotations. Organic and mineral fertilizers are applied in large amounts. Stock rearing is based on field forage production, sowed hayland and pastures.

I_{10} Dairy-beef cattle rearing, potato farming. Cereal-grass-arable rotations. Organic and mineral fertilizers are applied in considerable amounts. Together with field forage production natural hayland and pastures are of considerable significance.

I_{11} Beef-dairy cattle rearing, cereal crops. Rotations are cereal-fallow with fallow partly bastard, partly bare, with big portion of cereal crops. Perennial grasses are mostly outside field rotations. Organic and mineral fertilizers are applied in relatively small amounts.

I_{12} Dairy-beef cattle rearing on the basis of natural meadows and exclusively forage crops on arable land. Considerable parts of the territory are covered by forests.

II. Crop and cattle intensive husbandry

Territories with intensive agricultural development. Livestock production depends on forage from crop husbandry. Little significance of natural and improved forage land. Intensive ways of water regime and nutrient status control by fertilizers, diverse crop composition with large part of cultivated crops and cereals. Areas of fallow and perennial grasses are limited.

II_1 Beet production, cereal crops, beef-dairy cattle rearing, pig rearing. Cereal-arable rotations with bastard fallow. Organic and mineral fertilizers are applied in big amounts. Cattle rearing is based on field forage production with very little significance of natural forage land. Fattening of livestock is developed.

II_2 Cereal crops, beet production, sunflower, beef-dairy cattle rearing, pig rearing. Cereal-arable rotations. Organic and mineral fertilizers are applied in considerable amounts. Cattle rearing is based on field forage production. Fattening of livestock is developed.

II_3 Cereal crops, beet production, beef-dairy cattle rearing. Cereal-arable and cereal-fallow-arable rotations. Organic and mineral fertilizers are applied in considerable amounts. Cattle rearing is mainly based on field forage production.

II_4 Cereal crops, dairy-beef and beef-dairy cattle rearing. Cereal-arable and cereal-fallow-arable rotations. Organic and mineral fertilizers are applied in considerable amounts. Cattle rearing is mainly based on field forage production.

II_5 Cereal crops, beef-dairy cattle rearing, pig rearing. Cereal-fallow rotations. Organic and mineral fertilizers are applied in considerable amounts.

III. Crop and cattle husbandry

Territories of highly intensive agricultural development. Livestock rearing is based on field forage production. Agricultural systems are directed to water accumulation in soil. Irrigation is applied vastly.

III_1 Cereal crops, sunflower, beef-dairy cattle rearing, pig rearing, poultry. Cereal-arable and cereal-fallow-arable rotations. Organic and mineral fertilizers are applied in considerable amounts. Cattle rearing is based on field forage production with very little significance of pastures.

III_2 Cereal crops, viticulture and fruit growing, vegetable farming, beef-dairy cattle rearing. Cereal-arable and cereal-fallow-arable rotations. Fertilizers are applied in considerable amounts. Vast areas of irrigated land. Livestock rearing is based on field forage production.

III_3 Cereal crops, sun-flower, beet production, beef-dairy cattle rearing, pig rearing, poultry. Arable rotations. Organic and mineral fertilizers are applied in considerable amounts. Forage production is of intensive type with little significance of pasture forage.

III_4 Cereal crops, sunflower, pedigree sheep rearing, beef-dairy cattle rearing, pig rearing. Soil protective tillage is applied. Cereal-fallow-arable rotations. Vast areas of irrigated land. Fertilizer application in considerable amounts.

III_5 Cereal crops, sunflower, beef-dairy cattle rearing. Cereal-fallow-arable rotations. Fertilizer application in small amounts.

IV. Crop and cattle husbandry of relatively extensive type

Territories of highly intensive and intensive agricultural development. Large areas of arable land per worker. Natural forage land is of considerable importance for livestock rearing. Relatively low application of organic fertilizers. Cereals dominate among the crops, little cultivated crops, bare fallows occupy vast areas.

IV_1 Cereal crops, sheep breeding, beef-dairy cattle rearing. Cereal-fallow rotations. Soil protection tillage is applied. Pedigree fine-fleeced sheep breeding, supplying pedigree sheep to other regions.

IV_2 Cereal crops, beef-dairy cattle rearing, sheep breeding. Considerable areas of irrigated land.

IV_3 Dairy-beef and beef-dairy cattle rearing, cereal crops. Cereal-fallow rotations. Natural pastures and hayland are important together with developed forage production.

IV_4 Cereal crops with emphasis on grain production, beef-dairy cattle rearing. Cereal-fallow rotations. Soil protection tillage is applied. Livestock rearing is mainly based on field forage production.

IV_{4a} The same combined with marketable beet production.

IV_5 Cereal crops, beef-dairy and beef cattle rearing, sheep breeding. The most extensive and specialized forms of fallow cereal agriculture. Soil protection tillage. Considerable significance of natural forage land as well as field forage production.

IV_6 Cereal crops, sunflower, beef-dairy and beef cattle rearing, sheep rearing. Soil protection tillage. Cereal-fallow and cereal-fallow-arable rotations. Extensive form of field forage production.

IV_7 Cereal crops, sheep breeding, beef-dairy cattle rearing. Cereal agriculture with bare fallow. Stock rearing on the basis of field forage production and natural forage land.

IV_8 Cereal crops, beef-dairy and dairy-beef cattle rearing, pig rearing. Cereal agriculture with cultivated crops and perennial grasses. Stock rearing on the basis of field forage production.

IV_9 Soybean culture, cereals, beef-dairy cattle rearing. Stock rearing on the basis of field forage production.

IV_{10} Beef-dairy and dairy-beef cattle rearing, pig rearing, cereals, soybean. Considerable significance of natural forage land as well as of field forage production.

V. Agricultural specialization on fruit growing, viticulture, perennial industrial crops, vegetable farming

V_1 Fruit growing, mainly on irrigated land, beef-dairy cattle rearing.

V_2 Viticulture on irrigated and rainfed land, beef-dairy cattle rearing, sheep breeding in some locations.

V_3 Viticulture and fruit growing

V_4 Viticulture, fruit growing, tobacco growing, beef-dairy cattle rearing, sheep breeding.

V_5 Fruit growing, viticulture, tobacco growing, vegetable farming, beef-dairy cattle rearing. Considerable areas of irrigated land.

V_6 Tea farming, subtropical fruit and industrial crops. Spring vegetable farming, tobacco growing in some locations.

V_7 Spring vegetable farming, tea farming, subtropical fruit crops, partly on irrigated land.

V_8 Vegetable farming, dairy-beef cattle rearing

V_9 Vegetable farming, water melon, melon and gourd cultivation, pasture sheep breeding, beef and beef-dairy cattle rearing.

VI. Crop and crop-cattle husbandry on the basis of irrigation

VI_1 Cotton growing, dairy-beef cattle-rearing based on forage produced by irrigated land.

VI_2 Cotton growing, relatively intensive silkworm breeding, beef-dairy cattle-rearing based on forage produced on irrigated land.

VI_3 Cotton growing, beef-dairy cattle and sheep breeding based on forage produced on irrigated land and natural rangeland.

VI_4 Cotton growing, sheep breeding based on natural forage land.

VI_5 Cotton growing, viticulture and fruit growing.

VI_6 Cotton growing viticulture and fruit growing beef-dairy cattle and sheep rearing based on forage produced on irrigated land and natural rangeland.

VI_7 Rice growing, beef-dairy cattle rearing.

VII. Plain pastoral cattle rearing

Composition, number of cattle and kind of livestock products depend mainly on the type of natural forage land. Natural forage resources are to different degree supplemented with forage from agriculture, which is a subsidiary branch of stock rearing farms. Partly imported forage is used.

VII_1 Pastoral sheep rearing, beef cattle rearing, cereals. Winter forage storage is provided mainly by rainfed agriculture and mowing down natural grass, partly on the areas of liman irrigation.

VII_2 Pastoral sheep rearing supplemented with beef cattle rearing or herd horse-rearing. Winter forage storage is provided by mowing down natural grass, partly from areas of liman and regular irrigation. The more transportable forage is shipped from other regions.

VII_{2a} the same combined with beef cattle rearing on the basis of natural forage land.

VII_3 Pastoral, mainly astrakhan, sheep breeding, camel-rearing on the basis of all-the-year-round grazing. Pastoral forage is supplemented with imported combined forage, mowing of natural grass, in some places - with irrigated forage production.

VII_4 Beef cattle rearing on the basis of natural forage land, rice growing

VII_5 Sheep rearing, beef-dairy and beef cattle rearing, cereals.

VII_6 Beef-dairy cattle rearing, sheep breeding, cereals

VII_7 Sheep rearing, beef-dairy cattle rearing, cereals.

VII_8 Beef and beef-dairy cattle rearing, herd horse rearing with winter grazing, hay storage from natural hayland and cereal and forage growing on arable land.

VIII. Mountain pastoral cattle rearing

Mainly pastoral cattle rearing on the basis of combination of natural forage land of different altitude bands. Livestock rearing is combined with agriculture, located on different heights.

$VIII_1$ Beef-dairy cattle rearing, sheep rearing, cereal production on irrigated and rainfed land, locally fruit growing.

$VIII_2$ Beef-dairy cattle rearing, sheep rearing, viticulture, fruit growing, locally tobacco growing

$VIII_3$ Beef-dairy cattle rearing, sheep rearing, developed rainfed cereal production

$VIII_4$ Beef-dairy cattle rearing, sheep rearing, subsistence agriculture

$VIII_5$ Pastoral sheep rearing, beef-dairy cattle rearing, marketable cereal crops on rainfed, partly on irrigated land.

$VIII_6$ Pastoral sheep rearing, beef-dairy cattle rearing, cereal crops, marketable fruit growing and viticulture on irrigated land

$VIII_7$ Pastoral sheep rearing, beef-dairy cattle rearing, tobacco growing on irrigated land

$VIII_8$ Pastoral sheep rearing, beef cattle rearing. Subsistence agriculture on irrigated land.

$VIII_9$ Sheep rearing, beef cattle rearing, locally moral-rearing. Poorly developed agriculture is oriented on forage production

$VIII_{10}$ Pastoral sheep rearing, beef cattle rearing, herd horse rearing, subsistence agriculture

$VIII_{11}$ Pastoral sheep rearing, cattle rearing on the basis of all-the-year-round grazing.

$VIII_{12}$ Pastoral sheep rearing, beef and beef-dairy cattle rearing. Winter forage storage is provided mainly by irrigated agriculture in trans-mountain hollows. Winter grazing is used.

$VIII_{13}$ Pastoral sheep rearing. Stock rearing on the basis of combination of pastures on different altitudes in the mountains and on plains. Driving (transportation) of sheep to plain winter pastures. Subsistence agriculture.

$VIII_{14}$ Pastoral sheep rearing, subsistence agriculture on rainfed and partly irrigated land

$VIII_{15}$ Pastoral sheep rearing, beef-dairy cattle rearing, cereal crops on rainfed and partly irrigated land

IX. Mountain crop and cattle husbandry

Cattle rearing on the basis of natural forage land of different altitudes and plains. Combination of different forms of agriculture and cattle management on one farm.

IX_1 Viticulture, fruit, tobacco and vegetable growing, cereal crops, beef-dairy cattle rearing, sheep rearing. Considerable part of agricultural land is situated on drained land.

IX_2 Beet production, cereals, dairy-beef and beef-dairy cattle rearing, sheep rearing. Agriculture on irrigated land.

IX_3 Fruit growing, cereals, beef-dairy cattle rearing, sheep rearing. Agriculture on rainfed and irrigated land.

IX_4 Viticulture, cereals, beef-dairy cattle rearing, sheep rearing. Agriculture on irrigated and partly on rainfed land.

IX_5 Fruit growing, viticulture, vegetable growing, beef-dairy cattle rearing, sheep rearing. Agriculture on irrigated land.

IX_6 Tobacco growing, fruit growing, viticulture, cereals, cattle rearing, sheep rearing. Agriculture on irrigated and partly on rainfed land.

IX_7 Tobacco growing, cereals, beef-dairy cattle rearing, sheep rearing. Agriculture on irrigated and partly on rainfed land.

X. Reindeer-rearing and hunting

XI. Territories of little agricultural use

XI_1 Cattle- and crop-husbandry types of agriculture, producing local food resources in poorly developed and sparsely populated areas.

XI_2 Hunting-agricultural types in poorly developed and sparsely populated areas

XII. Highly intensive agriculture near big cities and town agglomerations

XII_1 Vegetable farming, potato growing, dairy-beef cattle rearing, poultry.

XII_2 Vegetable farming, fruit growing, viticulture, dairy-beef cattle rearing, poultry.

Additional symbols

СП Seasonal pastures.

3 Land not in agricultural use.