Recognition, visibility, and the beacons set for a handover: Highlights of a decade of interdisciplinary research and education in the Aral Sea Basin in Central Asia

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1 Introduction

Creating resilient and sustainable agricultural and ecosystems is urgently needed in Central Asia. To achieve this, an over-arching concept, coordination, cooperation and vision for this region is required. Uzbekistan, as the other four countries in Central Asia, is confronted with the degradation of natural resources that is not likely to be arrested in the near future. In this sense, the ZEF/UNESCO project “Economic and Ecological Restructuring of Land- and Water Use in the Region Khorezm (Uzbekistan)” addressed challenging issues such as: How can science, knowledge, and innovation reduce the loss of natural resources and resource use inefficiencies, benefit livelihoods and sustain environmental health?

Sustainable use and management of natural resources in Khorezm, a region in the lower part of the Aral Sea Basin in Central Asia, was the overall goal of a research and education project - with a focus on land and water. ZEF’s concept was guided by the principle of efficiency and aimed at defining sustainable options for land and water use: namely ecologically and economically sound practices to increase resource use efficiencies, fight land degradation, mitigate greenhouse gas emissions, and increase rural incomes. The project was developed and implemented by ZEF in cooperation with the science sector of UNESCO, German Space Agency (DLR), the University of Würzburg, and the State University of Urgench (UrDU), Uzbekistan. Next, water and land use options as well as studies to increase the understanding about institutions and processes on land and water use were conducted. During Phase III (2007-2011) the project’s researchers tested an integrated concept for restructuring land and water use on a landscape segment (75 ha) provided by the regional authorities.

The evaluation and adaptation of innovations with stakeholders (farmers, water managers, policy makers), a method developed by the project and called ‘Follow-the-Innovation’ (FTI), was a crucial component of Phase III.

It is common that activities of research and education projects end with the research findings being published, without bringing them to practitioners and policymakers. The researchers and management of this project intended to act in a different way. They started disseminating (selected) innovations and findings in the last Phase III with the aim of translating these innovations into action and introducing them to national agricultural policy-makers. The project findings and highlights will be summarized hereafter according to seven categories: (section 2) Building infrastructure and institutional capacities, (3) human capacity building, academic qualifications and international recognition, (4) publications, (5) decision support tools, (6) reproducibility of project findings for out-scaling, (7) efficiency and criteria and (8) a post-project perspective.

<table>
<thead>
<tr>
<th>Table 1: Project Phases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase</td>
</tr>
<tr>
<td>I</td>
</tr>
<tr>
<td>II</td>
</tr>
<tr>
<td>III</td>
</tr>
</tbody>
</table>

2 Building infrastructure and institutional capacities

The people leading and running this project did not focus merely on outputs, but also on the inputs that helped to get these outputs. Therefore, they set up a local infrastructure to support advanced research and education in natural and social sciences.

An old training and education building (Figure 1a), made available by the University of Urgench (UrDU), was refurbished with funds of BMBF and ZEF into a modern working space of 680 m² with a traditional exterior design (Figure 1b). The project’s building included five up-to-date laboratories, a library, 14 office rooms and teaching facilities for about 30 scientists. The building was inaugurated in June 2003.

The project’s office building included a GIS (Geographical Information System) laboratory, which was installed by the DLR. It became fully operational in September 2003 and provided services for the entire project by giving state-of-the-art, technical support for carrying out GIS and remote sensing (RS) activities. The GIS-lab was equipped for processing data that had been either collected from study sites in Khorezm directly or that were supplied by collaborating Uzbek institutions in the form of maps and other data (hardware, computers, printers, laboratory equipment), which helped to develop and disseminate training and teaching materials which also leveraged the investments in institutional capacity building. Courses on GIS and RS, experimental statistics, crop production and economic modeling were conducted regularly to all-level students. The entire database, hardware, training materials and the infrastructure were handed over in 2011 to the partners KRASS and UrDU. The partnership between ZEF, UrDU and UNESCO resulted also in establishing a UNESCO Chair at UrDU for improving the education of young researchers on sustainable development issues.
3 Human capacity building, academic qualifications and international recognition

While recognizing that the future of the Aral Sea Region depends on knowledge and skills, which in turn depend on the quality of education, training researchers from Khorezm and Uzbekistan became one of the project’s key objectives. To enhance the motivation of Uzbekistan’s youth to engage in agricultural education and research, the project facilitated the collaboration between local and international (mainly German) institutions. Due to the unique learning atmosphere created by the project, young, talented people were linked to national and international institutions in addressing the intractable problems of natural resources degradation in the Aral Sea Basin. This was one mean to lure young talents from the region and support their integration in the local and international science community.

Human capacity building was integrated into all levels of project activities. It aimed at different academic levels and graduating both women and men. Thus, a young and upcoming generation in Uzbekistan was prepared for becoming future teachers and decision-makers. Since the onset in 2002, 54 Ph.D. students (table 2), about half of them from Uzbekistan, completed their field research whilst 35 graduated successfully, 17 of them from Uzbekistan (as of April 2013). Noteworthy is that these 53 Ph.D. students, 18 arranged partly their own finances and, including stipends from the DAAD (2 students), the DAAD-Stipend of the partner UrDU. Each dissertation permitted the elaboration of on average 2-3 scientific publications. By the end of the project, 668 papers had been published, of which 206 in scientific, double peer-reviewed, international journals and books. Others are still under review, in press or planned. It is valid to assume that the numbers in table 2 are still to increase because some journal articles have been published after completing the dissertation and some authors who left the project have sometimes forgotten to report back.

One publication was recorded in 2012 in the top10-Download-List of SSRN (Social Science Research Network) under the theme ‘Development Economics’. An updated overview of the overarching project results can be extracted from three “Project Books” (section 9). Since its online publication on September 2011, there has been a total of 722 chapter downloads of the book from Martius et al. (2012) available on the online Springer platform. Two more project books are in preparation. A documentary film of the project (in Russian, German or English) can be watched at http://www.youtube.com/watch?v=FpX0Db4Cxnw&feature=plcp.

Facts and figures

Table 2: Academic qualifications in the ZEF/UNESCO-project (status 01.06.2013)

<table>
<thead>
<tr>
<th>Phase</th>
<th>Uzbek students</th>
<th>Non-Uzbek students</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>Completed</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>On-going</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>M.Sc.</td>
<td>Completed</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>B.Sc.</td>
<td>Completed</td>
<td>66</td>
<td>21</td>
</tr>
<tr>
<td>Habilitation</td>
<td>Completed</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>On-going</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>112</td>
<td>78</td>
<td>28</td>
</tr>
</tbody>
</table>

4 Publications

A decade of research has generated a catalogue of information on science, knowledge, and innovations, from improving land and water use to social, market and institutional development of the Khorezm region. The research findings were communicated in the first place through numerous journal articles, book chapters, conference and symposia contributions, discussion papers and short communications (table 3). As far as copyright agreements allow, these manuscripts can be downloaded from the project website (http://www.khorezm.zef.de), or at least full references accessed. The knowledge which is documented in different languages (English, Russian, Uzbek, German), has thus been made accessible to a broad as well as academic public, which ensures a future use in regions with similar agro-ecological conditions.

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5 Decision support tools

Findings of individual work packages have also been used for a wide range of modeling approaches on various levels (see table 4). The objectives of modeling included (i) to integrate findings of different project components, (e.g. yield models, alternative crops, water productivity, agricultural sector) and (ii) to up- and out-scale project findings with the support of satellite images and extrapolation approaches.

GIS and RS supported information was used to estimate and predict crop yields (cotton, wheat, rice, maize) with a high accuracy or analyse the land use dynamics of the last decades. With the use of high resolution satellite images land use data could be linked to water management strategies and water distribution models. Social and economic studies covered a wide spectrum of topics including analyses of agro-service organizations and of the agricultural sector. Pivotal for the project was the combined modeling of economic and ecological processes to understand their dynamics and allow, through simulations, the development of scenarios for optimizing land and water use (table 4).

Computer models such as FLEOM (Farm-Level Economic Ecological Optimization Model) consist of spatially distributed sub-units for resource utilization, natural constraints, economics and human driving forces. These helped to understand the dynamics of long-term sustainability of ecological and economic conditions of Khorezm and Uzbekistan and support land use planning at the levels of farms and Water Users Associations (WUAs). The researchers concluded that economic and ecological sustainability could be achieved simultaneously when, for instance, farmers are allowed to take more flexible decisions at the farm level. However, it is cautioned that environmental deterioration may continue until farmers gain more flexibility in their decision-making.

Economists in the project simulated various scenarios for assessing the ecological and economic consequences of potential changes in policies such as the state order (area and production-quota fixed by the state for cotton and winter wheat), the upgrading of crop value chains, the water footprints of alternative crops, changing water prices, and innovations to increase water use efficiencies. For instance, a gradual adjustment of the present cotton policy (e.g. from area-based to quantity-based) would facilitate crop diversification and thus bears the potential to increase rural incomes as well as attract farmers’ interests to invest in land and water improvement practices and to unfold their experience and creativeness. Unless the existing state procurement system is changed, pricing of irrigation water is likely to remain infeasible and farmers’ interest in water-wise technologies will likely remain limited.

Linking the value chain and water footprint approaches of dominant crops such as cotton and winter wheat helped to identify water saving options and opportunities for improving water management. Reductions in water use can be achieved by diversifying the economy and moving from water intensive agricultural production to less water consuming industrial sectors, introducing water saving irrigation technologies and raising awareness in the population about the real value of water. The combined findings of the economic based value chain analysis and ecologically oriented water footprint analysis enabled better informed decision-making to reach land, water and ecosystem sustainability in the study region.

An increased understanding of formal and informal institutional arrangements and thus variants of differentiation in an Uzbek society in transition facilitated the implementation of informal decisions, by embedding the project knowledge of improved water and land management in the context of local practices (‘doing things’). Analyzing the gendered nature of rural relations in agricultural production processes and the system of agricultural service provision in post-Soviet Uzbekistan contributed to a better understanding of local social structures, actors and processes of decision-making. Various models are made suitable also as an education and research-oriented open-source platform for integrating the various databases and identifying the relevant key processes. The management and administration of the project’s central GIS facilities in Urgench continues to provide the platform for this task.

<table>
<thead>
<tr>
<th>Total</th>
<th>668 scientific works</th>
</tr>
</thead>
<tbody>
<tr>
<td>Articles in international double peer reviewed journals</td>
<td>86</td>
</tr>
<tr>
<td>Articles in local journals</td>
<td>70</td>
</tr>
<tr>
<td>Working and discussion papers</td>
<td>25</td>
</tr>
<tr>
<td>Contributions to international and local conferences</td>
<td>204</td>
</tr>
<tr>
<td>Completed habilitations</td>
<td>2</td>
</tr>
<tr>
<td>Completed Ph.D. dissertations</td>
<td>35</td>
</tr>
<tr>
<td>Completed M.Sc. theses</td>
<td>105</td>
</tr>
<tr>
<td>Chapters in books</td>
<td>52</td>
</tr>
<tr>
<td>Project books</td>
<td>7</td>
</tr>
<tr>
<td>Science Briefs - ZEF-UNESCO Rivojlanishlari – ZUR</td>
<td>25</td>
</tr>
</tbody>
</table>

Value chain and water footprint

Understanding institutional setting
Table 4: Overview of developed and applied models

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Spatial level/ functional entity</th>
<th>OWN development</th>
<th>Web-access</th>
<th>Stand-alone tool</th>
<th>Vali- dation</th>
<th>Further development necessary</th>
</tr>
</thead>
<tbody>
<tr>
<td>KhoRasm</td>
<td>Agricultural sector model</td>
<td>Region/Khorezm</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>-</td>
</tr>
<tr>
<td>KhoriRik</td>
<td>Water &amp; Risk management</td>
<td>Regional/Khorezm</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>-</td>
</tr>
<tr>
<td>KhoWadi</td>
<td>Water distribution</td>
<td>Khorezm</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>-</td>
</tr>
<tr>
<td>UzSem</td>
<td>General equilibrium model</td>
<td>Nationwide (Uzbekistan)</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>-</td>
</tr>
<tr>
<td>VCA</td>
<td>Value Added Chain analyses</td>
<td>Crops</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>-</td>
</tr>
<tr>
<td>FLEOM</td>
<td>Farm optimization</td>
<td>Farm level</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes (dynamic, additional crops)</td>
</tr>
<tr>
<td>CropSyS</td>
<td>Crop growth and development</td>
<td>Crops (cotton, wheat, maize)</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>-</td>
</tr>
<tr>
<td>APSIM</td>
<td>Crop growth and development</td>
<td>Crop (Rice)</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>-</td>
</tr>
<tr>
<td>LUE model (Monteith)</td>
<td>Remote sensing based crop growth and yield modeling</td>
<td>Crops (Cotton, rice), field-based and regional</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>-</td>
</tr>
</tbody>
</table>

**Economy**

- **HYDRUS** Water dynamics, water and mineral transport (and balances) in the soil
  - Field
  - Time, tran- sition, and transfer
  - Database services
  - Web-access
  - Stand-alone tool
  - Validation
  - Further development necessary

**Hydrology**

- **FELOW** Groundwater dynamics
  - Water User Association: hydrologic boundaries and sub-units of a drainage and irrigation systems
  - Field level up to the level of discharge units of major collectors
  - Yes (Restructuring of drainage systems)

**Agronomy**

- **AquaCrop** Irrigation management/planning for full and deficit irrigation
  - Field level
  - Linking with existing models
  - Yes (additional application for years with a high/low water supply)

- **AquaCrop – Hydrus** Irrigation management and planning with consideration of the capillary rise from shallow groundwater in the Khorezm region
  - Field level
  - Yes (application for other primary channels; very close to practice due to the backward linkages with water and channel managers and users)

- **CropWat-Hydрус-Feeflow** Management of surface water (canal system) and ground water
  - Units with a hydrological border
  - Linking with existing models
  - Yes (improvements for the soil heat flux module, inclusion of the spatial variability of meteorological parameters over the region)

- **WRRM-Kulawat** Water distribution for large units with a high temporal and spatial resolution
  - Regions fed by primary channels
  - Yes (Partner: SIC ICWC; Uni Würzburg; ZEF)
  - Yes (application for other primary channels; very close to practice due to the backward linkages with water and channel managers and users)

- **SEBAL** Surface Energy Balance Algorithm for Land (Evapotranspiration)
  - Regional model, spatial resolution 1 km
  - Yes (improvements for the soil heat flux module, inclusion of the spatial variability of meteorological parameters over the region)

6 Reproducibility for out-scaling of findings

The innovative concept and approach used in the project was based on four pillars: (i) Integrating science, research and education at national and international levels, (ii) building human and institutional resources in the intervention areas and creating a center of excellence, (iii) a long-term commitment, and (iv) a science-based idea for improving land and water use. The project’s multi-faceted approach has given it an advantage over other actors. Yet, with respect to the reproducibility of innovations and the innovative approach various lessons learned can be shared:

- The implementation of this research and educational concept in the intervention region was innovative in itself: the establishment of an extended research and educational infrastructure, including a well-equipped GIS laboratory with skilled staff which can serve as a centerpiece for offering services and products. The use of GIS, mathematical modeling, new analytical methods, household surveys, and a transdisciplinary process of innovation testing and further development together with local stakeholders offered a spectrum of different insights that led to an increase in knowledge and innovations of scientific novelty as well as local use.

- The time frame of the project was conducive for strategic capacity building. The early connection of the variety of research findings and data collected through multiple disciplines permitted an early and permanent cross-checking of information with the project objectives and an optimization of the applicability. As the project in Uzbekistan was implemented at a time of socio-economic transformation processes, the capacities built – among them the project’s alumni – immediately fed into the shaping of these processes of change. Furthermore, the project concept and lessons learned can be reproduced in other regions without much restrictions while the experience and expertise are available in Uzbekistan, Germany (at ZEF) and with international collaborating organizations (such as UNESCO).

- The concept of project data integration for enabling interdisciplinary research as well as the inclusion of data management into capacity building can be transferred to similar projects irrespective of their nature. The main components of a successful implementation of GIS and database services comprise (i) a simple and applicable service concept (standardized data management, GIS/RS applications at different user levels and scales, monitoring workflows), ii) adequate equipment including hardware, software, field devices and the databases (MDB, CDB), iii) defined applications and products (ac- cess rights for databases, scientific models, maps, etc.), and iv) human capacity building. One elementary step is thus the adaptation of standards to actual local knowledge. Depending on the country to which this concept will be transferred, these steps could help to reduce complexity, and increase the use of simple and understandable algorithms, and integration of the educational partner insti- tutes.
The economic models developed reflect the characteristics of the Khorezm region and country specific features such as state order, reduced land tenure, imposed land size etc. Whereas the theoretical background of these models will fit many regions in Central Asia, they will need adaptation to become of use for regions with frame conditions different from Uzbekistan.

A parameterization is needed for the crop models developed with CROPPSYST or APSIM (Table 4). An outscaling of these models therefore needs targeted preparations. With the support of the partner ICARDA, one version of CROPPSYST was translated into the Uzbek language. This allowed a better access to this model to a research community till then deprived from such tools.

During a number of modeling studies different spatial scales (e.g. at field, farm, WUA, district and regional levels) were integrated (e.g., modeling crop development, alternative crops or water use efficiency) as well as used up-to-date satellite imagery to outscale the methods and outcomes to other regions. For instance, the remote sensing approach was used to accurately estimate regional cotton, wheat, and rice yields as well as accurately depicting changes in the agricultural system for a decade. New satellite imagery with high spatio-temporal resolution (RapidEye) covering entire Khorezm facilitated to accurately capture and forecast crop yields. Application of modeling techniques in water management based upon up-to-date land use maps derived from remotely sensed images indicated the potential of stabilizing agricultural yields for Khorezm under increasing water variability. These models, approaches and findings can be extrapolated to other regions although a groundtruthing of crops would be needed.

Several innovations were developed in the specific context of the study region Khorezm while taking into account specific frame conditions such as the state order, the varieties cropped for the determination of efficient N use but also others. These need to be fine-tuned to a new region if considered for out-scaling.
7 Efficiency and criteria

The research and educational goals have been in compliance with the UN Millennium Development Goals of eradicating poverty and hunger and achieving food and water security, but also with the United Nations conventions on desertification, land degradation and climate change as well as with the long-term strategic programs of the EU and Germany developed for Central Asia. Scientific research and technological development not only form a centerpiece for economic growth and development, but are also needed for responding to today’s global challenges. The bilateral collaboration between Germany and Uzbekistan permitted the sharing of each other’s academic strengths and resources and for preparing the ground for a joint transfer of scientific results into innovative applications.

The project would not have existed if it were not for the persistent support from the BMBF. Their willingness to think long-term and agree in principle to support an ambitious and challenging program with a 10-year lifespan, is unique and highly appreciated in a development context. This support offered opportunities to engage in complex, inter and multi-disciplinary research. Time series analysis allowed for impact analysis as well as localized innovation development and uptake. Working across disciplinary boundaries comes with opportunity costs; yet to meet the complexity of reality also the approaches for developing alternative options or ‘solutions’ have to be inter and transdisciplinary in nature.

The efficiency of the project can be assessed by various indicators (Table 5). For instance, the accumulated mileage by the nine cars of the project during a decade of work equaled a distance of 5.5 times the earth’s circumference (40,075 km), which illustrates the efficiency of the drivers and the care they took of the cars. With this, a total of 159 Ph.D. and M.Sc. students could collect the information that was made public through more than 668 different publications. When referring to the total project portfolio over 10 years, BMBF supported each student with on average 76,000 €. The average of 147,540 € per Ph.D. student amounts to about 39,800 € per Ph.D. student and year. When taking into account that many more students and publications will follow even after the cessation of the project, these efficiency indicators would improve further.

Table 5: Relations of the different efficiency criteria

<table>
<thead>
<tr>
<th>Number</th>
<th>Unit</th>
<th>Amount per unit (€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total budget</td>
<td>Jan 2002 - Dec 2011</td>
<td>796,721</td>
</tr>
<tr>
<td>Students</td>
<td>159</td>
<td>50,482</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>54</td>
<td>147,540</td>
</tr>
<tr>
<td>M.Sc.</td>
<td>105</td>
<td>75,964</td>
</tr>
<tr>
<td>Contributions to books and conferences</td>
<td>281</td>
<td>28,385</td>
</tr>
<tr>
<td>Articles</td>
<td>206</td>
<td>38,719</td>
</tr>
<tr>
<td>Final reports</td>
<td>199</td>
<td>40,081</td>
</tr>
<tr>
<td>Books</td>
<td>7</td>
<td>1,139,458</td>
</tr>
<tr>
<td>Distance driven</td>
<td>2,226,910 Km</td>
<td>--</td>
</tr>
<tr>
<td>Contracts with third parties</td>
<td>57</td>
<td>139,933</td>
</tr>
<tr>
<td>Employees</td>
<td>762</td>
<td>10,467</td>
</tr>
</tbody>
</table>

Some numbers

8 A post-project perspective

Quantifying the efficiency of a project (Table 5) remains a major indication of success. However, the sustainability of achievements can also be assessed by looking at the interest spurred and the attention received for ensuring the handover of results. By the end of Phase III, various beacons had been set for proposing project findings to practitioners, education and research institutes as well as policy makers. Therefore, governmental declarations, letters of intent from national institutions as well as invitations from national and international institutions and structures were arranged to collaborate with the project consortium and implement findings. Also a consortium was established through a Memorandum of Understanding between UNESCO, UrDU and KRASS for the period 2010-2020 to disseminate project findings in and beyond the Khorezm region. Recent experience shows that besides UrDU the NGO KRASS is capable of handling such challenges - although it still seeks support in organizational development and long-term planning, donor approach and networking. Dissemination activities that continued after the cessation of the project can be monitored on the Website of the NGO KRASS (www.krass.uz/news.html).

Summary of highlights:

- With the human and institutional capacity built at UrDU/KRASS and the creation of a UNESCO chair for sustainable development at URDU, the way was paved for the introduction of innovative curricula on sustainable land and water management. The infrastructure established and handed over with a well-equipped GIS laboratory and skilled staff, can serve as a center for offering services and products.
- In 2010, the project partners submitted four selected innovations to the Agrarian and Water Management Committee of the Lower House of the Legislative Chamber of Uzbekistan’s Parliament (Oliy Majlis), including the use of EM-38 for rapid mapping of soil salinity, afforestation of marginal, salt-affected cropland in the irrigated areas for rehabilitation and enhancement of agro-ecosystem services, improved options for crop management and sustainable land use (including the laser-guided land leveling and the principles of conservation agriculture), and the introduction of dye-producing Indigofera tinctoria L. as a potential cash crop. In December 2010, the Ministry of Agriculture and Water Resources confirmed the scientific validity and endorsed the recommendations. The Government of Uzbekistan supported thus the spread of selected innovations.
- Key project research results and policy recommendations were shared with international financial institutions and development agencies active in Uzbekistan, including the World Bank (WB), German Technical Cooperation (GTZ – now GIZ), Swiss Agency for Development and Cooperation (SDC), Japan International Cooperation Agency (JICA), Korean International Cooperation Agency (KOICA), Organization for Security and Co-operation in Europe (OSCE), Israeli Agency for International Development Cooperation (Mashav), Europa House, United Nations Development Program (UNDP), United Nations Educational Scientific and Cultural Organization (UNESCO), and the International Center for Agricultural Research in Dry Areas (ICARDA).
- Since Phase III, ZEF and its partners have collaborated in joint proposal writing for various organisations such as Volkswagen Foundation, BMBF and others.
The project's concept for integrating research and education for sustainable development has also been instrumental for the dissemination of selected findings. Majis have entrusted KRASS/UrDU with specific tasks to disseminate project findings are important for the project's innovations and ideas, then adapt them according to his local situation and developed them further along the socio-economic lines of the Amudarya and cooperates with an economic project on afforestation and the value chain of alternative energy.

Since its establishment in November 2008, the NGO KRASS has conducted activities in the field of agricultural extension services, implementation of innovations and preparation of training materials for adults. KRASS has collaborated with local organizations such as the Farmers Association and the President's Academy but also with international organizations such as Cornell University, GIZ, ICARDA, UNDP, UNESCO, AIM and others. Substantiated by the governmental declaration as well as virtual water and land management to germination and bio-physical needs of his and his colleagues farm enterprises, without ever reporting this back to the project of origin, stands for the diversity and multitude of the project's long-term and nearly untraceable local consequences. The ZEF/UNESCO project in Uzbekistan, while having ended in 2011, provided a fertile ground for many more seeds, trees, and creative ideas for a more sustainable water and land management to germinate.

For further reading


