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**Estimation of seasonal dynamics of arid zone pasture and crop
productivity using NOAA/AVHRR data.
Phase II. Launching the Remote Sensing System**

Annual report

US-Israel AID/CDR/CAD program

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Technical Aspects

During summer 1998 and winter 1998-1999, hardware and software of non-conventional system which use NOAA operational polar-orbiting satellites for quantitative assessments of pasture/crop conditions and productivity in Kazakhstan was upgraded to receive NOAA-15 images

Now, the system includes

- completely integrated and self-contained, High Resolution Picture Transmission receiving station with tracking antenna and positioner and receiver/demodulator/sectorizing subsystems,
- on-line PC IBM 486 for data collection and initial processing,
- image processing hardware and software for data processing, storing and distribution,
- algorithms for converting satellite radiances into new Vegetation Condition Index (VCI),
- algorithms for converting the VCI into ground-derived environmental and agricultural characteristics such as seasonal dynamic of pasture and crop conditions, their productivity, drought detection and monitoring

Scientific Aspects

1 Techniques for remote estimation of agricultural areas covered by crops and status of crops using NOAA/AVHRR data was developed and validated for northern Kazakhstan (Akmola region case study) The technique for quantitative assessment of crop areas was validated during growing season 1998 It allows remote assessment of agricultural land areas with an estimation error of less than 3%

2 During growing season 1998 just near test sites where verification of the techniques were performed, meteorological data (precipitation and temperature), as well as crop yield were collected Historical database (and crop yield) was designed Database contains data on crop yield, precipitation and temperature for Zelnograd (Akmola region) for the period 1985-1998 These ground observations will be a base for comparison satellite retrieved estimates and actually measured variables

3 10-days digital Normalized Difference Vegetation Index (NDVI) maps were created for a period April-September 1998 for Akmola region and submitted to decision makers in Kazakhstan (Ministry of Agriculture and Premier Minister)

4 It polygon Novoishimsky in Acmola region during growing season 1998 (since April to September), radiometric measurements were carried out together with ground observations during NOAA/AVHRR overpasses Data sets include reflectance of crops

and soils measured just above the canopy, areas covered by crops, status of crops and its yield

Operational steps for up-coming research activities

The main task of upcoming activities

- validation of techniques for remote estimation of crop status and productivity developed during the first year of the project Validation satellite-retrieved estimates will be done against ground observations in northern Kazakhstan,
- estimation of crop productivity using AVHRR data obtained in Kazakhstan, *using techniques and personal of Space Research Institute, Kazah Academy of Sciences* As a result of the activities, 10-days maps of crop productivity in Kazakhstan will be produced and distributed

The Remote Sensing Lab (BGU) will develop model and algorithms for estimation of crop yield from the Vegetation Condition Index (VCI) Accuracy of assessment of environmental and agricultural characteristics such as density of vegetation and biomass from NOAA/AVHRR data will be determined

BGU and NOAA/NESDIS will prepare files containing minimum and maximum NDVI values for Kazakhstan, retrieved from AVHRR data 1985 to 1999

BGU and Space Research Institute (Kazakhstan) will process the radiometric data obtained during field companies in Acmola region during 1988 growing season and compare it with bio-physical characteristics of crops