Integration of Green Technologies in rice production

Green Economy and Sustainable Private Sector Development Program in Kyrgyzstan (GIZ)

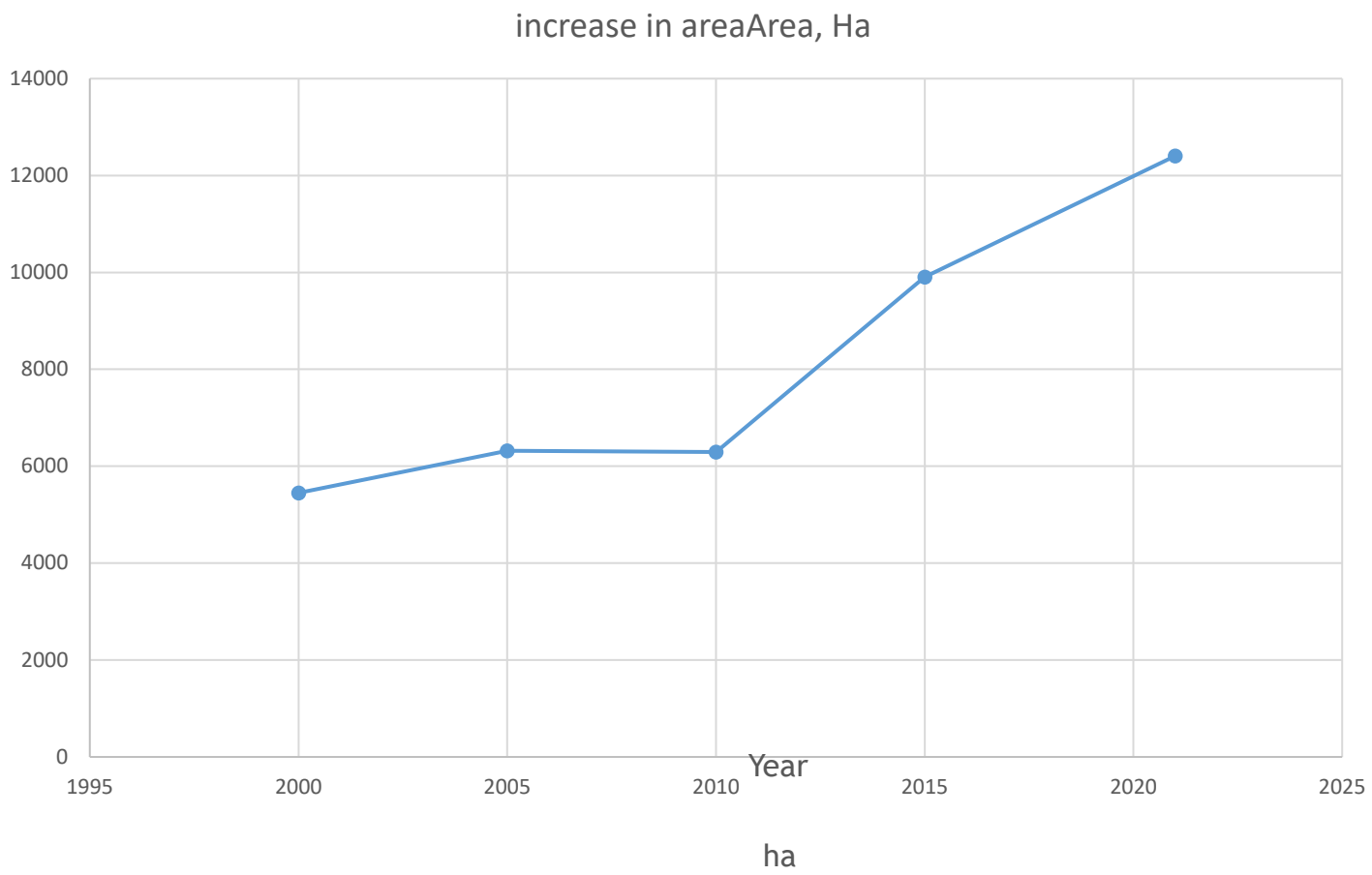
Green Economy and Sustainable Private Sector Development in Kyrgyzstan 2021-2026

Objective: The transition towards an inclusive green economy that benefits the well-being of the Kyrgyz population is strengthened.

Supporting the development of several agricultural VCs:

- ✓ *Early Vegetables in Nooken and Aravan district of Jalal-Abad and Osh oblasts*
- ✓ *Organic Plum in Aksy district of Jalal-Abad oblast*
- ✓ *Animal husbandry*
- ✓ ***Rice in Batken oblast***
- ✓ *Cereals on the rain fed land*

Rice cultivation in Kyrgyzstan



- *Area under rice doubled in the last 10 -12 years*
- *Rice is grown in the South, 30% of rice is grown in Batken*
- *Average yield: 2900-3500 kg/ha*

http://www.fao.org/faostat/en/#data/QC

Statistics: Rice in Batken

	Batken Oblast	Kadamzhai Rayon	Batken Rayon	Leilek Rayon
Average yield (t/ha)	**3,7**	**3,7**	**3.5**	**3.5**
Total area (ha)	**3353**	**2735 (>4000)**	**280**	**338**
Average area per 1 HH (ha)	**0.7**	**1**	**0.3**	**0.5**
Average price (KGS per 1 kg)	**100 (Burgondu Ak-Turpak) – 180-220 (Sokh Ak-Turpak)**			
Average production cost	**1 700 EURO per ha (Fertilizers, Pesticides and Herbicides, Harvesting, Threshing, Drying, Processing, Packaging, Transportation)**			
Average income	**3 500 EURO per ha**			
Average profit	**1 800 EURO per ha**			

Value Chain Characteristics: Rice

Strengths

- Stable prices (+ significant income impact)
- Stable yield
- Established marketing structure
- Local processing (to the level of ready-to-consume product)
- Many processors (lack of monopoly)
- Relative inclusiveness (compared to EV – less investment costs)
- Sufficient water availability (current consumption is 2.5 liters per second in the rice growing cluster)
- Progress in mechanization (up to 35%)
- Potential for more export to Uzbekistan and Tajikistan and import substitution from Russia
- Local “brand” (appreciation by the local population)

Weaknesses

- Comparably low yield due to non-balanced plant nutrition
- Non-optimal use of herbicides (water pollution)
- No systematic testing of new varieties (missing link between science and production)
- Food safety risks due to drying on the roads
- Post-harvest losses due to insufficient drying

Project Approaches

Increase of yield levels and water productivity through:

- Promotion of balanced plant nutrition (Revolving Fertilizer fund)
- Improved seed management and seed improvement
- Crop monitoring
- Training on sound pesticide application

Food safety improvement through better drying

Introduction of water-saving technologies (furrow and intermittent irrigation of rice) - demonstrations

Demonstration of alternatives to rice crops (bone fruit, berry, etc.)

Challenges

- Water consumption by ha will stay relatively high
- Limited employment impact
- Limited gender impact

Expected green economy impact:

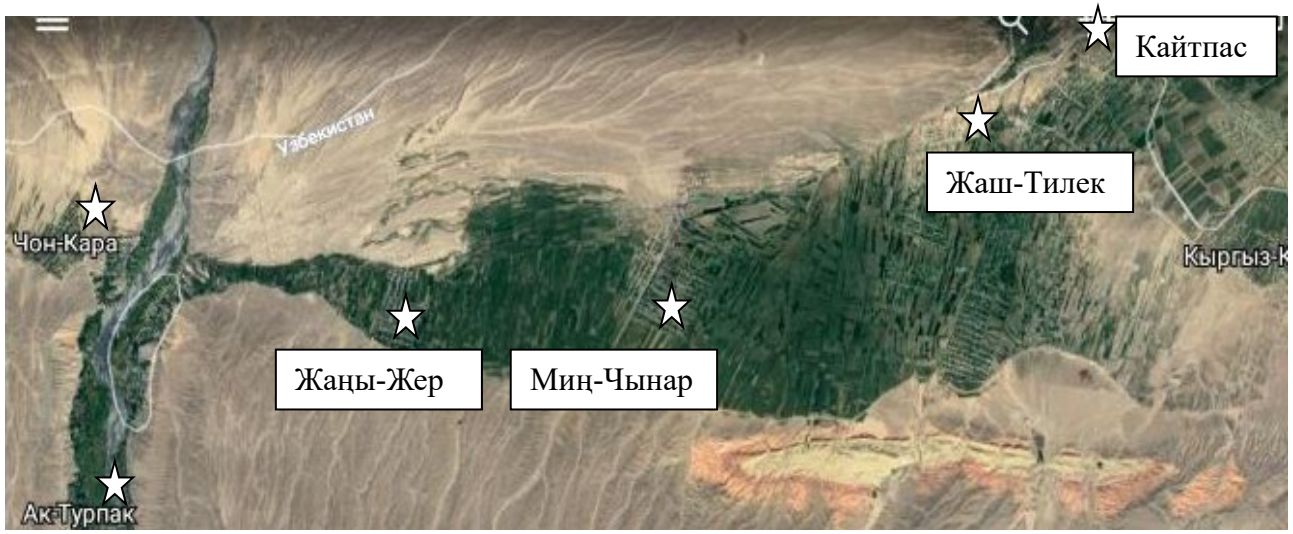
- 30 - 50% increase in water productivity
- 30% increase in profits
- Reduction of methane emissions by 50% per 1 kg produced
- Advice and better plant nutrition lead to reduction in production risks, hence, the crop becomes more attractive to risk-adverse (poor) people

Project activities 2021-2025

2021:
120 farmers, 5 villages, 5 brigadiers
Area - 120 hectares

2022 :
158 farmers, 6 villages, 7 brigadiers
Area - 242 ha

2023- 2025:
372 farmers
Area – 570 ha



Increase in average yields by **25%**

Additional income per 1 ha - 570-**680 $**

CO2 emissions decreased:
2021 – **240 t**
2022 by - **489 t**
2025 by – **1700 t**

Increase of yield levels and water productivity

Development of regular Crop Monitoring System – **local brigadiers (field advisors)** - the core of this system

Promotion of ***balanced plant nutrition -*** Using not only (traditionally used) nitrogen fertilizers, but also complex fertilizers (NPK)

Creation of ***revolving fertilizer fund –*** ensuring timely delivery of fertilizers to farmers on 50% prepayment

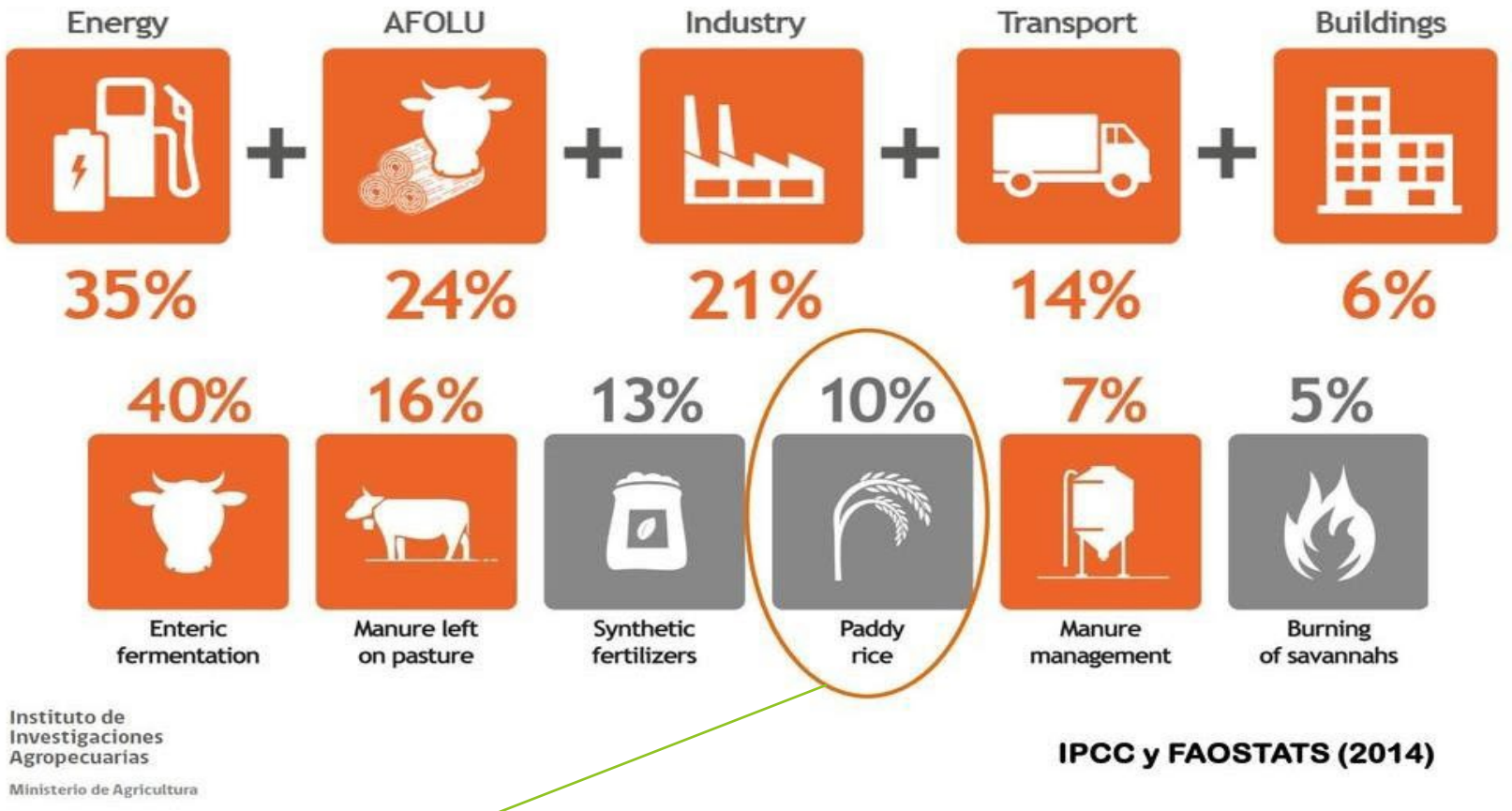
Increase of yield levels and water productivity

Improvement of seed management and quality -Testing varieties from Uzbekistan and local multiplication of the best selected varieties

Training on sound water-saving cultivation technologies and pest control

Introduction of quality pesticides and safe application techniques - introduction of drones

Introduction of global GHG from rice paddies

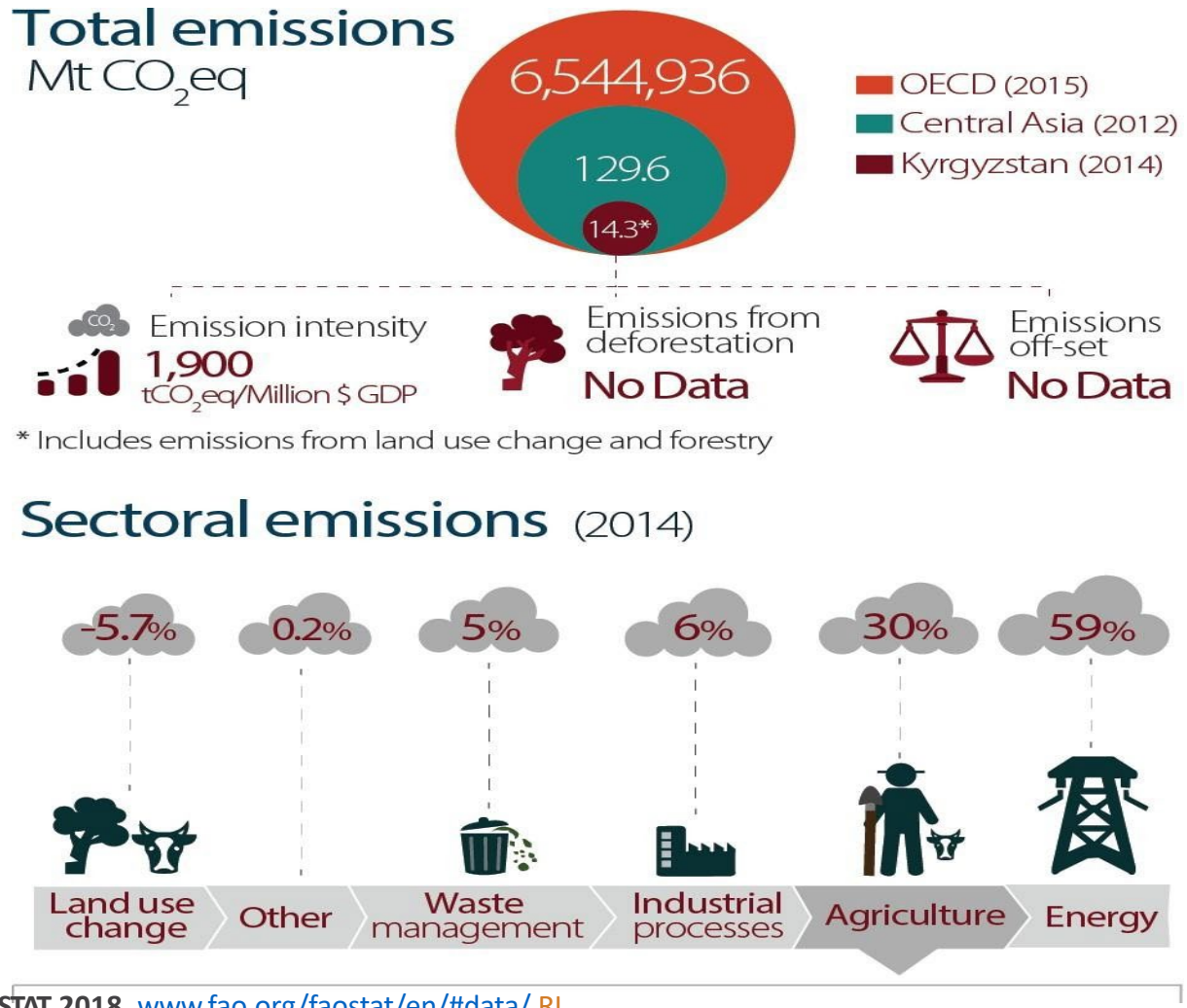


http://www.fao.org/3/i6340e/i6340e.pdf

https://slideplayer.com/slide/13183275/

The GHG emissions in Asia is about 24%

GHG emission in Kyrgyzstan

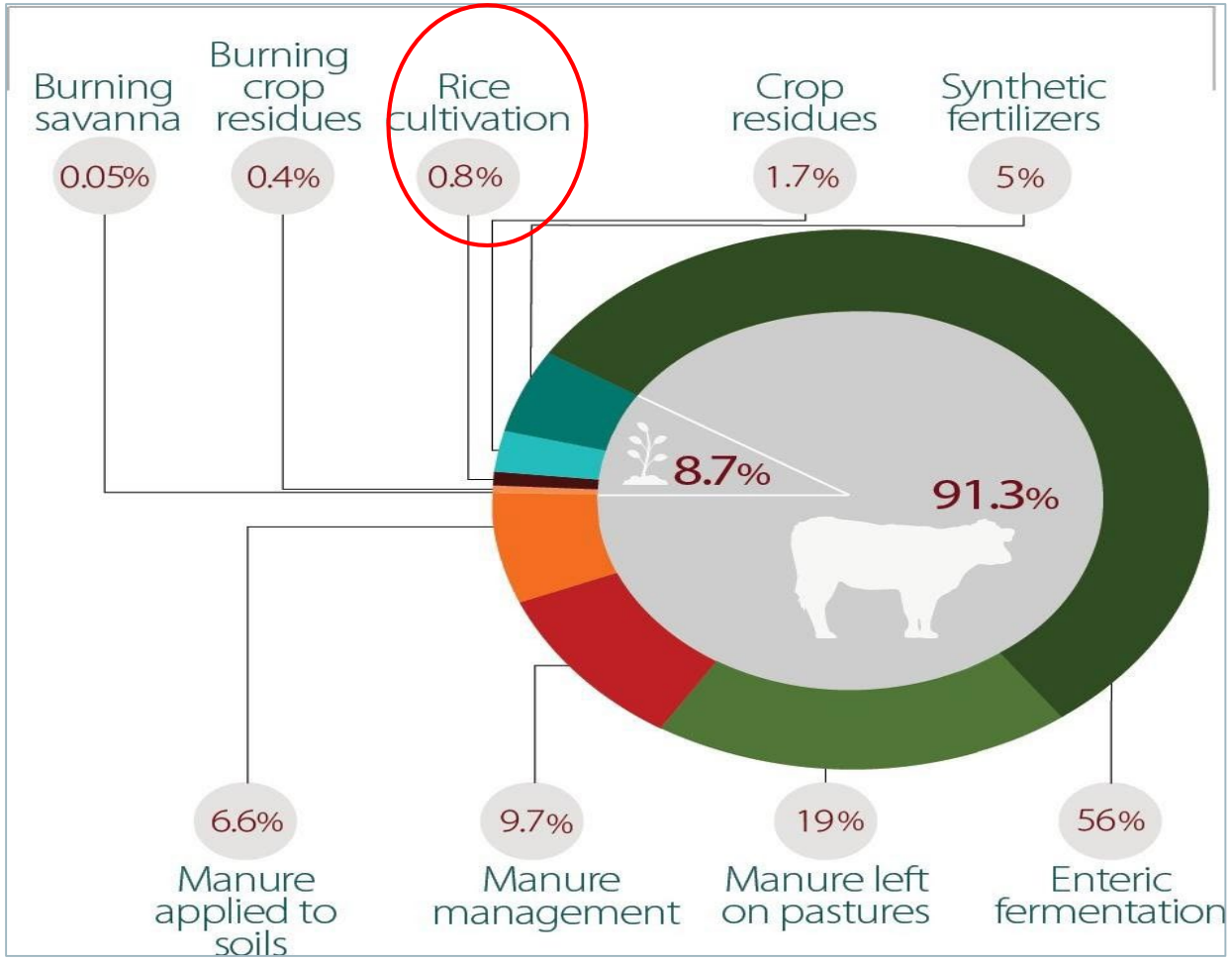


FAOSTAT. 2018. www.fao.org/faostat/en/#data/ RL

https://climateknowledgeportal.worldbank.org/sites/default/files/2019-06/CSA%20_Profile_The%20Kyrgyz%20Republic.pdf

www.google.com

GHG emission from agriculture, Kyrgyzstan



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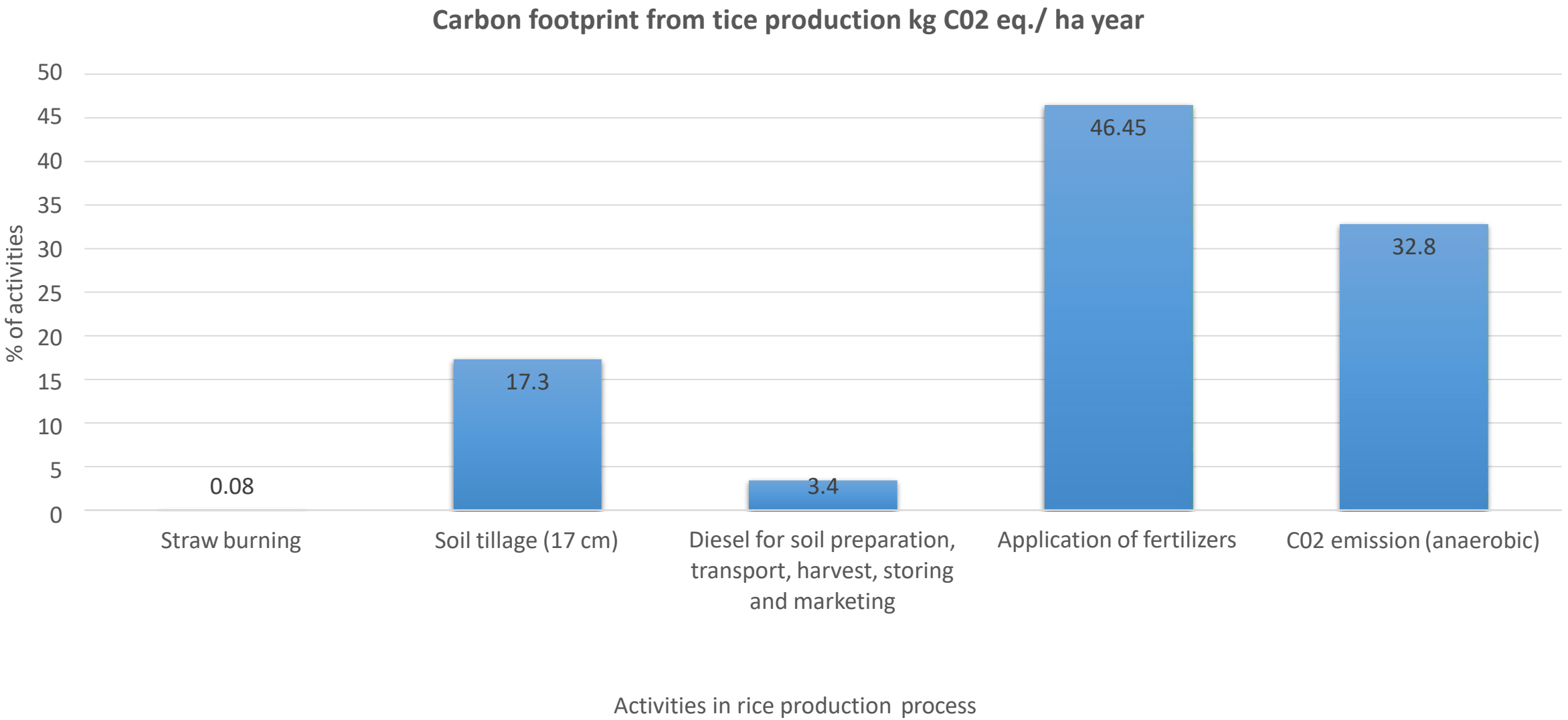
Carbon footprint from rice production

INPUT Жайдары куруч-Jaidary rice **(3000 кg/ha) Jash-Tilek**	**Carbon footprint of input (kg CO2eq/kg)**	**Traditional production**	
		Units (kg/ha/ year	**Total carbon kg CO2 eq/ha**
Straw burning	0,08	150	11,40
Soil preparation (ploughing, harrowing, for 1 hectare)	2,30	60,00	138
Soil tillage-ploughing (15-20 cm) assumptions…	2448	1	2448
Seeding is done by hand	0	150 kg	0
Diammonium phosphate (DAP-диаммофос)	4,34	0	0
MonoAmmonium Phosphate (MAP-аммофос)	4,59	200	917,40
Urea (мочевина)	4,82	400	1928
Ammonium nitrate (аммиачная селитра)	9,28	400	3712
Application of herbicides (no information	0	4 кг	0
Harvest of rice (Harvester -diesel)	2,3	16	36,80
Transportation and storage of rice	2,3	32	73,60
Rice processing and transportation to market	2,3	26	59,8
Transportation about 6 km distance within 4 months	2,3	75	172,5
Irrigation comes from Sokh river (4000 кg is needed for 1 kg)	0	12000 000,00	0
C02 emission (CH4 and N20)-anaerobic condition	4 616,00	1	4616,00
Total emission kg C02 eq./ha year			14113,5
Emission from 1 kg of rice paddy			**4,7**
Emission from 1 kg of raw rice (*1 kg rice paddy=0,65 kg of raw rice)*			**7**

Please go to the excel file for more detailed information

Carbon footprint from rice production



Application of fertilizer (Technological map for 2023)

INPUT	Carbon footprint of input		Scenario 1: Application of fertilizers				Scenario 2: traditional production				Difference "modern" versus "traditional" scenario	
			units		total Carbon		units		total carbon		in kg CO2 eq/ ha	
Application of mineral fertilizers: Diammonium phosphate (DAP-диаммофос). *Example (Jash-Tile)*	4,34	kg CO2eq/kg	300	kg/ha	1 302	kg CO2 eq/ha	0,00	kg/ha/ year	0,00	kg/ha/ year	1302	kg CO2 eq
Application of mineral fertilizers: MonoAmmonium Phosphate (MAP-аммофос)	4,59	kg CO2eq/kg	100	kg/ha	459	kg CO2 eq/ha	200	kg/ha/ year	918	kg/ha/ year	--459	kg CO2 eq
Application of mineral fertilisers: Urea (мочевина)	4,82	kg CO2eq/kg	300	kg/ha	1446	kg CO2 eq/ha	400	kg/ha/ year	1928	kg/ha/ year	-482	kg CO2 eq
Application of mineral fertilisers: Ammonium nitrate (аммиачная селитра)	9,28	kg CO2eq/kg		kg/ha		kg CO2 eq/ha	400	kg/ha/ year	3712	kg/ha/ year	--3712	kg CO2 e q
TOTAL					**3207**	kg CO2 eq/ha			6557	kg/ha/ year	**-3350**	kg/ha/ year

Application of fertilizers according to a new technological map can reduce the CO2 ***emission-3351 kg CO2/ ha year!***

«Dry Rice»
Demonstrations of rice furrow irrigation

2022

6 test plots for rice cultivation by furrows were organized in 3 villages (0.03-0.13 ha each):

- Rice as the main crop
- Rice as a second crop (after early potatoes, winter wheat)
- Rice in the orchard intercrop

2023

7 plots – 7 ha

The average yield of raw rice on the demo plots was about **37.7 t/ha**

Advantages:

- ✓ More than 2 times water saving
- ✓ Rationale use of land
- ✓ Saving on machinery services

Challenges:

- ✓ changing stereotypes
- ✓ weed control

Thank you!