

THE SELECTION OF COLOR FOR THE U.S.S.R. AGRICULTURE ATLAS*

A Brief Examination of the Use of Process Colors
In a Limited Edition Atlas

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Color-coding, that is, the assignment of colors to things represented on a map, is a complex process and a very important ingredient in map design. The success of a map could very well depend on the proper use of color. Using color requires, among other things, a good judgment and a "feel" for color and there are many differences of opinion, even by those with extensive training and experience.

Many questions confront the cartographer when using colors, such as, "Do I use colors just to make the maps more attractive regardless of whether it can be as effective with fewer colors?" The objective of the map should surely have an influence on the answer to whether color should be employed, but the use of process colors, i.e., the use of combinations of only a few basic colors to produce a wide range of tones, will more readily allow one to answer such a question in the affirmative.

Process colors normally used for reproduction consist of transparent inks in magenta, cyan, and yellow. These transparent inks can be used in combination to produce numerous visually-discriminable tones. Artwork is separated into individual overlays for each component tone and three plates are required in the printing process. For map work, we have substituted a transparent red ink for the magenta which allows for the utilization of the conventional red for symbols or line work.

Process colors offer a wide variety of selection from which to choose that is limited only by percentages of the tint screens available. This limitation is minor, however, since utilizing the three primary colors with ten percentage screens including 5%, 10%, 20%, etc. to 90% plus the solid colors and the "zero tones" (absence of each color), it is possible to produce 1,728 physically different tones. Percentages of black mixed with the primary colors will extend the available selection somewhat.

The first phase of a successful process color map is planning. The economy or cost of construction and printing is a major consideration. If it is possible to construct the map with a limited number of colors (less than three primaries, plus black), then this simpler process will reduce the materials and the time needed in both the construction and printing phases. Color association with the

**U.S.S.R. Agriculture Atlas*, Central Intelligence Agency, U.S. Government Printing Office, Washington, D.C., 1974.

map subject also plays an important role in planning the color selection. For example, the use of cool and warm colors are associated with temperatures (p. 8 of the atlas), blues with precipitation (p. 12), greens with various types of vegetation, etc.

Color progressions to represent a wide range of numerical values often cause the most difficulty in planning (p. 13 Thunderstorms, p. 55, livestock). Generally it is desirable that each step in the range increase by a visually uniform increment. If the progression moves from one area of the color spectrum to another, the complexity magnifies.

Other aspects of color selection, such as color balance, avoiding color clashes, using more brilliant or stronger colors for small areas, and using softer or pastel colors for larger areas must also be weighed in making a selection. Often single color tones do not blend or work well together. In the color selection of the U.S.S.R. Agriculture Atlas, an effort was made to produce colors with an "earthy" look. For example, the map on thermal resources on p. 8 includes a small amount of red mixed with the blues, green, and yellow, while the yellow, orange, and red have a small percentage of cyan. The darkest blue of the relatively simple three-category precipitation map on p. 12 contains small amounts of both yellow and red. The results are harmonious, "earthy" colors that are neither too contrasting nor garish.

To use process colors, it is necessary to have a controlled color guide from which to select the colors. Although printings may differ even with the same printer, the guide must be the basis for color selection. It is then the printer's responsibility to maintain that control in final reproduction. Inconsistencies by printers sometimes cause cartographers to hedge -- by making selections of greater diversity in order to play safe -- and the results may be less than optimum. Process color chips, which are duplicates of the color guide but are cut into individual pieces, aid in the selection of colors. The chips can be moved and arranged into progressions or can be associated with the other colors used on the map. Hence, a more controlled environment is available for color selection.

Another step in the system employed for the U.S.S.R. Agriculture Atlas was to place the selected color chips on a 3" x 5" card. Each card represented the color scheme for one page of the atlas. As work progressed, quick and easy reference was possible through the use of this color file and the technique was invaluable. As a result of maintaining such a file, we were able to duplicate a color scheme easily when desired for a new page.

The process of selecting color combinations is a difficult one to describe and the evaluation of the results by those who made the selection would probably be biased. For the interested reader, however, we present in the following section the entire set of color specifications used in the U.S.S.R. Agriculture Atlas. It is hoped that this information will prove useful to others groping with the problems, both mechanical and intellectual, of color selection.

COLOR SPECIFICATIONS

The inks used in the atlas are obtained from the Capitol Printing Ink Co., Inc., Washington, D.C. A Capitol Printing Ink (CPI) number is used for ink identification except "off the shelf" Speedlith inks. The yellow, blue, and brown inks are special

mixes for CIA with the formulas on file by GPI. The following color inks were used: black (offset dense process black, CPI No. 15418), yellow (process yellow x-1, CPI No. 22813), cyan (process cyan blue x-3, CPI No. 49308), red (speedlith map red x-12, CPI No. --), brown (brown x-9, CPI No. 80257).

	<u>Red</u>	<u>Cyan</u>	<u>Yellow</u>	<u>Other Color</u>
Agriculture's Role in the Economy, p. 4 --				
USSR graph and pie tones	R60			
US pie tones		C70		
Commodity Trade, p. 5 --				
Grain trade				
Net imports	R20	C20	Y100	
Net exports	R20	C50	Y100	
Total Soviet exports and imports	R40	C20	Y100	
Soviet agricultural trade	R80	C20	Y100	
Policy Issues, p. 6 --				
Comparative area				
USSR tone	R40			
Land tone			Y30	
Water tone		C10		
Climatic analogs				Brown half-tone
Environment, p. 7 --				
Thermal Resources, p. 8 --				
Very cold	R10	C70		
Cold	R10	C50		
Moderately cold	R10	C20	Y60	
Moderate	R10	C10	Y60	
Warm	R30	C10	Y60	
Hot	R100	C10	Y60	
Mountain region				Black 30
Moisture Resources, p. 9 --				
Sufficient		C70	Y100	
Inadequate		C30	Y100	
Negligible		C10	Y60	
Mountain region				Black 30
Wintering Conditions, p. 10 --				
Winter grains and perennial grasses				
Excellent	R50	C5	Y30	
Good	R20	C20	Y30	
Satisfactory	R10	C30	Y30	
Less than satisfactory	R10	C50	Y30	
Poor	R10	C70	Y30	
Area of no data				Black 10
Tree crops and berries				
Warm	R10		Y70	
Mild	R10	C20	Y70	
Cold		C30	Y70	
Severe		C50	Y70	
Harsh		C70	Y70	
Winterkill chart	R10	C70	Y30	

	<u>Red</u>	<u>Cyan</u>	<u>Yellow</u>	<u>Other Color</u>
Snow, p. 11 --				
None or very thin	R5	C10	Y20	
Year to year variability	R5	C30	Y20	
Thin to moderate	R5	C50	Y20	
Moderate depth and duration	R10	C60	Y20	
Moderate depth, long lasting	R30	C60	Y20	
Deep, long lasting	R50	C60	Y20	
Mountain region				Black 30
Precipitation, p. 12 --				
Moderate	R10	C60	Y20	
Light		C40		
Scanty		C10		
Weather Hazards, p. 13 --				
Drought				
0 - 5		C40	Y100	
5 - 20	R10	C40	Y60	
20 - 40	R30	C40	Y60	
40 - 60	R50	C10	Y60	
60 and above	R50		Y100	
Sukhovey				
0 - 20	R10	C40	Y100	
20 - 30	R30	C40	Y100	
30 - 50	R50	C40	Y100	
50 - 70	R100	C40	Y100	
70 and above	R100	C10	Y100	
Surrounding tone/mountain region				Black 20
Water tone		C10		
Thunderstorms				
0 - 20	R10	C60	Y20	
20 - 40	R30	C60	Y20	
40 - 60	R50	C60	Y20	
60 - 80	R60	C60	Y20	
80 and above	R100	C100	Y20	
Stormy Weather, pp. 14-15 --				
Soils, p. 16				
Chernozem	R100	C60	Y100	
Chestnut	R100	C40	Y100	
Gray and brown forest	R60	C40	Y100	
Sierozem	R40	C40	Y100	
Alluvial	R20	C40	Y100	
Mountain	R20	C20	Y100	
Podzolic	R20	C20	Y20	
All other				Black 10
Agricultural Land, p. 17 --				
Meadows, pastures, orchards	R40	C5	Y100	
Arable	R5	C60	Y100	
Non-ag tone/land tone	R5	C5	Y20	
Zone of agriculture				Black 5

	<u>Red</u>	<u>Cyan</u>	<u>Yellow</u>	<u>Other Color</u>
Agroclimatic Regions, p. 18 --				
Arctic agriculture/alpine	R20	C40		
Farming for local market	R20	C40	Y60	
General farming			Y60	Black 10
Diversified, commercial		C50	Y60	
Drylands grazing	R20		Y30	
Regional Crop Calendars, p. 19 --				
Crop bar		C70	Y100	
Frost free period		C40	Y100	
Average daily temp. above freezing			Y30	Black 10
Snow		C20		
Technology, p. 20 --				
Fertilizer, p. 21 --				
Mineral and organic fertilizer				
Mineral fertilizer	R100		Y40	
Organic fertilizer	R10		Y40	
Zone of agriculture				Black 5
Organic fertilizer (chart)	R20	C10	Y60	
Mineral fertilizer (chart)				
Delivered/weight/composition	R70			
Planned	R70			Black 20
Irrigation and Drainage, p. 22 --				
Irrigated land use	R40		Y40	
Drained land use			Y40	Black 10
Concentrated irrigation	R100			
Scattered irrigation	R40			
Concentrated drainage				Black 100
Scattered drainage				Black 30
Surrounding tone	R20	C10	Y40	
. . . in Southeast European USSR, p. 23 --				
Share of irrigated land	R50			
Major irrigation system				
Existing	R50			
Planned	R20			
Irrigation map				
Major irrigation area	R40			
Surrounding land tone				Black 5
Water tone		C20		
Terrain				Brown half-tone
. . . in Soviet Central Asia, p. 24 --				
Same as p. 23 except:				
Major irrigation area (inset)	R50			
USSR land tone (inset)				Brown 30
River Reversal, p. 25 --				
Diversion potential of rivers		C30	Y50	Brown 30
Kama-Vycheгда-Pechora	R40		Y50	Brown 30

	<u>Red</u>	<u>Cyan</u>	<u>Yellow</u>	<u>Other Color</u>
Ob'-Irtysch-Tobol	R40	C20	Y50	Brown 30
Land tone				Brown 30
Water tone		C20		
Mechanization, p. 26 --				
Mechanization, p. 27 --				
Total production of farm equipment		C40		
Delivery of farm equipment		C70		
Inventory table tone	R10		Y40	
Land Use, p. 28 --				
Fodder		C50	Y100	
Grain crops	R60		Y100	
Industrial crops		C100		
Other	R30		Y100	
Surrounding land tone	R20	C10	Y60	
Water tone		C50		
Zone of agriculture				Black 5
Land Use, p. 29 --				
Wheat	R30		Y100	
Barley	R60		Y100	
Corn		C60	Y100	
Surrounding land tone/Typical system	R10		Y60	
Water tone	R20	C10	Y60	
Zone of agriculture				Black 5
Trends chart tone	R10		Y60	
Erosion Control, p. 30 --				
Area of dust storm/chart tone	R10		Y40	
Surrounding land tone	R20	C10	Y60	
Water tone		C50		
Pest Control, p. 32 --				
Pesticide background tone	R10		Y40	
Pesticide trends totals	R40 (op R10)		Y40	
Pest Control, p. 33 --				
Insects and diseases tone	R10		Y40	
Crop tone	R20	C10	Y60	
Plant and Livestock Breeding, p. 34 --				
Environmental Modification, p. 35 --				
Hail control areas	R70			
Surrounding land tone	R20	C20	Y60	
Water tone		C50		
The System, p. 36 --				
Management, p. 37 --				
The Government		C40		
The Party	R30			

	<u>Red</u>	<u>Cyan</u>	<u>Yellow</u>	<u>Other Color</u>
Rural Population, p. 38 --				
Rural population chart tone	R10		Y40	
Education attainment chart				
Higher education	R100			
Incomplete higher education	R70		Y100	
Specialized secondary education	R70	C20	Y100	
General secondary education	R50	C10	Y100	
Incomplete secondary education	R40	C10	Y100	
Primary education	R20	C10	Y60	
Less than primary education	R10		Y40	
Rural population proportion				
60% or more	R70	C40	Y100	
40-59%	R70	C20	Y100	
0-39%	R50	C10	Y100	
Change in rural population				
Over 15% increase	R70	C40	Y100	
0-15% increase	R70	C20	Y100	
Decrease	R40	C10	Y100	
Rural Settlement, p. 39 --				
Populated places eliminated				
0 - 9	R20	C10	Y100	
10 - 29	R20	C30	Y100	
30 - 49	R20	C50	Y100	
50 or more	R50	C40	Y100	
Population of rural settlements	R100	C40	Y100	
Organizational Forms, p. 40 --				
Proportion of agricultural land				
Zone of agriculture	R20	C10	Y60	
Surrounding tone	R10		Y30	
45 years of socialized agriculture				
Background tone	R10		Y30	
Chart bands tone	R10	C10	Y30	
The Collective Farm, p. 41 --				
Field crop rotation	R30	C10	Y100	
Fodder crop rotation	R10	C10	Y100	
Vineyard	R10	C50	Y100	
Pasture	R10	C30	Y100	
Garden	R10	C30	Y30	
Surrounding land tone	R10	C10	Y30	
Water tone		C30		
Private Holdings, p. 42 --				
Percentage of private livestock	R20	C30	Y100	
The State Farm, p. 43 --				
A sovkhos in transition				
Arable land	R30	C10	Y100	
Hay	R10	C10	Y100	
Woodland	R10	C50	Y100	
Pasture	R10	C30	Y100	
Garden	R10	C30	Y30	

	<u>Red</u>	<u>Cyan</u>	<u>Yellow</u>	<u>Other Color</u>
Surrounding land tone	R10	C10	Y30	
Water tone		C30		
Number of sovkhoses				
Background tone	R10		Y30	
Chart bands tone	R10	C10	Y30	
Production, p. 44 --				
World Production, p. 45 --				
USSR	R100			
US		C70		
Other tone	R20	C10	Y60	
Wheat. . . Other Crops, pp. 46-53 --				
Crop distribution	R60			
USSR comparison bars	R100			
US comparison bars		C80		
Production, sown area graph tone	R20	C40	Y100	
Production map				
Production proportional circles	R80	C20	Y100	
Zone of agriculture				Black 5
Surrounding land tone	R20	C20	Y100	
Water tone		C50		
Livestock, p. 54 --				
Meat production chart tone	R10		Y40	
USSR comparison bars	R100			
US comparison bars		C80		
Livestock, p. 55 --				
Number of livestock chart tone	R10		Y40	
Cattle, swine, sheep and goats				
0 - 1	R10		Y40	
1 - 10	R20	C10	Y60	
10 - 20	R40	C10	Y100	
20 - 30	R50	C10	Y100	
30 - 40	R70	C20	Y100	
40 and above	R70	C40	Y100	
Marketing and Consumption, p. 56 --				
From source to consumer				
Gosplan	R20	C20	Y50	
Private plot		C20	Y50	
Average diet				
Sugar		C50		
Milk	R80	C50		
Fats and oils	R20	C20	Y100	
Meat and fish	R80	C20	Y100	
Vegetables, fruits and eggs	R20	C50	Y100	
Grains and potatoes	R20		Y100	
Weights and Measures, p. 57 --				
Weight	R30	C30	Y70	
Yield conversions		C30	Y70	

	<u>Red</u>	<u>Cyan</u>	<u>Yellow</u>	<u>Other Color</u>
Administrative Divisions, p. 58 --				
Latvian/Uzbek	R10			
Azerbaijan/Kirgiz		C10		
RSFSR			Y30	
Turkmen/Ukrainian		C10	Y30	
Lithuanian/Tadzhik	R10	C10		
Estonia/Moldavian/Armenian	R10	C10	Y30	
Belorussian/Georgian/Kazakh	R10		Y30	
Surrounding tone				Black 5