



**Kazakh Research Institute
Ecology and Climate
(MEP RK)**

**«Reducing uncertainties in GHG inventory
using modern agricultural lands
monitoring systems»**

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Landscape map of Kazakhstan



- 1 – Forest steppe
- 2 – Steppe
- 3 – Desert and semi-desert
- 4 – Mountain region

GHG emission in Kazakhstan

Total: **233.9 – 245.8 Tg CO₂- eq**

Agricultural sector:

Direct emission: **14.4-30.8 Tg CO₂ eq (6-12 %)**

Sinks: **5.9-9.2 Tg CO₂-eq (2-3 %)**

Uncertainties in GHG inventory for agricultural sectors are **80-95 %**

Kazakhstan passed strategic solution for decreasing carbon consumption in economic foresee steady resolution for GHG emission by **15 % in 2020 to **25 %** by 2050.**

According to the expert judgment the GHG emission resolution commitment of Kazakhstan witch mainly relate to energy and industry measures may limit annual economic growth to maximum **6 %.**

State Programmer on the Boosted Industrial and Innovative Development of Kazakhstan and Strategic Development Plan by the Ministry of Agriculture for 2010-2014 include a potential possibilities for agricultural sector both to promote economic indices and sustainability of production and to reduce direct GHG emission and increase carbon sequestration:

- increasing the percentage of forest at the area from 12 270 to 15 984 thousand hectares;
- organize of use lands nature on 187 000 thousand hectares;
- expansion of spring wheat areas by 300 thousand hectares annual, which are to be tilled by moisture – soil and resources-saving practices including minimal and zero soil treatment;
- increase of a number of large farms for animal production on the basis of livestock breeding complex, milk farms, poultry factories and fattening grounds with infrastructure for emission treatment.

Nature pasture in the Kazakhstan on big area is key course of carbon sequestration

	Forest (F)	Pasture (P)	F:P
Area (thousand ha)	14.150	187 000	1:13
Soil carbon (thousand t)	1050-1290	2400-4860	1:2 (4)
Total Biomass carbon (thousand t)	290	1000	1:3

Estimation of realty potential of carbon sequestration for present day pasture's ecosystems is based on the complex methods, in including:

- empirical ground studies;**
- landscape- and ecological studies using space systems information;**
- modeling of production processes at pastures.**

Application of the «Pasture» model (Kazakhstan) for estimation of bio- and energy potential of the pasture ecosystem on big areas, witch presented by general equations:

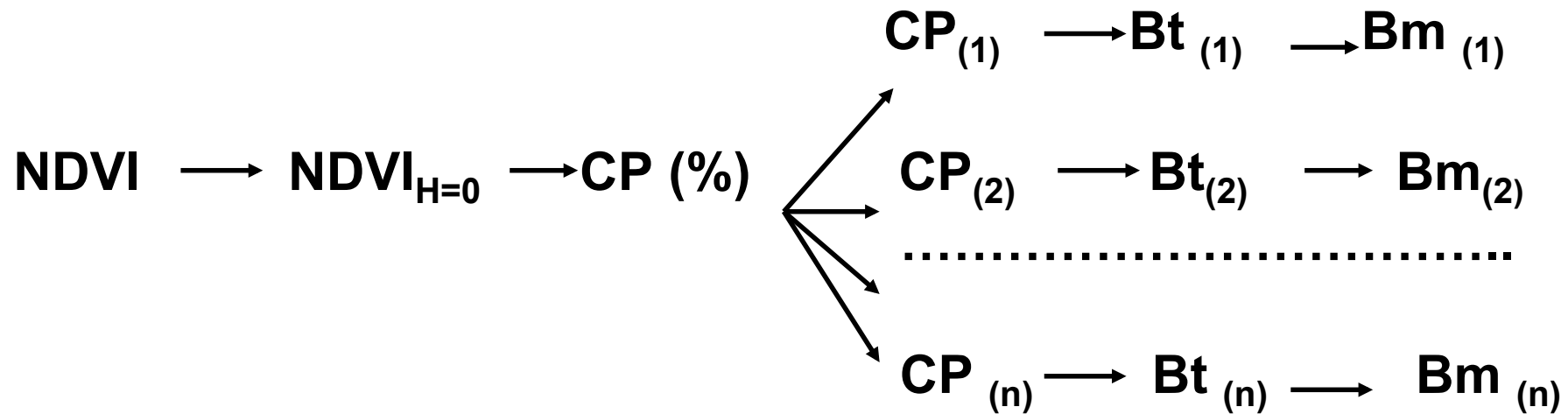
$$B_t = B_m \cdot R_t \quad (1); \quad B_m = F (Ph, A) \quad (2);$$

$$Ph = F (J, C_o) \quad (3); \quad R_t = R_m \cdot F (T) \cdot F (W) \quad (4);$$

$$B_t' = B_t \cdot \exp^{-b} \quad (5); \quad b_t = F (T, W) \quad (6),$$

were: **B_t** is the biomass (annual increment), t/ha; **R_t** is the plant growth function, dimensionless; **B_m** is the maximum biomass for vegetative period under optimum conditions, t/hectares; **Ph** is the photosynthesis product for vegetative period, kg CO₂/m² s; **A** is the factor of leaves amount at plants, dimensionless; **J** is the photosynthesis active radiation (PAR), J/m² s; **C_o** is the CO₂ concentration in atmosphere; **R_m** is the growth function under optimum environment conditions, dimensionless; **T** is the air temperature, °C; **W** is the moisture sufficiency for plants, dimensionless; **B_t'** is the Biomass in destruction, t/hectare; **b_t** is the biomass destruction factor, dimensionless.

Indemnification of model parameters B_m is based on data from empirical ground and air-space and surveys



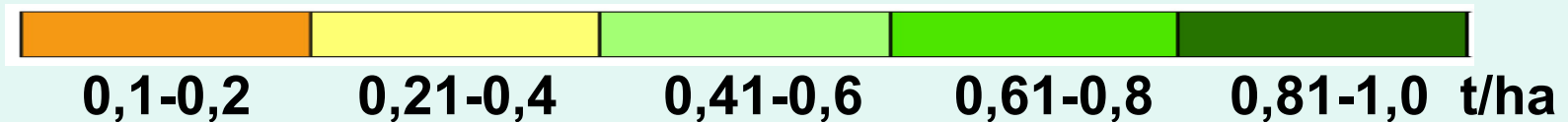
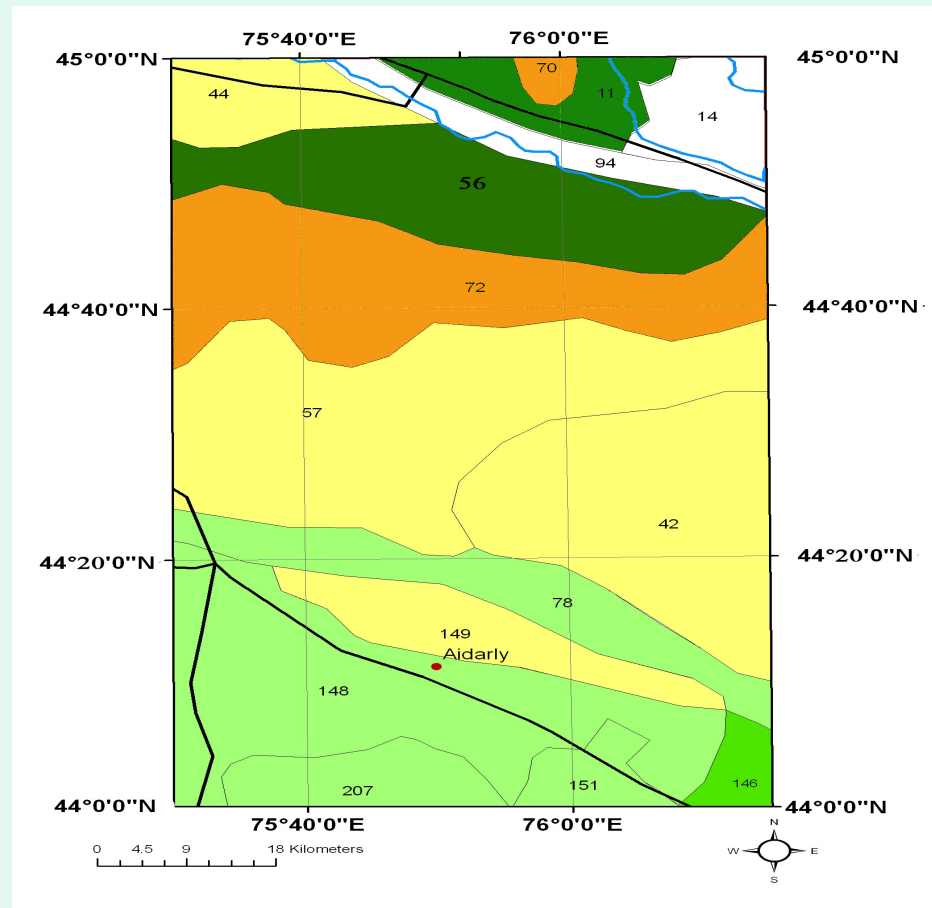
were 1n – dominants plants for landscape's – and ecological contours on pasture mag

Modeled of Aboveground biomass for plants dominants in dynamic for 2007 year on pasture of Balkhash area. Map 1:200 000 scale contour.



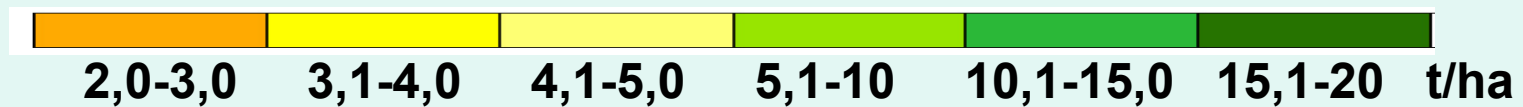
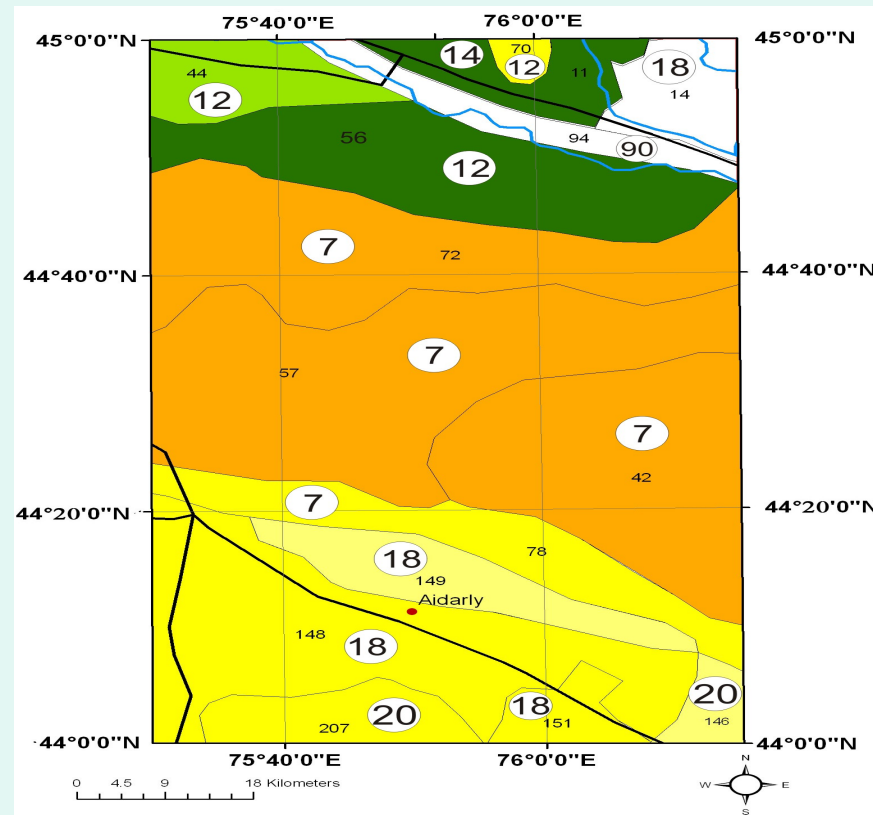
- 1- Ephemery group, 2- Artemisia terrae -albae,
3- Agropyron fragile, 4- Calligonum aphyllum,
5- Kochia prostrate, 6- Ceratocarpus utriculosus.

Map with simulated of Primary aboveground production on present days pasture of Turanica desert in Balkhach area on years with moisture by 75 % probability. 1: 1 000 000 scale.



Map with simulated of Total Biological Production on present days pasture of Turanica desert in Balkhach area on years with moisture by 75 % probability.

1: 1 000 000 scale



⑦ - Soil carbon volume, t/ha

THANK YOU
(Дякую за терпіння)