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SOS: SAVE OUR SOILS!

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Abstract. *In this article a bird eye's view is given about the Uzbek dairy section, the land allocation for the various crops and the challenges for dairy farmers, small, medium and large, to produce sufficient forage for economic milk production under conditions of shortage of land, crop placement and water shortages. It explains the principles of agro-ecology and regenerative agriculture and gives recommendations how and why the current cropping pattern should be changed for the benefit of all farmers but above all to avoid further degradation of Uzbek's irrigated crop land and make a start in regenerating these lands.*

Key words: *forage production, crop rotation, soil structure, soil biology, regenerative agriculture*

INTRODUCTION.

Uzbekistan's livestock sector contributes 49% to the agricultural GDP, but when it comes to land allocation it has access to less than 20% of the crop land. The most important forage crops were and still are Lucerne and silage maize. However, the largest part of the country's dairy animals are kept by what is usually called owners of household plots and dekhans, which in the rest of this article will be addressed as "small and medium-size farmers'. This group depends to feed its cattle on what could be called 'diffuse grazing' along roads, canals, some remaining usually degraded communal pastures and in winter mainly wheat straw, which is readily available and sold at a relatively high price in comparison to its feeding value (20-25.000 sum in autumn 2023 whereas, if available, Lucerne hay costed 40-45.000 sum with a much higher feeding value due to higher digestibility and crude protein contents). Table 1 and 2 give an overview of the distribution of cattle over small, medium and large farmers and their respective shares in overall milk production.

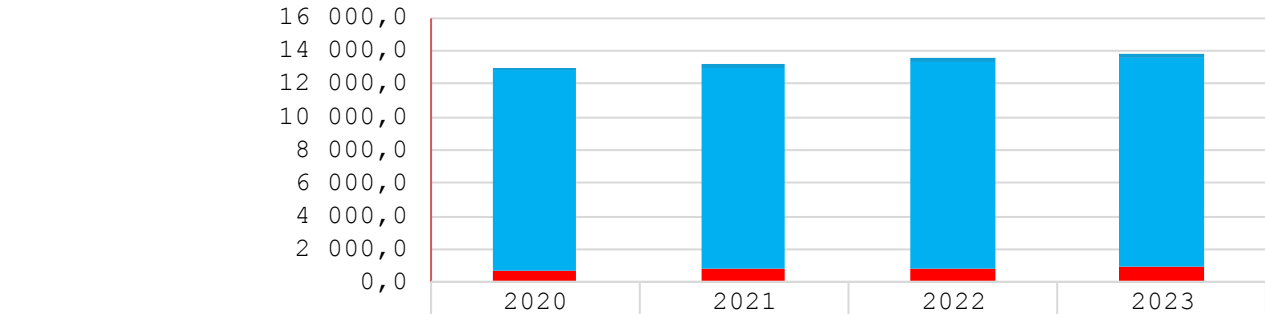
In 1975 the country had 1.8 million hectares of cotton and 0.6 million hectares of Lucerne; in 2022 the country had 1 million hectares of cotton, 1.3 million hectares of wheat and only 0.03 million hectares of Lucerne. Most cows in Uzbekistan utilize the 'diffuse' grazing along roads, canals and communal pastures during the summer; in winter straw is the main fodder. Our programme aims at bringing more forage production back into the cropping cycle, increase availability and connect larger-scale forage production with the small and medium-scale farmers to increase production of and access to high quality forages.

EFFECT OF CROP ROTATION ON SOIL HEALTH.

The current prominent 2-year crop rotation of cotton-winter wheat-maize involves frequent cultivation and almost complete removal of all organic material. Cotton stalks are used to heat rural houses and to fire up the tandir for bread baking. As many of the larger crop producers do not have livestock, no or little manure is returned to the soil, fertility is maintained with artificial fertilizers and organic matter content in the soil diminishes. The soil biology is upset further by frequent cultivation, turning the aerobic zone down and bringing the anaerobic zone up. Soil life of beneficial bacteria (Rhizobium, Azotobacter, Frankia) and fungi (Mycorrhiza) suffers. Barren land in winter deprives the

Table 1.

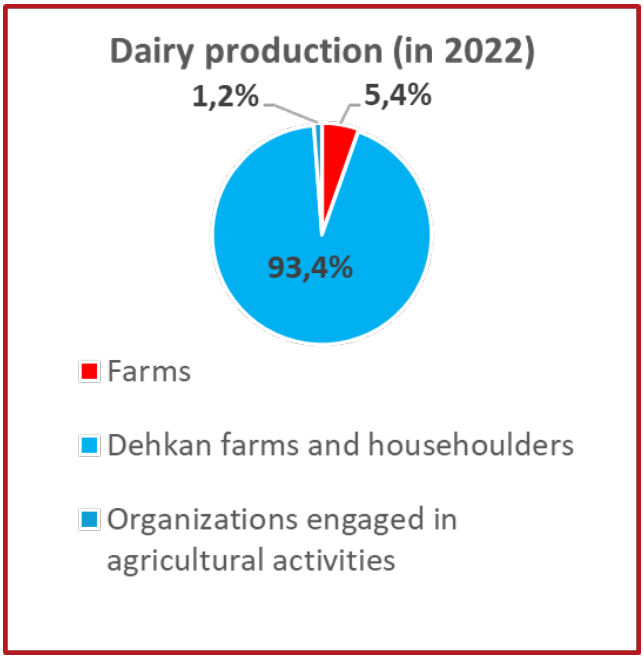
Number of cattle per category of dairy farmers as per 2023



	2020	2021	2022	2023
Organizations engaged in agricultural activities	169,7	200,6	224,3	246,3
Dehkan farms and householders	12 071,7	12 169,2	12 431,1	12 644,9
Farms	708,3	784,5	889,0	962,3

Table 2.

Total milk production in 2022 [3]



rhizo-microbiome from their source of nutrition: exudates from living roots. These root exudates, besides feeding the rhizo-microbiome also form a communication system between plants and associated microorganisms, and with neighboring plants [1], including shaping the composition of the rhizomicrobiome and reducing inter-plant competition via allelopathy exudates. Some allelopathy exudates of e.g. rye can prevent weed growth [2], other exudates create a symbiotic relationship between N-fixing micro-organisms such as azotobacter and crops.

With increasing prices of equipment, fuel and especially inorganic N fertilizers nurturing these relationships between the microbiome, fungi and organisms living in the soil and our crops are becoming critically important to create a sustainable cropping system. With access to and affordability of mechanization a constraint to many farmers alternative crop growing methods, which reduce this constraint, will bring great benefit to many, not in the least to the farming environment.

AGRO-ECOLOGY

In agro-ecology the aim is to follow and strengthen natural processes in the farming systems. A simple summing up of the key elements of this is as follows:

Nature does not plough: in agriculture this is emulated by zero- or reduced tillage, the use of deep rooted cover crops to penetrate hard layers and make soil moisture and minerals in the lower soil profile accessible to the crops. The hyphae of the mycorrhiza play an important role in this as an extension of the crop root systems. Increased soil life, especially earth worms, will develop a natural drainage system and together with crumb formation through the exudates of plant roots and mycorrhiza increase infiltration rate, thus reducing run-off.

In Nature the soil is always covered: Currently we 'denude' the soil several times per year. this natural phenomenon can be emulated by growing cover crops, leaving trash on the surface after harvesting and applying compost and/or manure on top of the soil. The trash will feed soil organisms and eventually be converted to humus, increasing mineral supply and water holding capacity of the soil.

Nature doesn't practice monocropping: mixed cropping mimics nature and creates mutual benefits for various crops in terms of nitrogen exchange, weed suppression, increases in organic matter in the soil and stimulation of the soil rhizo-microbiome. Ways and means should be found to develop multi-cropping systems for the main crops in Uzbekistan, which will also contribute towards increased forage availability. Especially in the drylands mixing grain crops with suitable legumes such as vetch/vica shows great promise of improving soil fertility, reducing production cost and providing a more nutritious forage by-product (straw-legume mixture).

In Nature there are always living roots present in the soil: Currently the soil is without living roots one winter out of two. We can feed and nurture the rhizo-microbiome through mixed cropping, using winter-hardy mixed cover crops in autumn, under-sow e.g. maize with green manure crops etc.

In Nature there are always animals present: any crop farming operation needs to have links with livestock farming: crop residues should be grazed by or fed to animals to be converted into manure. In this way livestock adds value to crops and crop residues through its growth and milk production and returns better accessible minerals and organic matter back to the soil and the soil biology.

REGENERATIVE AGRICULTURE: AN ANSWER TO THE CONSTRAINTS

When all of the above principles are applied we talk about regenerative agriculture, in which the farmer relies increasingly on the natural processes to increase the fertility of his soils, improve its structure, grow healthier crops, needing less or no crop protection measures, by chosing those plants and crops that fit best on his soils and under his conditions. He has his own livestock and/or has durable business relationships with livestock farmers of any size to exchange forage and manure between them. Regenerative agriculture requires a holistic way of thinking how agriculture, the complex of crop and livestock production, works and should benefit of one another. This means that also at policy level Uzbekistan's policy makers should depart from the old approaches and adopt a more holistic approach, in which policies and strategies are developed with the above principles in mind. Both plant and livestock production will be improved in terms of resistance to diseases and pests, but most importantly in terms of cost price reduction. This last is something which needs to become an important criteria in decision making instead of the various prikazes and control by hakims in terms of water and crop allocation. Maximum yields are not necessarily the most profitable yields for farmers and the old mantra of maximizing productivity and production has to be changed in aiming for the most sustainable and cost-effective production modes, maintaining and improving soil fertility, benefitting both crop and livestock production activities and guaranteeing all farmers, small, medium and larger, with a liveable income guaranteeing their livelihood.

RESEARCH UNDER THE UZBEK-GERMAN DIALOGUE PROGRAMME

Together with local research institutes, agrarian universities, small, medium and larger farmers, the ministry of agriculture and the veterinary committee and their German equivalents, we work on promoting agro-ecological principles and regenerative agriculture through the piloting of more drought resistant alternatives to maize (sorghums and millets), mixed cropping (maize and sorghum with indetermined soybean, runner bean, field beans), the possibilities of C3 grasses legume mixes as cover/undersown crops to keep live roots in the soil, increase organic matter and N, but above all

with all our research programmes we aim at producing more and nutritious forage plants and strengthen the links between crop production and livestock and small and medium farmers. The larger farmers should be encouraged to on their available land produce more forages for sale to the small and medium farmers. Only if and when all actors in the agricultural sector of Uzbekistan acknowledge that there are major challenges in terms of water availability, declining soil fertility and quality, providing sufficient high quality forages for ALL cattle in the country and all adopt in their own way and under their own conditions the principles of what is commonly called 'regenerative agriculture' we can find solutions to the earlier mentioned challenges and develop a vibrant agricultural production system that is ecologically sustainable, financially the most profitable without subsidies and providing a livelihood to the 5 million small and medium-size farming households of Uzbekistan!

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TECHNOLOGIES FOR EFFICIENT UTILIZATION OF CORN FEED IN POULTRY PRODUCTION

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Abstract. *This article reviews recent technological developments and managerial strategies designed to improve the effective utilization of corn feed in poultry farming.*

Key words: *Corn feed, poultry, efficiency, feed additives, genetic selection, pelleted feed.*

Аннотация. *В этой статье рассматриваются последние технологические разработки и управленческие стратегии, направленные на повышение эффективности использования кукурузного корма в птицеводстве.*

Ключевые слова: *кукурузный корм, птицеводство, эффективность, кормовые добавки, генетическая селекция, гранулированный корм.*

Annotatsiya. *Ushbu maqolada parrandachilikda makkajo'xori ozuqasidan samarali foydalanishni yaxshilashga qaratilgan so'nggi texnologik ishlanmalar va boshqaruv strategiyalari ko'rib chiqiladi.*

Kalit so'zlar: *Makkajo'xori ozuqasi, parrandachilik, samaradorlik, ozuqa qo'shimchalari, genetik seleksiya, granulalangan yem.*

Introduction. Corn plays a crucial role in the dietary requirements of poultry, as it supplies the necessary energy for their growth, maintenance, and production. Moreover, it is also crucial to optimize production outcomes and reduce environmental impacts by maximizing the efficiency of corn feed utilization in poultry diets. Nonetheless, the inadequate utilization of corn feed can result in both financial setbacks and environmental complications within poultry production systems. This segment highlights the significance of enhancing the efficiency of corn feed utilization and underscores the necessity for technological advancements to accomplish this objective.

Materials and methods. In order to enhance digestibility and facilitate enzyme activity, it is customary to grind corn kernels, thereby augmenting the available surface area. The process of finely grinding corn has been found to particularly benefit the digestive process of young avian species. Hammer mills, roller mills, and attrition mills are frequently employed in the grinding of corn.

Pelleting is a process that entails compacting ground corn feed into pellets using elevated pressure and temperature. This method enhances feed efficiency by enhancing bulk density, minimizing feed loss, and enhancing the digestibility of nutrients. Additionally, pelleted feed enables the incorporation of various additives, such as protein sources, vitamins, and minerals, into a consistent blend. Steam conditioning necessitates the introduction of moisture and heat to the feed prior to the pelleting step. This particular procedure serves to enhance the malleability of the feed, bolster its binding characteristics, and promote the gelatinization of starch, thereby yielding superior pellet quality and digestibility. Extrusion is a thermal processing technique characterized by high temperature and short duration, where the feed mixture is cooked under pressure before being quickly depressurized. This results in the expansion and texturization of the feed. The process of extrusion enhances the gelatinization of starch, denaturation of proteins, and deactivation of anti-nutritional compounds, ultimately leading to improved nutrient bioavailability and digestibility.

This supplementation improves nutrient absorption and decreases the need for artificial additives. Preparatory methods such as micronization, flaking, and roasting can be employed on corn feed with the purpose of enhancing its digestibility, palatability, and nutrient availability. These procedures cause alterations in the structure of the corn and promote increased enzymatic access to nutrients during the process of digestion.