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Pastoral Farming in the Ili Delta, Kazakhstan, under Decreasing Water Supply: An Economic Assessment

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Abstract

The Ili Delta with an extension of 8.000 km^2 is the largest natural delta region of Central Asia. It contains large areas of pastures, which are dominated by *Phragmites australis* reed vegetation. For local population, pastoral farming is one of the most important land use forms and income sources. The pastures are almost entirely dependent on Ili River's runoff. The Ili River is a transboundary river shared by China, upstream, and Kazakhstan, downstream. Due to the expansion of irrigated agriculture, as well as, shortcomings of inter- governmental agreements, the Ili Delta is threatened by water shortages and subsequent pasture degradation.

Against this background we aimed to assess these threats from an economic point of view and analysed the economy of the pastoral system in the Ili Delta in its current state and in three scenarios including different assumption on water supply: (I) sufficient water supply (*Normal situation*), (II) *Decreasing water supply*, and (III) significantly decrease of water supply (*Worst Case*). Data was collected in 2015 through 35 farm and additional expert interviews. Production parameters were calculated and entered to a cost-benefit analysis from the farm-household perspective, in order to estimate profits of livestock keeping for three scenarios.

Three farm types, family-, medium- and large-scale farms, were identified at a range between subsistence and market orientated commercial production. Beef cattle, 24.000 animals in 2015, dominate livestock throughout the Ili Delta. Interviews revealed a continuous decrease of water flow into the Ili Delta over the last few years. This already resulted in a qualitative and quantitative reduction of pastures at margins of the Delta, where most of villages are located. Big commercial farms produce at the upper stretch of Ili River, whereas villages at the underflow are almost cut off water supply. As adaption strategy in face of pasture degradation, most farmers purchase winter fodder. According to our calculations, this significantly reduces profits of *Worst Case* in comparison to *Normal situation* (by 80 or 90 %) for all farm types.

We conclude that under further decreasing water supply, especially downstream village population will have to reduce livestock significantly or migrate from the delta region completely.

Keywords: adaption strategies, cost-benefit analysis, Ili Delta, livestock, pasture farming, upstream-downstream conflict

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Introduction

Delta regions are the most productive ecosystems in the large dry and mountain areas of Central Asia (MEA, 2005). Due to their importance for livestock farming, these ecosystems represent an essential food basis for large populations, even beyond the Delta region. The functionality of these Systems entirely depends on the runoff of the particular river. There for, they are high vulnerable to changes in water supply. The nearly dried up Aral Sea with its partly degraded Amu-Darya-Delta is the best-known example (UNEP).

The Ili Delta with an extension of 8.000 km^2 is one of the largest natural river Delta in Central Asia (Kreuzberg, 2005; Dostaj, 2006; Khairbek and Bragin, 2012). It contains large areas of *Phragmites australis* reed vegetation, which were used as pastures and hay meadows (Thevs et al., 2017). The pastures are almost entirely dependent on Ili River's runoff. The Ili River is a transboundary river shared by China, upstream, and Kazakhstan, downstream. Two thirds of Ili River's runoff originate in China. An increase of irrigated agriculture in the past, as well as, current plans for further expansions of agricultural areas along the river basin in China, leads to a drastic reduction of the water level (Luo and Gao, 2011) and threatened Ili Delta's ecosystems (CBD, 2014). In addition, in the near future of Kazakhstan a growth of irrigated agriculture along the Ili River is expectable (Christiansen and Schöner, 2004; Dostaj, 2006; Bazarbaev and Baekenova, 2009; Starodubtsev and Truskavestkiy, 2011; Imentai et al., 2015). A reduction of the river's runoff not only affects the direct water supply for humans and livestock, but also the extent of available pasture grounds. Sinking groundwater levels and a subsequent degradation of pastures are expected in front of decreasing water flows of the Ili River into the upstream-located Delta. Against this background, we aimed to assess the threats for livestock keeping in the Ili Delta from an economic point of view.

Methodology

Study area and data collection

The Ili Delta is located at the eastern shore of Lake Balkhash, Kazakhstan. The study area has a total extent of around 262.000 ha and is administrative structured in nine village districts. 97 % of the total area is according to the statistical information managed as pastures and hay meadows (Akimat Bakanas, per. comm. 2015-07-24). Primary data was collected in 2015 through 35 farm and additional expert interviews in four of nine districts. Farms were randomly selected and information on their livestock, pasture management, sales, subsistence and water supply were collected. This was done using semi-structured questionnaires, exploratory conversations and participatory observation.

Cost-benefit analysis and Calculation scenarios

Based on the interview data, farm types were established. Number of cattle, participation within the state subsidy programme, location of sales markets, level of mechanisation and the number of employees served as indicators for differentiation. Three farm types were identified at a range between subsistence and market orientated commercial production (see table 1).

Table 1: Farm types of Ili Delta

Criteria	Family Farm	Medium-scale Farm	Large-scale Farm
Livestock (number of cattle)	mixed herd 10 – 30 cattle	mixed herd 31 – 80 cattle	cattle specialisation >80 cattle
State subsidy (Elite bulls programme)	-	no participation	participation
Sales market	prior regional	regional & supra-regional	supra-regional
Level of mechanisation	low	medium (overage)	high (modern)
employees	family-managed	one (shepherd)	at least two (cowboy)

Production parameters were calculated and entered to a cost-benefit analysis, in order to estimate profits of livestock keeping for each categorised farm type. Economic analysis followed a full-

cost accounting. Aim was the identification of the distribution of individual cost categories and the presentation of their impacts on the profitability for each farm type.
The calculations were done for three scenarios including different assumptions on water supply: (I) sufficient water supply for farm owned, cost-effective winter fodder production (*Normal situation*), (II) *Decreasing water supply* with one-half farm owned production and additional purchase of winter fodder, (III) insufficient water supply with complete purchase of winter fodder and installation costs for a groundwater well (*Worst Case*).

Results and Discussion

The livestock system in the Ili Delta is stationary, because of high productive grounds. Farmer have use rights for pasturages, which are mainly derived from 49-year lease contracts. Beef cattle, 29.000 animals in 2015, dominate livestock throughout the Ili Delta. Farmers are the only and most important meat suppliers at local markets within the Delta. Big commercial farms also trade on supra-regional markets and are notable meat suppliers in major cities, such as Kapchagay and Almaty. Especially, the male population of the Delta depend on work in livestock keeping, due to a lack of education and employment alternatives.

Threats and adaption strategies on decreasing water supply

Interviews revealed a continuous decrease of water flow into the Ili Delta over the last few years. This already resulted in a qualitative and quantitative reduction of pastures at margins of the Delta, where most of villages are located. Districts at the underflow of the Ili River are almost cut off water supply. Farmers adapt by a partly or completely purchase of hay as winter fodder in front of increasingly degraded pasturages. Moreover, the installation of groundwater wells for provision of livestock is necessary. According to our calculations, this significantly reduces profits of *Worst Case* in comparison to *Normal situation* by 80 – 90 % for all farm types (table 2).

Table 2: Cost-Benefit calculation for categorized farm types in three scenarios on water supply

	Family Farm [KZT[1]/a]	**Medium-scale Farm [KZT[1]/a]**	**Large-scale Farm [KZT[1]/a]**
Benefits			
Meat sale	810.076	2.531.011	7.926.192
Meat subsistence use	414.538	864.037	-
State subsidy	-	-	4.379.700
Sum of Benefits	*1.224.614*	*3.395.048*	*12.305.892*
Costs independent of water supply			
Variable (veterinary, transport)	211.385	56.540	584.144
Fix (area, buildings, machines, employee)	77.273[2]	659.060	3.127.806
Sum of water independent costs	*288.658*	*715.600*	*3.711.950*
Costs depending on water supply – variable winter fodder costs			
Normal situation	147.808	729.504	2.972.128
Decreasing water supply	424.948	1.519.800	5.015.466
Worst Case	775.992	2.553.264	7.801.836
Costs depending on water supply – fixed installation costs for groundwater well			
Worst Case	1.792	1.792	1.792
Operating Profits			
Normal situation	788.148	1.949.944	5.621.814
Decreasing water supply	511.008	1.159.648	3.578.476
Worst Case	158.172	124.392	790.314

[1] Kazakh tenge, exchange rate August 2015: 1 KZT = 0,00528 USD

[2] family-managed, fixed cost calculation without labour costs

Profits in the *Worst Case* scenario of 158.172 KZT/a (835 USD/a) for family farms, 124.392 KZT/a (657 USD/a) for medium-scale farms and 790.314 KZT/a (4.173 USD/ a) for large-scale farms are insufficient for a continued existence of these operations and the provision of a family.

Conclusions and Outlook

We conclude that under further decreasing water supply, especially downstream village population will have to reduce livestock significantly or out migrate from the delta region completely. The lack of education and employment alternatives for rural population threaten their existence in the future. Closures of farms as important meat suppliers may endanger the food security, also across the borders of the Ili Delta. Further research is needed to capture the threat of livestock and thus to food security. Coevally the development of appropriate measures in the field of water management and alternative fodder plants is necessary to reduce the threats.

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