NEESPI GLP RESEARCH

C-Cycle Dynamics in Semi-arid EURASIAN LAND USE SYSTEMS

NEESPI RESEARCH
on LAND USE

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Cindy Keough (CSU)

GLP

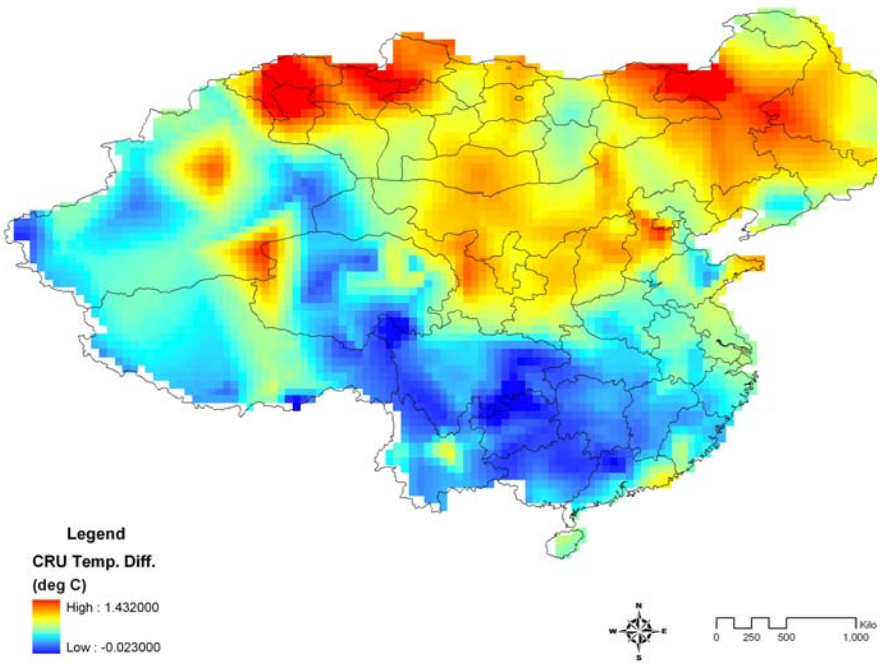
MAIN ISSUES IN THE NORTHERN EURASIAN REGION

- INTERACTIONS OF LAND USE AND CLIMATE CHANGE
- WATER AND LAND RESOURCE MANAGEMENT
- INFRASTRUCTURE DEVELOPMENT
- INSTITUTIONAL AND POLICY CHANGE
- MARKET ACCESS

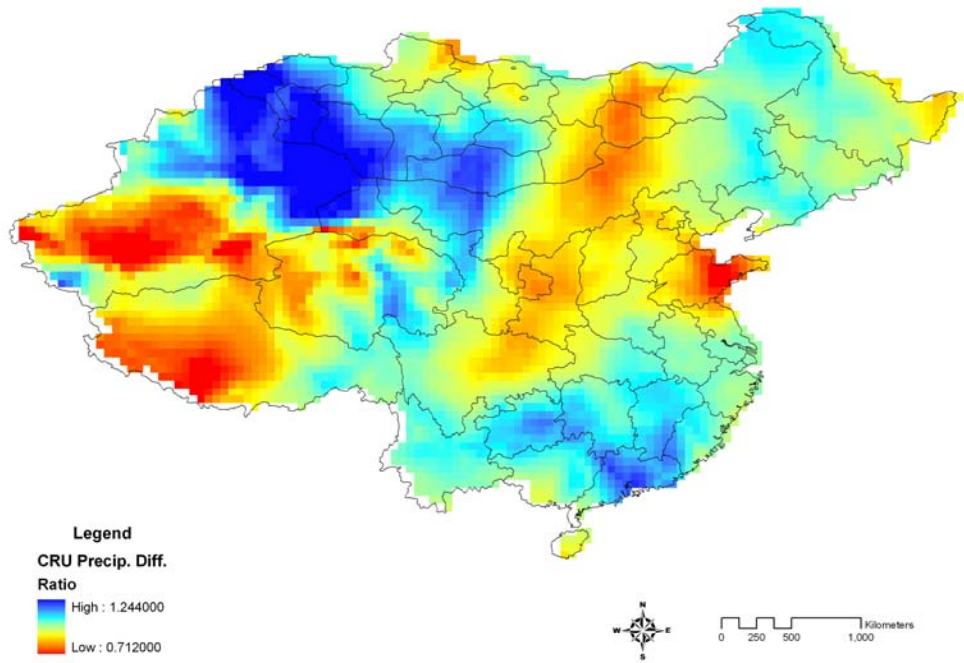
GLP

CLIMATE TRENDS OF THE 1990'S

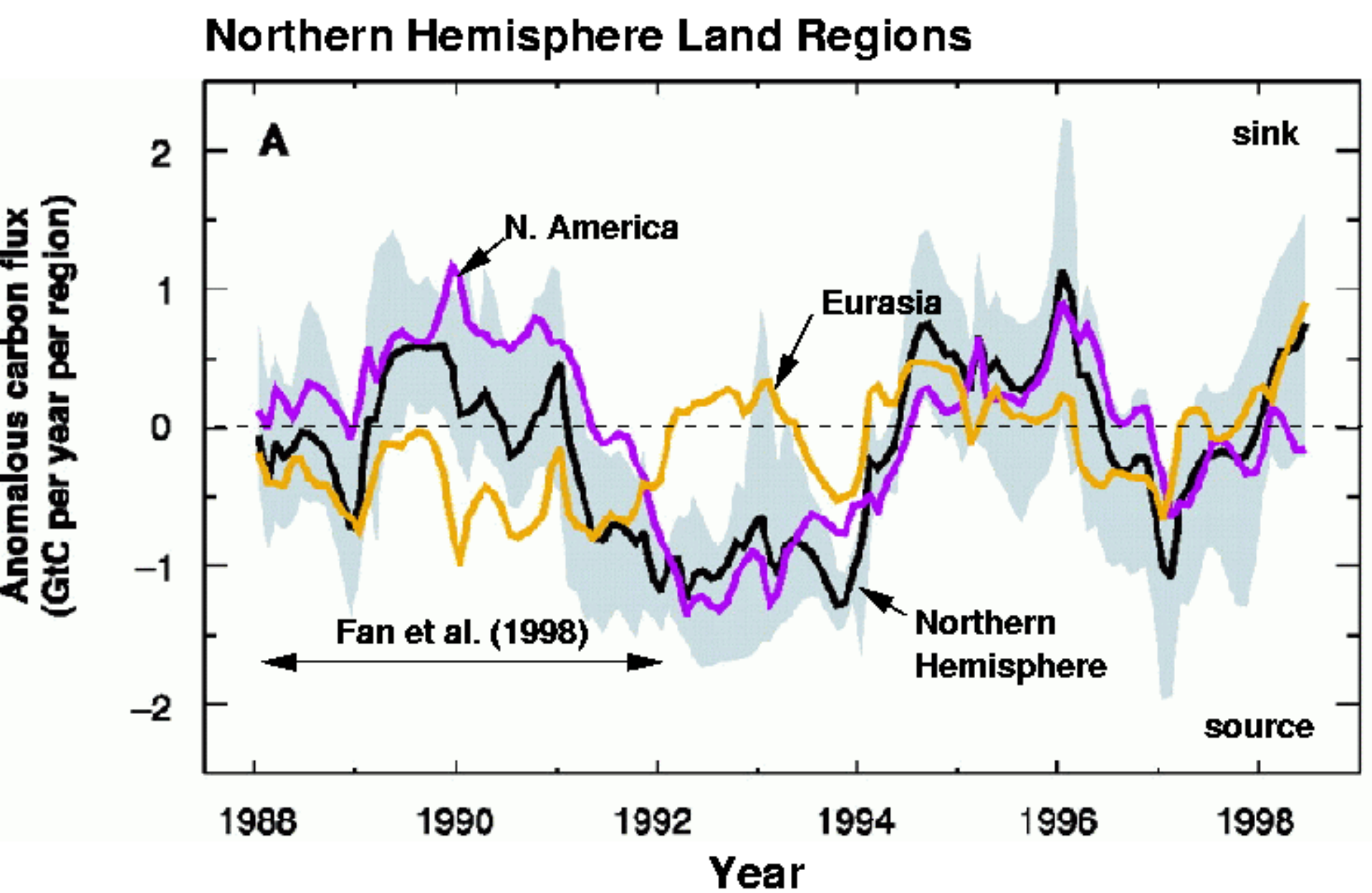
CRU Difference in Average Temperature (deg C)
1991 to 2000 vs. 1961 to 1990



CRU Difference in Average Precipitation -- 1991 to 2000 : 1961 to 1990



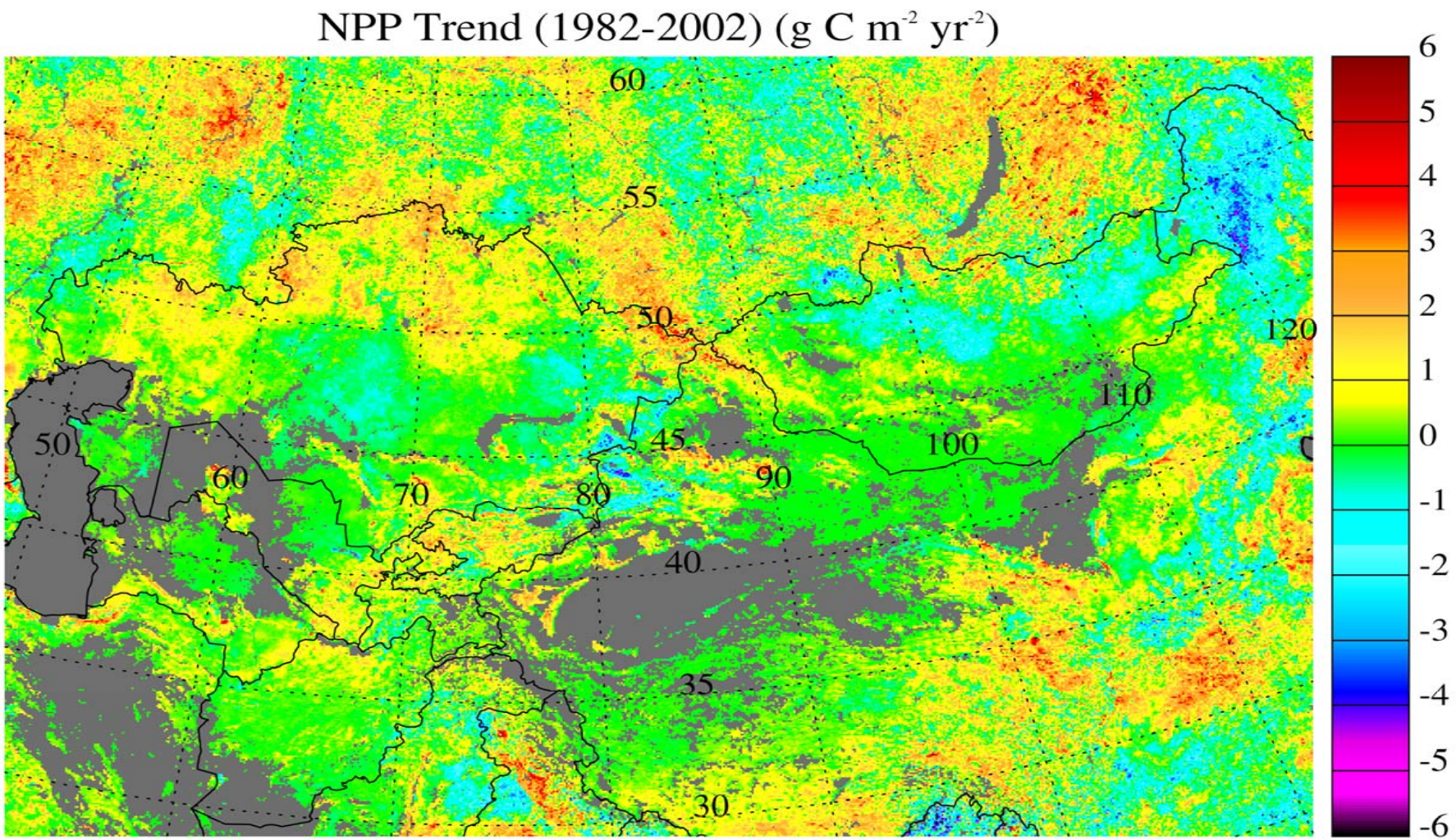
Temperatures of the 1990's as much as 0.5°C warmer
Precipitation drier by 30% of the 30 year average



Bousquet et al. 2000. Science 290, 1342–1346. Figure 4A.

(Modified by W. Post, ORNL)

NPP Trends based on Satellite Analysis (8km AVHRR data product)



Analysis of Hicke and Tucker

LAND USE ANALYSIS

ATMOSPHERE

CHEMISTRY

TEMPERATURE

PRECIPITATION

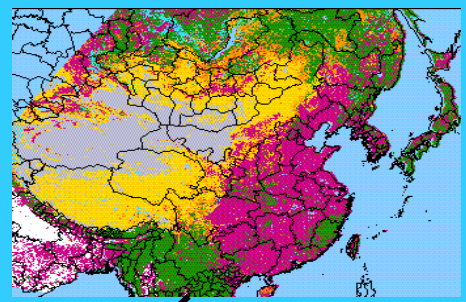
ENVIRONMENT

WATER

TOPOGRAPHY

SOIL

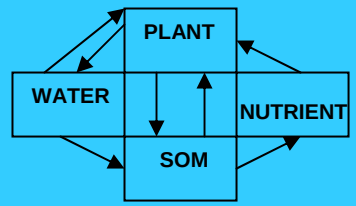
LAND COVER/USE



LAND USE MANAGEMENT

CROPS
GRAZING
LIVESTOCK
FOREST
URBAN

ECOSYSTEM



REGIONAL ACCOUNTING

HUMAN DIMENSION

PROPERTY RIGHTS

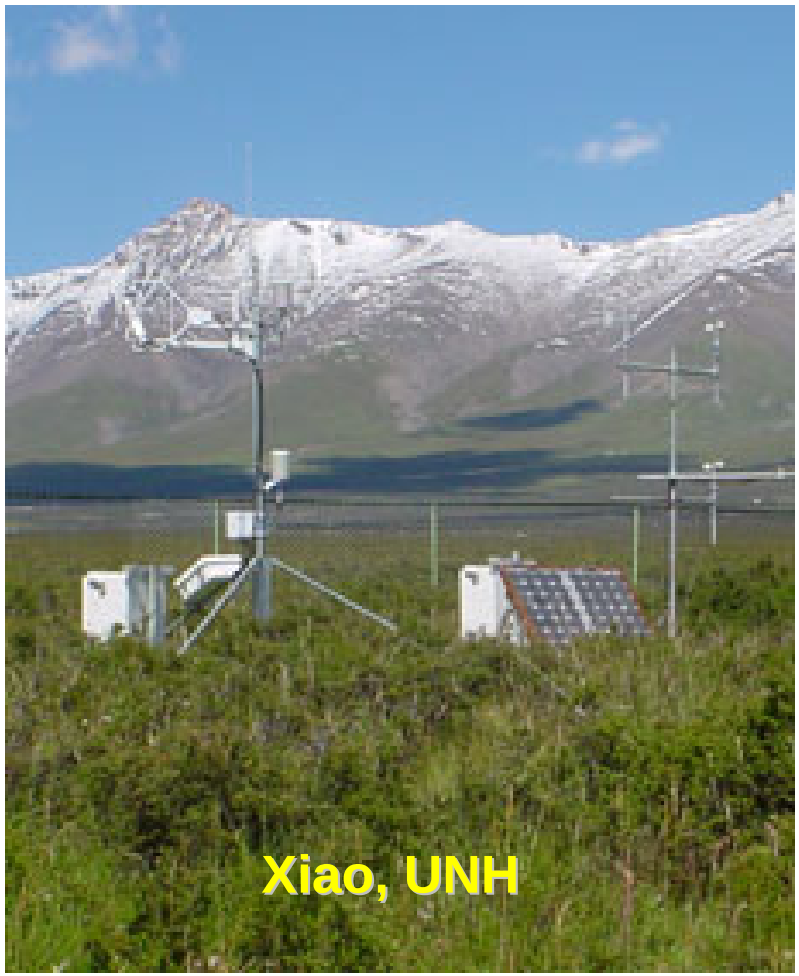
REGULATORY RULES

CULTURAL PRACTICES

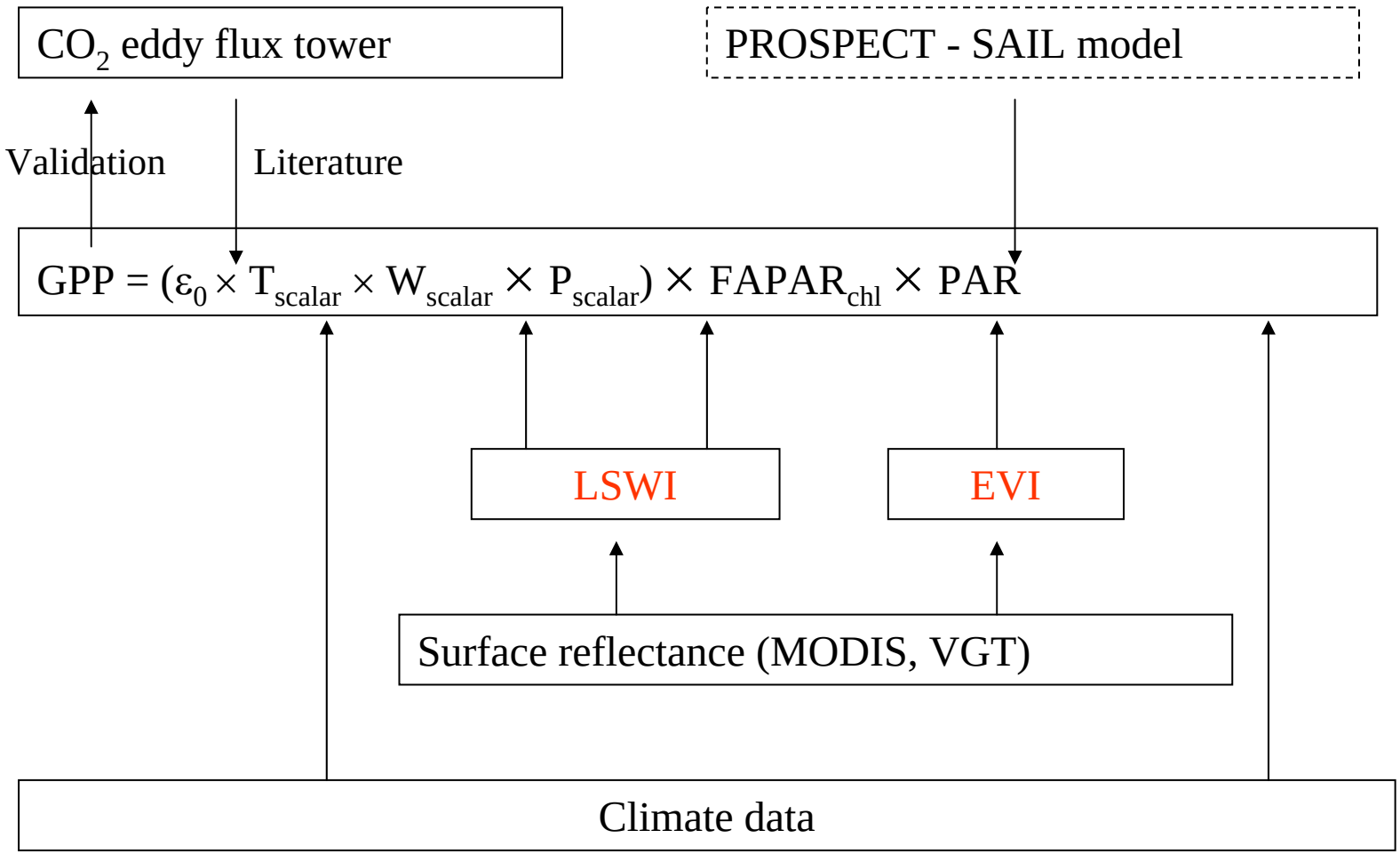
ECONOMICS

Chinese Terrestrial Ecosystem Flux Research Network (ChinaFlux)

Flux tower clusters are distributed over 8 long-term ecosystem study sites (grassland, alpine, forests, croplands)



Satellite-based Vegetation Photosynthesis Model (VPM)



Xiao, UNH

Comparison between GPP_{est} and VI

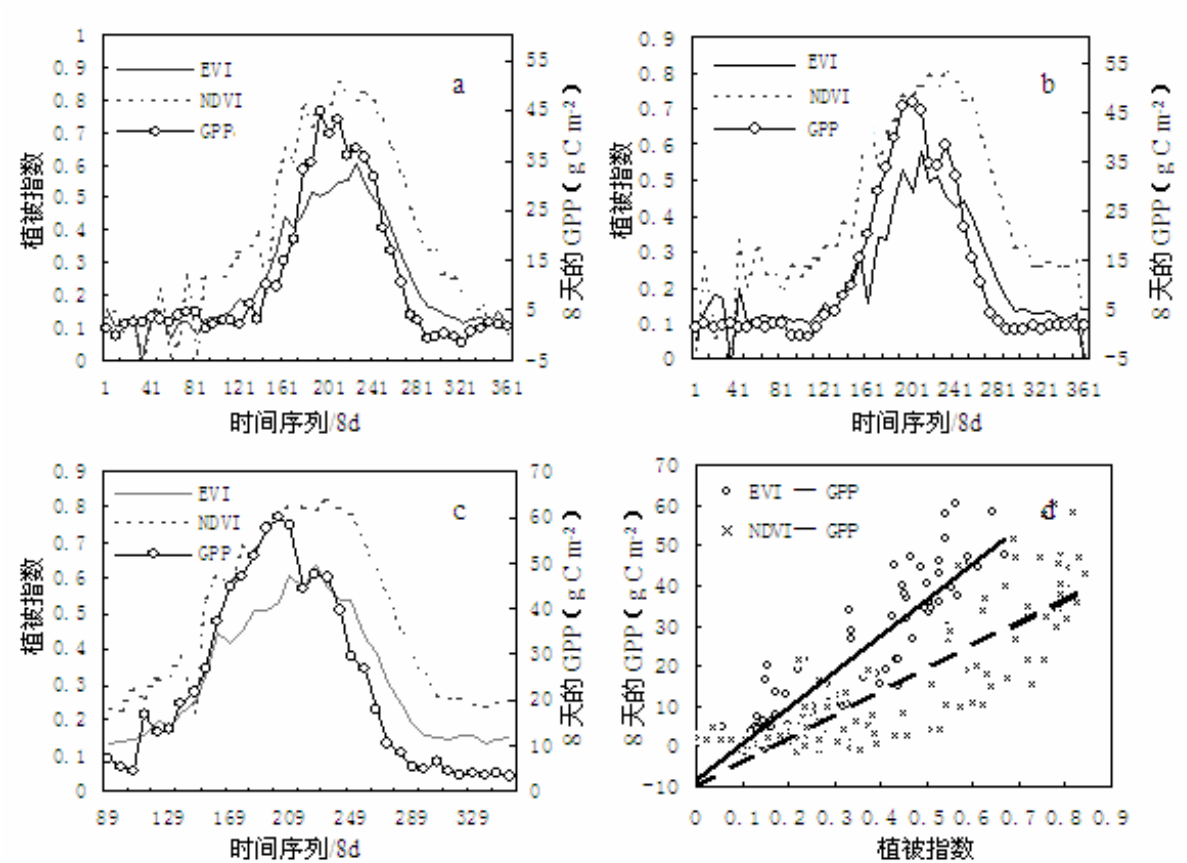
From Li, Z, et al., 2006

GPP = 58.53*NDVI - 9.88

$R^2 = 0.73$

GPP = 90.20*EVI – 8.59

$R^2 = 0.85$

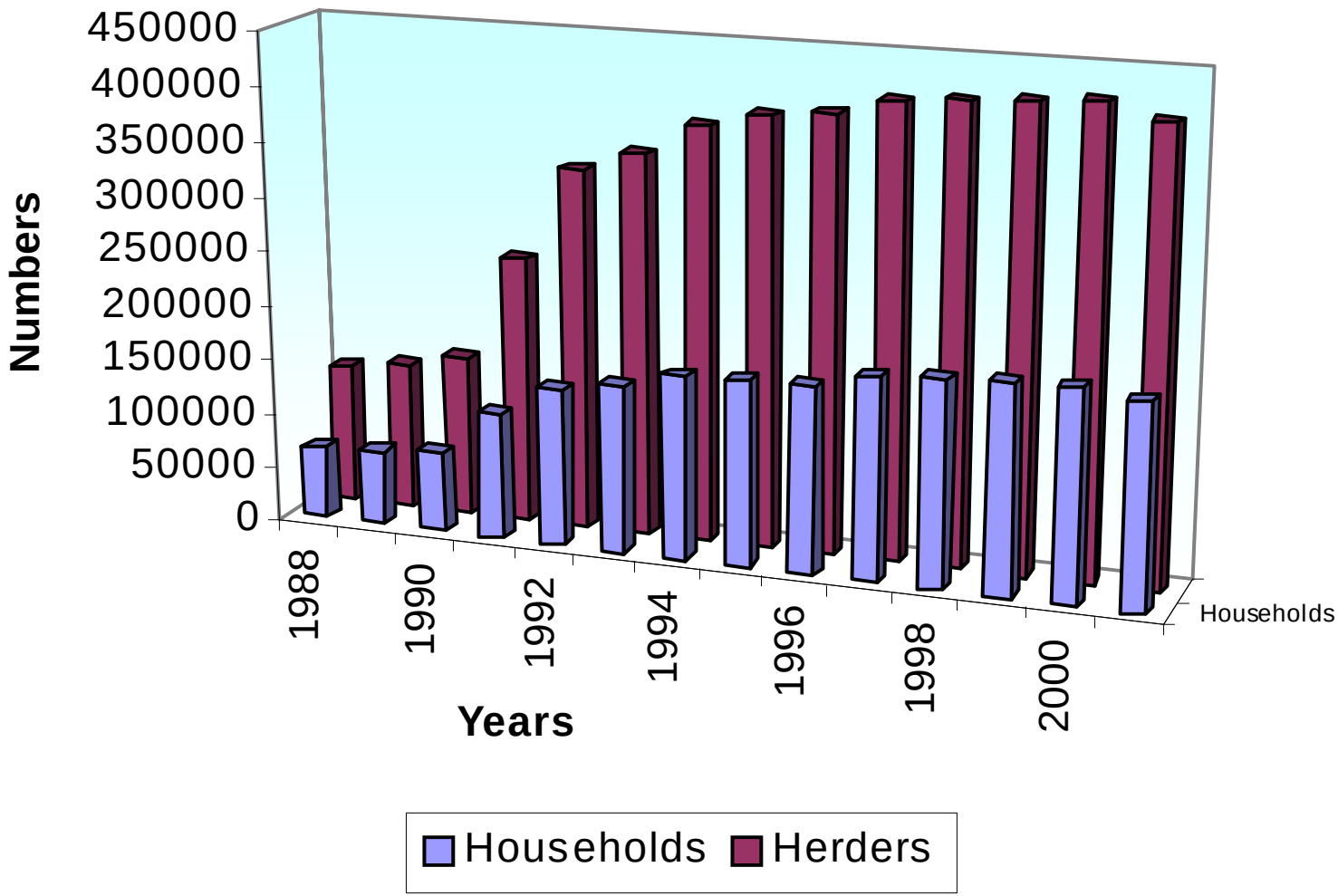


三种生态系统类型植被指数与初级生产力(GPP)的关系分析; a: 沼泽化草甸生态系统, b: 高寒灌丛生态系统, c: 高寒草甸生态系统, d: 三种生态系统的 EVI 和 NDVI 与 GPP 的线形关系回归分析, 黑实线为的 EVI 与 GPP 的拟合方程(GPP = 90.20EVI – 8.59, $R^2 = 0.85$), 黑虚线为的 NDVI 与 GPP 的拟合方程(GPP = 58.53NDVI - 9.88, $R^2 = 0.73$)

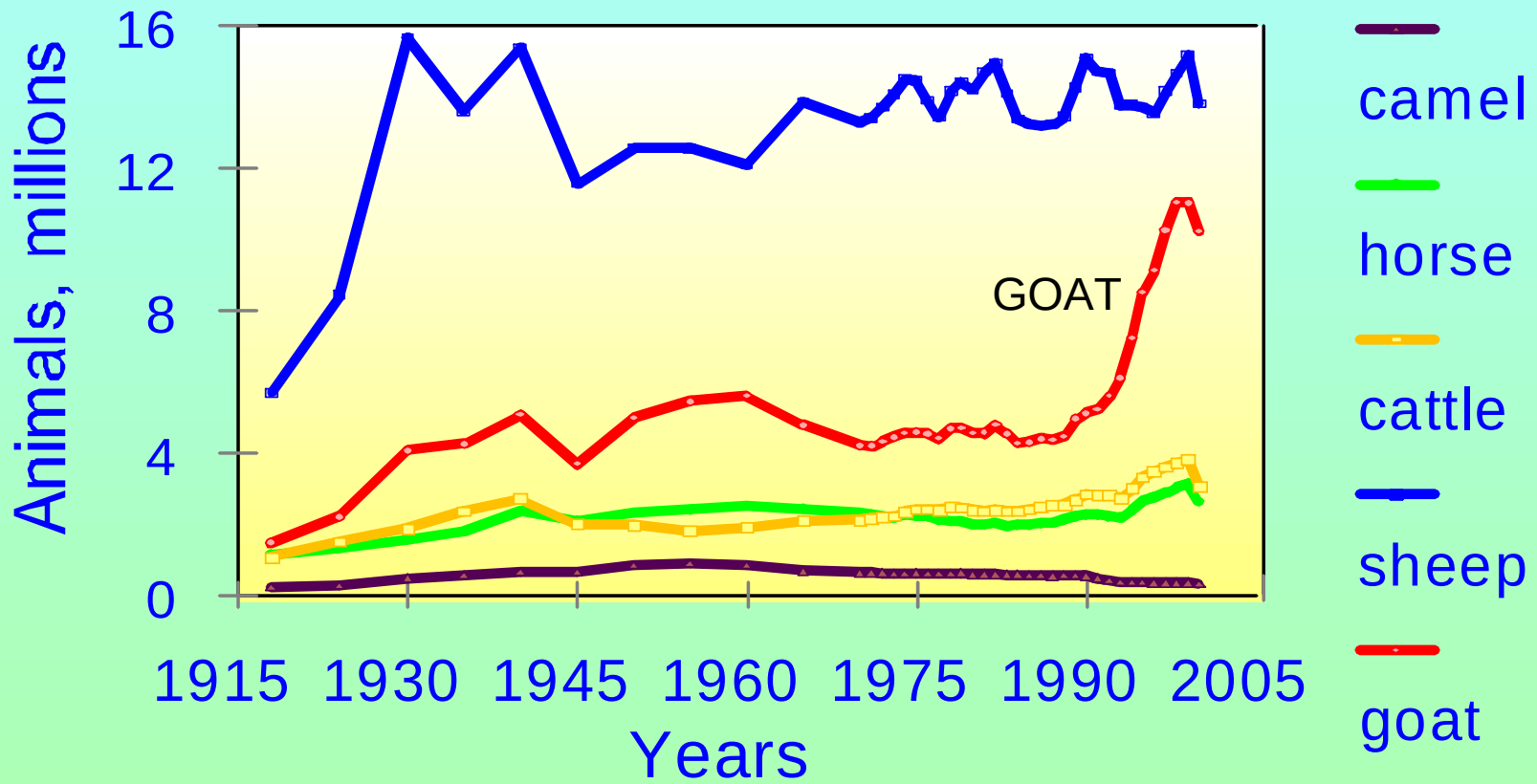
Xiao, UNH

LAND USE PRESSURES

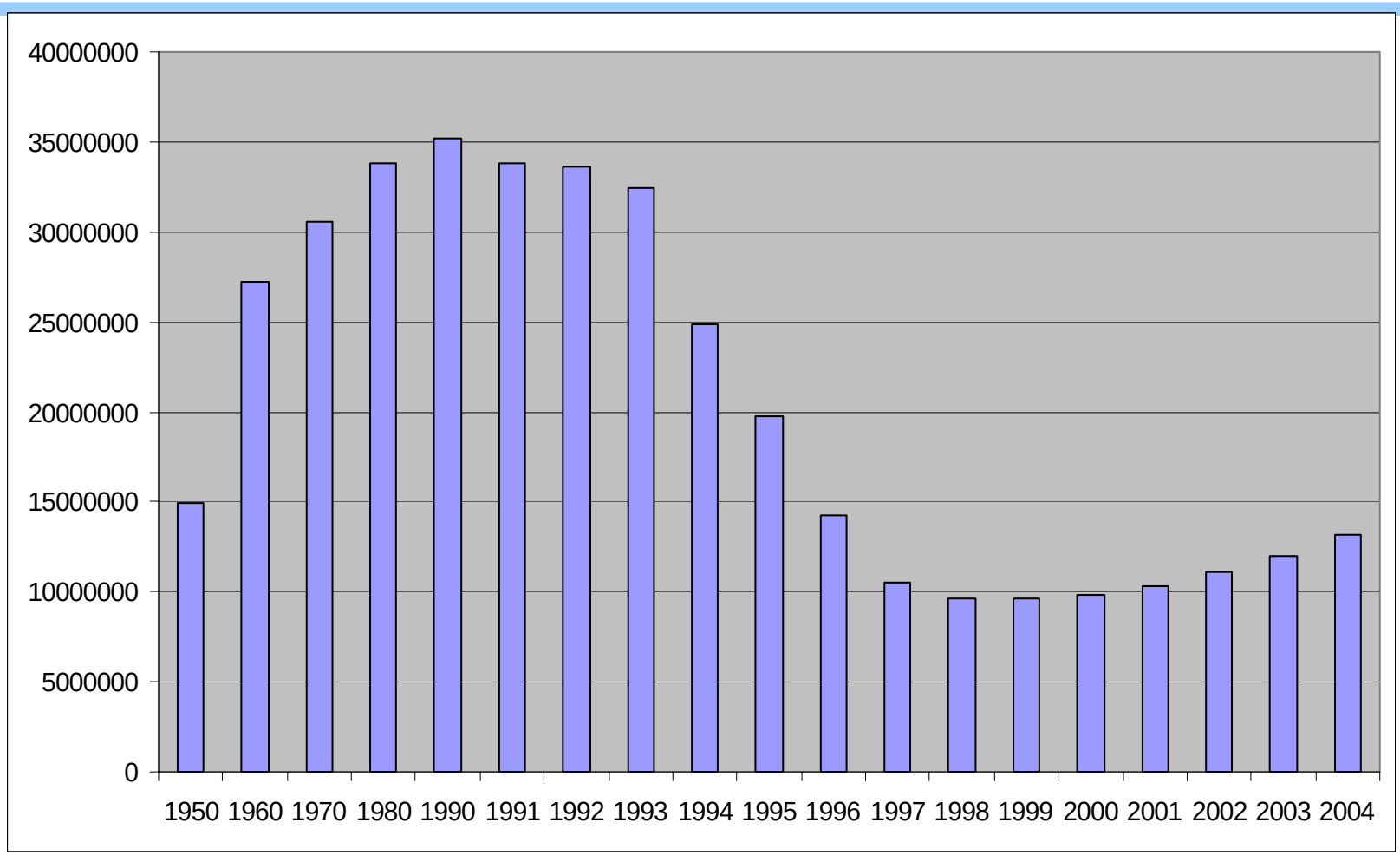
Herders and Households in Mongolia

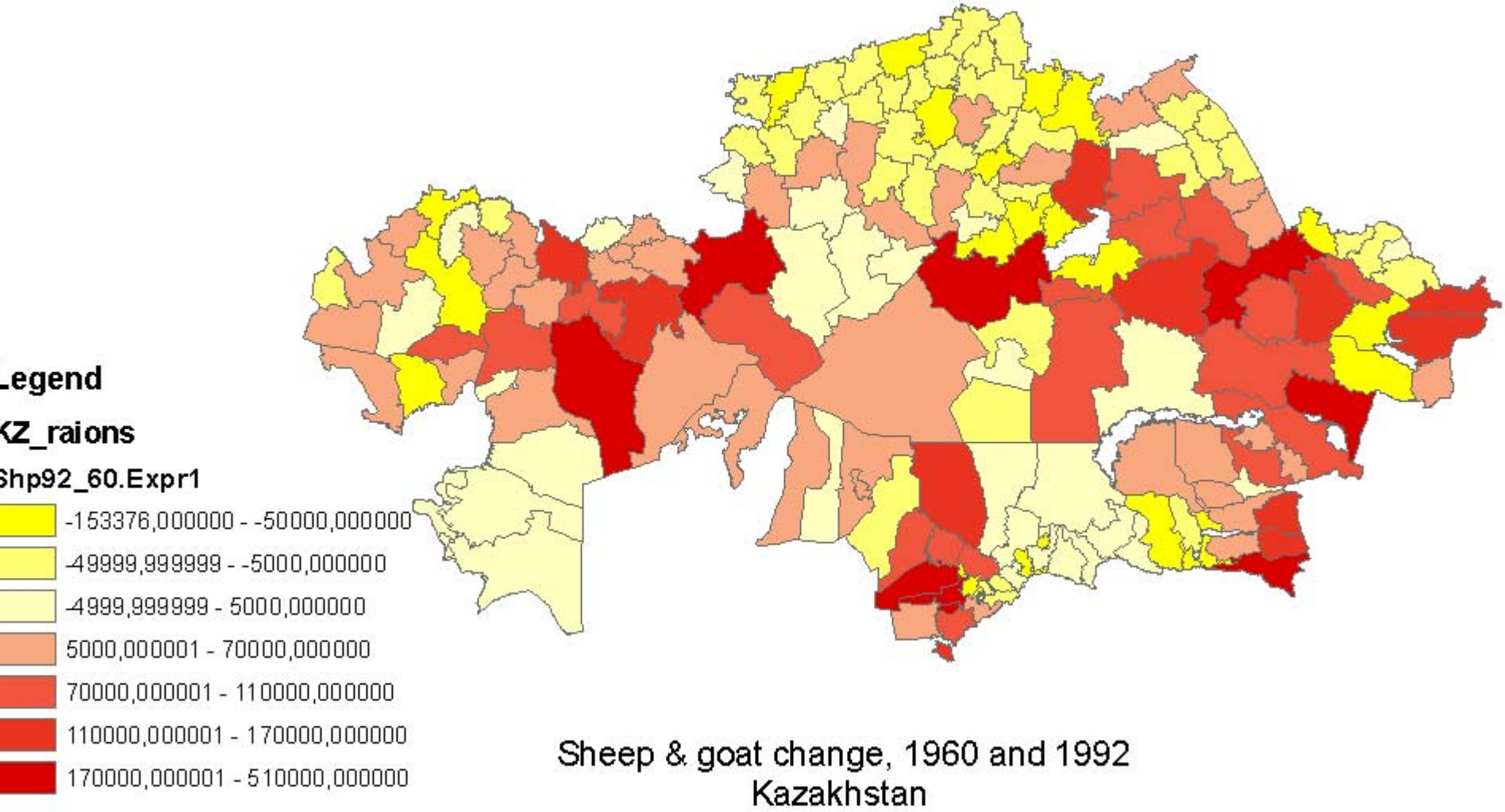


Livestock dynamics in Mongolia

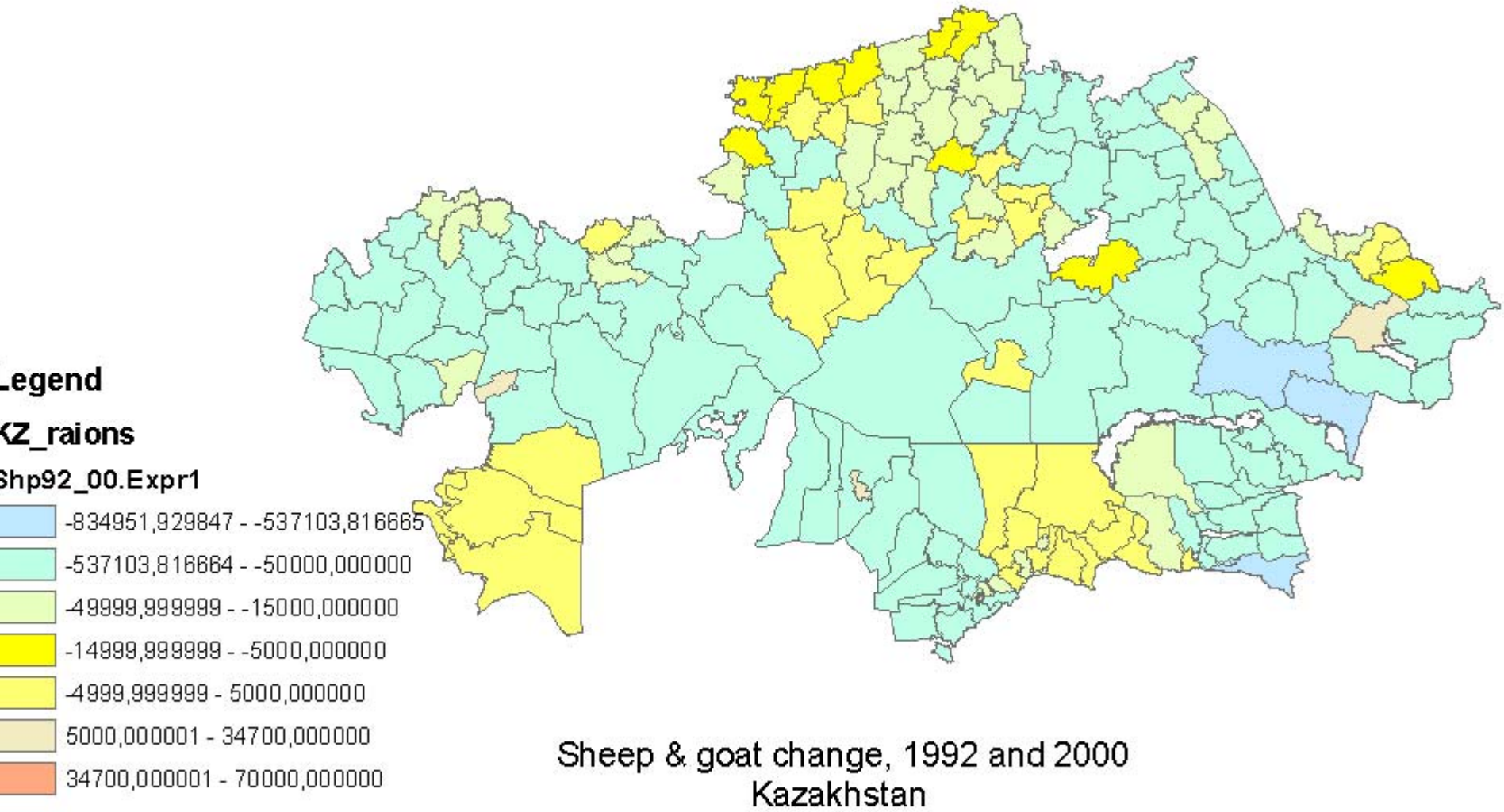


Dynamics of the amount of sheep and goat in Kazakhstan 1950 – 2004 (mln. head)





Sheep & goat change, 1960 and 1992
Kazakhstan

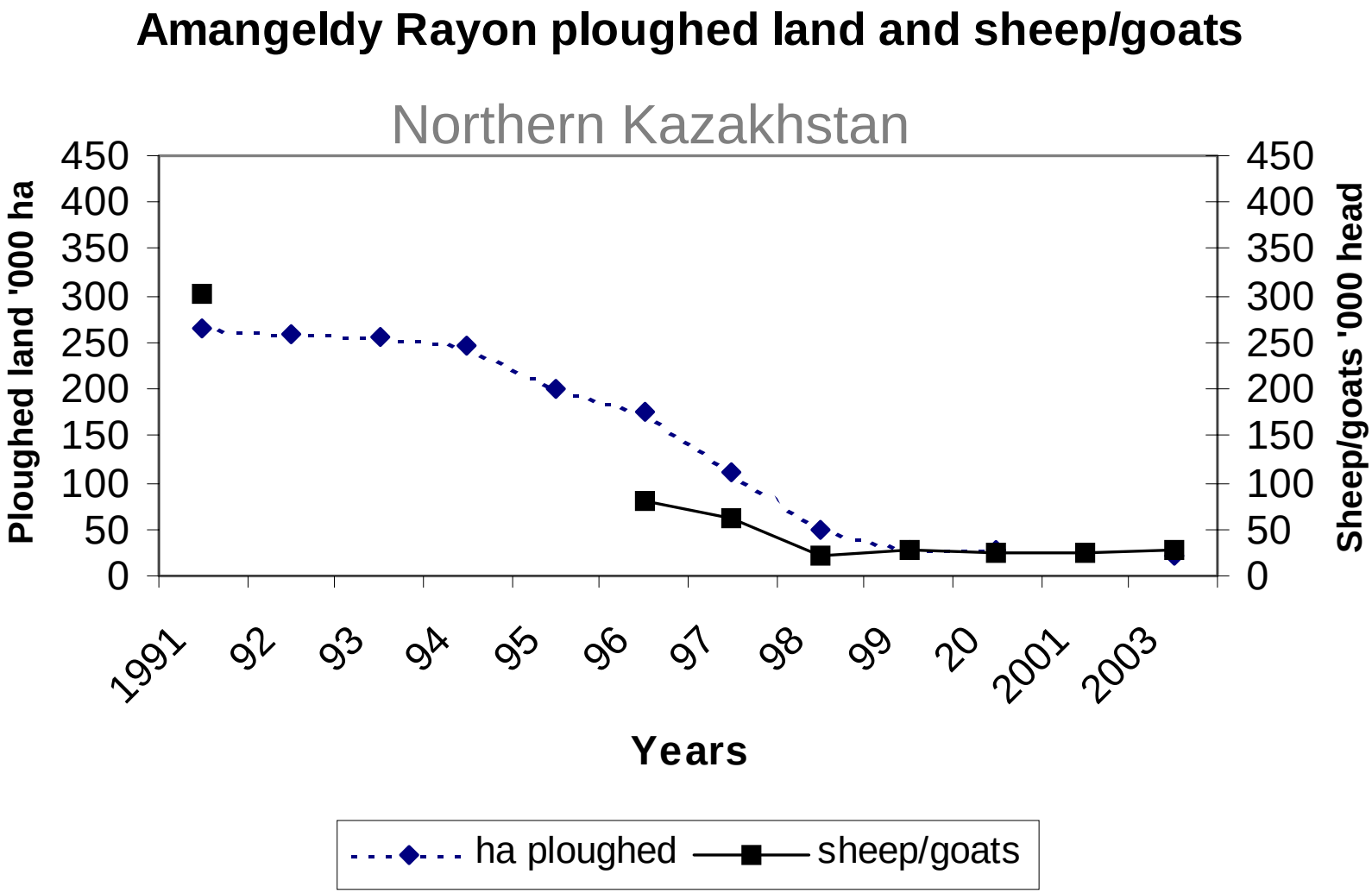


Sheep & goat change, 1992 and 2000
Kazakhstan

Dynamics of arable land in Kazakhstan 1950-2004

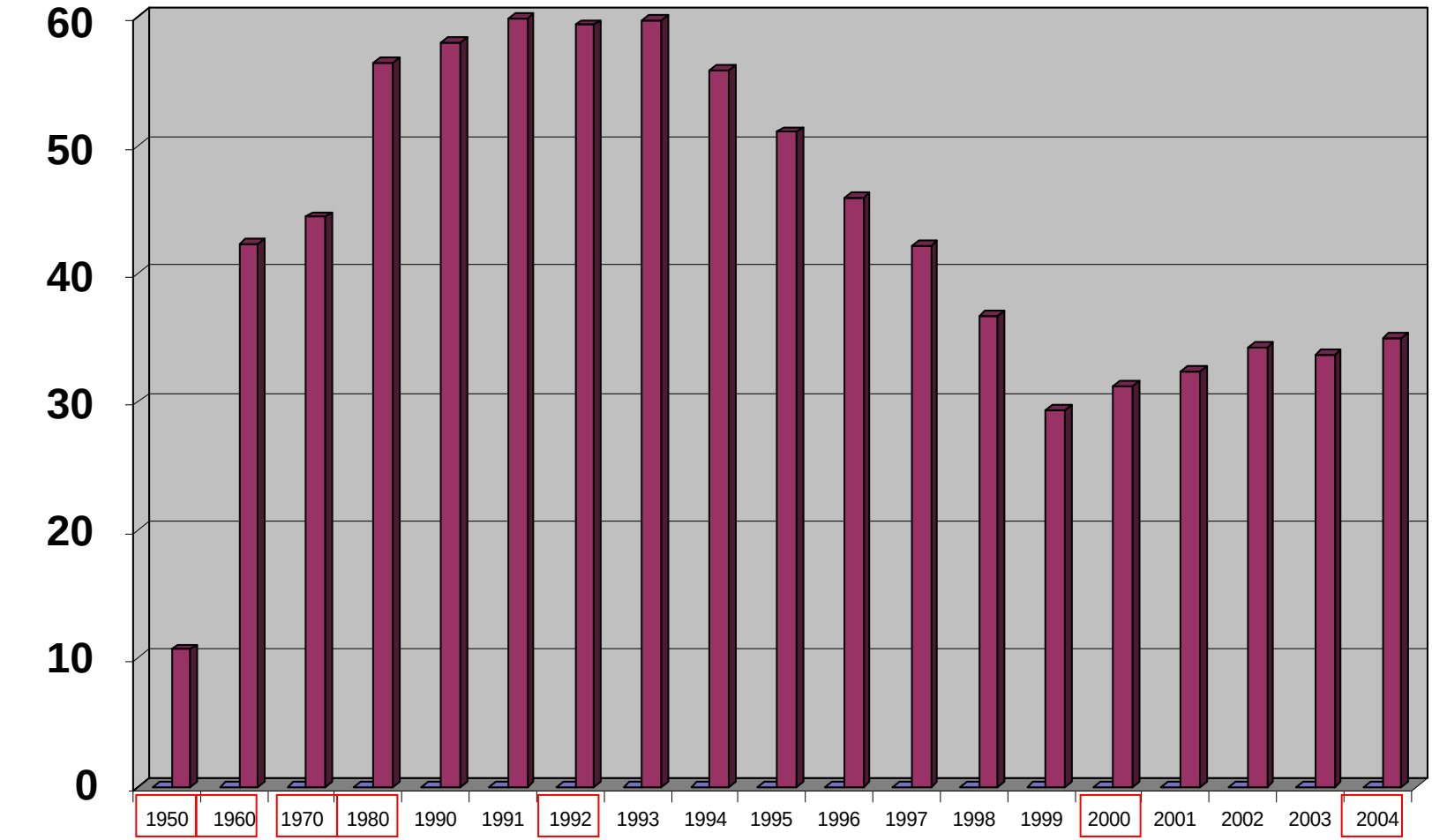


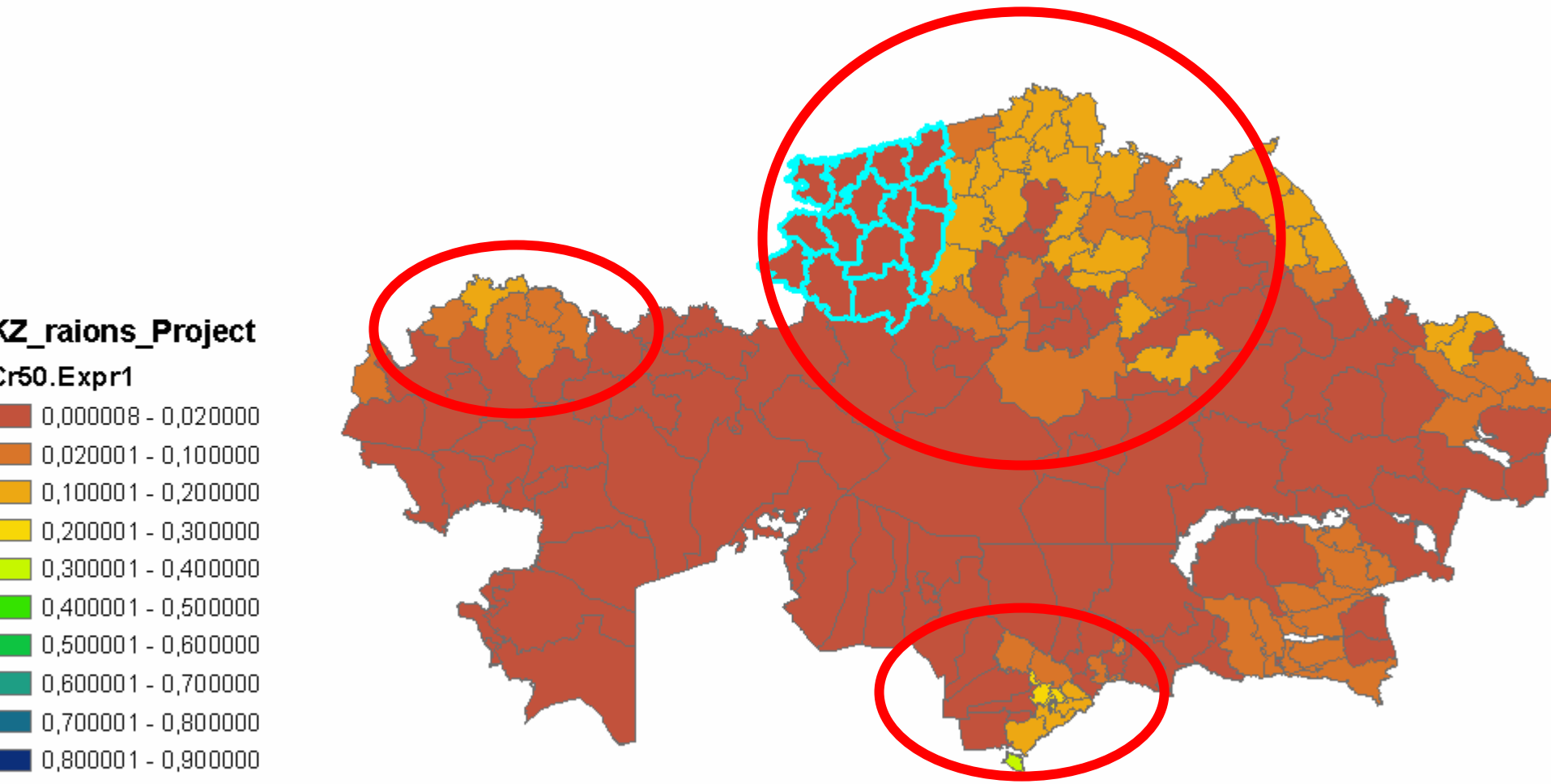

LOSS OF LAND PRODUCTIVTY



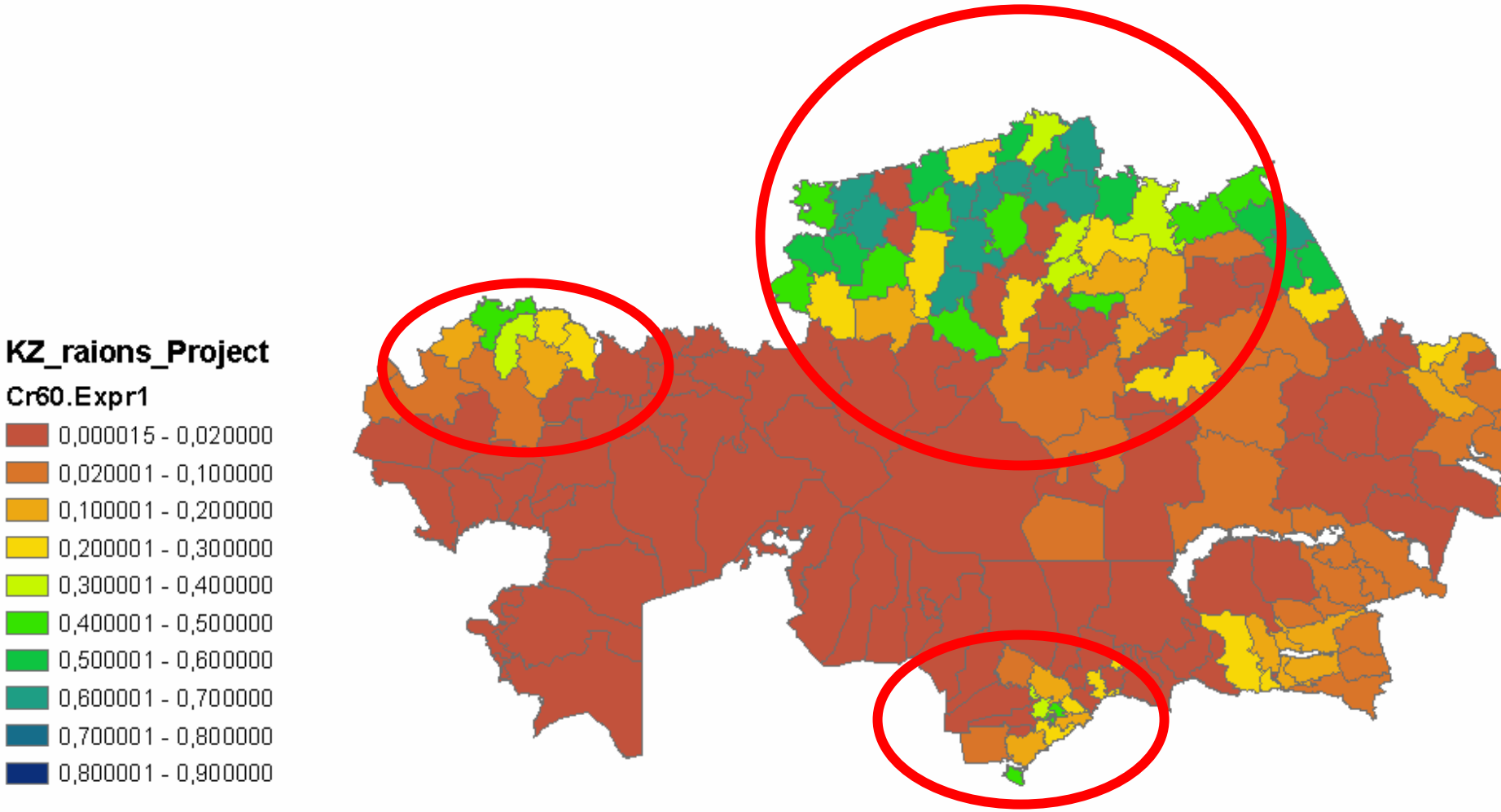
Smailov, Bragin, Temirbekov, Kerven

Arable Land Dynamics in Kazakhstan (1950 to 2004)

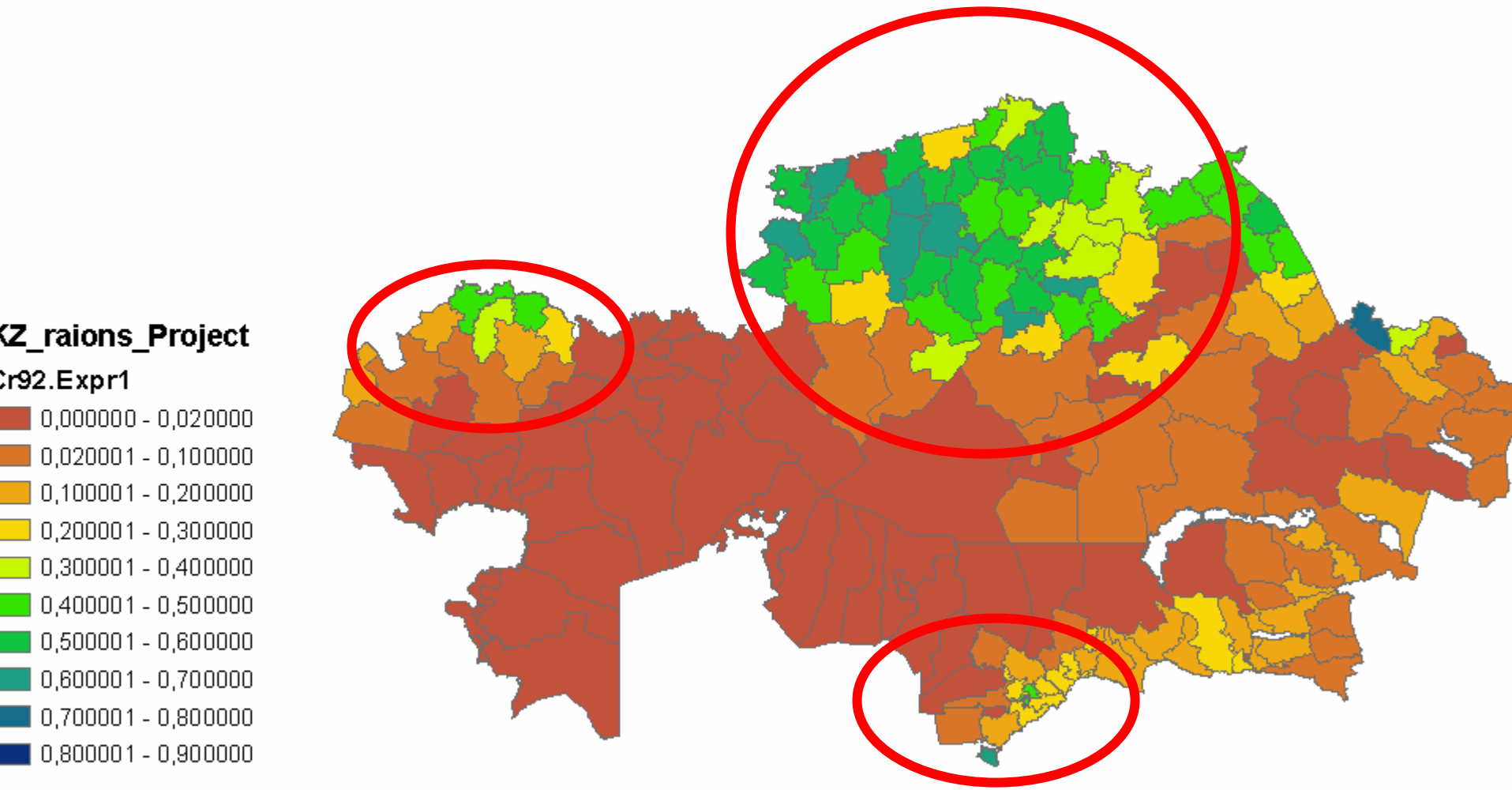




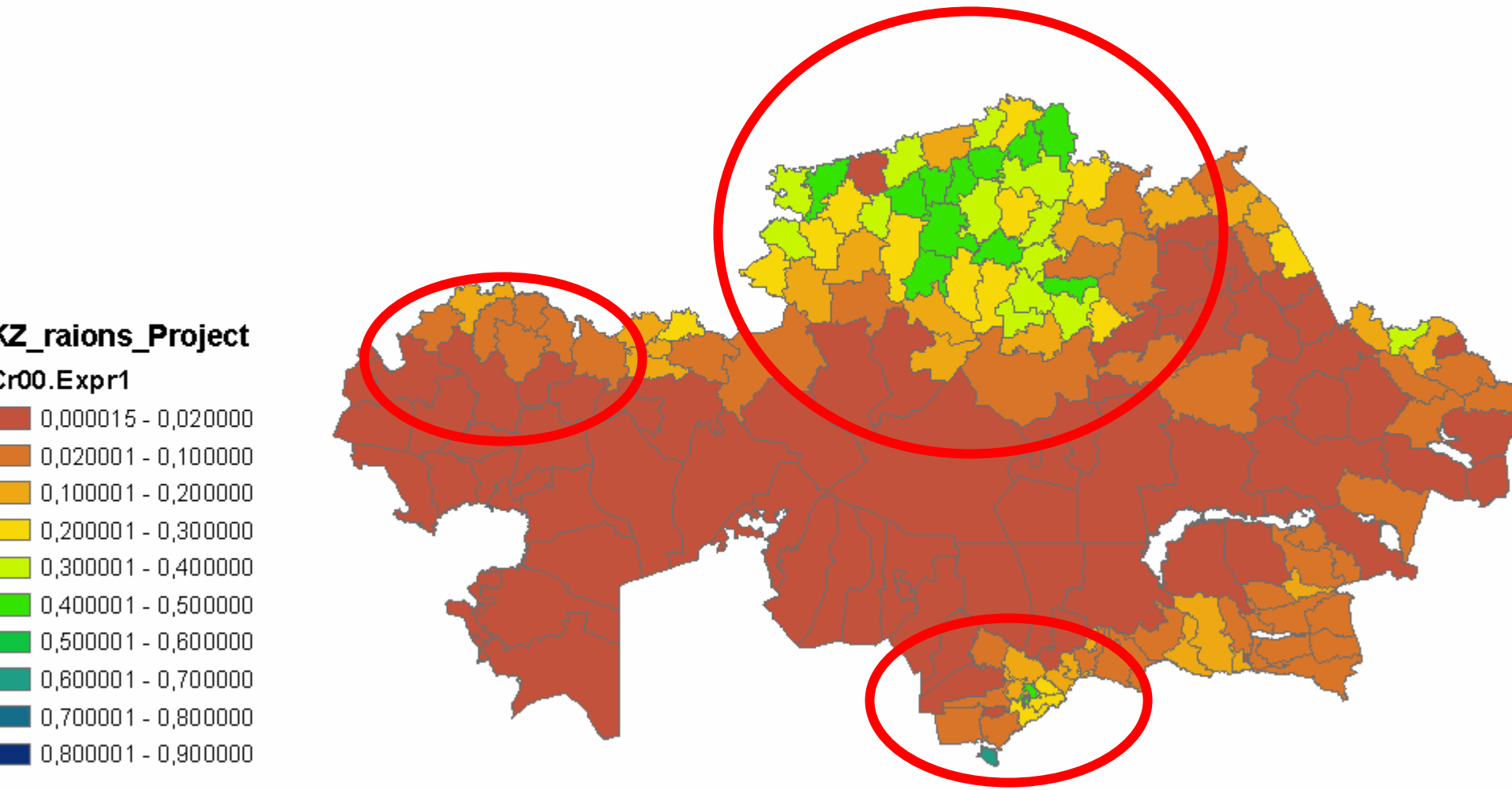
Fraction of arable land in raions of Kazakhstan, 1950



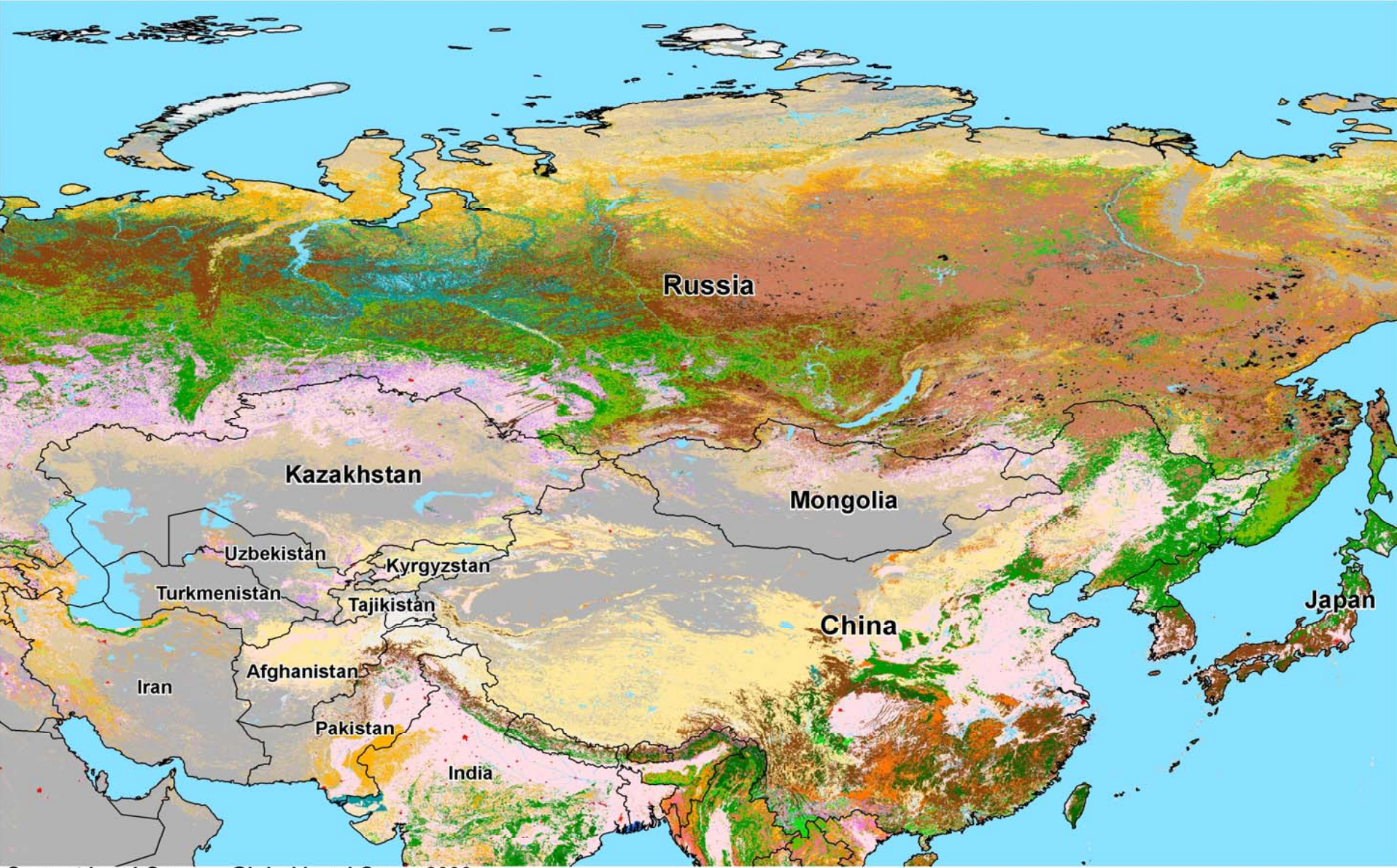
Fraction of arable land in raions of Kazakhstan, 1960



Fraction of arable land in raions of Kazakhstan, 1992



Fraction of arable land in raions of Kazakhstan, 2000



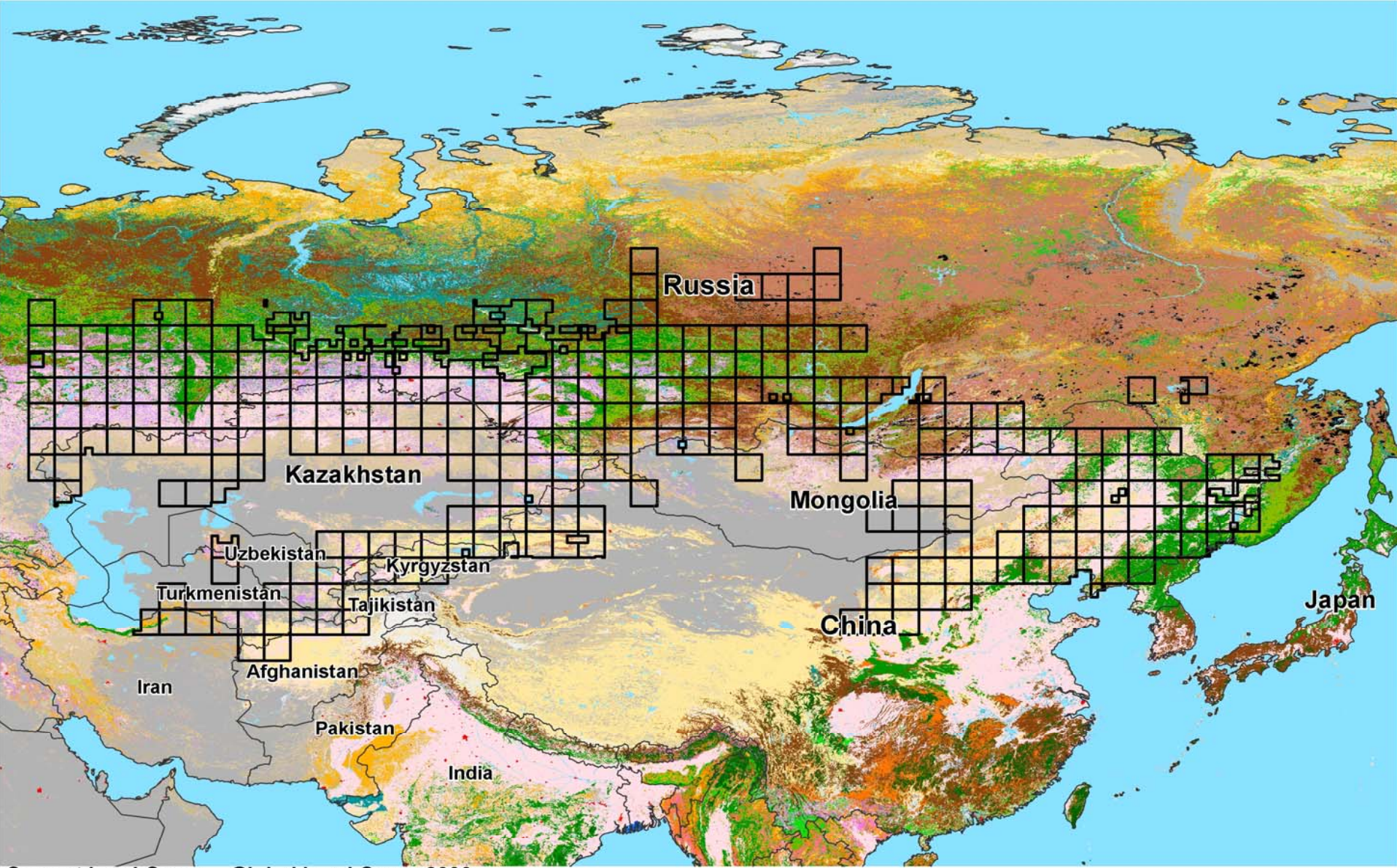
Current Land Cover -- Global Land Cover 2000

- Tree Cover, Broadleaved, Evergreen
- Tree Cover, Broadleaved, Deciduous, Closed
- Tree Cover, Broadleaved, Deciduous, Open
- Tree Cover, Needle-Leaved, Evergreen
- Tree Cover, Needle-Leaved, Deciduous
- Tree Cover, Mixed Leaf Type
- Tree Cover, Regularly Flooded, Fresh
- Tree Cover, Regularly Flooded, Saline
- Mosaic: Tree Cover/Other Natural Vegetation
- Tree Cover, Burnt
- Shrub Cover, Closed-Open, Evergreen
- Shrub Cover, Closed-Open, Deciduous
- Herbaceous Cover, Closed-Open
- Sparse Herbaceous or Sparse Shrub Cover
- Regularly Flooded Shrub and/or Herbaceous Cover
- Cultivated and Managed Areas
- Mosaic: Cropland/Tree Cover/Other Natural Vegetation
- Mosaic: Cropland/Shrub and/or Herbaceous Cover
- Bare Areas
- Water Bodies
- Snow and Ice
- Artificial Surfaces
- No Data

N W E S

0 500 1,000 1,500 2,000 Kilometers

1-Kilometer Resolution



Current Land Cover -- Global Land Cover 2000

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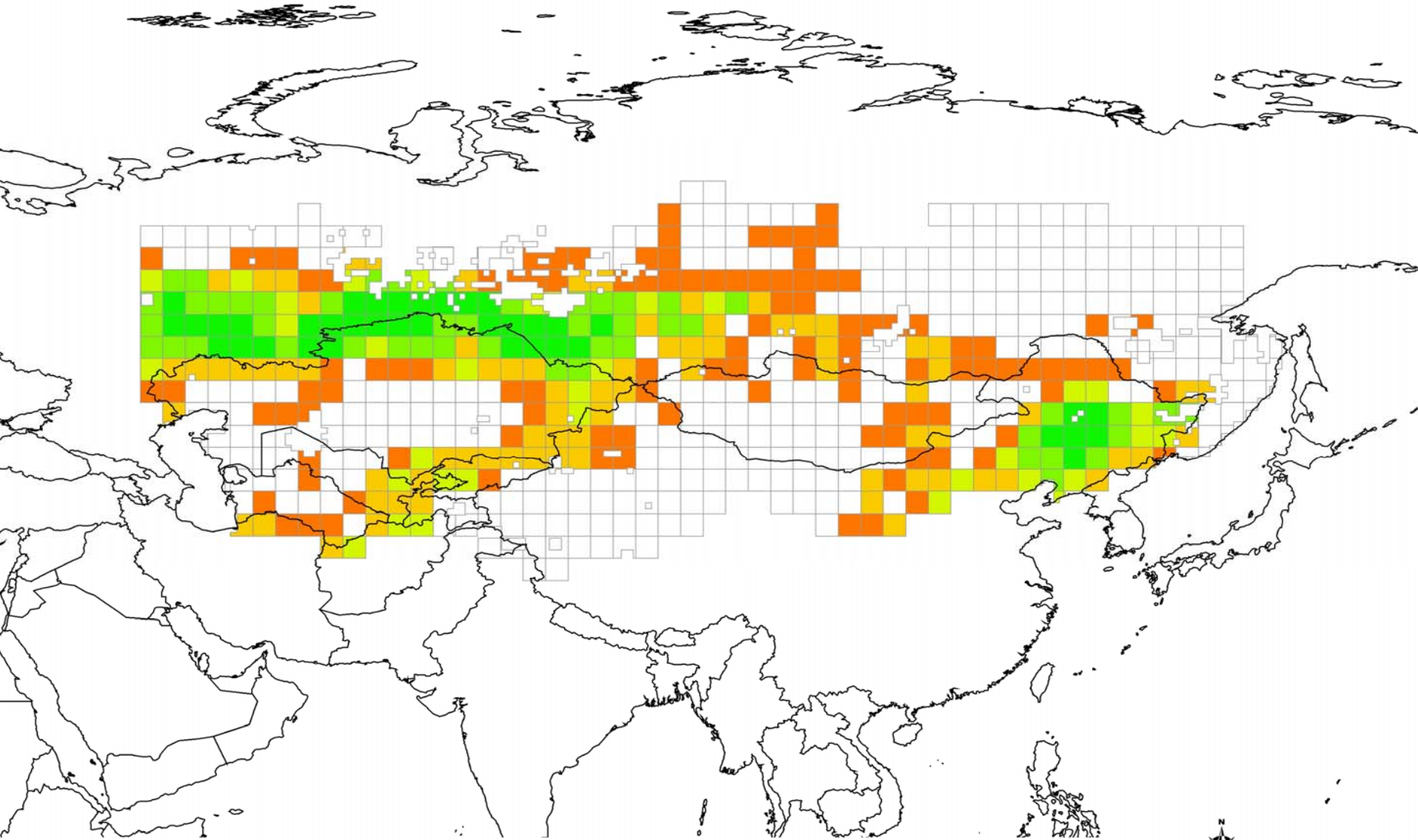
- Artificial Surfaces
- DAYCENT Simulation

N W E S

0 500 1,000 1,500 2,000 Kilometers

1-Kilometer Resolution

Percent Cropped Area by NCEP Cell



1992 Croplands Dataset, Ramankutty, N. and Foley, J. (1988)

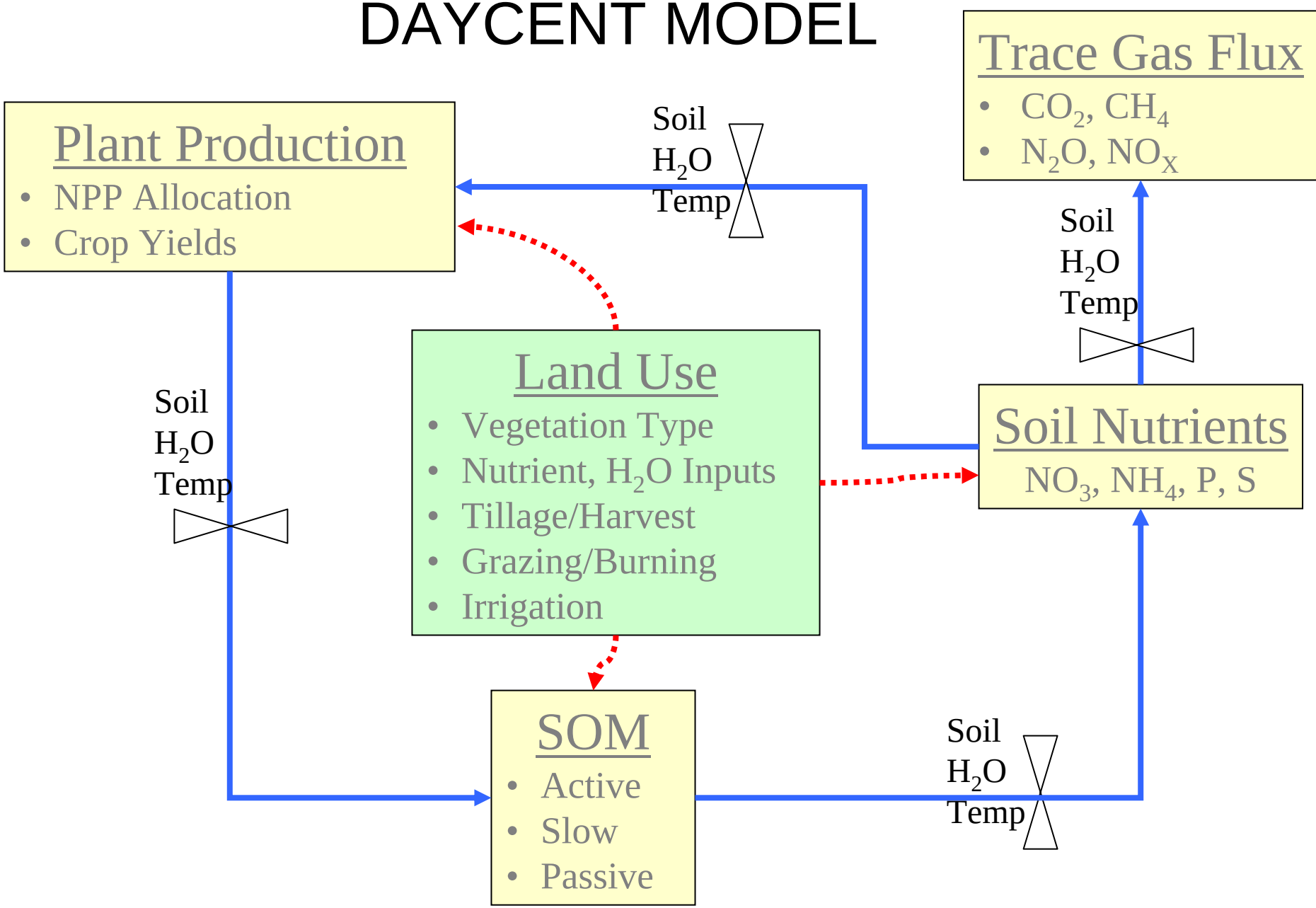
Percentage

- 0 - 5
- 5 - 10
- 10 - 20
- 20 - 30
- 30 - 50
- > 50

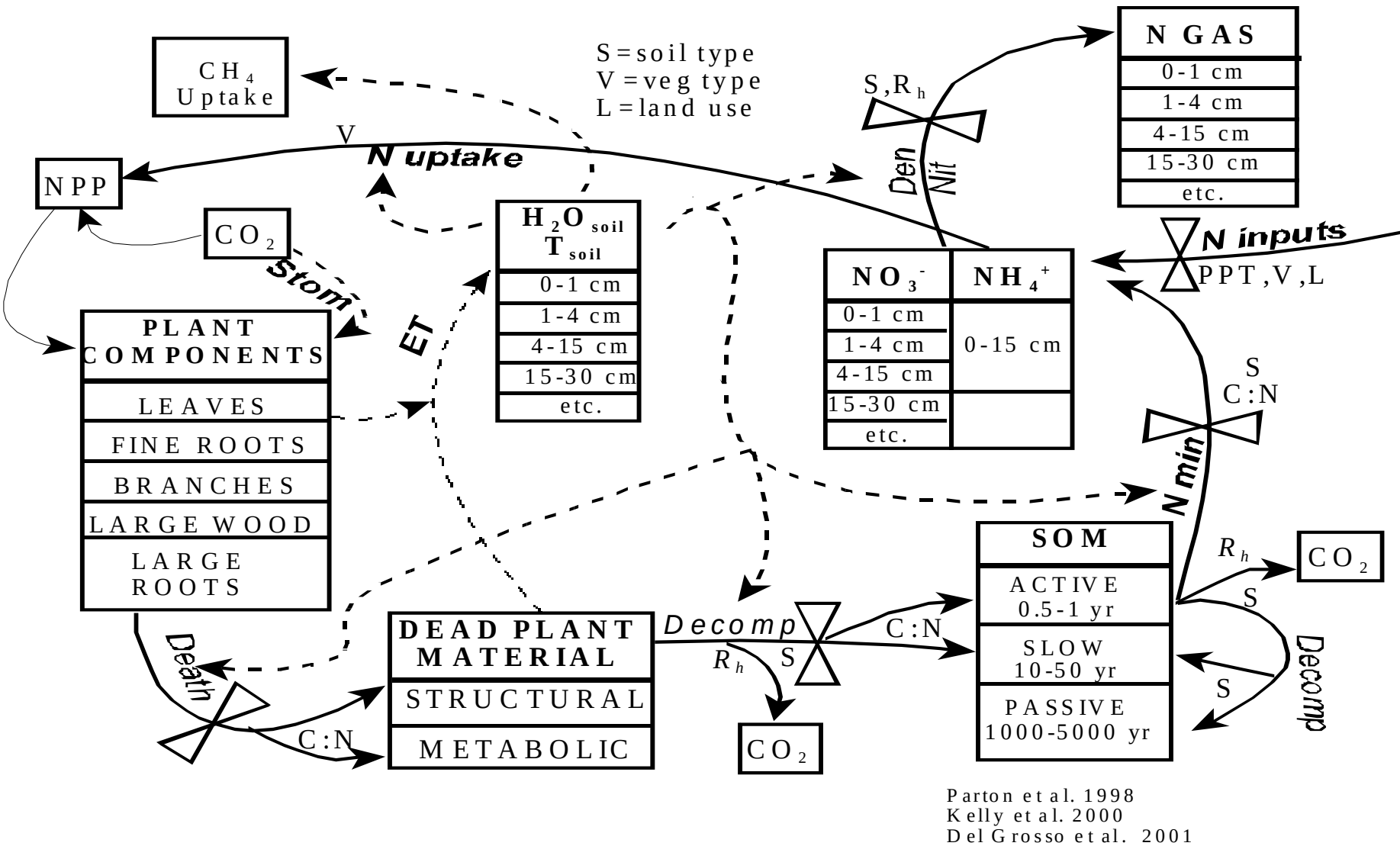
0 500 1,000 1,500 2,000 Kilometers

1-Kilometer Resolution

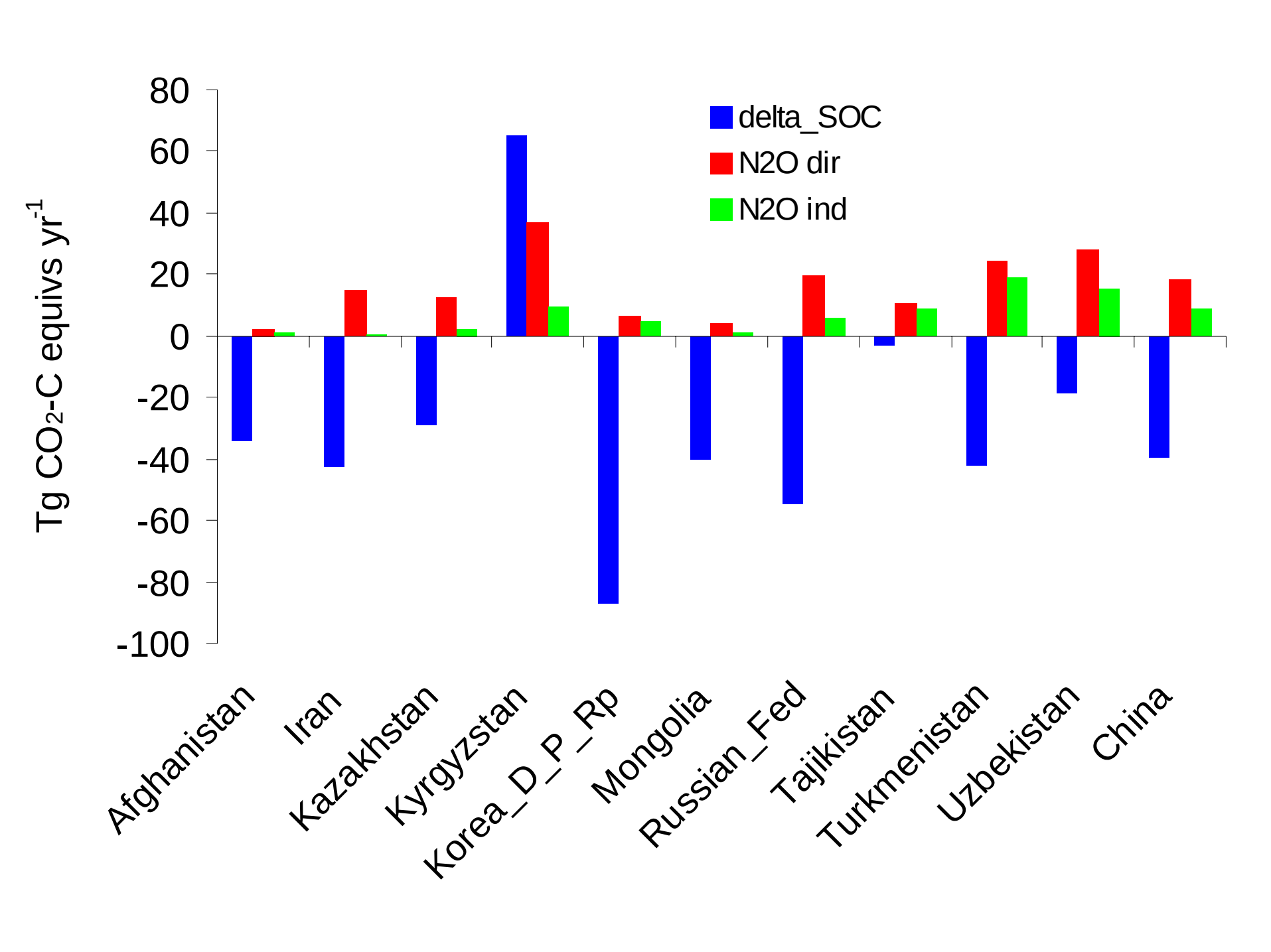
DAYCENT MODEL

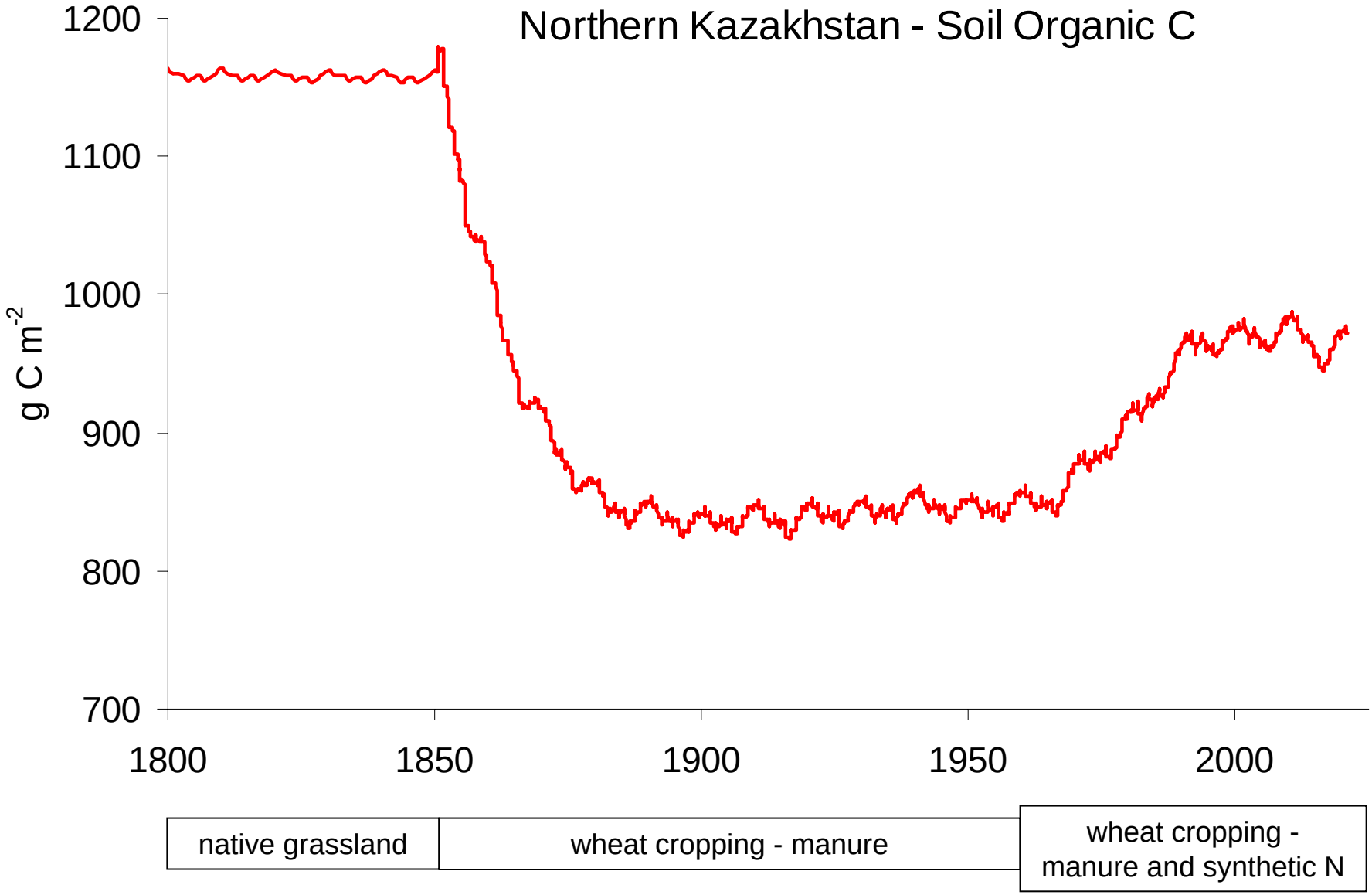


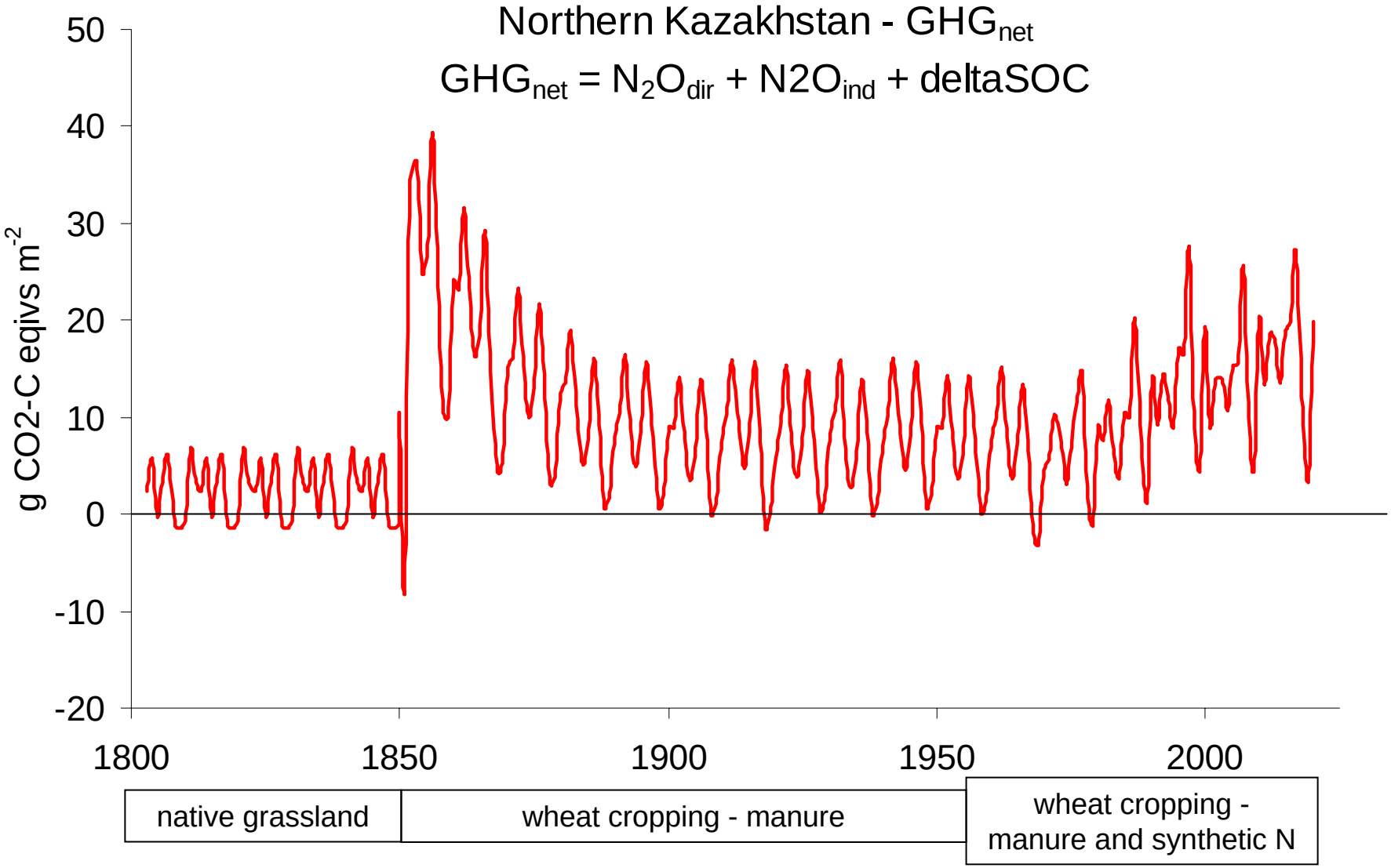
DAYCENT MODEL



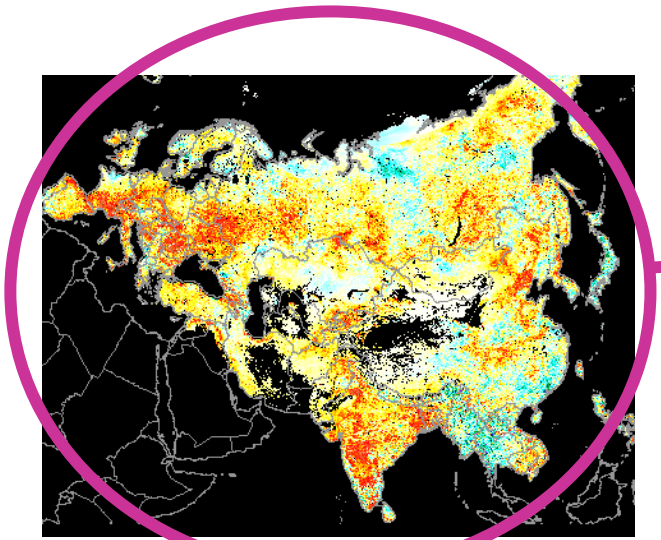
Parton et al. 1998
Kelly et al. 2000
Del Grosso et al. 2001

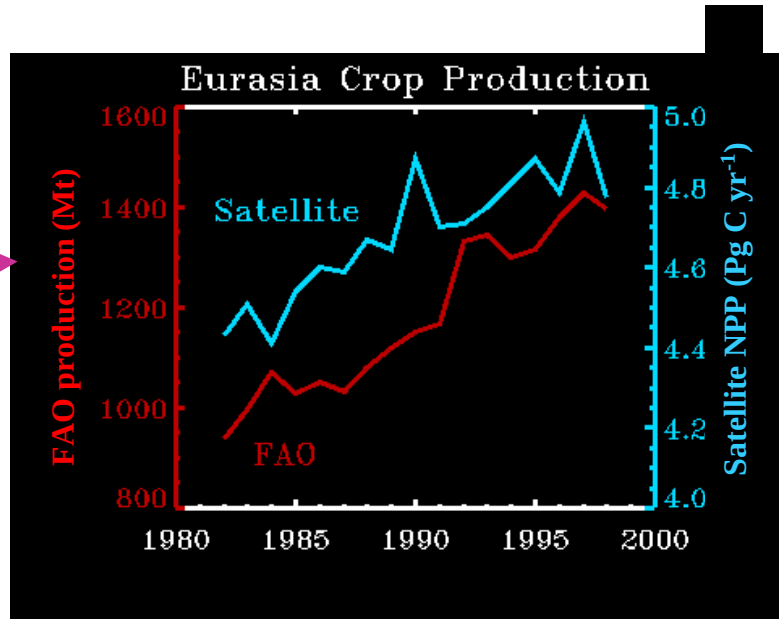

80
60
40
20
0
-20
-40
-60
-80
-100
Tg CO2-C equivs yr-1
delta_SOC
N2O dir
N2O ind
Afghanistan
Iran
Kazakhstan
Kyrgyzstan
Korea_D_P_Rp
Mongolia
Russian_Fed
Tajikistan
Turkmenistan
Uzbekistan
China


Northern Kazakhstan - Soil Organic C
g C m-2
1200
1100
1000
900
800
700
1800
1850
1900
1950
2000
native grassland
wheat cropping - manure
wheat cropping - manure and synthetic N


Northern Kazakhstan - GHGnet
GHGnet = N2Odir + N2Oind + deltaSOC
g CO2-C eqivs m-2
50
40
30
20
10
0
-10
-20
1800
1850
1900
1950
2000
native grassland
wheat cropping - manure
wheat cropping - manure and synthetic N

Similarity of agricultural statistics, satellite-derived production highlight importance of crops





PROPOSAL OPPORTUNITY

Advancing Capacity to Support Climate Change Adaptation (ACCCA)

(3-Asia and 6-Africa)

Call for Proposals and Terms of Reference

DEADLINE: 22 MAY 2006

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Dr. Neil Leary, International START
E-mail: nleary@agu.org.

THANK YOU