



LANDENERGYBIODIVERSITY



**ELEMENTARY TECHNOLOGIES-
BIG BENEFITS**



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Uzbekistan

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This publication was compiled by GEF Small Grants Programme (GEF SGP), with the support of UNDP in Uzbekistan. It includes infographics on innovative technologies in sustainable agriculture, which impact both economic and environmental outcomes.

Our current projects are presented using advanced techniques in information design to explain principles of operation for these technologies and to demonstrate the advantages and benefits of applying these state-of-the art solutions compared with traditional approaches and practices. This collection of infographics includes technologies such as -zero tillage; establishment of varietal pistachio plantations; laser land leveling; isolation of irrigation canals; micro hydro power plants; biogas technologies; intensive aquaculture; drip irrigation and others.

We hope that this publication will be useful for the farming and peasant communities of Uzbekistan, as well as for a wide range of stakeholders to include employees of Water User Associations, professionals and employees of regional divisions of the Ministry of Agriculture and Water Resource Management, regional forestry staff, experts of regional Committees for Nature Protection, teachers and students of agricultural universities and institutes of national economy, and academicians.

Partners:

NGO 'KRASS'

Institute of Microbiology, Academy of Sciences of the Republic of Uzbekistan

Republican Scientific and Production Center of Ornamental Horticulture and Forestry

Tashkent Institute of Irrigation and Melioration

UNDP/GEF project 'Promoting energy efficiency in public buildings'

Any views of opinions presented in this publication are solely those of the authors and do not necessarily represent those of the GEF SGP and UNDP in Uzbekistan.

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During the period of privatized former state property and original accumulation of capital, funding for both novel and proven technologies aimed at habitat conservation and safer natural resources extraction was constrained. While the merit in reducing biodiversity loss is supported and considered necessary; perceived utility of making investments in these alternative and renewable technologies, as compared with other income-generating avenues such as business enterprise, continues to be a point in question. The GEF Small Grants Programme supports leading-edge solutions to alternative and renewable energy challenges. The Programme search for people who are driven to innovate approaches aimed at the honorable cause of habitat and biodiversity conservation. This work reduces pressure on ecosystems through the strategic implementation of progressive technologies. Our future priorities are to focus on the efficacy of these projects put simply is making sure they work!

Bakhtiyor Kamilov, the head of the intensive Aquaculture project.



Alternative energy sources and resource-saving technologies make it possible to heat houses, buildings, and greenhouses more efficiently and are also used for rational resource extraction in agriculture. Yet, many of these technologies are not applied or rarely applied in practice. While the reasons for this are not entirely known, one possible explanation is lack of knowledge or concerns over the costs associated with project implementation. Thanks to joint efforts in the Khorezm region, a project on energy effective greenhouses was launched, which trains local residents on high-yielding vegetable provision for the winter period. We designed a biogas power plant that provides clean household heating and high-performance bio-fertilizers. GEF SGP in partnership with KRASS also pioneered land laser leveling technology in Khorezm. Since that time, land laser leveling has become one of the leading innovations today within Uzbekistan. The implementation of these new technologies is possible with minimum energy and economic investments and will improve quality of life for Uzbek citizens.

*NGO «KRASS»
Khorezm region*



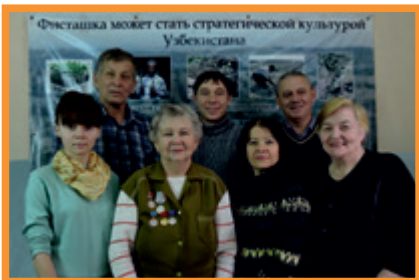
The studies of Uzbekistan floral biodiversity have more than 150 years history. During this period, noted advancements were made in the study of agro-diversity as evidenced in countless articles, scientific reports, and field journals. Uzbekistan currently holds the most substantive and detailed data source on herbarium plant specimens, which is located in the pool of the Central Herbarium of the Institute of the Gena pool of plants and animals of the AS RUz. This unique botanical collection boasts more than 1,5 millions of herbarium plant specimen sheets, collected since 1840 in all the regions of Uzbekistan and in Middle Asia. Since 2013, the Institute of the Gena pool of plants and animals of the AS RUz with the support of GEF Small Grants Programme implemented the project, whose goal is the development of Uzbekistan flora electronic database. It is our hope that this database will be viewed as a source of invaluable information on sustainable extraction techniques for the conservation of floral biodiversity. We are certain this resource will make profound contribution to the sphere of ecological education and ecotourism.

*Komiljon Tojiboyev and Natalia Beshko,
The Institute of the Gena pool of plants and animals AS RUz*



"Thanks to GEF SGP, we were able to install and operate a biogas power plant. At the beginning of the project, few believed that this technology would work. However the GEF SGP team supported our undertaking and provided assistance to us during every phase of the project. Today our power plant has been successfully operational for nearly three years. During that time, there have been commendable improvements to household infrastructure and livestock conditions. We measured a 30 percent increase in the number of domestic pigs with no loss of young animals during the winter period. As a direct result of derivable bio-fertilizers, fodder crops productivity increased by 25-30 percent. We are elated with the project results and are grateful to GEF SGP for their valued support".

*Farm "Nadejda (Hope)"
Sirdarya Region*



Since 2008, GEF SGP has actively collaborated with the scientists of the Republican Scientific and Production Center of Ornamental Horticulture and Forestry to engineer solutions to challenges in scaling-up pistachio commercial crops in Uzbekistan. Due to the characteristics of exceptional drought tolerance and high adaptability, this species is the most promising in relation to the rainfed drylands cultivation, particularly in areas with a shortage of irrigation water where other species cannot thrive without irrigation. Pistachio cultivation in such territories improves the ecological stability in the adjacent areas, and above all, converts these degraded lands (previously used for grain-crops and grazing) into lands suitable for agriculture. Pistachio cultivation is of great significance to the economy, and this sector of agriculture is very promising for the country as well as for the population that inhabits the rainfed dryland foothills. *Pistacia vera* is an invaluable nut-bearing species that can become an important strategic crop in Uzbekistan.

Collective of scientists of the Republican Scientific and Production Center of Ornamental Horticulture and Forestry



GEF Small Grants Programme supported the initiative on beekeeping development in the Parkent district of the Tashkent Region. The joint project has provided residents of the district and surrounding mountain villages with beekeeping education. An observation of bees and their pollinating ability conducted during the project suggests a tremendous connection between bees' life activities and crop productivity. For example, the crop yields of one clover increased by 53 percent. Bee cultivation led to the production of an additional two tons of cucumbers from 0.5 hectare of the experimental field in comparison with the control group. One can argue with confidence that the more bees there will be, the greater crop yield farmers will harvest. Beekeeping is an illustrative way of demonstrating the economic importance of environmental services, and safeguards food and economic security in Uzbekistan.

Marsel Minzafarov – beekeeper from Parkent district in Tashkent region



GEF Small Grants Programme works to promote the application of innovative technologies in Uzbekistan. A joint partnership with the Institute of Microbiology of the Academy of Sciences of the Republic of Uzbekistan (AS RUz) is supporting construction on a low-tonnage greenhouse complex. A new biological product, SERHOSIL, is engineered from green microalgae of *Scenedesmus* genus and is currently being tested successfully in several districts. The lead institutes of MAWR RUz are overseeing the application of SERHOSIL in Uzbekistan districts and preliminary data suggests notable improvements in the ecological condition of soils; increased fertility; in crop productivity and in crop quality; and hardiness and drought resistance of all kind of crops. SERHOSIL can significantly reduce the cost of fertilizers and irrigation water, increase plants immunity and reduce their disease incidence.

Djumanyazova Gulnara and the team SERHOSIL



"In my role as a local drip irrigation system producer, I partnered with GEF SGP on a project to install a production line for drip irrigation systems adapted to the conditions of Uzbekistan. Currently, we are working on production and installation of irrigation systems, equipment installation and training farmers on how to use this technology. Drip irrigation reduces water use by an astounding 2000% compared with traditional irrigation techniques-reducing the litres of water required from 900-1000 m³ to a mere 46-48 m³. Mineral fertilizers are served with water in the dissolved form, thus watering time is reduced. Our goal is to deliver affordable products and services to farmers. Using this framework, I install the system at no cost on 1 hectare for each farm that implements the drip irrigation system. Scale-up of this project in the near future will require the construction of a micro hydroelectric power station to meet the needs of the drip irrigation system's fabrication shop".

Abdulvokhid Boltaboyev, Drip Irrigation System Producer in Namangan region

PLASTIC ISOLATION OF CANALS

Isolation of irrigation canals with polyethylene film for reduction of water infiltration loss is 2 times cheaper than other isolation technologies.

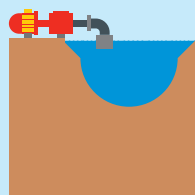
Economic effectiveness of plastic isolation of 1 km of canal with perimeter of 5 meters

Problems of interfarms and intrafarms canals



More than **50%**

of water is lost, on the way to farmer, due to the infiltration into the soil. Infiltration causes to secondary soil salinization. Water shortage and soil salinization result in losses of crop yield and profit.

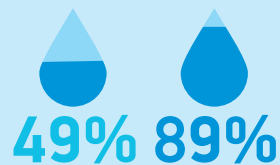


Electric water pump usage

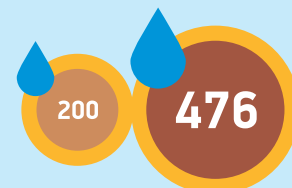
high energy consumption of water pumps (for watering [purposes]) results in high production cost. Interruptions in electric supply lead to uneven watering, decrease in quality and quantity of crop yield.



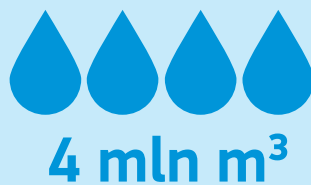
cost of 1 km of canal, soums



Canal efficiency before and after canal isolation



area of the irrigated lands before and after plastic isolation, ha



annual water savings after the implementation of isolation



increase in crop yield of raw cotton due to the better water supply, tons/ha



profit from additional crop yield, soums



annual savings on electricity consumption due to the non-use of water pumps, kW/h



Reduction of electricity costs, soums



Reduction of water supply costs, soums





On the level of farms



**16,9
mln**

Total profit of canal isolation
=
reduction of electricity costs
+
profit from the additional
crop yield, *soums*



1,9

Payback period, *years*



On the level of Water Users Association



**37,0
mln**

Total profit of canal isolation
=
reduction of water supply costs
+
reduction of electricity costs
+
profit from additional crop yield, *soums*



**4,8
mln**

Net income
in the first
year, *soums*

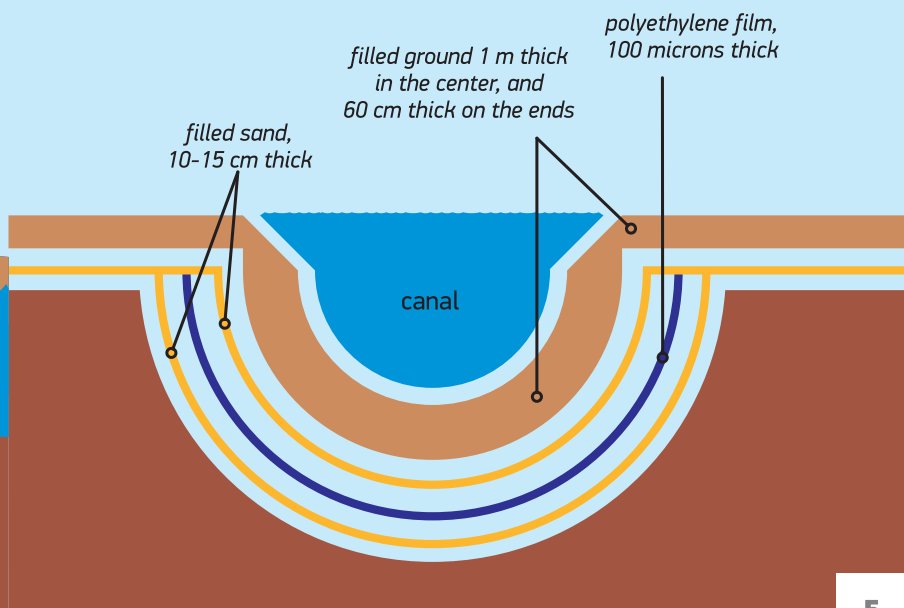
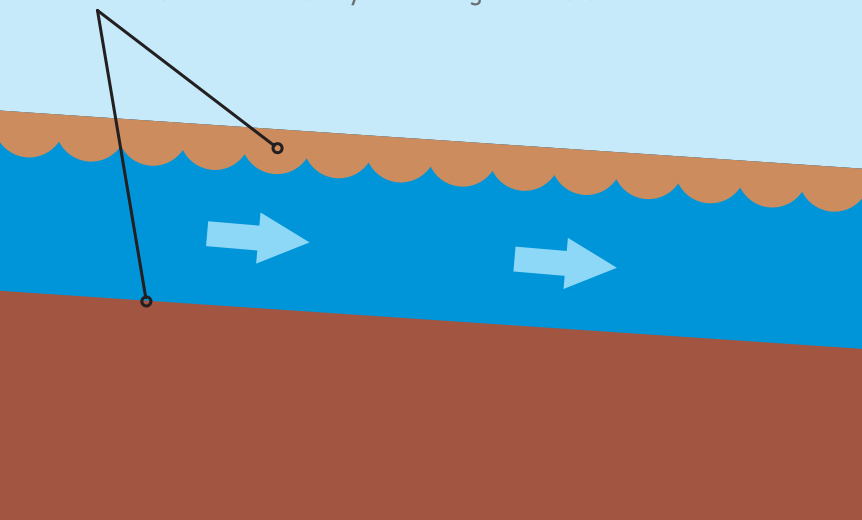


0,9

Payback
period,
years

Structure of a canal with plastic bottom isolation

Angle of canal slope (bottom and side slopes)
are designed in such a way that ensures the
free-flow water delivery to the irrigated fields.



**On technology of canal isolation,
please contact Ms. Inna Rudenko:**

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e-mail: irudenko@mail.ru

kkrass@ymail.com



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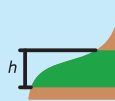
PISTACHIO PLANTATIONS IN UZBEKISTAN


Central Asia is home to pistachios which can grow without irrigation.


Establishing a wide variety of pistachio plantations is an economically profitable and environmentally justified alternative to existing land use practices.

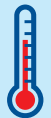
Selection of a place for establishment of pistachio plantations

In Uzbekistan it is profitable to establish commercial pistachio plantations in the dry foothills


 in the range of from
600-1300 m
above sea level


 land areas with
a slope steepness
equal to $\leq 30^\circ$


 with an average
precipitation
> 300-350 mm


 with an annual
sum of positive
temperatures
 $\geq 3500^\circ\text{C}$


Development benefits of cultivating pistachios in Uzbekistan

 Creation of economically
favorable conditions for
development of pistachio
agriculture.


 Long-term lease of foothill
land - 49 years with a right
for renewal.


 Tax "holidays" for the land
before the first crop.


 Access to a preferential
mini-loans.


 Establishment of a network of consulting centres with
pistachio demo-plantations and uterine plantations of
a variety of pistachio

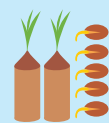
Agricultural methods for the establishment of pistachio plantations

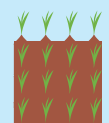
 Enclose the territory with wire fences,
trenched with a parapet or a clay wall.

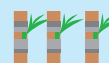
 Separate the territory into units based on
landform and area aspect.


 Depending on steepness, prepare the soil
through solid ploughing, strip plowing or
with an on-plow and cross and bulk terraces.

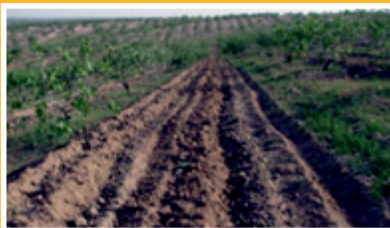
 Mark the planted areas in the allotments.

 Establish plantations by seeding methods
that concentrate in a specific place or by
planting seedlings with a closed root
system and grown in small containers.

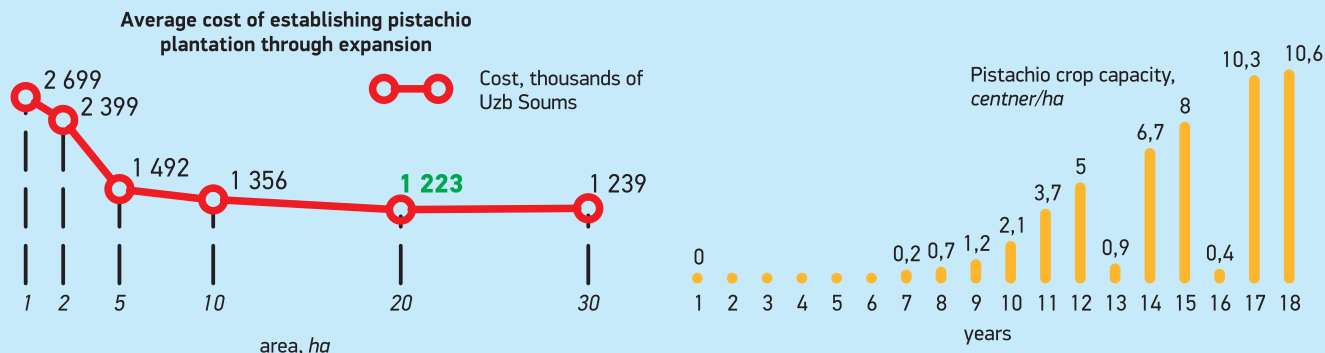
 Add and upkeep young plants before
inoculation; planting agricultural crops
in between.

 Inoculate young pistachio plants.

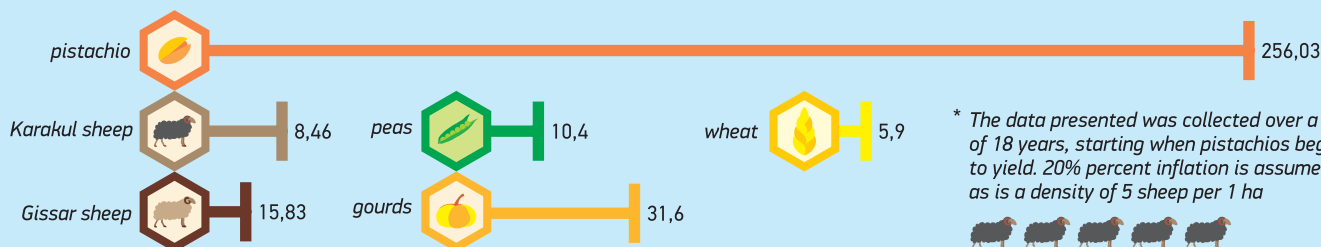
 Form a tree crown, while up keeping old
vegetation.



Economic Indicators Favorable for Cultivating Pistachios



Cost-efficiency of cultivating pistachio in comparison to other crops and sheep, mln of Uzb soums per 1 ha*



Pistachios are a promising crop for the economic and international advancement of the Republic of Uzbekistan. The various strains available for cultivation are listed.

	Albina	Orzu	Gornaya jemchujina	Oktyabrskaya	Dangarinka	Zorka
Full fruit bearing years	10-12	10-12	12-15	12-15	12-15	8-10
Proposed areal density of trees, pcs/ha	100-120	100-150	180-200	180-200	150-180	100-150
Crop capacity, centner/ha	8	10	8	10	10	10

Please direct enquiries regarding the establishment of pistachio plantations to Mr. Evgeniy Botman:

mobile tel.: +998 90 174 53 85

e-mail: darhanbek@yandex.com

and Mr. Lyutsian Nikolyai:

mobile tel.: +998 94 631 93 17

e-mail: 77lucian77@mail.ru



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FIELD-PROTECTIVE BELTS

Field-protective belts consist of several rows of trees and bushes that protect fields from wind erosion and improve fields' microclimate.

Field-protective belts abate the wind velocity in the space between strips, i.e. in the protected fields.

Abatement of the wind velocity influences all other microclimate parameters of the area, such as air humidity, the temperature of air and soil.

Main issues of saving the land capacity



Wind erosion

is one of the main factors for loss of both the topsoil and land capacity



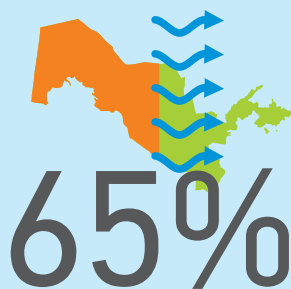
Aridization

of the soil and the surface air brings changes in the structure and removal of the topsoil

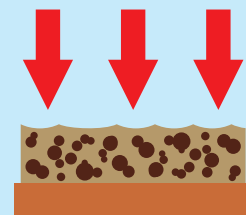


Loss of the crop

Summer wind with low air humidity and high temperature leads to loss of the crop

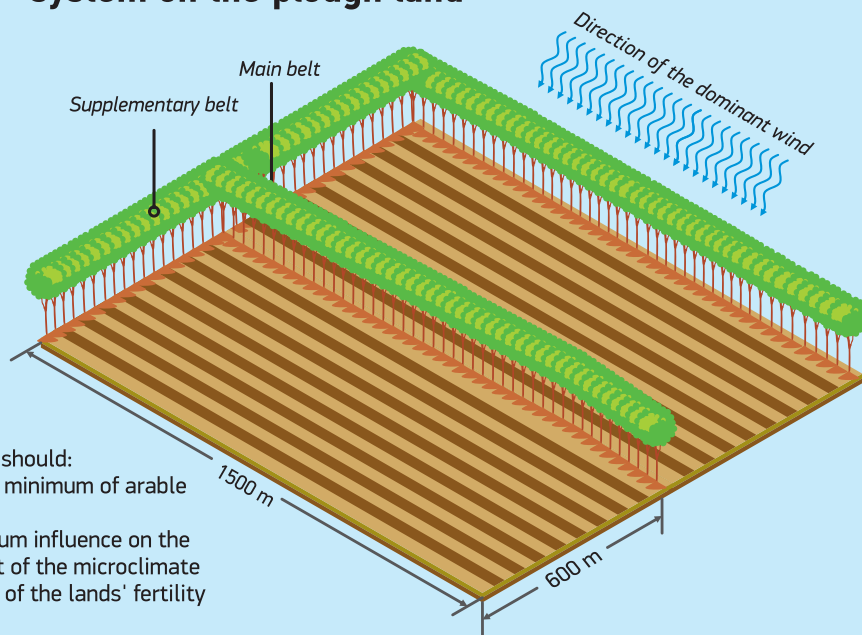


of all irrigated lands in Uzbekistan are exposed to wind erosion



humus content in the soil is decreased to **30–50%**

Structure of the field-protective belt system on the plough land

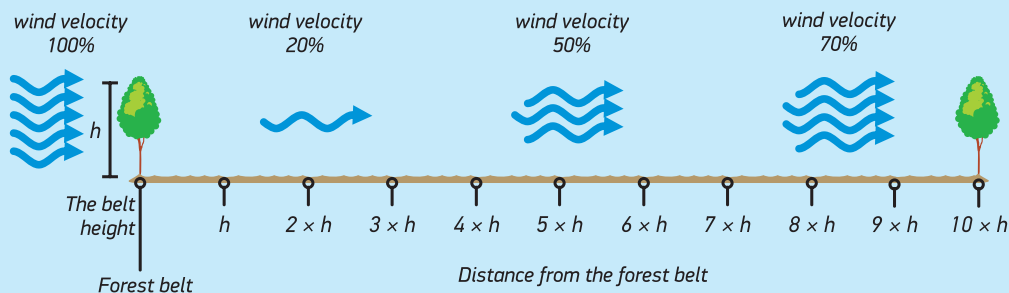


Forest belts should:

- Occupy the minimum of arable land
- Has maximum influence on the improvement of the microclimate and increase of the lands' fertility



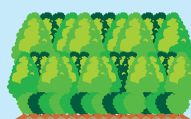
Distance of effect and construction of field-protective belts



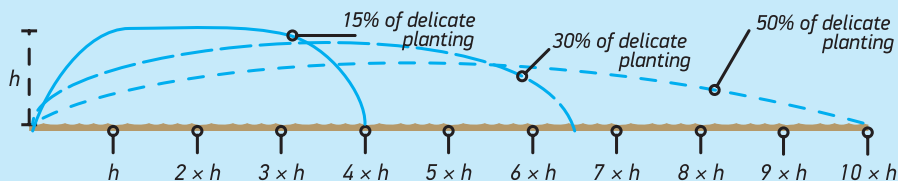
permeable belt



open shelter belt
(combined planting
of high trees
and bushes)



Dense shelter belt
(combined planting
of high, short trees
and bushes)



crop yield and
quality of the
crop is increased
by **15-20%**

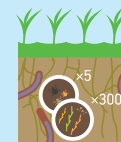


Decrease of the wind
velocity halts the loss
of the topsoil

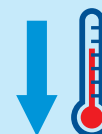
Advantages of the forest belts on irrigated and dry lands and benefits from the belts to nature



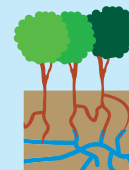
Wind velocity is
decreased for
34-38%
and humidity of the
surface air is increased
up to 5-9%



Increase of biodiversity
and landscape capacity
contribute to growth
of the soil microfauna



Up to 1 degree C
the air temperature
is decreased in summer
and the soil temperature
falls up to 1.2 degree C



Lowering the
groundwater level
leads to decline of
resalinization

For questions regarding
the establishment of
field-protective belts,
please contact Mr. Evgeniy Botman:
mobile tel.: +998 90 174 53 85
e-mail: darhanbek@yandex.com



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BEEKEEPING IN UZBEKISTAN

Bees one way to guarantee of food security in the country.

As Einstein said, "As soon as the bees disappear from the surface of the globe, people will follow them within four years".

The main contribution of bees to food security for people is not honey, but their ability to pollinate plants. Without these pollinators, most of the plants would not be able to produce any crops. Due to pollination, the crop can double, or even triple.

Outputs of one hive per year

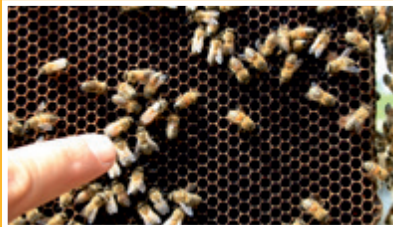
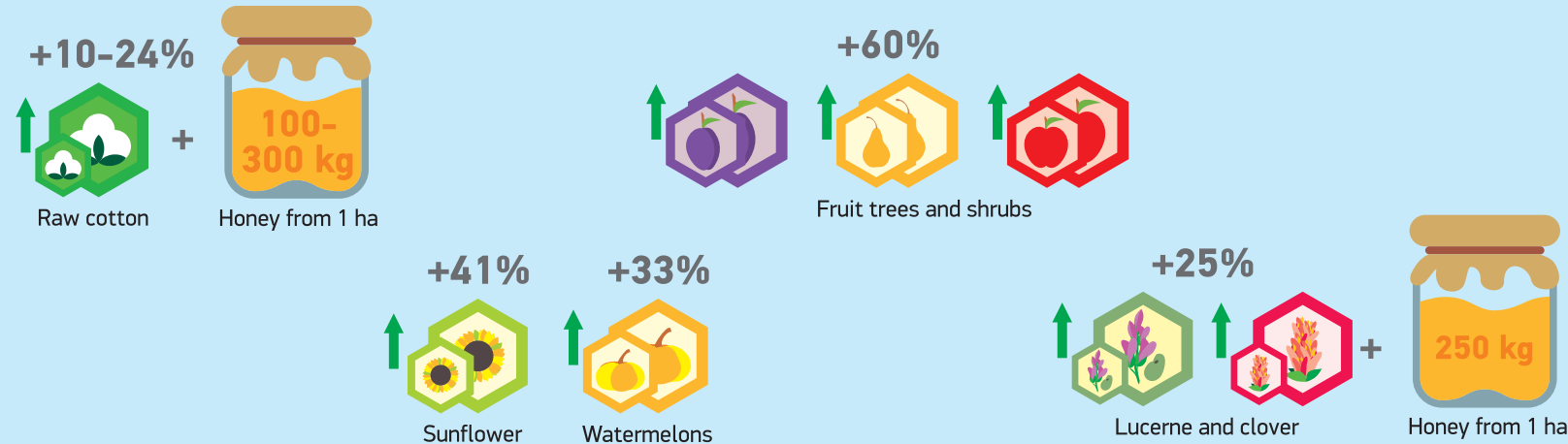
Number of flowers visited
More than 1 bln

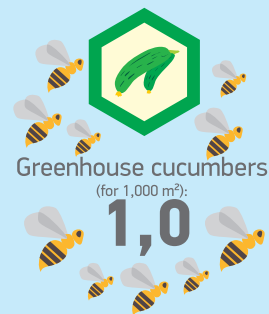
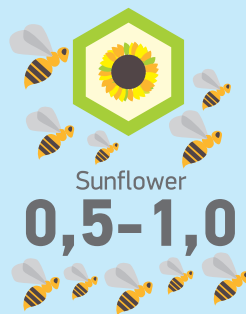
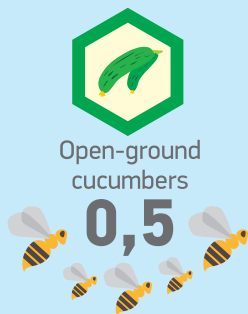
The amount of honey from one hive
More than 10 kg

Gathered pollen
20-25 kg

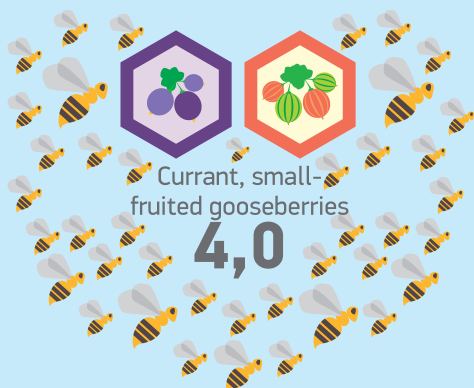
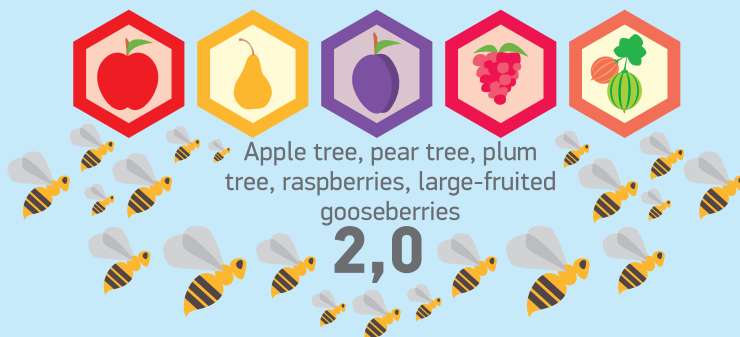
Gathered nectar
200 kg

The minimal increase of the crop yield when a bee apiary is minimum placed near the field





**The required quantity
of bee hives for
pollination of
agricultural crops
(per 1 ha)**



**For more details regarding beekeeping,
please contact Mr. Marsel Minzafarov:**
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e-mail: minzafarov.marsel@yandex.com

FOUR-FIELD CROP ROTATION

Crop rotation is a scientifically approved [practice of] crop rotation and if needed of vapor rotation in time and in allocation to fields.

The suggested [practice of] crop rotation allows to rotate crop sequentially over 4 years, and allows to increase the crop yield by 3 times.

Advantages of four-field crop rotation



Preservation, restoration and improvement of soil fertility; and its protection from erosion in the future

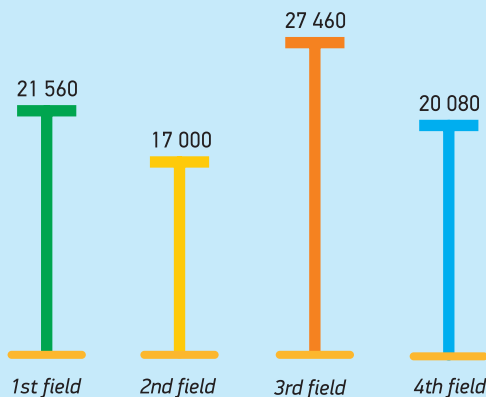


Increase in crop productivity from 1 ha of the irrigated [field] for the production of the fodder, necessary for animal husbandry

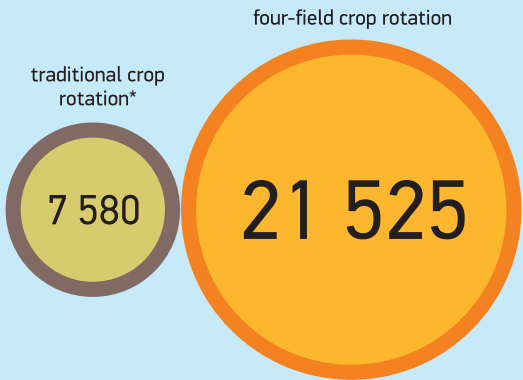


Reduction of the production cost of fodder due to many factors

Key performance indicators of four-field crop rotation



Quantity of crop units from 1 ha under the four-field crop rotation

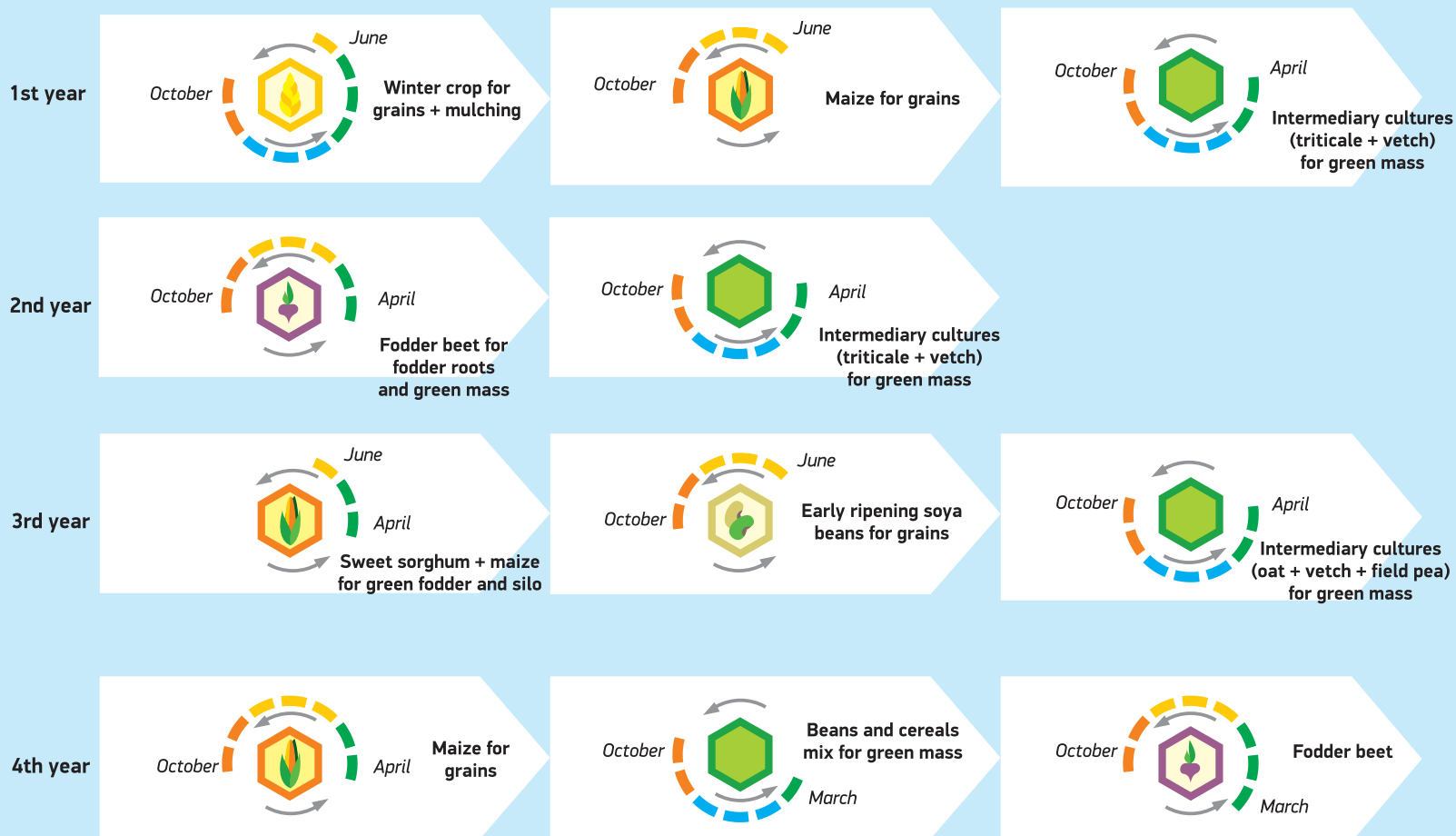


Average crop productivity under the traditional four field crop rotation from 1 ha (in crop units)

**Traditional crop rotation - is [a practice of] crop rotation on the field, when correct soil tillage and soil fertilizers are applied to achieve improvement of soil fertility and crop yield*



Chart on four-field crop rotation of short rotation



On practices of four-field crop rotation implementation, please contact **Mr. Nasriddin Khalilov**:
mobile tel.: +998 91 529 76 20
e-mail: xalilov_07@mail.ru



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LAND LASER LEVELLING IN UZBEKISTAN

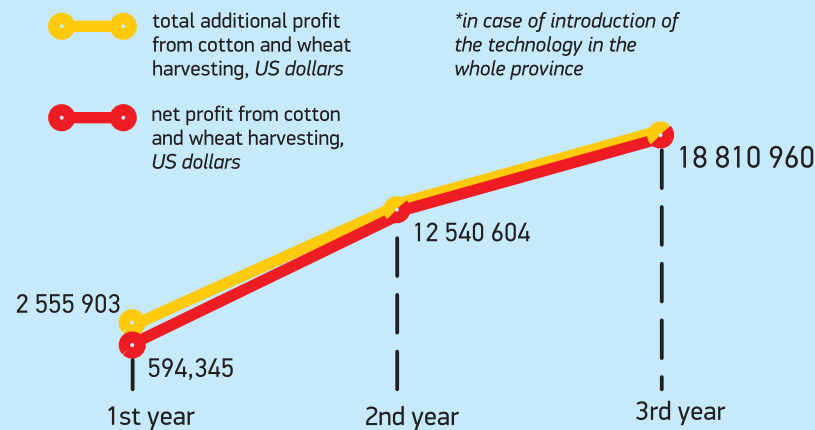
Land laser levelling (LLL) is a method of land levelling with the use of the system for automated control of the height of an operating device, where the final difference of roughness on the surface is ± 3 cm or less.

Laser levelling technology is widely used in construction of houses, highways and also in levelling of agricultural lands, trenching of irrigated canals, drainage and collector systems.

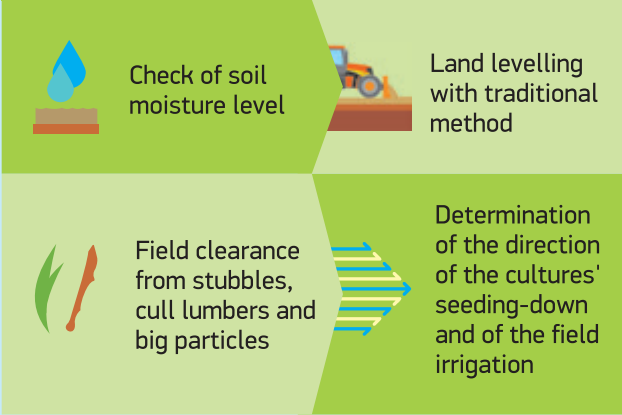
Provinces in Uzbekistan where LLL is implemented



An aggregated profit in case of the introduction of LLL technology in Khorezm province*



Procedures of land preparation for laser levelling



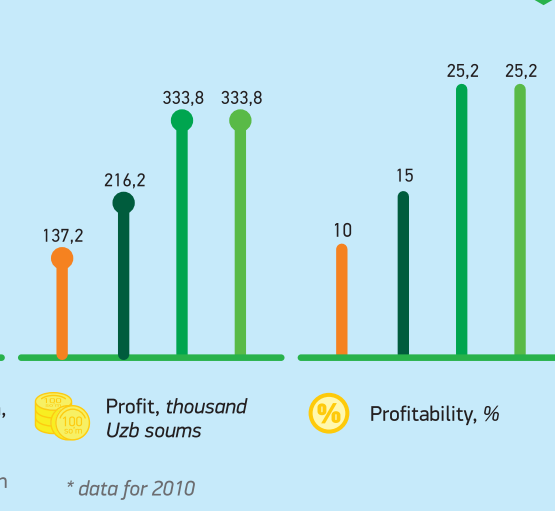
Comparative analysis of traditional method of levelling versus LLL technology in Wheat and Cotton Cultivation (for 1 ha)*



Cultivation of wheat

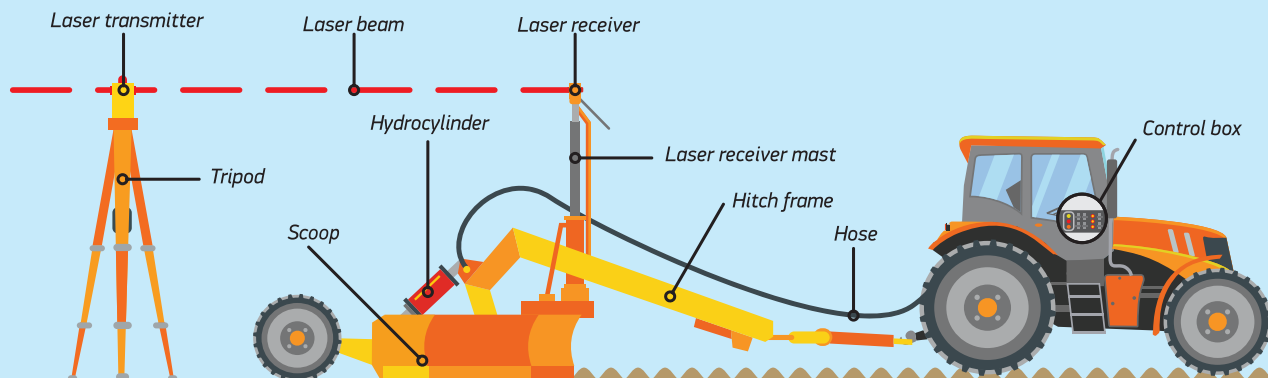


Cultivation of cotton



* data for 2010

A general overview of the unit for LLL



15

For questions on land laser levelling technology, please contact Mr. Oybek Egamberdiev:
mobile tel.: +998 91 571 72 39
e-mail: kkrass@ymail.com
oybek_72@yahoo.com



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PHYTOMELIORATION IN UZBEKISTAN

Phytomelioration refers to a number of measures designed to restore productive functions to soil and thus prevent land degradation. It primarily uses crop rotation, field-protective belts, flap and planting and forest shelter belts.

Tradition crop rotation for crops such as cotton and wheat demands the introduction of leguminous herbs.

This involves:

- Combined planting of annual lucerne under cover of winter wheat;
- Intermediate planting of legume cereal mixture (Triticale and winter-resistant peas) in the space between rows when the rotation area is not occupied by the primary crop.

Advantages of phytomelioration

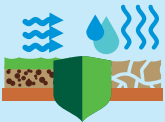
Soil-enrichment with organic matter and nitrogen replenishment up to 100 kg/ha



Restoration of the soil and land reclamation

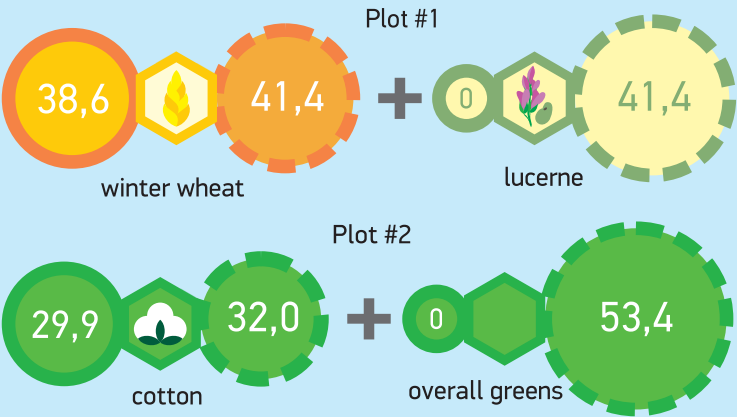


Increased productivity of irrigated hectares, increased production of the fodder



Protection from the wind and water erosion, protection from excessive moisture evaporation and salinization

Indicators of phytomelioration effectiveness



— The average harvest from the fields with conventional technology, c/ha
— The average yield of the fields with phytomelioration, c/ha

753 m³/ha

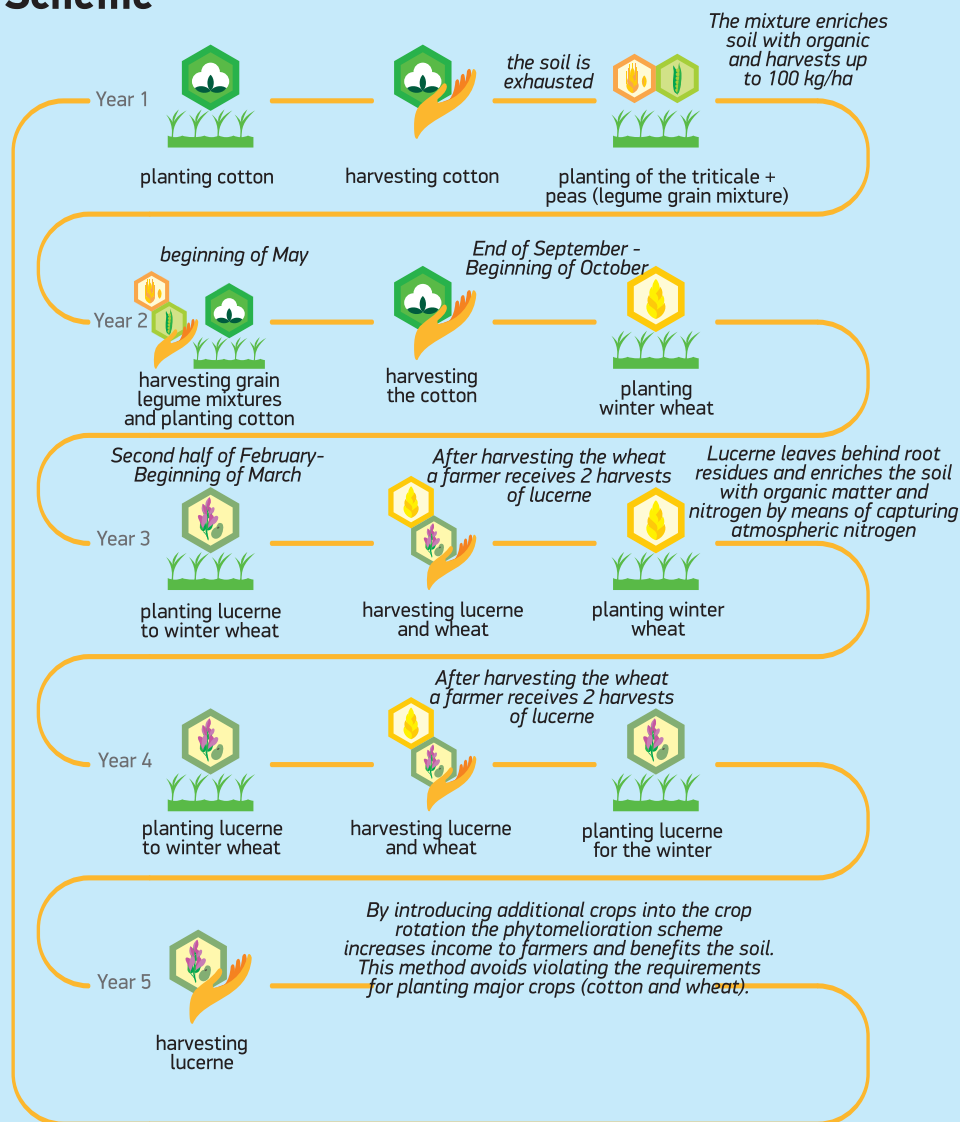
Water saved through completely covering the soil with vegetation thus reducing soil moisture evaporation.

831 974 Uzb soums/ha
Average earning per two plots of land

↑ Profits are 1.4-4 times higher per ha in comparison to traditional methods of cultivation



Phytomelioration Scheme



For questions on phytomelioration technology, please contact

Ms. Lyudmila Shurova:

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e-mail: lydmila.shurova@mail.ru

INTENSIVE AQUACULTURE

Intensive aquaculture is breeding, incubation of aquatic organisms such as fish and others in natural conditions or in artificial ponds. Growth of the fish is fully maintained due to provided feed.

Fish breeding in Uzbekistan equals to 30k tonnes/year*



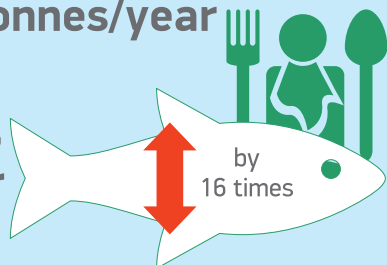
Up to 2009 the consumption of fish in the country was around **0.4 kg/person/year**

Due to introduction of the intensive aquaculture technology, the consumption has increased and currently equals to **1 kg/person/year**

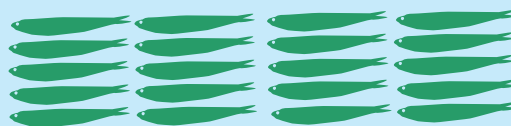
It should be increased up to **400k tonnes/year**

which equals to the required rate of consumption for assuring the adequate nutrition equaling to

16 kg/person/year



Currently, low intensity pond aquaculture produces an average of **0.1 to 0.2 kg/m³/year** of fish

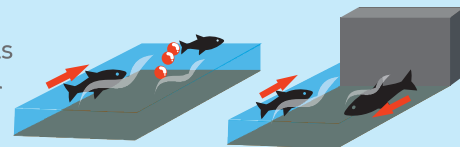


however, there are alternative technologies with productivity equaling to **20-40 kg/m³**

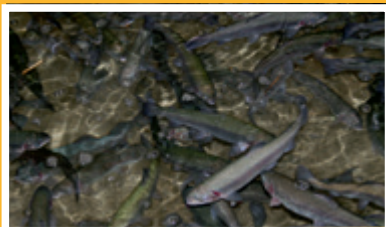
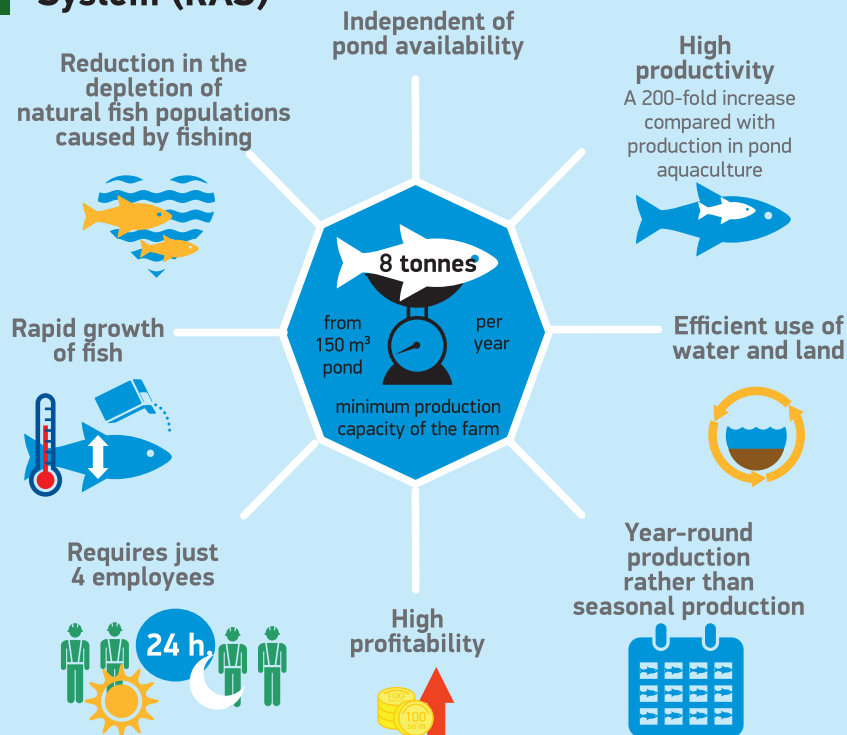
*According to data provided by specialists from Scientific and Experimental Station on Fish Breeding in Uzbekistan

The main reason for fish stock reduction is Over-regulation of rivers

Over-regulation of rivers conflicts with a biological cycle of natural reproduction of fish.



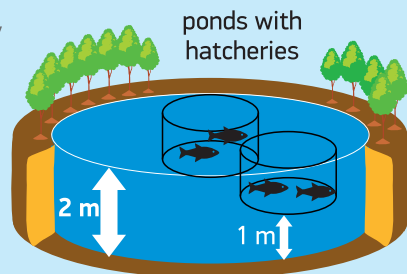
Advantages of a Recirculating Aquaculture System (RAS)



Intensive aquaculture versus conventional pond aquaculture

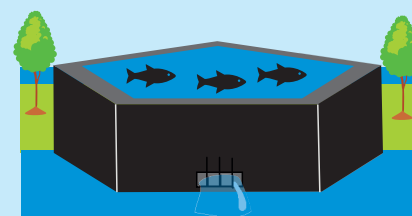
Fish breeding hatchery

in the existing ponds larger than 0.5 ha with a depth of not less than 2 m. The technology requires the use of added feed. The productivity is around 100-200 kg/m³/year



Flowing-water pools

near rivers, canals and other ponds in sloped landscapes, gravity can be used to move water through flowing-water pools

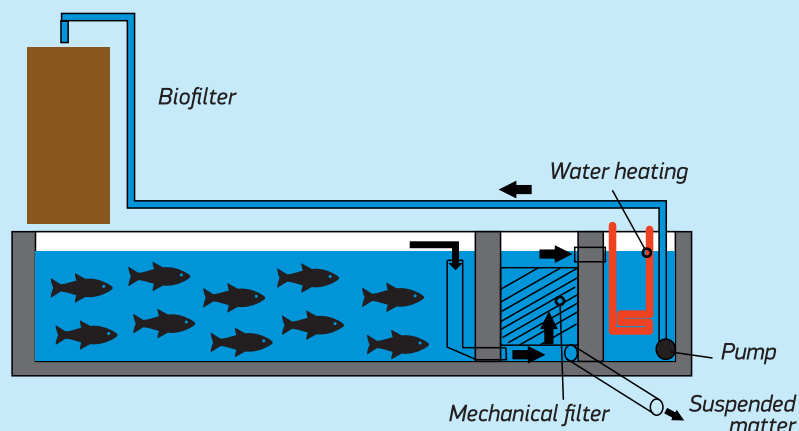


Recirculating aquaculture system (RAS)

In RAS, an artificial pond is equipped with a water circulation system, filtration and heating. Water is recirculated in a closed cycle.

The RAS can be built anywhere a guaranteed power supply exists, and is not limited by pond availability.

Diagram of a recirculating aquaculture system

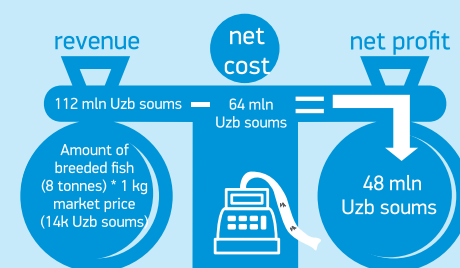


Costs and benefits of RAS



net cost of 1 kg of carp
= 8 000 Uzb soums

Market price of 1 kg
of carp = 14 000 Uzb soums



Revenue, net cost and net profit for a RAS producing 8 tonnes of fish per year in an area of 150 m², the minimum area required to guarantee profitability and return on investment within 3 years.



Cost of fish eggs
12 mln Uzb soums



Cost of fish feed
(70% of the cost of production) 12k kg,
feed coefficient of 1.5
40 mln Uzb soums



other costs
employee salaries



heat and electricity

= 64 mln Uzb soums

*For further detail about intensive aquaculture, visit our website: www.sgp.uz where technical manuals and financial calculations are provided.

For questions regarding intensive aquaculture technologies, please contact Mr. Ibragim Khalilov: mobile tel.: +998 90 906 65 66
Mr. Bakhtiyar Kamilov: mobile tel.: +998 93 396 12 69
e-mail: bkam58@rambler.ru



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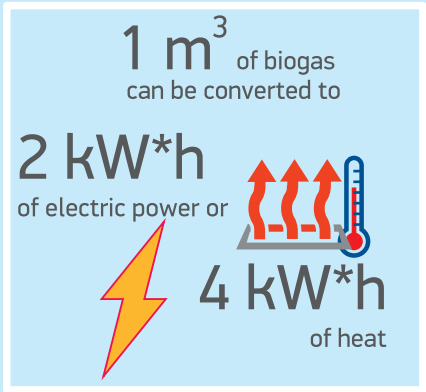
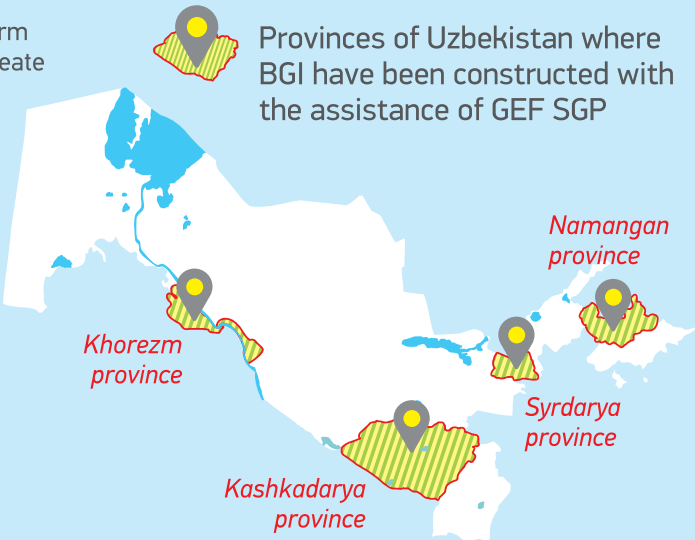
www.uz.undp.org

BIOGAS INSTALLATION (BGI)

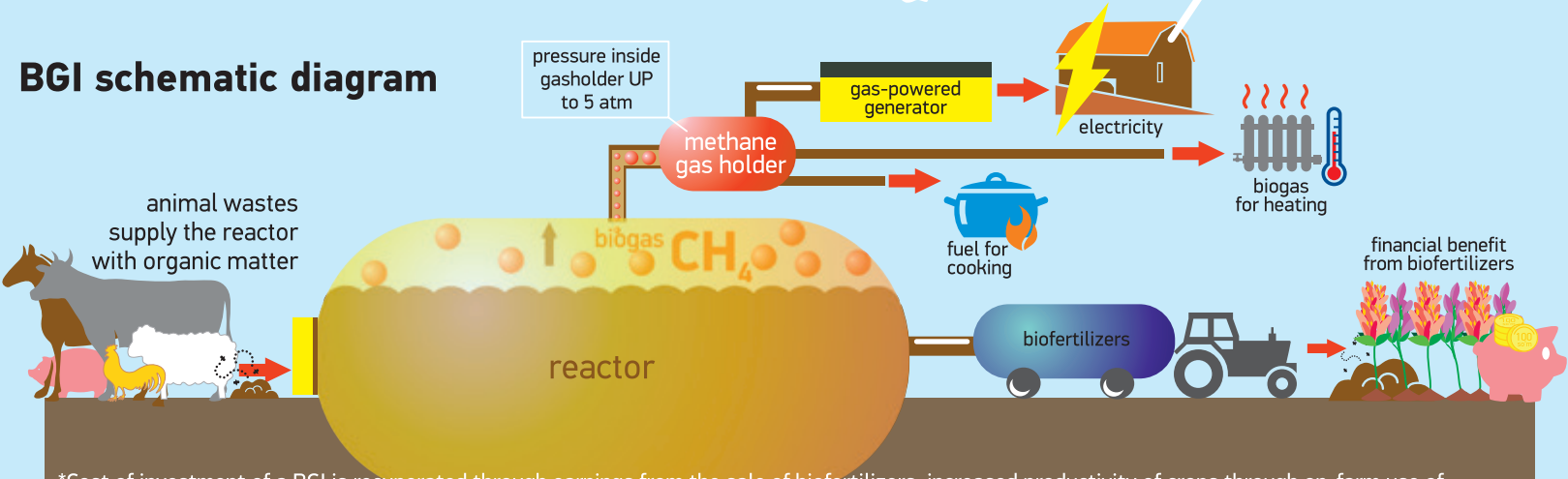
Biogas installation: a facility that uses on-farm animal wastes and other organic wastes to create biogas and biofertilizers.

Potential areas for BGI construction with GEF SGP assistance:

- Navoi
- Bukhara
- Samarkand
- Republic of Karakalpakstan
- Surkhandarya
- Jizzakh
- Fergana
- Andijan



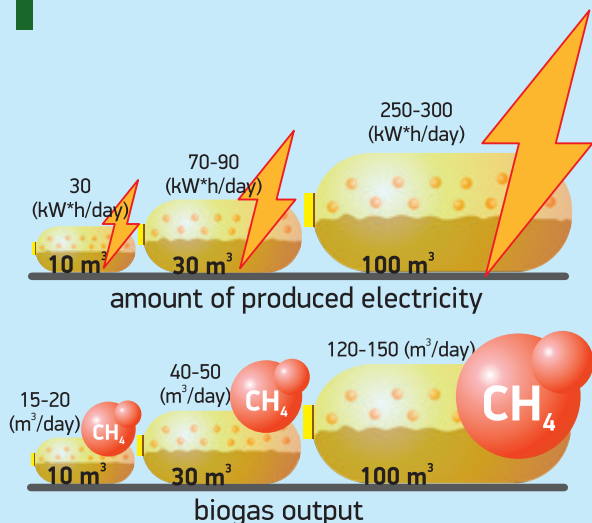
BGI schematic diagram



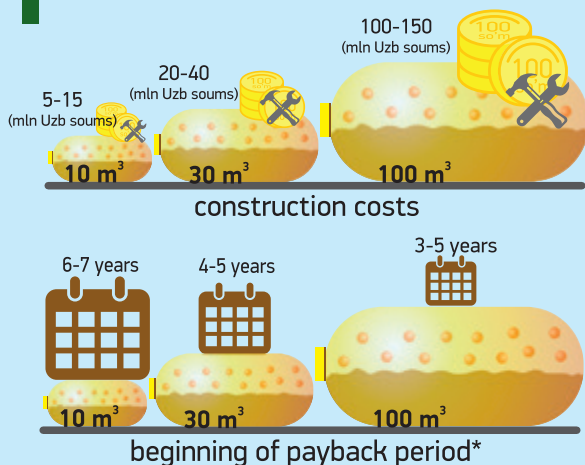
*Cost of investment of a BGI is recuperated through earnings from the sale of biofertilizers, increased productivity of crops through on-farm use of biofertilizers, and improvement of production processes made possible by a stable and reliable supply of energy



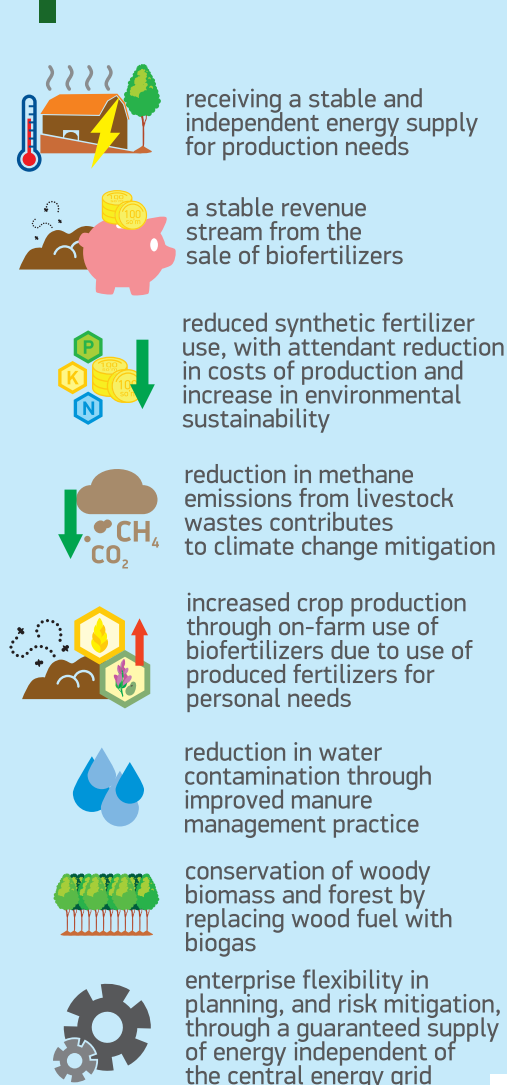
Production from reactors of different sizes



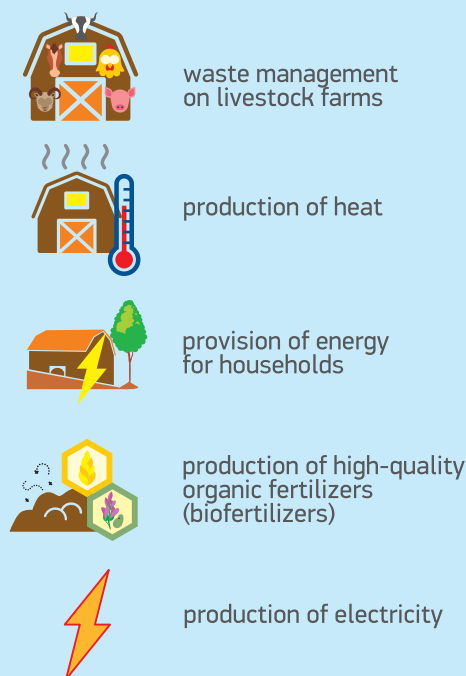
Construction costs



Benefits of BGI



BGI is a good alternative for:



More detailed information about BGI is available at:

www.sgp.uz and www.leds.uz

For questions regarding BGI, please contact:

Ms. Irina Dergacheva: mobile tel.: +998 90 358 37 39; e-mail: dergacheva_iv@mail.ru

Mr. Pulat Salikhov: mobile tel.: +998 98 128 46 26; e-mail: pulatboy@mail.ru

GEF Small Grants Programme in Uzbekistan:

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+ 998 71 120 34 62

mobile tel.: + 998 93 381 00 82

e-mail: alexey.volkov@undp.org



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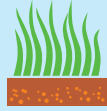
www.uz.undp.org

INFORMATION PORTAL FOR FARMERS AND DEKHKAN HOUSEHOLDS

What the portal is needed for



for establishing [business] contacts between producers and partners, and suppliers; and for exchange of information



for a wide access to sustainable and efficient agricultural technologies



information support for solving problems of agricultural producers

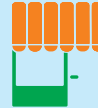
Web portal users and visitors



Farms



Entrepreneurs, sales representatives



Bulk buyers



Insurance companies



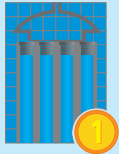
International agricultural products buyers and importers



Logistics companies



Research centers



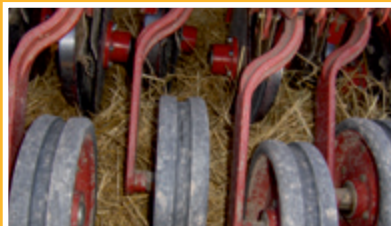
Financial institutions



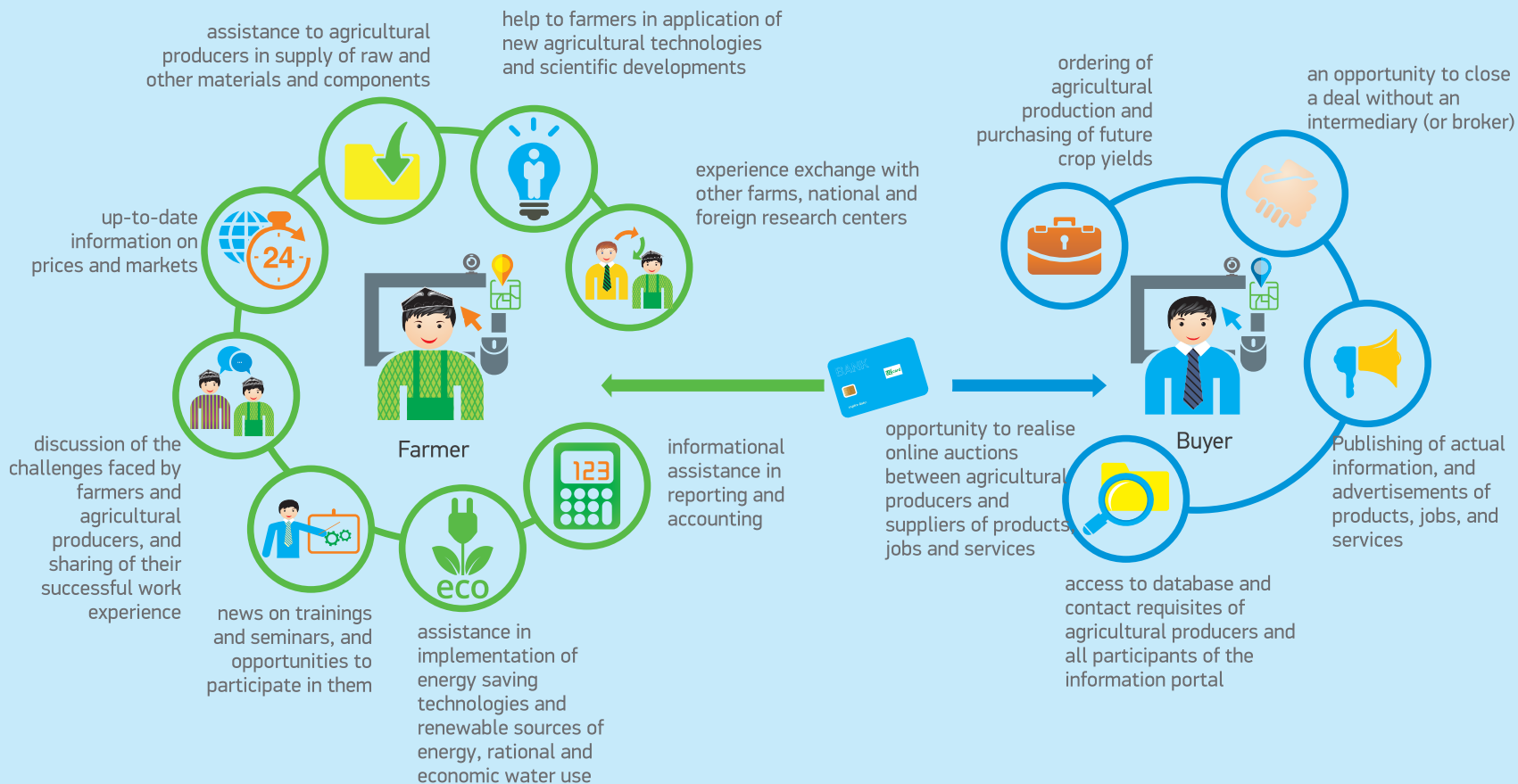
Producers of ecological products



Suppliers of agricultural equipment and technologies



What the portal gives to visitors



On using the web portal, please contact Mr. Umid Inagamdjanov:
 mobile tel.: + 998 94 645 47 91
 e-mail: inagamdjanov@outlook.com
and GEF SGP in Uzbekistan:
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 mobile tel.: + 998 93 381 00 82
 e-mail: alexey.volkov@undp.org



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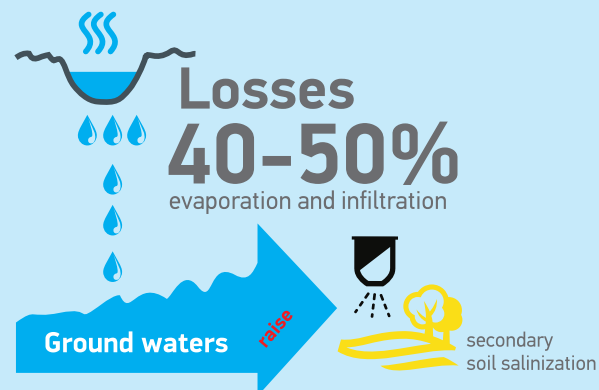
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REVOLVING FUND FOR WATER LOSS REDUCTION

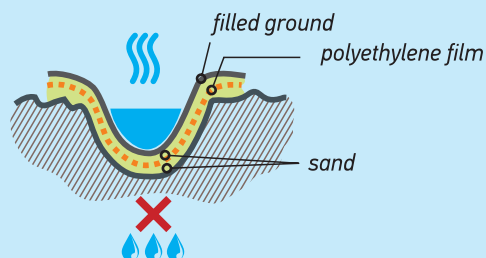
Current status of water management

Amu Darya
100%

efficiency not more than
0,46-0,56



Suggested solution



the technology has been tested in the context of GEF SGP in 2009-2012 by the employees of the Urgench State University on the "Navruz-yap" canal

efficiency
0,56 **0,89**
increase by
1.5 times

save
4 mln m³
per 1 km of canal
+
no need for water pumps additionally
276 ha
received water (per 1 km)

32
mln soums
cost of isolation of
1 km of canal

at the same time
technology allows
to save money
on electricity
to increase crop yield



Farmers do not hurry to invest [in the technology]

due to the scale **(20 km)**
it will be possible to reduce the cost of anti-infiltration measures up to
21,5

mln soums
per 1 km



Expected results of the project implementation

80 mln m³

annual water savings

per **20 km** of canals

will receive hydro isolation

Technology implementation will increase the crop yield and will allow to gain additional profit of

75 per 1 km
mln soums

free-flow regime of canal will allow to abolish the use of water pumps

Savings on electricity **60 000 kW** per 1 km

will reduce environmental pollution

CO₂

will reduce costs on electricity bills just after the first year of technology exploitation (**7 mln soums**)

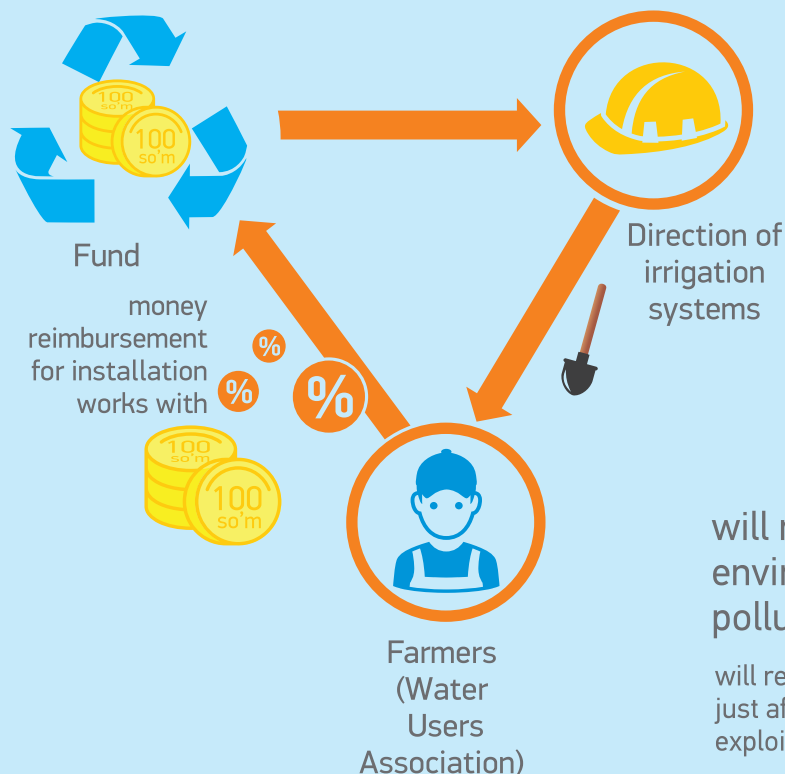
will improve the meliorative condition of

1878 ha of lands

15%

will increase crop yield

Work flow chart



GEF Small Grants Programme invites interested district and regional Farmers' Unions, Water Users Association, and regional municipalities (khokimiyats) to test the technology of work of the revolving fund for the purpose of isolation of the irrigation canals. It will be especially interesting for the regions with problems in water supply.

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GREEN MINI-TECHNOLOGIES

The advantages of solar ovens



Can be quickly constructed, using simple materials at hand



Allows for the cooking of a wide range of meals (including baked bread rolls)

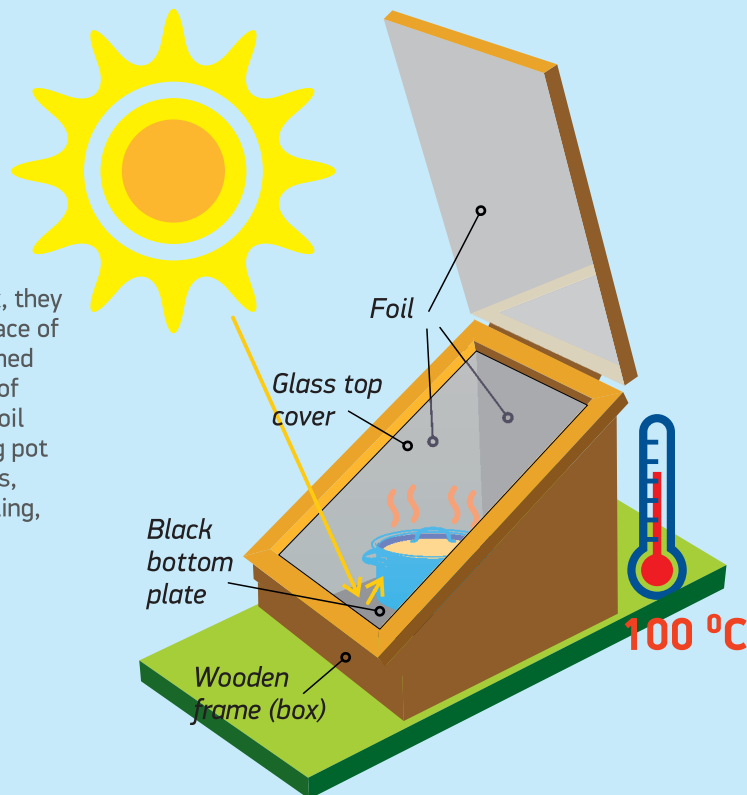


Saves money, as there is no need to purchase wood or fuel (it can save up to 600 kg of wood per year, or 4 trees!)



How Solar ovens work

When sun rays get into the box, they are absorbed by the black surface of the bottom plate and transformed into thermal energy. The sides of the box covered with foil; this foil reflects the rays on the cooking pot placed inside. As a result of this, as well as due to hermetic sealing, the temperature inside the box becomes suitable for cooking.



Fuel bricks and their advantages

Fuel bricks are pressed biomass or certain types of waste. This is a good alternative to wood used for regular home heating. These bricks can be produced using a briquetting machine.

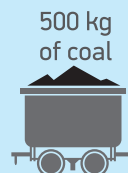


Raw materials used for fuel bricks include the following: weeds, leaves and lops, peelings of grains, waste of wood processing, oil production and farming as well as organic household waste.



Burning 500 kg of fuel bricks gives thermal power equal to

1 household raw materials = for 500 kg of fuel bricks which can replace 1 m³ of wood fuel



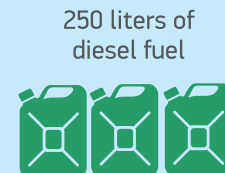
500 kg of coal



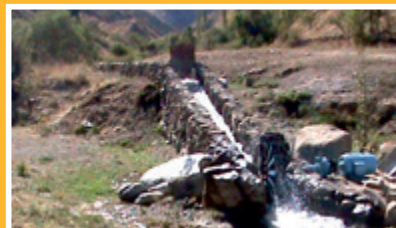
800 kg of wood fuel or 5 trees



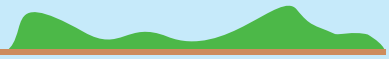
240 m³ of natural gas




250 liters of diesel fuel




The design and advantages of micro hydro power station




No natural landscape and environment disruption occurs during construction and while in operation



No negative impact on the water quality: it does not lose its natural properties, and it can be used for the public water supply.



It provides a constant water supply to consumers during all seasons



Micro hydro power stations can be both constructed, and put in operation within a short period of time


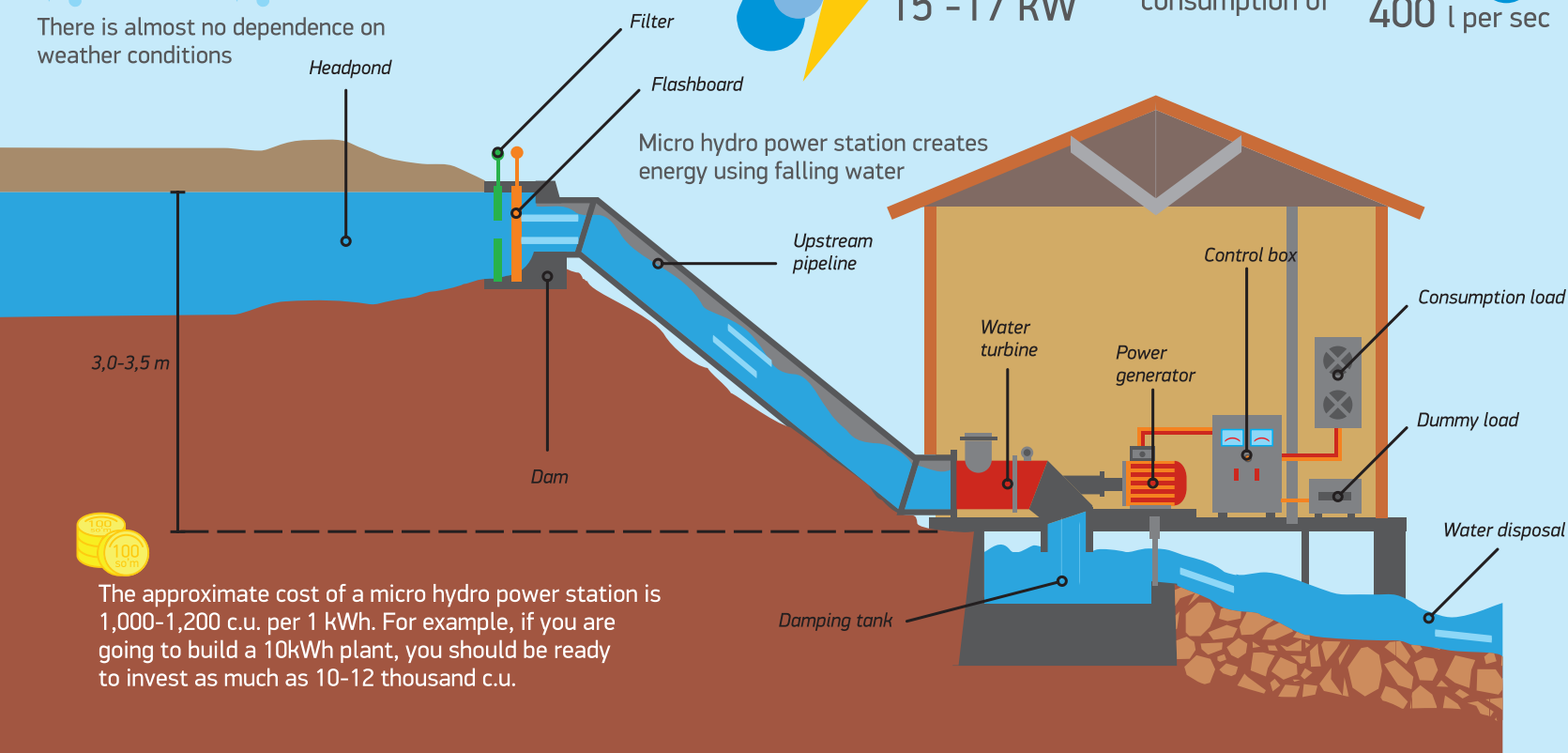


There is almost no dependence on weather conditions



average power
15 - 17 kW

at average water
consumption of 250 - 400 l per sec



The approximate cost of a micro hydro power station is 1,000-1,200 c.u. per 1 kWh. For example, if you are going to build a 10kWh plant, you should be ready to invest as much as 10-12 thousand c.u.

For questions about the construction of mini technologies, please contact GEF SGP in Uzbekistan:

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AGROFORESTRY MEASURES FOR THE PREVENTION OF DEGRADATION IN PIEDMONT AND MOUNTANEOUS AREAS

Causes:

the tilling of mountainous slopes



livestock overgrazing

falling trees and shrubs



Problems:

the formation of destructive mudflows, and soil erosion.

road construction in mountain areas, and the undercutting of slopes using typical bulldozers without specialized machinery



A solution...



to prevent mudflow hazards, and ensure erosion control situation of

50-60%

of areas that should be forested.

Crop cultivation possibilities

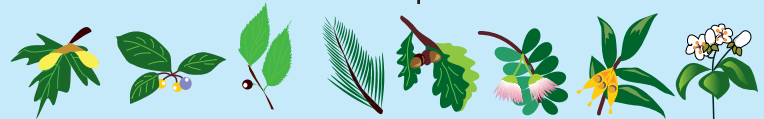
Fruit crops



Apples, Cherry plums, Almonds, Walnuts, Pistachios, Pears, Apricots and Hawthorn

Please note that fruits should be planted at the distance favourable for growth; this is because they require species-specific space to maximize sunlight. The correct amount of space results in more effective fruit ripening, and higher yield.

Forest species



Native species: Semenov's maple, buckthorn, hackberry

Non-native species: Crimean pine, oak, acacia, ailanthus, mahaleb

Forest species can be planted more densely than fruit crops. Dense planting increases their capacity to combat the erosion and degradation of soil. Dog rose and barberries are the best plants to plant in space between rows.



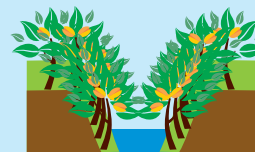
additional timber



profit from fruit yield

The benefits of long-term ecological security of local areas and prevention soil erosion due to longevity growth of the forest's trees.

How to cultivate forest species



forestation on streambeds



These species can create of terraces on mountain slopes.

This planting results in the creation of ravine-protecting, coast protecting, and flow regulating plants; this is important on slopes that are already eroded.



Types of tillage:

on gentle slopes with a degree less than $< 8^\circ$

In this case, tillage is not applied and for prevention of the surface flow and soil erosion; instead, the crop planting is preformed in the same manner as it would be on a plain; the techniques, however, would depend on the farming of a given crop.

... Tillage terracing

The slope degree is more than $< 10-15^\circ$

Tillage is implemented using several approaches; this includes the use of a plough, and it involves permanent dumping down the slope.

Tillage by strips in places where the slope degree is not more than $10-18^\circ$

The width of a ploughed belt, and of spaces between strips, depends on the slope and the soil steepness; the more steep the slope is, the wider the strip (and, the area for the absorption of surface flow). Wild vegetation is left on untilled lane (the field boundary) to prevent erosion.

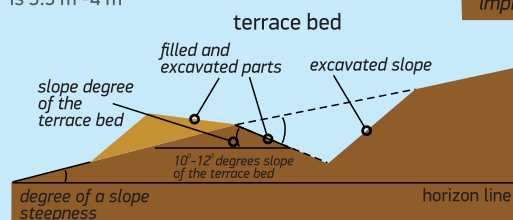
Excavated and filled terraces

$< 12-30^\circ$ slope degree is between

The terrace width is determined by the growing conditions.

in the case of forest species, the belt width is 2.3 m - 2.5 m

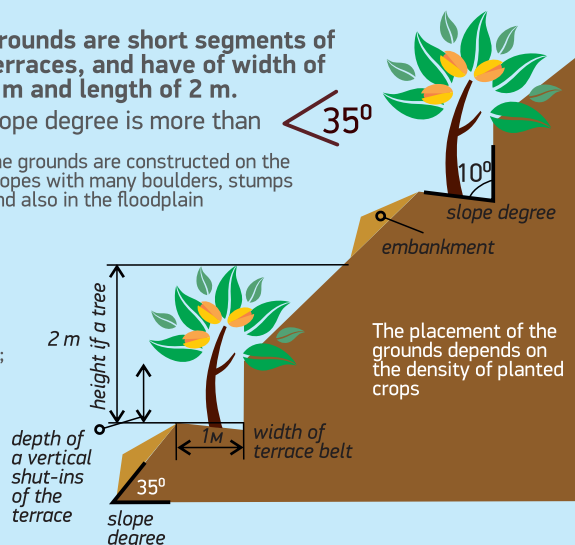
in the case of fruit species, the width is 3.5 m - 4 m



Grounds are short segments of terraces, and have of width of 1 m and length of 2 m.

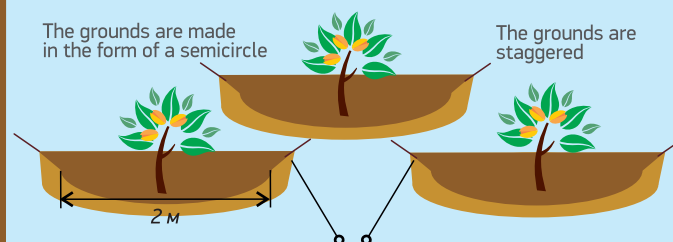
slope degree is more than $< 35^\circ$

the grounds are constructed on the slopes with many boulders, stumps and also in the floodplain

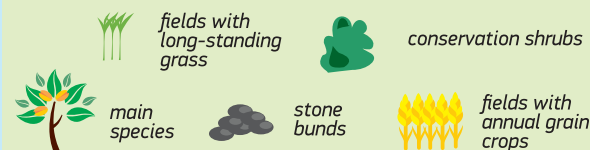
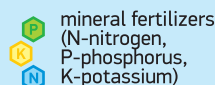
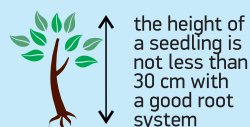
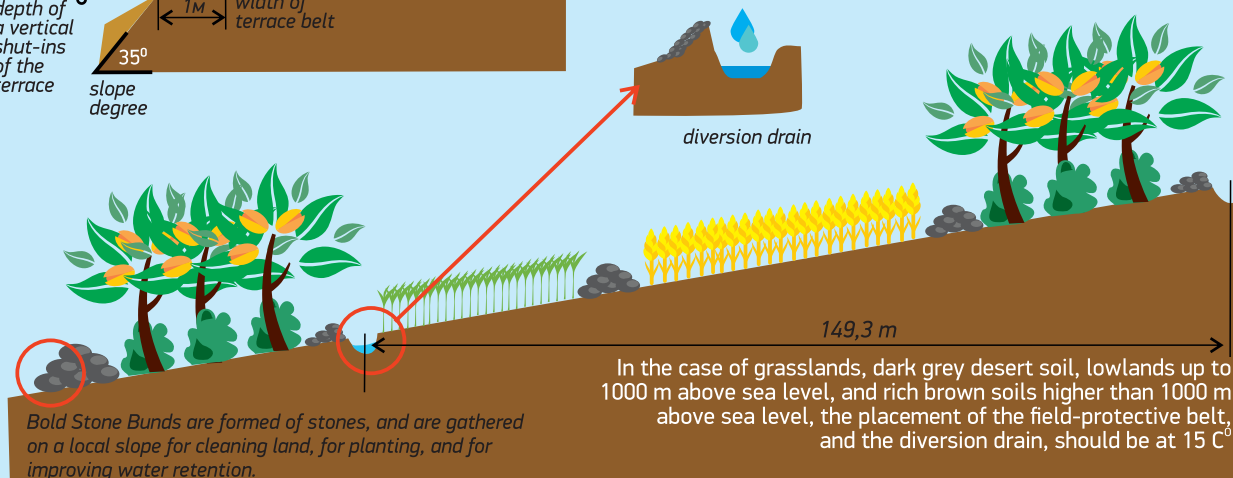


The grounds are made in the form of a semicircle

The grounds are staggered



If the distance between plantings is big, then "spurs" can be created on the ground (from angles); this increases the ground bed, and the interception of water flow



For questions regarding the agroforestry measures and species for these measures, please contact Mr. Evgeniy Butkov:

tel.: +998 71 225 72 32

mobile tel.: +998 90 969 62 32



www.sgp.uz

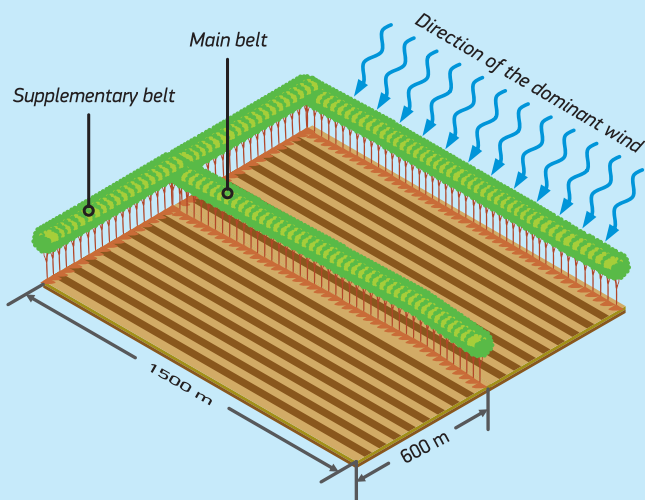
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FIELD-PROTECTIVE BELTS AND HABITATS OF NATURAL POLLINATORS AS AN INDICATOR OF AGRICULTURAL CROP IMPROVEMENT

Field-protective belts consist of several rows of trees and bushes that protect fields from wind erosion and improve their microclimate.

Abatement of the wind velocity influences all other microclimate parameters of the area, such as air humidity, the temperature of air and soil, and conditions for biodiversity existence.

Structure of the field-protective belt system on the plough land



Main issues of saving land capacity



Aridization

of the soil and the surface air brings changes in the structure and removal of the fertile topsoil



Wind erosion

is one of the main factors for loss of both the fertile topsoil and its capacity



Loss of crop

Summer wind with low air humidity and high temperature leads to loss of the crop

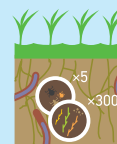
Advantages of the field-protective belts on irrigated and dry lands and their benefits for nature



Crop yield and quality of the crop is increased by up to 15-20%



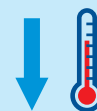
Wind velocity is decreased by 34-38% and humidity of the surface air is increased by up to 5-9%



Increase of biodiversity and landscape capacity contribute to growth of the soil microfauna



Decrease of the wind velocity halts the loss of the topsoil



Air temperature is decreased by 1°C in the summer and soil temperature drops down to 1.2°C



Lowering the groundwater level leads to decline of resalinization

For more details about field-protective belts, please visit GEF SGP website www.sgp.uz



Natural pollinators are the guarantors of the country's food security.

Natural (wild) pollinators eat nectar and pollen of plants and, like melliferous bees, help agricultural crops to breed. Wild pollinators work closely to their nests.



Therefore, farmers should:

- create habitats for natural pollinators in the form of field-protective belts or virgin areas with wild vegetation;
- plant melliferous crops;
- attract local beekeepers or create their own apiaries for increasing the efficiency of cross pollination and, as a result, increasing of agricultural crop yield.

Importance of natural pollinators for agricultural crops

1 Cross pollination

2 Genetic diversity

3 Adaptation and sustainability of ecosystems to climate change

4 Yield increase up to 35% in some cases

More than **200 000** species help plants to breed. The more pollinators there are, the better the crop (in terms of quantity and quality).

Natural pollinators



Insects



Birds



Bats

For example, some varieties of cotton disclose the flowers at night and are pollinated by bats (i.e. the plant is adapting to its pollinator).

60-90%

of various plants require natural pollinators

Such types of plants include cotton, berries, watermelons, sunflower, alfalfa, cucumbers, tomatoes, various grass and weed plants.

For example: double benefit from the hoverfly (Syrphidae) and lacefly (Chrysoperla carnea)



Larvae of hoverflies and laceflies are predators that eat fruit aphid, various mites and eggs of some insects in large quantities, thus protecting plants from pests.



Adult hoverflies and laceflies are inoffensive vegetarians that eat nectar, honeydew, and pollen.

For questions regarding the establishment of field-protective belts, please contact Mr. Evgeniy Botman:

mobile tel.: +998 90 174-53-85

e-mail: darhanbek@yandex.com

For questions regarding the protection of natural pollinators, please contact Ms. Dilosa Daminova:

mobile tel.: +998 90 355 42 06

e-mail: botany@uzsci.net



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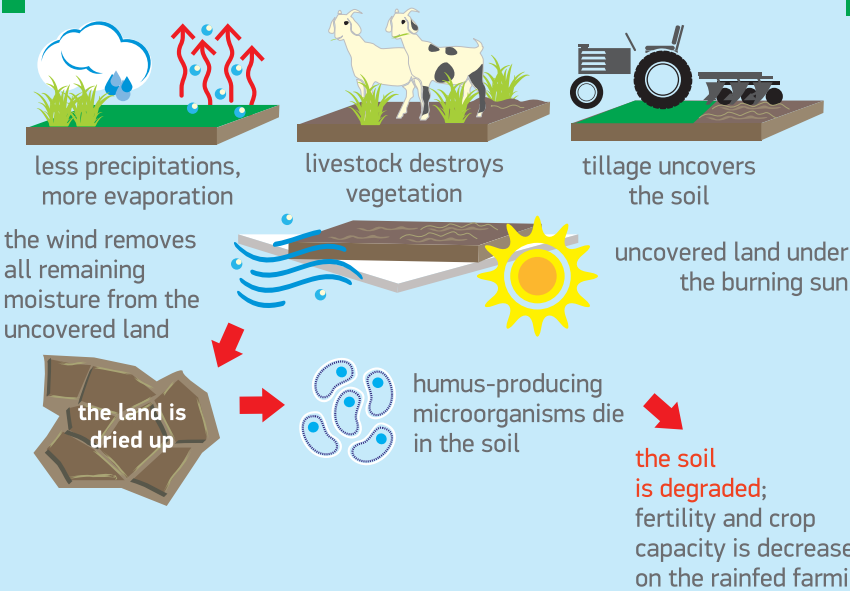
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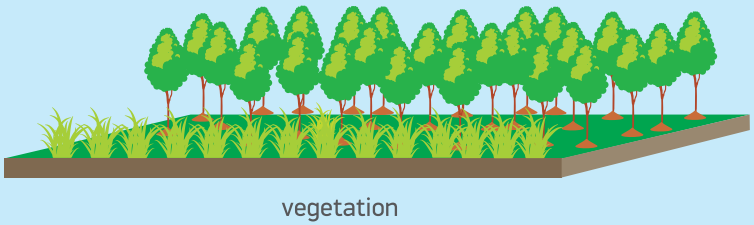
www.uz.undp.org

A GARDEN ON RAINFED FARMING LAND

What do we have on not irrigated land now?



What is necessary for rainfed farming lands?



How to create "healthy" rainfed farming lands?

Barriers



lack of water



expensive infrastructure for extraction, transportation, and consumption of water



few positive examples

What should be done?



Do not till rainfed farming lands



Cultivate dry cultures



Use mulch and always keep the soil covered and protected from burning sunbeams

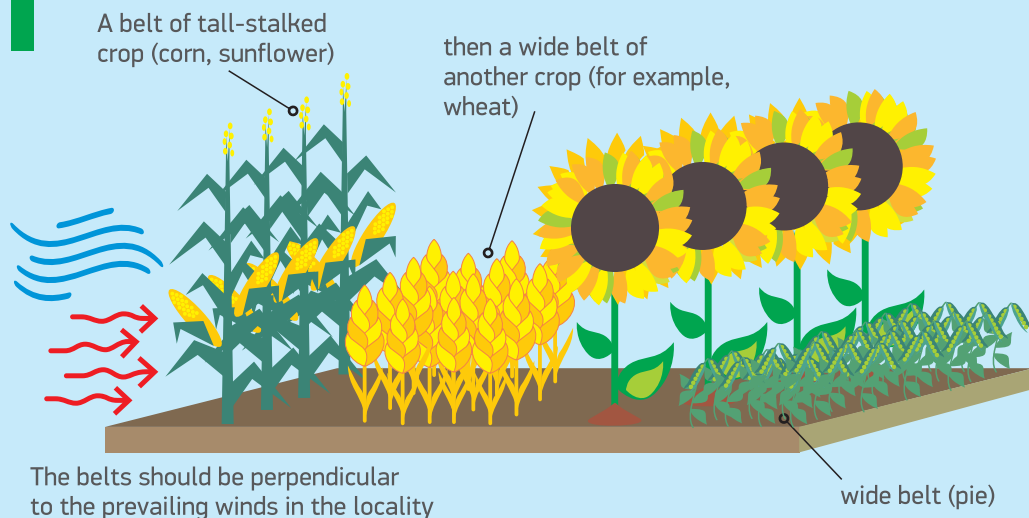


Create agroforestry and wayside systems on rainfed farming lands

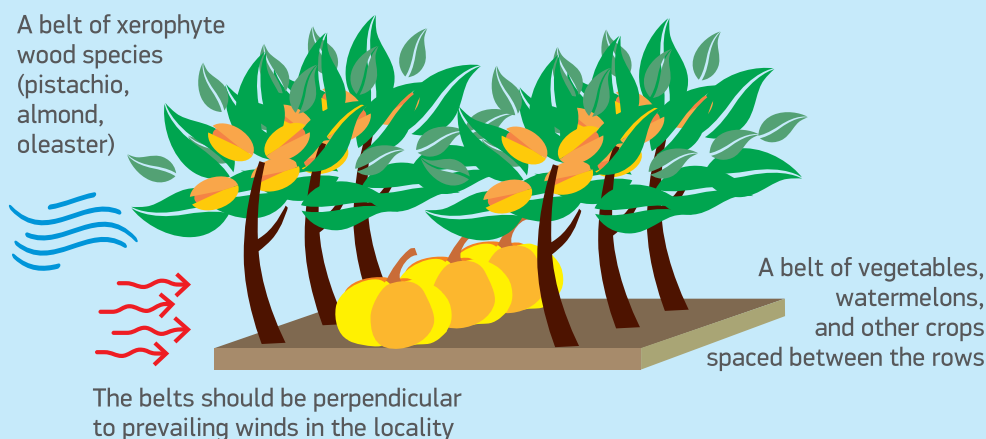
Example: In Australia a no-tillage practice was first introduced on rainfed farming lands in 1982 because a traditional tillage usually did not produce any crop. With the help of no-tillage, the wheat crop on rainfed farming lands equals 2.2 tons/ha in the presence of 250 mm of precipitation per year.



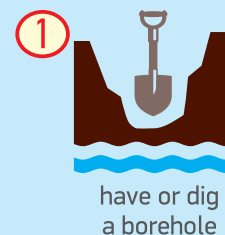
How to create wayside (flap) plantings?



How to create agroforestry systems?

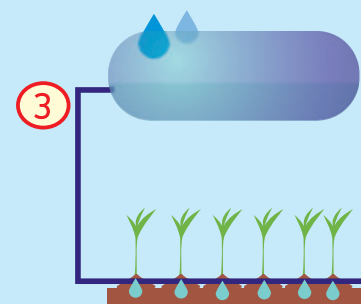
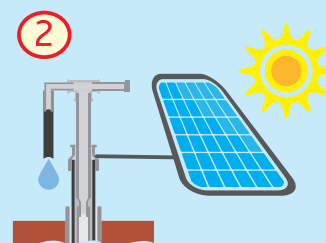


How to irrigate trees on rainfed farming lands?



There is no need for individuals who intend to implement an individual water intake from groundwater up to 5 cubic metres per day to get permission for boring.

Resolution of the Cabinet of Ministers RUz as of 4 August 2014 #214



For more information, please visit the GEF SGP in Uzbekistan website: www.sgp.uz

tel.: + 998 71 120 34 50 (additional 145)

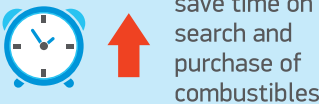
+ 998 71 120 34 62

mobile tel.: + 998 93 381 00 82

e-mail: alexey.volkov@undp.org

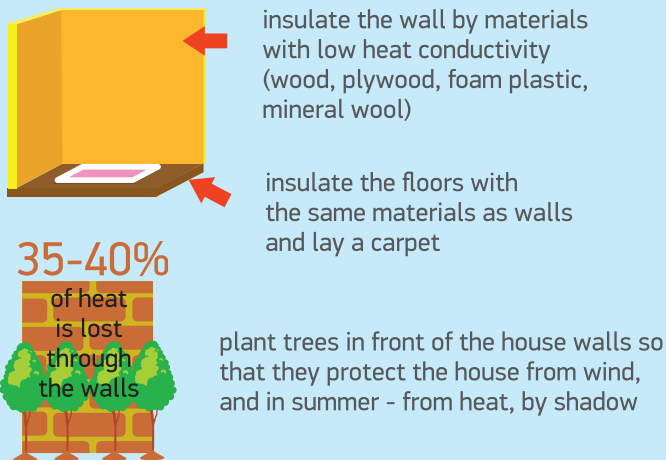
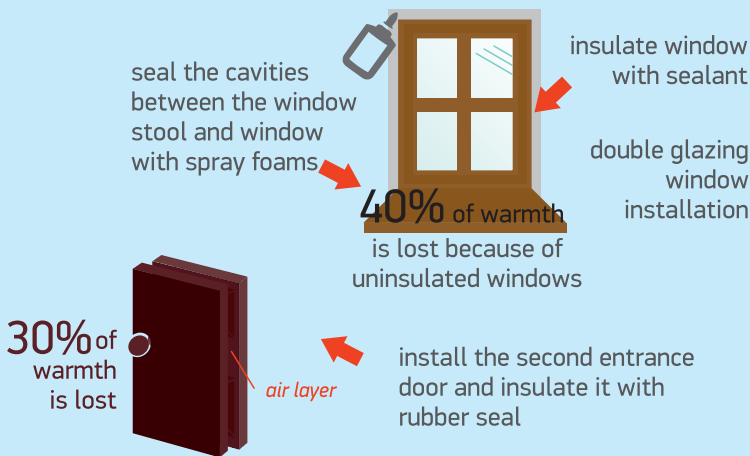
ENERGY EFFICIENCY IN RURAL AREAS

Energy efficiency will help you to:



How to realise it? There are a few ways:

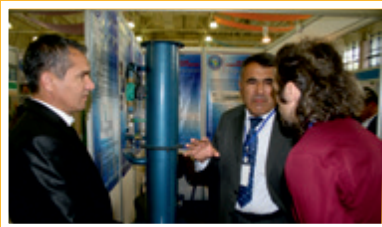
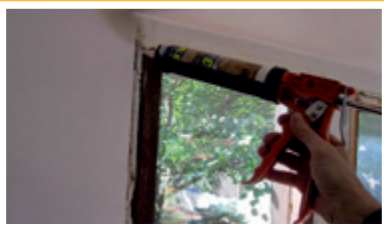
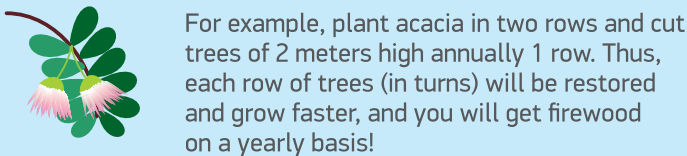
1. Thermal insulation in a house



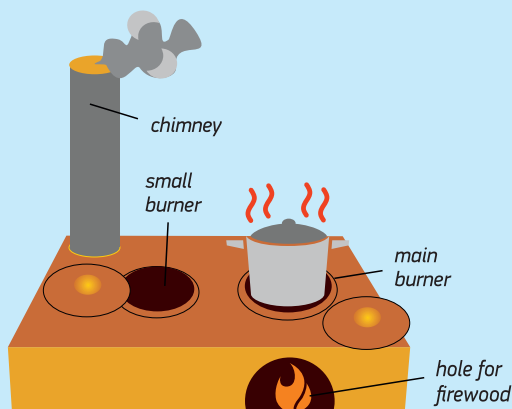
2. Annual trees planting for firewood



Calculate how much firewood your family consumes. Calculate how many trees would it be, and plant this quantity annually. In the coming years you can cut tree branches for firewood.



3. Efficient stove for food



puddle up the cracks of the stove so that the fire goes directly to food preparation



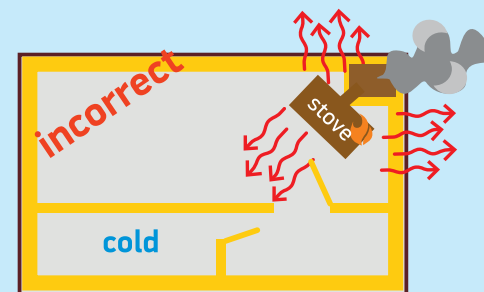
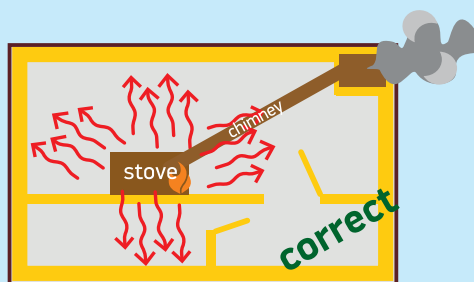
firewood consumption by 50%

If...
3-3,5
save
x 1 m³/year (4
of cut trees
)=
will be saved
12-14
millions
of trees

millions of rural houses in Uzbekistan

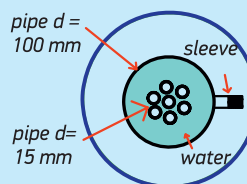
4. Efficient stove for heating

Stove disposition



install heat exchanger on the chimney of the wood stove:

More surface,
more heat!

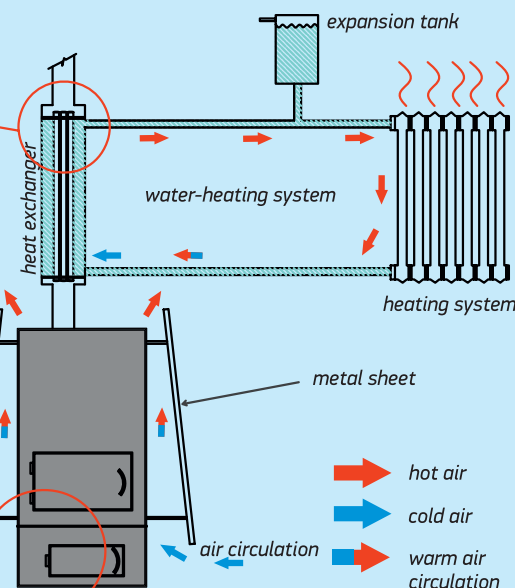


place "skirt" or weld
"crossbars" on the stove



saving of the firewood
because of the "skirt"
installation

for long-term heat
conservation, it is
recommended to
place firewood
closer to the door
and move ash deep
into the stove



More information can be found on:

www.beeca.net, www.uz.undp.org, www.sgp.uz, www.biom.kg

GEF SGP in Uzbekistan:

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PASSIVE SOLAR GREENHOUSES (PST) AS A SMALL BUSINESS FOR HOUSEHOLDS

The passive solar greenhouse is a type of greenhouse that captures and retains solar power in sufficient amounts for planting vegetables with no or minimal additional heating. Temperatures in the greenhouse during winter are between +5 and +15 C. It is constructed in such a way that captured solar energy creates a micro-climate suitable for year-round plant cultivation.

Advantages of passive solar greenhouses:



All-season planting



Low construction costs (approx. 10 mln soums per 2 acres)



Gas, wood and other fuels are not required for heating - only solar power is used



Does not require much time or money to operate



All expenses can be covered within two years if all requirements are met

Crops that can be planted in PST:



lemons



cucumbers



tomatoes



bell peppers



herbs



onions



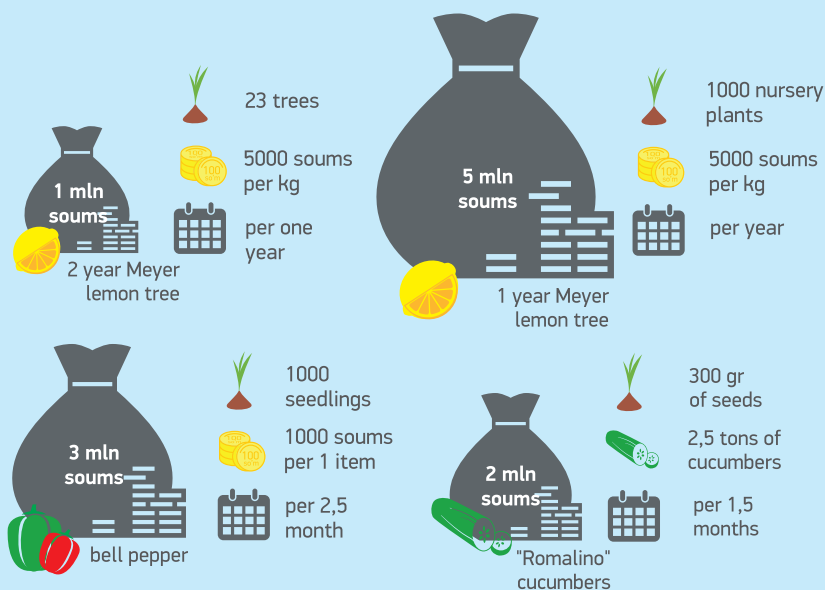
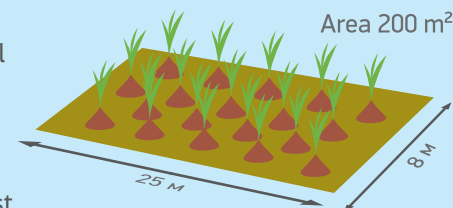
mushrooms



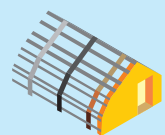
flowers

Profits from planting fruit and vegetables in PST - examples from the GEF SGP project

The largest profit is provided by bell peppers (also known as capsicum). The project has also demonstrated high profitability in growing Meyer lemons with vegetables planted in between the rows, giving the highest return.



100



Vents in the north side of the roof and in the door on the end walls of the greenhouse

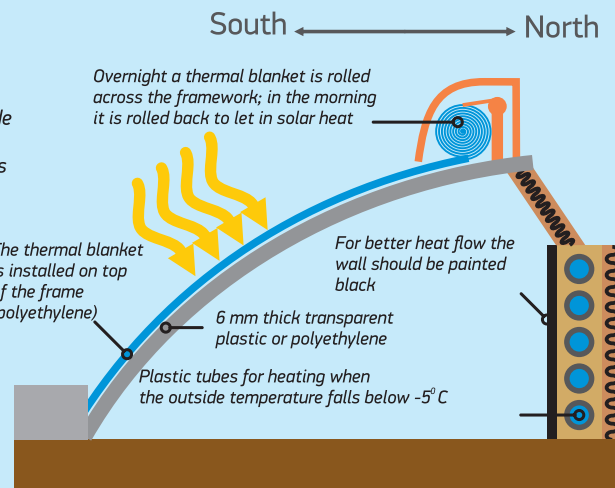
minimum
12-14

rear wall
thickness
must be
1 meter

plaster
with added

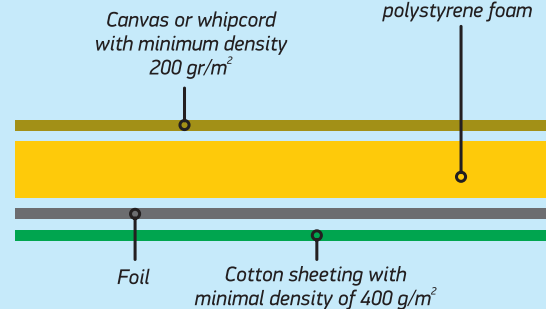
foundation of
M-150 concrete

ground water



1

Filler: sheep wool, PVC, batting or mineral wool, foil laminated roof felt, padding polyester or polystyrene foam



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DRIP IRRIGATION IN UZBEKISTAN

The GEF SGP experience in Namangan province

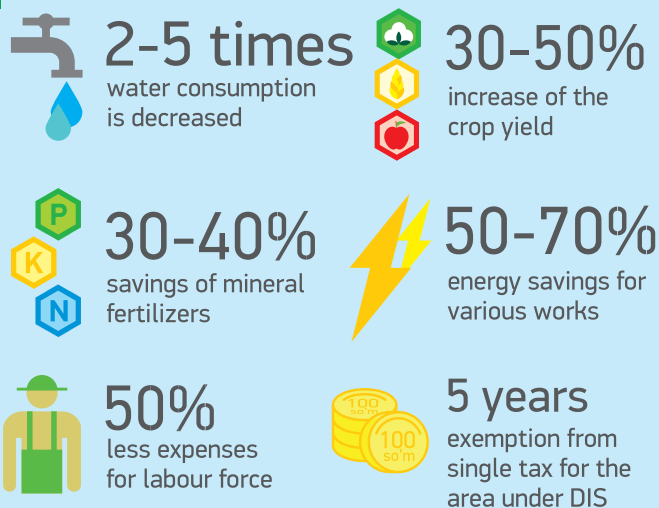
Drip irrigation is a system delivering water and required fertilizers directly to the root zone of an irrigated plant.

The amount and frequency of water supply is regulated in accordance with the needs of a plant.

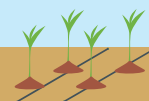
Water is delivered to all plants evenly in the required and equal amount, without floods and water loss.

Besides, huge losses of water due to evaporation during delivery of water to the plant are decreased.

Advantages of drip irrigation system



on farming and dehqan farming lands with area 44.5 ha

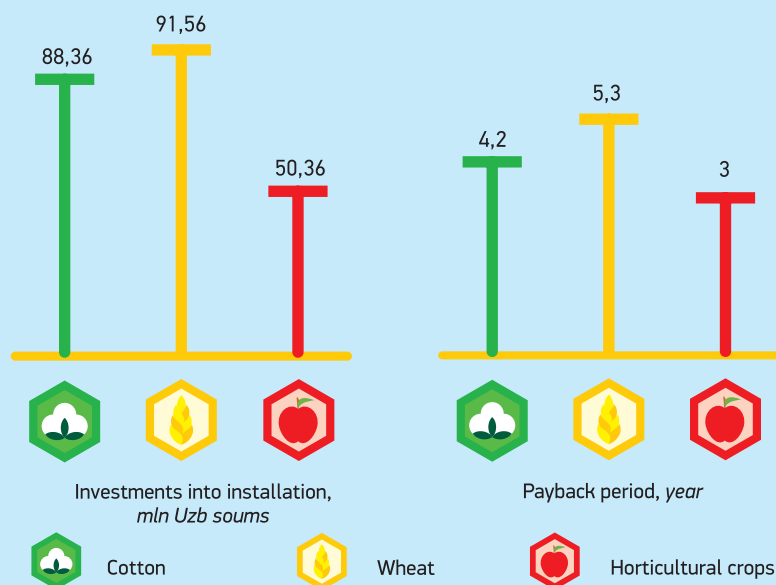


during 1.5 year

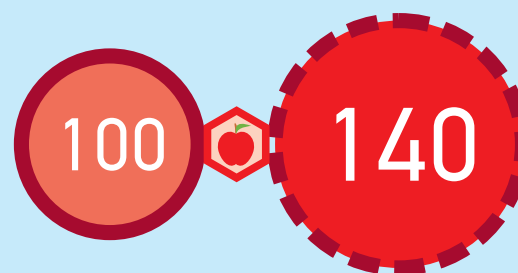
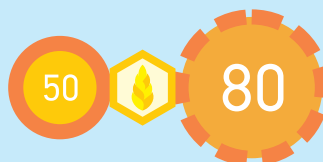
The systems produced in Namangan province have been already installed in the farming lands in some districts of the Fergana valley and Tashkent province that are involved into intensive horticulture (apple, peach, cherry trees) and cultivation of almond and pistachio.



Recoupment of funds invested into drip irrigation system



Crop capacity in cases of traditional irrigation and drip irrigation, c/ha

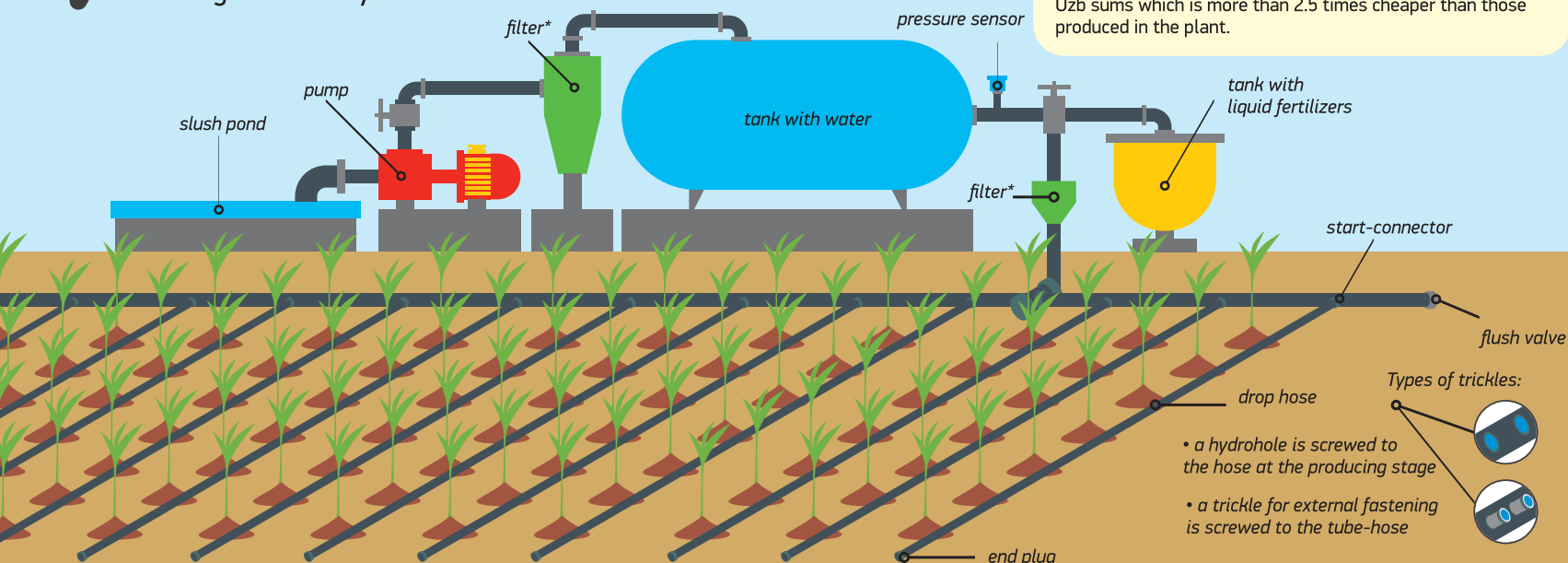


Construction of the drip irrigation system



DIS operation life for cotton (wheat) field - 10 years, for garden - 20 years

* A. Boltabaev, a producer of drip irrigation systems started to produce a cheap alternative of filter washer FS-35/5 with a capacity equaling to 90 m³/h. Price of the filter is 1.5 mln Uzb sums which is more than 2.5 times cheaper than those produced in the plant.



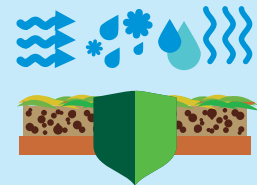
For questions regarding the drip irrigation system, please contact the producer in Namangan province
Mr. Abdulvohid Boltabaev:
 cell: +998 93 495 11 98
 e-mail: abdulvohid.b@mail.ru

CONSERVATION FARMING

GEF SGP experience in Karakalpakstan

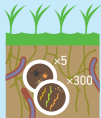


No-tillage is an alternative method of land cultivation for cropping without tillage or other operations by directly seedling crops with a special seeding-machine for soil covered with a mulch of plant residue from the previous yield.



Mulch is ground (with the use of KIR-1.5) and equally distributed plant residue composed of straw and green manure crops that protect soil from excessive heating, retain moisture, reduce salinity, and enrich it with valuable organic material.

Advantages of no-tillage



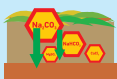
Recovery of soil fertility

All methods of no-tillage contribute to biological activity in soil which activates processes of recovery of soil fertility.



Restoration of soil moisture

Mulching helps to preserve moisture and allows plants to use it efficiently during the vegetative period, thus reducing the need for irrigation.



Reduction of seasonal saline accumulation

Preserved plant residues decrease evaporation from soil and reduce seasonal saline accumulation by 1.6-4 times in comparison with a plot without vegetation.



Increase of profitability

Due to the decrease in tillage activities (only direct seedling) and mulching, the following expenses are reduced: fuel, machinery use, material, labour and time, while crop yield is increased.

Factors affecting soil fertility



Excessive mechanical processing

leads to grinding of the soil particles and higher level of wind erosion.



Absence of crop rotation

impoverishes the soil, depletes humus and contributes to the appearance of harmful pathogens.



Removal or combustion of plant residues

from fields leads to soil dehydration, loss of fertility and deterioration of the soil structure.



Excessive use of water

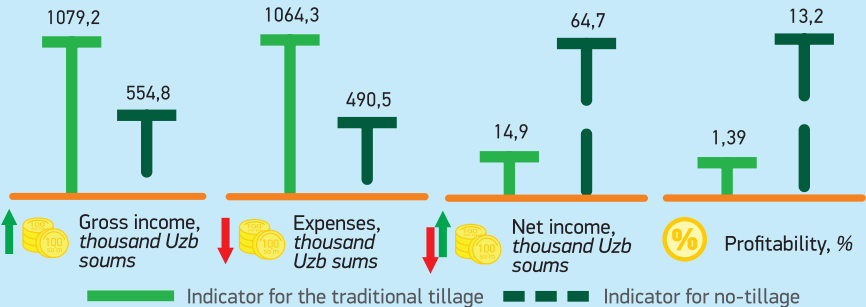
leads to washing-out of useful minerals and nutrients from the soil.

Cost efficiency example: cotton cultivation in Karakalpakstan



Crop yield, c/ha

Cotton crop yield was lower due to an initial distrust of farmers of the technology and their unwillingness to spend water testing it. These results were attained when fields with no-tillage were irrigated with two fewer waterings during summer than for typical fields. Usually, in the case of equal crop irrigation, crop yield with the use of no-tillage is almost equal to or even higher than with traditional tillage although even with lower crop yield the profitability of no-tillage was higher.



No-tillage efficiency index



amount of
extracted humus
after cotton yield

For humus recovery the following
is required at minimum:

11-14 tons of
dung per 1 ha



amount of
recoverable
humus from
1 ton of dung

6 tons of
mulch per 1 ha



amount of
recoverable humus
from 1 ton of mulch

Retention of soil moisture
due to mulch:

233,4-
276,9 m³/ha

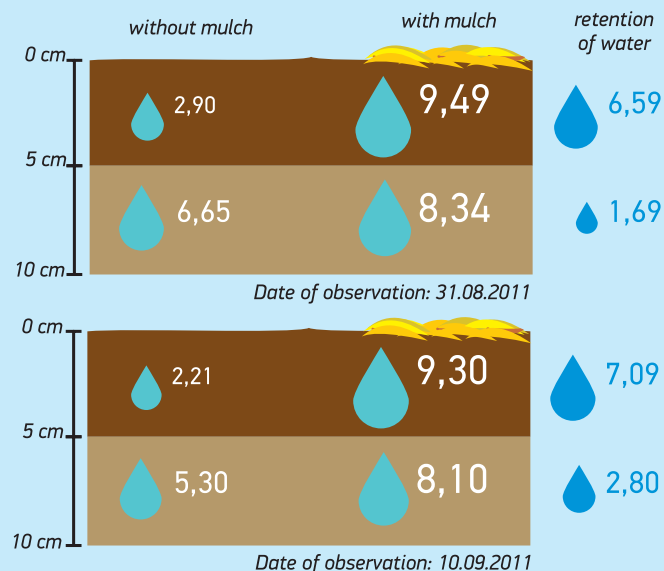
Water saved in the case of mulching
during the annual flushing of salt
from the soil:

1000
m³/ha

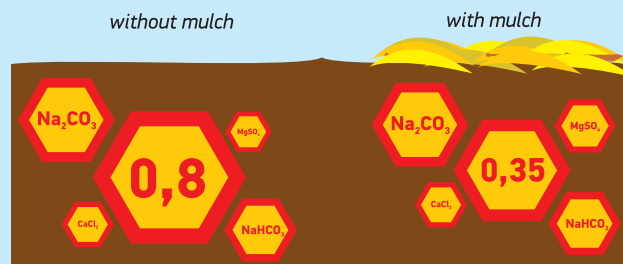
Total amount of water saved by
preserving the soil moisture during
the growing season and due to
the reduction in saline accumulation
by mulch:

2000
m³/ha

Effect of mulch on the soil moisture in %



Average salinity of the soil, % by solid residue



For questions on the introduction
of no-tillage technology, please
contact Mr. Bakhitbay Aybergenov:

cell: +998 90 575 05 14

e-mail: aybahit@rambler.ru

and Mr. Oybek Egamberdiev:

cell: +998 91 571 72 39

e-mail: oybek_72@yahoo.com

kkrass@ymail.com



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ECOTOURISM AS A WAY TO PRESERVE BIODIVERSITY IN UZBEKISTAN

Please take nothing but pictures, leave nothing but footprints

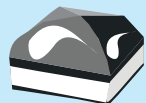
Ecotourism: Travel to fragile and pristine natural sites with ecological and sometimes cultural significance, with the goal of allowing visitors to learn about and appreciate the value of what they are seeing, while maintaining low negative impact on the site, providing funds for conservation and preservation activities, and opportunities for local engagement and empowerment.

The principles of ecotourism



preservation of the natural site that is visited

satisfaction in the tourist, in experiencing the natural site: seeing, understanding, making changes in behaviour toward preservation



involving and empowering the local people and increasing their income through the ecotourism activities

small scale and low traffic to ensure protection of the natural site



a mechanism for supporting the conservation effort: visitors spend money during the visit, and the funds are used for rehabilitation and preservation of the natural site



Benefits from ecotourism

for the country:



opportunities to rehabilitate and preserve natural sites through income generated when the ecotourists pay to experience the site and the educational activities at the site



cultural traditions, heritage and sites are often linked to important natural sites, and are part of the attraction of the ecotourism experience, creating opportunities to preserve culture and heritage as well



raising the national profile abroad through awareness of ecotourism experiences contributes to increased tourism of all kinds



creates opportunities for provincial investments where the natural sites are located

for local people:



creates new income opportunities



acts as a stimulus to the preservation of cultural traditions because they add value to the touristic experience



brings richness to the experience of local people through widening contacts, cultural exchange and the learning of foreign languages



increased awareness and understanding of the importance of conservation of natural sites and the environment

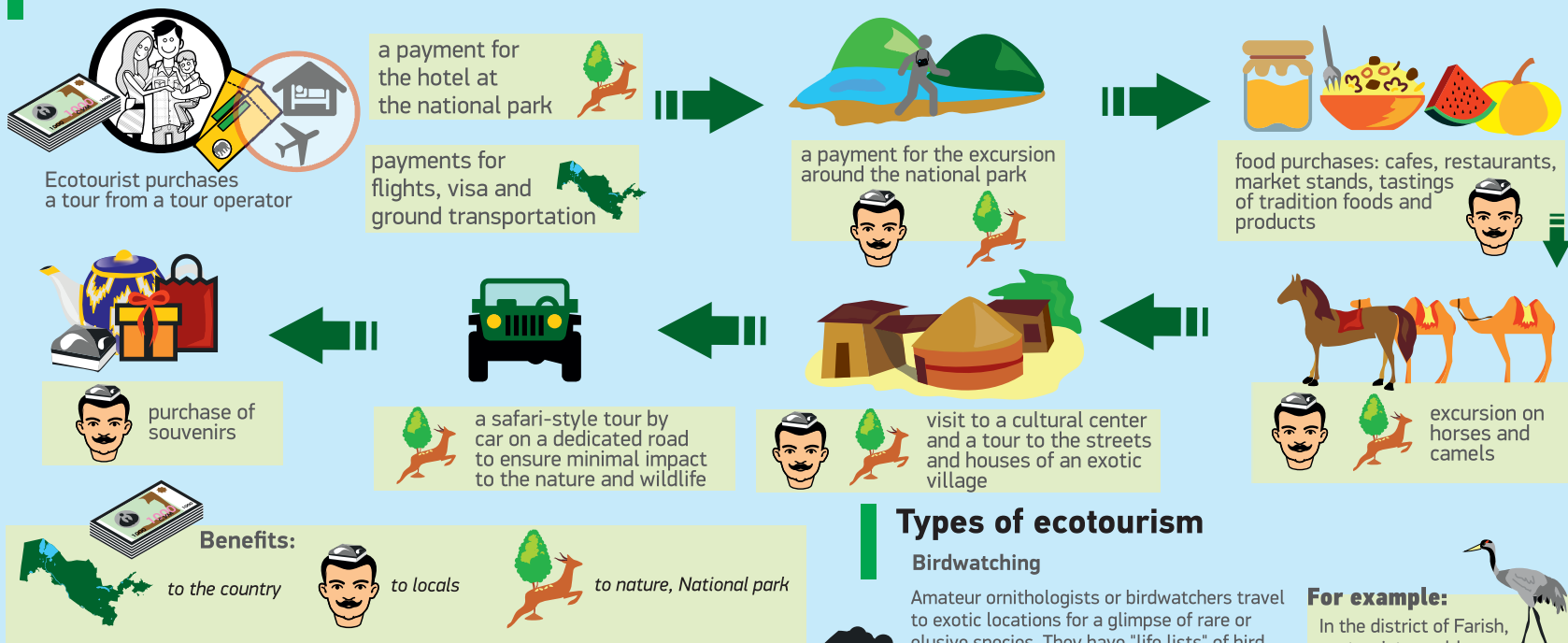
benefits for tourists:



ecotourists acquire new knowledge about nature, environment and culture in another country, and this accompanies them through life and their future actions



Example: distribution of benefits of a visit to a national park by an ecotourist



What is there for an ecotourist in Uzbekistan?

Ecocenter "Jeyran"



over 250 species of plants including old growth grove with trees many centuries old

over 257 species of birds

1200 species of invertebrates

39 species of mammals including herds of wild horses and gazelles

20 species of reptiles

18 species of fish

1 night in a hotel

a standard room with kitchenette and shower costs 20 000 UZS/day/person for citizens of Uzbekistan, or 20 USD for foreigners

detailed calculations for various tours and accommodations are available at the Ecocenter website:
<http://www.ecocenter.uz/eks>

Types of ecotourism

Birdwatching

Amateur ornithologists or birdwatchers travel to exotic locations for a glimpse of rare or elusive species. They have "life lists" of bird species they have seen, and will often spend significant amounts of money for the opportunity to add to their lists.

For example:

In the district of Farish, ecotourists could experience the pre-migratory gatherings of Northern Cranes.



Photography tours or photo hunting

Photographers and amateurs alike travel to exotic destinations to photograph landscapes and scenic views. In photo hunting, photographers shoot animals with their cameras rather than guns.

For example:

Photo hunting - a contest for the best photo of lizard, caracal, Ustyurt mountain sheep, hyena, snow leopard and others



Botanical tours

Plant lovers travel the world for the opportunity to study exotic flora in its natural habitat, and often document their expeditions in photo catalogues.

For example:

Find as many types of tulips or astragalus as possible and take their photos; exploring the saxaul bush ecosystems; or to experience the relict walnut forests



If you have an interest in participating in the development of an ecotourism project in Uzbekistan, please contact the GEF Small Grants Programme in Uzbekistan:

tel.: + 998 71 120 34 50 (additional 145)

+ 998 71 120 34 62

cell: + 998 93 381 00 82

e-mail: alexey.volkov@undp.org



The GEF Small Grants Programme

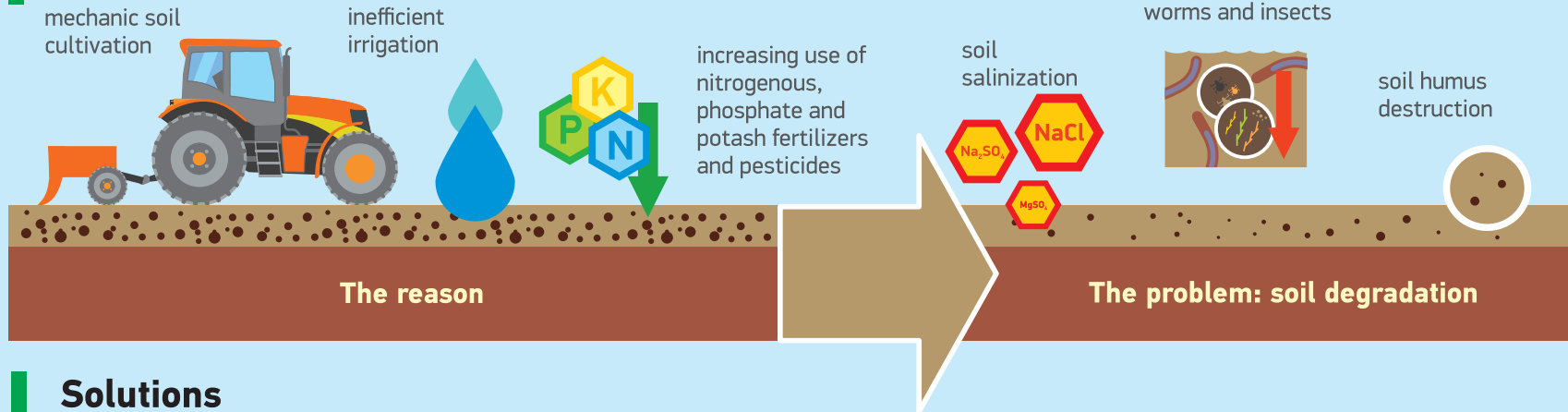


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Current state of the agriculture



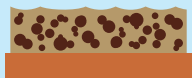
Solutions

The transition from intensive technological methods of soil cultivation to organic farming includes:



no-tillage, mulching and crop rotation

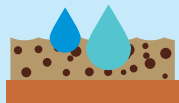
Organic farming helps to improve the physical properties of soil. It provides for:



self-loosening



preservation of moisture in soil



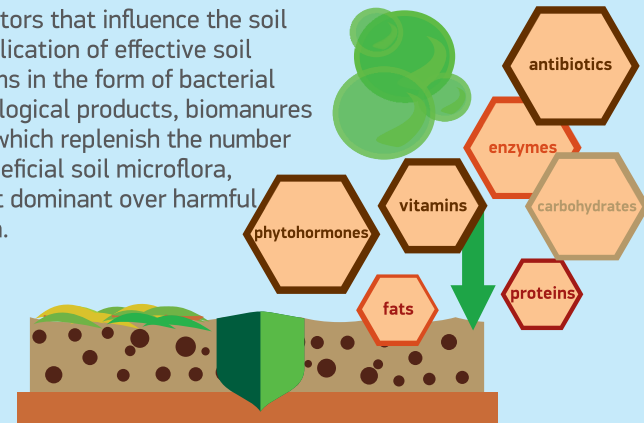
increasing water permeability



decreased soil erosion

The increasing concentration of organic substances enhances soil microbiological activity, improves its agrochemical and agrobiological state.

One of the factors that influence the soil fertility is application of effective soil microorganisms in the form of bacterial fertilizers, biological products, biomanures into the soil, which replenish the number of natural beneficial soil microflora, thus making it dominant over harmful soil microflora.

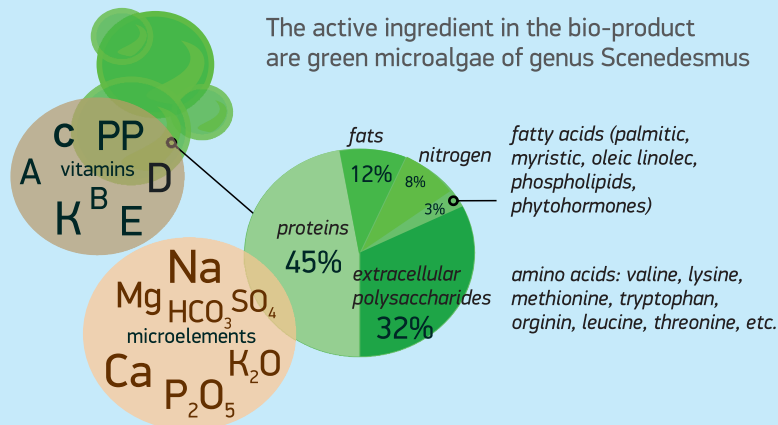


Serhosil: Composition and Advantages

Application of a new ecologically safe and growth stimulating biopreparation Serhosil, created at the Institute of microbiology of the Academy of Sciences of the Republic of Uzbekistan, is one of the means which can help to solve the agricultural problems.

(patent # IAP 04933, 2014 y.)

The active ingredient in the bio-product are green microalgae of genus *Scenedesmus*



water usage is reduced by 20-30% due to decrease in plant transpiration and soil water evaporation



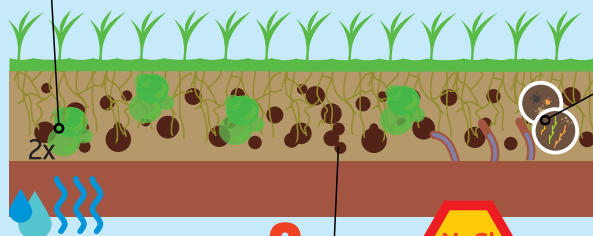
the mineral fertilizers usage is reduced by 25-30% due to improvement in photosynthesis and better leaves and soil nutrition



when pathogenic bacteria and fungi, which cause diseases in plants, animals and humans, die, the soil becomes healthy and fertile, yield and quality of agricultural production increase, population health improves

algae breed rapidly

up to 20 mln cells per 1 cm²



the surface membranes of seaweeds can have anti-erosion value and affect the water relationships of the soil



the higher, plants' immunity the less is their morbidity, vermin effect, and endurance of weather changes

favourable conditions are created for breeding of beneficial soil microorganisms

O₂

the humus content in the soil increases, and soil becomes enriched with oxygen



while growing, micro-seaweeds absorb readily soluble mineral salts, which are processed by micro-seaweeds, then they are disengaged and afterwards they are assimilated by the roots of plants

I'm a farmer! I want to produce Serhosil myself.



What should I do?



build a small greenhouse for seaweed farming, according to the requirements of the Institute of Microbiology



obtain a license from the Institute of Microbiology of the Academy of Sciences of the Republic of Uzbekistan



purchase stock culture, nutriment, and instructions for processing a bio-product

On bio-fertilizer's production and use, please contact Ms. Gulnara Dzhumaniyazova:

tel.: +998 71 262 14 38

mobile tel.: +998 90 318 25 59

e-mail: gulnara2559@mail.ru, nigora_1967@umail.uz



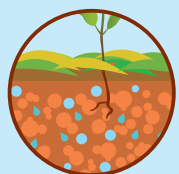
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LAND MELIORATION PUT SIMPLY

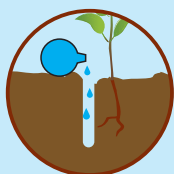
Melioration (lat. melioration - improvement) - are practices aiming at improving soil characteristics, increasing its productivity.

Melioration types or what to improve:



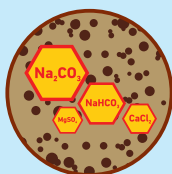
Strive against deterioration of water and air permeability and soil compaction

1 2 3 4 6 7 8



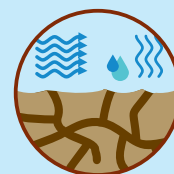
Achieve optimal soil moisture content (with the help of) irrigation or drainage)

2 3 5 6 7 9



Strive against excessive salt concentration in soil

2 4 7 8 9



Reduce water and wind erosion of the fertile layer of soil

3 5 6 7



No-till - sowing seeds without prior soil tillage.



Mulching - refinement of plant remains and covering of the soil with the remains.



Cover crops - at every moment soil should be covered with growing plants. It is advisable to use beans (legumes) as secondary crops.



Organic fertilizers - are necessary to be applied for restoration of the lost soil organic matter. Application rate - is not less than 10 ton/ha. [It should be] combined with mulching and green manuring.



Field protective forest belts - reduce the speed of surface wind, while preventing from soil moisture loss, wind erosion of the fertile layer of soil.



Efficient watering techniques - watering provides for optimal (without excess or shortage) soil moisture content for plants growth and crop yield.



Green manuring - ploughing green matter of specially cultivated secondary crops (green fertilizers) under the soil in order to enrich the soil with organic matter/humus.

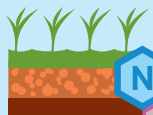


Crop rotation - rotation of crop in order to achieve better systematic effect on crop yield of all the crops.

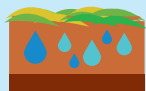


Effective water supply - isolation of canal bottom and improved water allocation within Water Users Association.

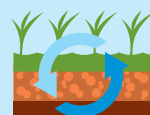
When applying these methods of melioration, you can achieve:



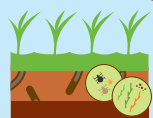
Enrichment of the tillable layer of soil with organic matter



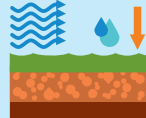
Retention of the essential soil moisture, without increasing water consumption



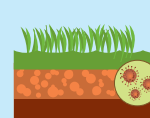
Improvement in soil self-loosening, increase in water and air permeability



Increase in the activity of beneficial soil micro flora



Lower the loss of fertile layer of soil caused by wind and water erosion

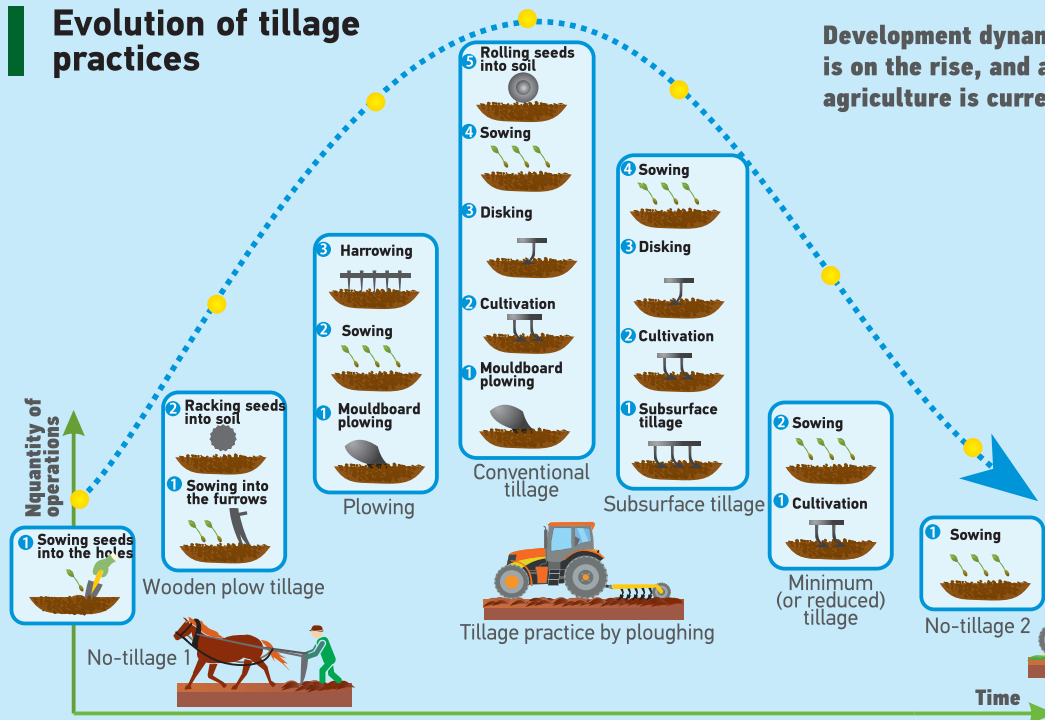


Decrease in number of weeds and plant diseases

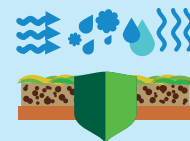
You can preserve and increase soil fertility, and this means more crop yield in the future!



Evolution of tillage practices



Development dynamics of soil protective agriculture is on the rise, and according to FAO this type of agriculture is currently applied on approximately



125 mln ha of tillage, which is **9%** of all arable lands in the world on all continents and agricultural and economic zones



Decrease in fuel and lubricants costs and in other costs by **30-50%**

Sources: 1. Kurdyumov N.I. "Mastery of [soil] fertility", ID VLADIS, Rostov/D RIPOL Classic, Moscow, 2008, 512 pages.
2. naturalworld.ru

Efficient watering

Currently, from the water source it is taken **2** parts of plants' biological need for water

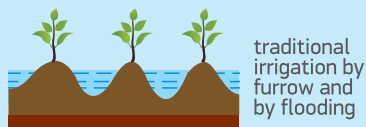


It is possible to take **1,4** part of plants' biological need for water **without canals' reconstruction**



with regard to soil characteristics, depth of occurrence of groundwaters, and time (hour) of watering

It is necessary to abandon gradually [the practices of]



On melioration practices, please contact the **GEF Small Grants Programm in Uzbekistan**:
tel.: +998 71 120 34 50 (additional 145)
websites: <http://water-salt.ru>, <http://water-salt.narod.ru>, www.sgp.uz



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MICRO HYDRO POWER PLANT (HPP) FOR SMALL BUSINESSES

Micro hydro power plant (micro HPP) is a technology for obtaining electricity using energy from minor watercourses.

Capabilities for building HPPs in Uzbekistan*

Prospects of small hydroenergetics in Uzbekistan, bln kW*h per annum

4,07 bln kW*h per annum worth of undeveloped capabilities



1,85 bln kW*h per annum is the volume of electric power produced by minor rivers, reservoirs, and channels



656 rivers

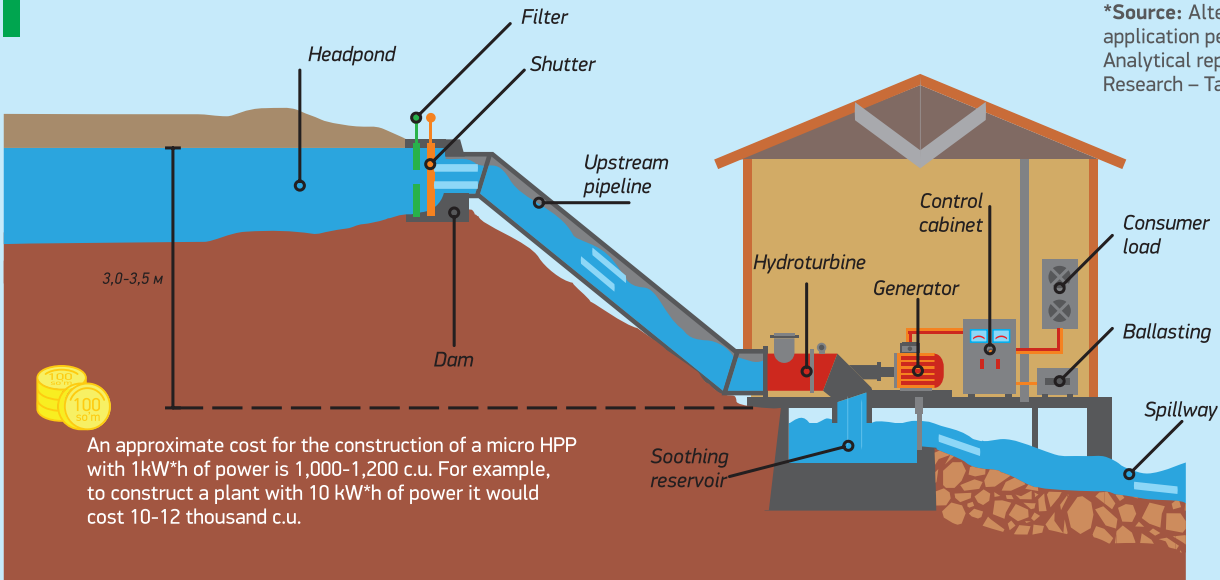
Can be built on large and medium rivers 250 big and medium HPP

1100 small HPPs on tributaries

98 on channels and collectors 42 on water reservoirs



Micro hydro power plant scheme



*Source: Alternative sources of energy: application perspectives in Uzbekistan Analytical report by the Center of Economic Research – Tashkent: CER, 2011

Micro hydro power plant produces electricity from the energy of falling water

average power generated is 15-17 kW

average water supply flow rate is 250-400 liters per second

An approximate cost for the construction of a micro HPP with 1kW*h of power is 1,000-1,200 c.u. For example, to construct a plant with 10 kW*h of power it would cost 10-12 thousand c.u.



Advantages of micro hydro power plants



landscape and environment are not destroyed during construction and operation



absence of negative influence on the water quality: it does not affect initial natural quality and can be used as a water supply for the population



practically no dependence on weather conditions

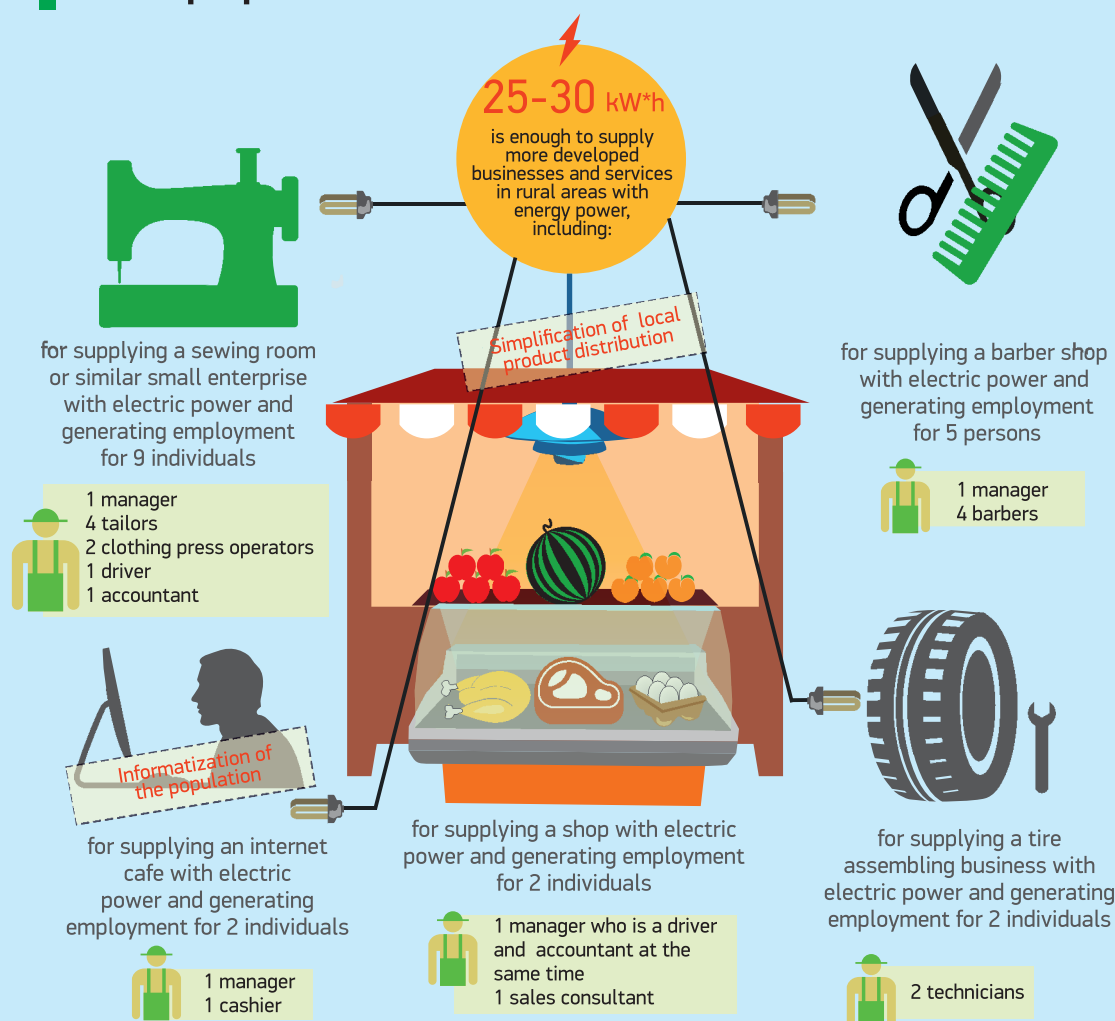


consumers are supplied with cheap electricity at any time of the year



micro hydro power plants can be established and launched in a short time period

Micro HPP for small businesses in rural areas: What purposes can ONE micro HPP serve?



! ONE micro HPP with a capacity of 25-30 kW*h can supply power to ALL the businesses mentioned above and generate 20 job placements.

For questions on construction of micro hydro power plants, please contact Mr. Rustamjon Tashmuradov:
mobile tel.: +998 91 601 53 14
e-mail: atashmatov75@mail.ru
and Mr. Rakhmatulla Shodiev:
mobile tel.: +998 90 360 51 02
e-mail: ogmachit@mail.ru



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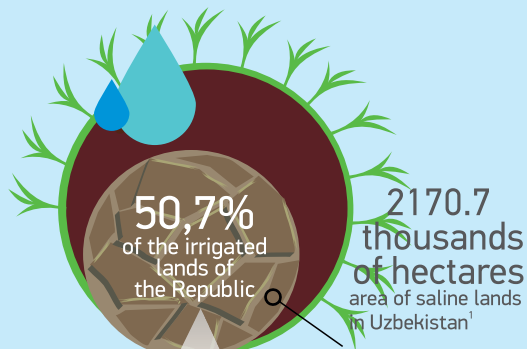
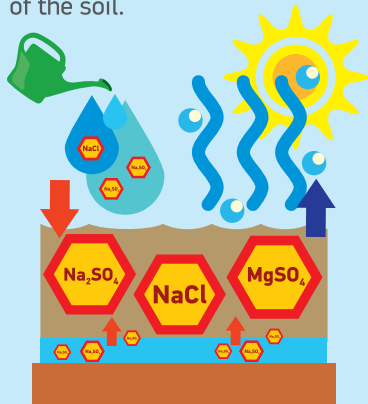
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SALT TOLERANT AND RESTORING SOIL CROPS

Problem

Salinisation is an excessive increase of water-soluble salts value in the root layer of the soil.

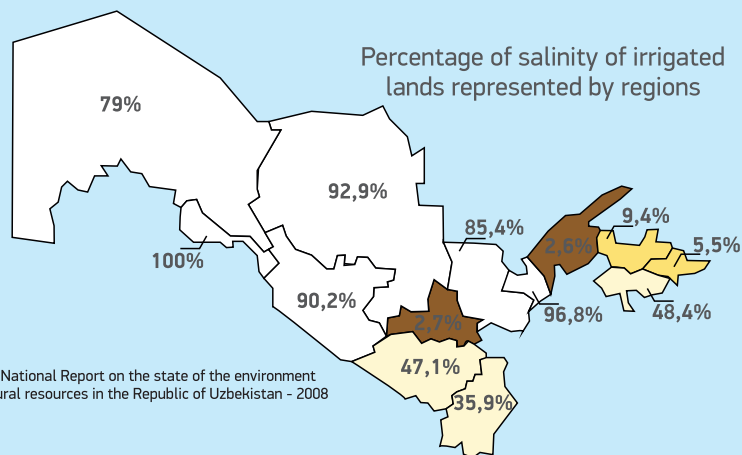


162.6 thousands of ha highly saline lands

663.5 thousands of ha moderately saline lands

1344.6 thousands of ha slightly saline lands

17.5 thousands of ha non-saline lands



¹Data from the National Report on the state of the environment and use of natural resources in the Republic of Uzbekistan - 2008

Causes of salinity in irrigated agriculture

application of excessive volumes of water for irrigation

dry climate

irrational application of mineral fertilizers

complicated outflow or absorption of surface and subsoil water

investments in land amelioration

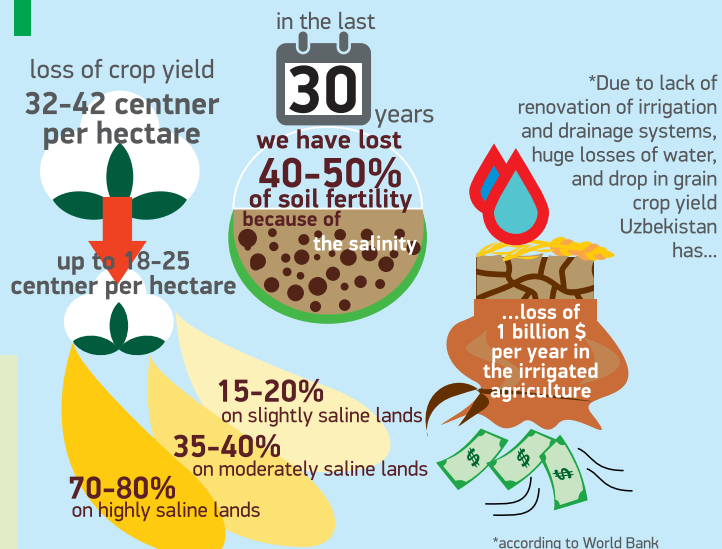
absence and neglect of land amelioration costs in the net cost

at present, 2 units are used for irrigation to cover water losses in irrigation system

plants need 1 biological unit of water

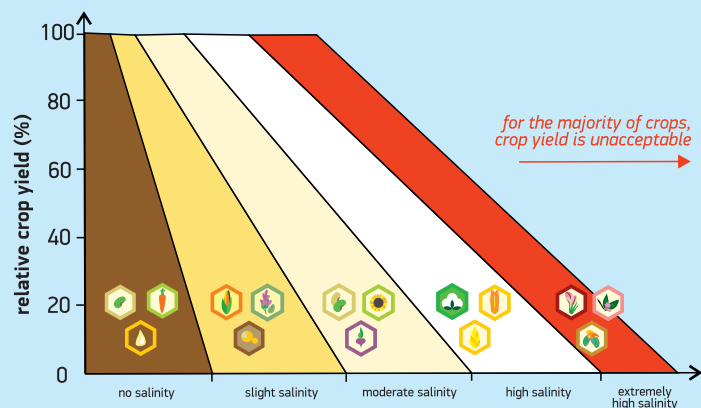
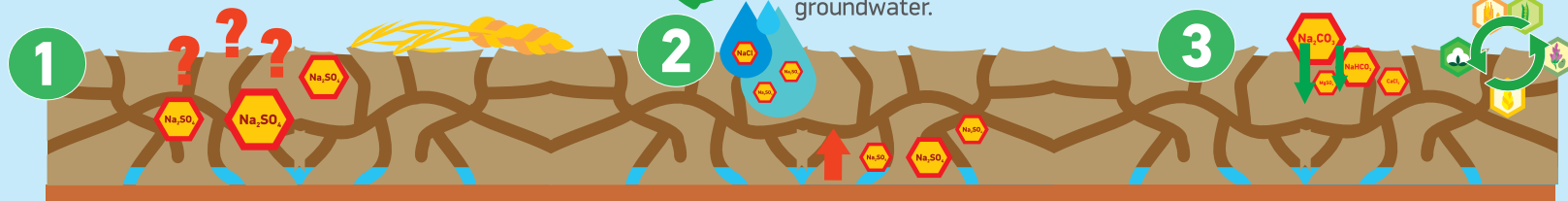
It is possible (without reconstruction of channels) to use only 1.4 units after changing irrigation practices

Consequences of salinity



Recommendations on desalination of soils

Find out and minimize/eliminate the source of the salinity. It is important to understand where the salt comes from!



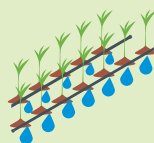
no salinity	slight salinity	moderate salinity	high salinity	extremely high salinity
<ul style="list-style-type: none"> mung bean (lentil) sesamum carrot 	<ul style="list-style-type: none"> maize medick (burclover) chick-pea 	<ul style="list-style-type: none"> soybean sunflower sugar beet 	<ul style="list-style-type: none"> cotton triticale barley 	<ul style="list-style-type: none"> indigofera licorice silverberry

source: Maas and Grattan (1999) from FAO (1985 - Annex 1. Crop salt tolerance data)

How dealing effectively with soil salinity and its consequences:



laser land leveling technology reduces the secondary salinisation due to the decrease (up to 25 %) and the uniform distribution of washing and irrigation water on the surface of the field



any advanced methods of irrigation that reduce the use of irrigation water, such as drip irrigation, control of the water amount, etc.



planting of successive crops with fibrous root system. For example: peas, rye, sunflower, rapeseed.



formation of a system of forest shelter belts (bio-drainage) along with cultivation of plants with high transpiring properties. For Example: mulberry, poplar (populus), willow, silverberry (Elaeagnus).



manure application (not less than 15 tons per 1 ha)



various drainage methods around fields



mulching



green manuring



withdrawal lands from land circulation with the purpose of their desalination via salt-tolerant crops. For Example: indigo, licorice, silverberry.

On salt-tolerant and restoring soil practices, please contact the GEF Small Grants Programm in Uzbekistan:

tel.: +998 71 120 34 50 (additional 145)

websites: <http://water-salt.ru>, <http://water-salt.narod.ru>, www.sgp.uz



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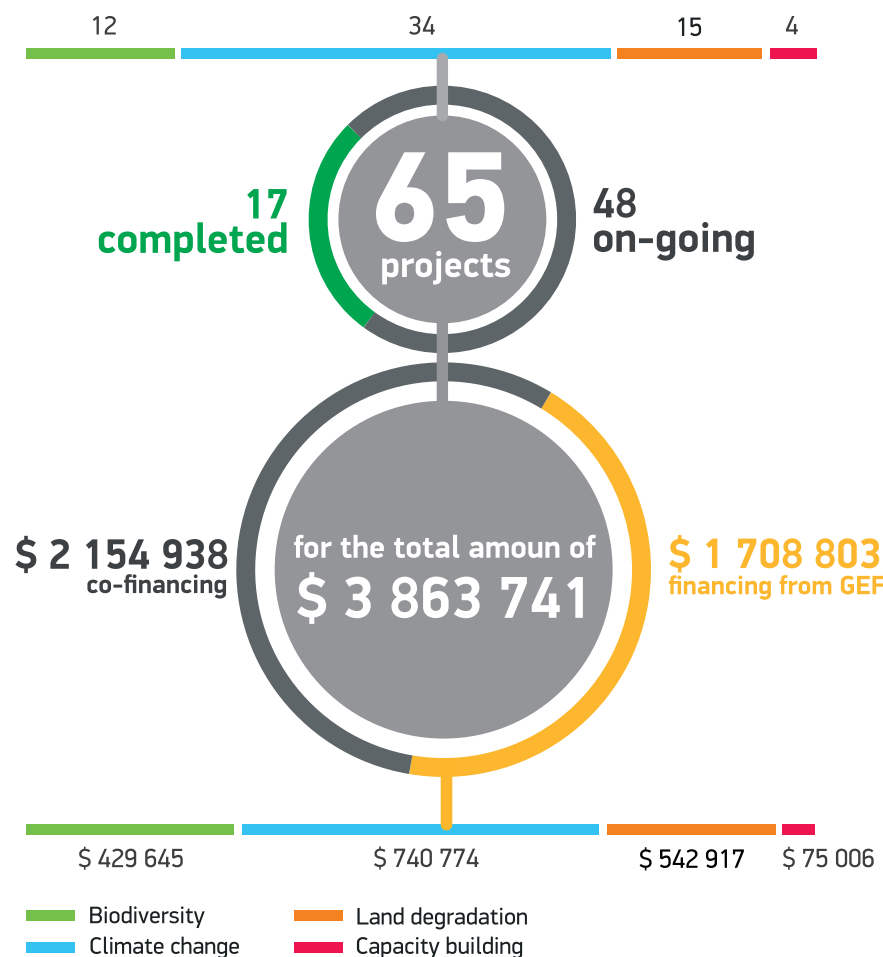
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Notes

The programme in Uzbekistan was launched in 2008.
Since that time 65 projects have been activated
with the assistance of the GEF SGP




There are many impressive results achieved
during this period:

more than
4,5
billion
kW/h



are saved for
citizens using
"clean"
technologies
of energy production

39,465
thousand
tons of **CO₂**



emissions into
the atmosphere are reduced



157,560

seedlings of different
kinds are planted

43.9
mln **m³**



of water locals save annually
and use this water for other
purposes

2,402
ha
of land



became more healthy and fertile
due to improved management

over
5,800
of people



participated in the trainings and
learned how to use innovative
approaches and practices