



PRESENTATION

Session: **Traceability**

Title: **Development of an Electronic Traceability System for Cotton products in the Supply Chain:
From the field to the Textile Mill**

Speaker: **Rinat Gulyaev**, Cotton science-innovation Center, Bukhara, Uzbekistan

Presentations are available in the conference archive: <https://baumwollboerse.de/en/competencies/international-cotton-conference/speeches/>

Conference Organization

Faserinstitut Bremen e.V., Bremen, Germany. E-Mail: conference@faserinstitut.de

Bremer Baumwollbörse, Bremen, Germany. E-Mail: info@baumwollboerse.de



DEVELOPMENT OF AN ELECTRONIC TRACEABILITY SYSTEM FOR COTTON PRODUCTS IN THE SUPPLY CHAIN: FROM THE FIELD TO THE TEXTILE MILL

R.A. Gulyaev – Director, Cotton science-innovation Center

Presented by



Ministry of innovative
development of the
Republic of Uzbekistan

Presented by



Cotton Science-Innovation
Center

Presented by



Bukhara Agrocluster

Vision

1

The textile and light industry of Uzbekistan expand the assortment and range of manufactured finished textile products. 100 % percent of cotton fiber and more than 45 % of yarn processed now locally. The volume of exports of textiles increased to 3.1 billion US dollars in 2021.

2

As one of the most important measures for increasing the export of Uzbek textile products, primarily to the markets of the European Union, the United States and other developed countries, is to ensure the transparency and traceability of the supply chain of textile products.

3

The EU has accepted the Republic of Uzbekistan as the 9th beneficiary country of the special incentive arrangement for sustainable development and good governance (GSP+) under the unilateral Generalized Scheme of Preferences (GSP). The EU will start applying preferential tariffs for products imported from Uzbekistan under this arrangement from 10 April 2021.

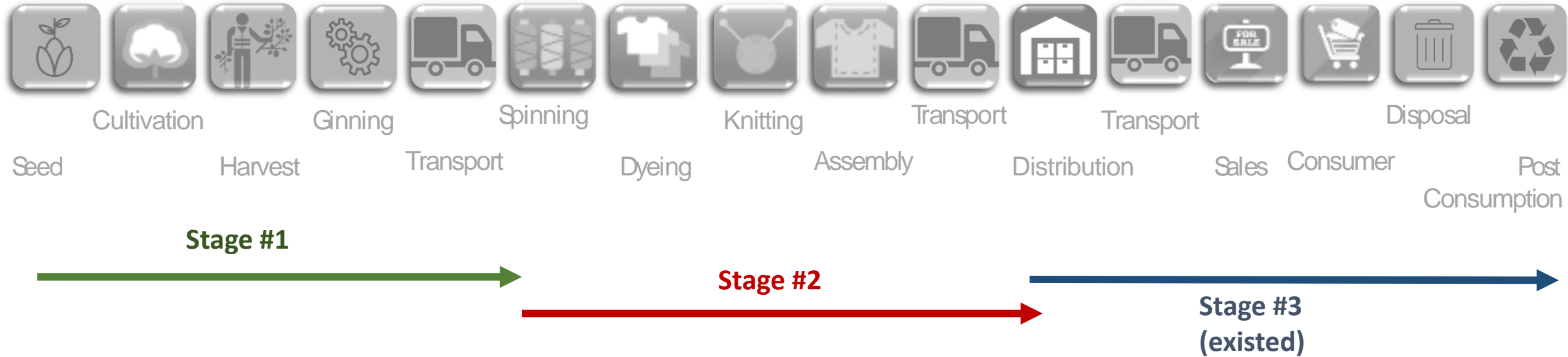
Target parameters:

by 2025 it is planned to increase the production of textile, knitwear and garment products to 15 billion US dollars, and the volume of exports to 7 billion US dollars.



Cotton Value Chain

Example for a Cotton Value Chain



The traceability chain systems for finished textiles and garments are mainly supported by textile mills in partnership with retailers. However, this data chain lacks information on raw material suppliers, farmers, ginneries, fiber producers.

1

At the level of the cotton and textile industry in Uzbekistan, there is every opportunity to implement a traceability program. Identification and labeling standards can be applied by virtually everyone in the production chain. Thus, farms can trace the origin and parameters of the supplied sowing cotton seeds, ginneries have the ability to identify lots of seed cotton coming from farmers, and bales of cotton fiber and linters produced as a result of primary processing. Textile mills that process cotton products, manufactured textile products (yarn, fabrics, knitted fabrics, finished garments) are mostly labeled with barcode tags based on GS1 international standards, control (identification) signs with security elements, control (identification) signs based on RFID technology, and other methods.

2

The lack of conceptual integrity between the elements of this disparate system in the form of international standards for identification and labeling, a common data model, lack of semantic compatibility does not yet allow the implementation of an integrated technology for traceability of goods in the cotton and textile complex of Uzbekistan

3

Aim of the project - the development and integration of the functionality of the existing specialized systems in the cotton-textile complex of the Republic of Uzbekistan at the stage from sowing to the supply of cotton fiber to textile mills, which can subsequently be integrated into existing international traceability systems.

4

The project are aimed at informing consumers of finished textile products about the entire production chain of the purchased product, its origin, composition, quality parameters, compliance with social, environmental and labor standards, etc. At the same time, retailers, through the implementation of these programs, have the opportunity to reduce reputational risks by preventing the supply of products from countries / from suppliers where basic social and environmental requirements, labor standards, and environmental protection standards are not observed.

Cotton Value Chain: SEED

Block number 1. SEED

Information for each lot of sowing seeds:

- Variety
- Reproduction (Super elite, Elite, R1, R2, R3)
- Grade
- Class
- The type of seeds (seeds of traditional selection, genetically modified seeds, hybrids, etc.).
- Fuzziness of seeds (bare, slightly pubescent, pubescent)
- The chemicals used during the treatment (fungicides, insecticides, stimulants, etc.)
- The type of treatment (chemical or mechanical)
- Date of production
- Producer/Supplier of sowing seeds
- Seed buyer



Seed Warehouse



Workshop for preparation of sowing seeds



Farm

Seed



Cotton Value Chain: SEED

Available

«UZPAXTA-1C» Software Database (UZOOTTON – 1 C)

Склад	Номенкл. №	Ед. изм.	Цена	Остаток на начало периода	Приход	Расход	Остаток на конец периода
Номенклатура				Количество	Сумма	Количество	Сумма
Теплава Юнус (Чист товаришунки)				2 672 431,2	24 154 570 441,85	2 672 431,2	24 154 570 441,85
2017				2 599 581,2	22 946 476 444,48	2 599 581,2	22 946 476 444,48
Урожай чист (Бурага 6, R-1, Туска, п4-фит+сп, 19-090, Гиджудан)	00000000000000000000	кг	6 214,73	22 946 476 444,48	142 376 316,38	22 946 476 444,48	142 376 316,38
Урожай чист (Бурага 6, R-1, Туска, п4-фит+сп, 19-090, Гиджудан)	00000000000000000000	кг	7 676,82	396	3 000 105,11	396	3 000 105,11
Урожай чист (Бурага 6, R-2, Туска, п4-фит+сп, 19-090, Гиджудан)	00000000000000000000	кг	4 803,25	76 997	373 685 696,25	76 997	373 685 696,25
Урожай чист (Бурага 6, R-1, Туска, п4-фит+сп, 19-090, Гиджудан)	00000000000000000000	кг	6 214,73	12 098	75 186 179,34	12 098	75 186 179,34
Урожай чист (Бурага 6, R-1, Туска, п4-фит+сп, 19-090, Гиджудан)	00000000000000000000	кг	6 214,73	2 291	14 237 941,85	2 291	14 237 941,85
Урожай чист (Бурага 6, R-1, Туска, п4-фит+сп, 19-090, Гиджудан)	00000000000000000000	кг	6 214,73	37 637	236 174 880,94	37 637	236 174 880,94
Урожай чист (Бурага 6, R-1, Туска, п4-фит+сп, 19-090, Гиджудан)	00000000000000000000	кг	4 387,61	26,2	110 567,85	26,2	110 567,85
Урожай чист (Бурага 6, R-1, Туска, п4-фит+сп, 19-090, Гиджудан)	00000000000000000000	кг	10 216,06	110 216	1 125 972 938,31	110 216	1 125 972 938,31
Урожай чист (Бурага 6, R-1, Туска, п4-фит+сп, 19-090, Гиджудан)	00000000000000000000	кг	10 216,06	57 754	586 618 165,96	57 754	586 618 165,96
Урожай чист (Бурага 6, R-2, Туска, п4-фит+сп, 19-090, Гиджудан)	00000000000000000000	кг	10 216,06	103 473	1 057 086 065,96	103 473	1 057 086 065,96
Урожай чист (Бурага 6, R-1, Туска, п4-фит+сп, 19-090, Гиджудан)	00000000000000000000	кг	12 463,25	26 642	324 567 826,29	26 642	324 567 826,29
Урожай чист (Бурага 6, R-1, Туска, п4-фит+сп, 19-090, Гиджудан)	00000000000000000000	кг	10 216,06	62 667	634 080 009,82	62 667	634 080 009,82
Урожай чист (Бурага 6, R-1, Туска, п4-фит+сп, 19-090, Гиджудан)	00000000000000000000	кг	10 216,06	60 859	621 739 612,96	60 859	621 739 612,96
Урожай чист (Бурага 6, R-1, Туска, п4-фит+сп, 19-090, Гиджудан)	00000000000000000000	кг	10 216,06	49 177	502 395 035,09	49 177	502 395 035,09
Урожай чист (Бурага 6, R-2, Туска, п4-фит+сп, 19-090, Гиджудан)	00000000000000000000	кг	7 968,54	44 956	358 233 684,24	44 956	358 233 684,24
Урожай чист (Бурага 6, R-1, Туска, п4-фит+сп, 19-090, Гиджудан)	00000000000000000000	кг	7 968,54	27 946	224 074 365,74	27 946	224 074 365,74

Necessary to create system

Bar code console

Bar code

Each bag of Seeds

Bar code reader

Database



Cotton Value Chain: Cultivation

Available

Block number 2. CULTIVATION

Information for each contour (field):

- Culture (cotton, wheat)
- Cotton or other crop development (NDVI index)
- The content of macro, mezo and microelements in the soil (phosphorus, nitrogen, potassium, boron, magnesium)
- Agrochemical maps
- Salinity maps
- Water maps (irrigation, drip irrigation, without irrigation)
- Water, Seed, Fuel, Fertilizer consumption
- Salary expense
- Agrotechnical measures (technological map)
- Yield

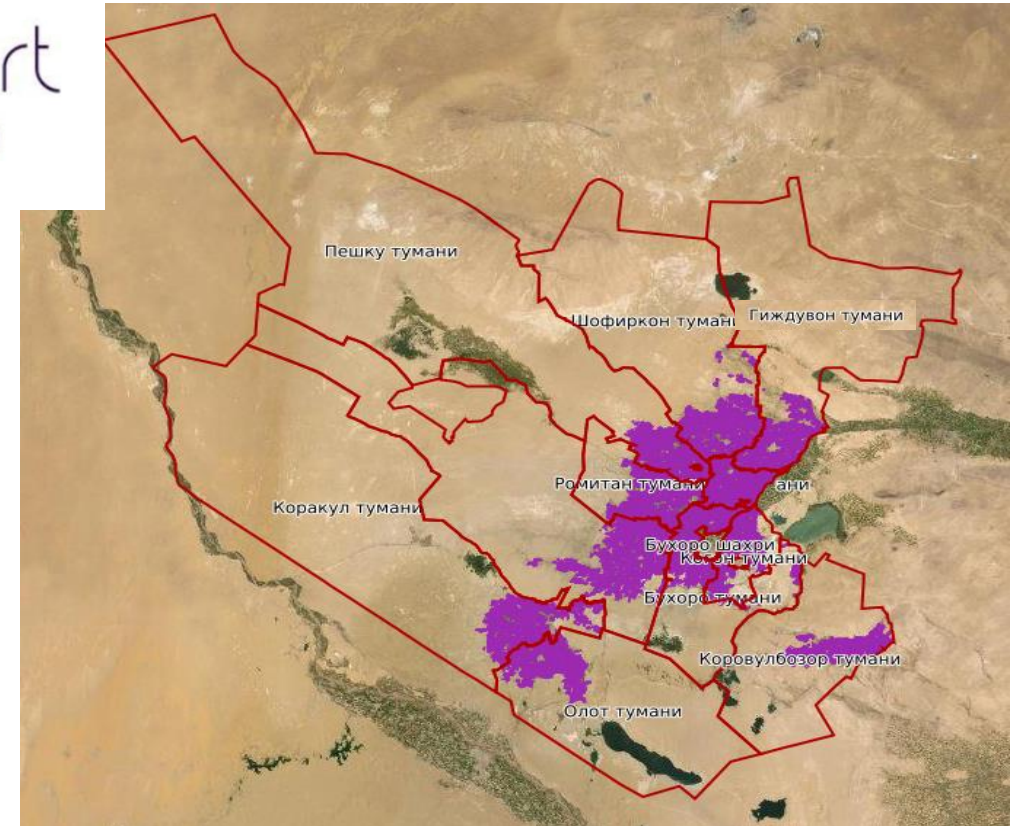
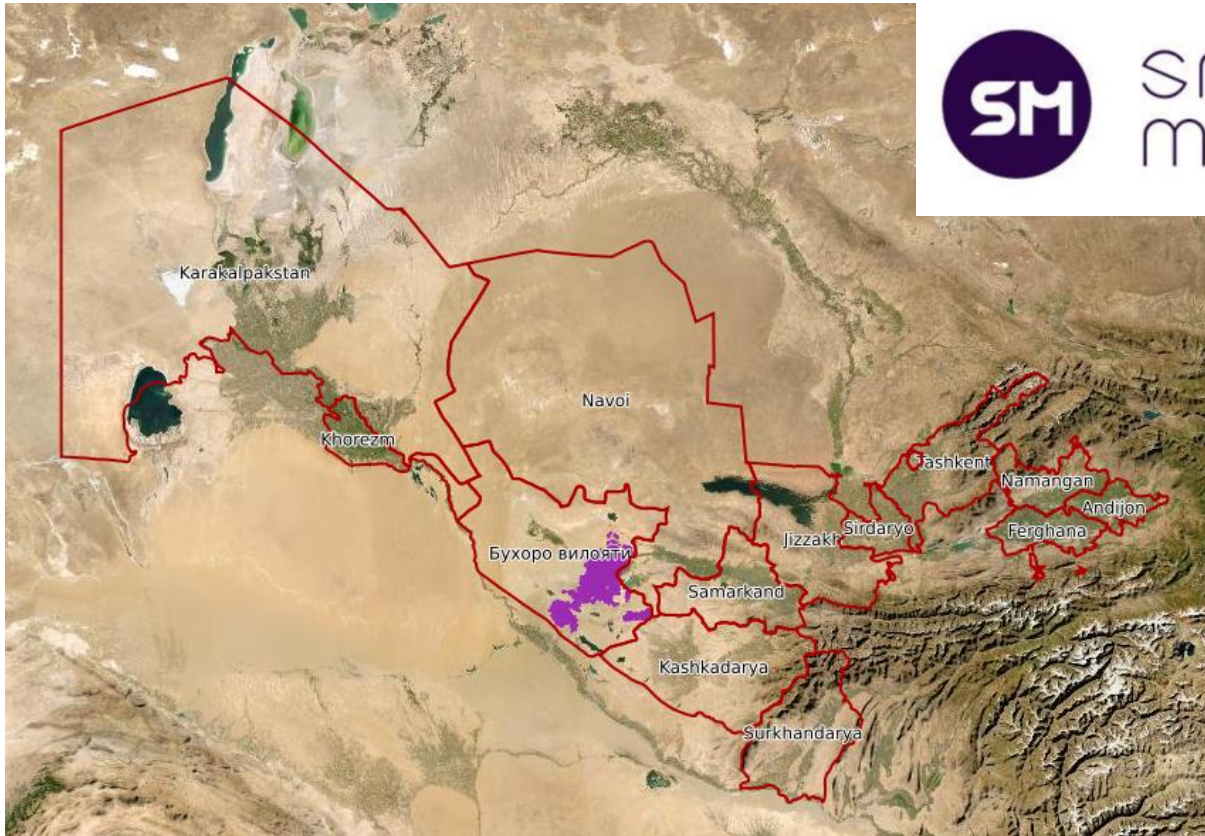


Cotton Value Chain: Cultivation

225 553 **ha**
Total area

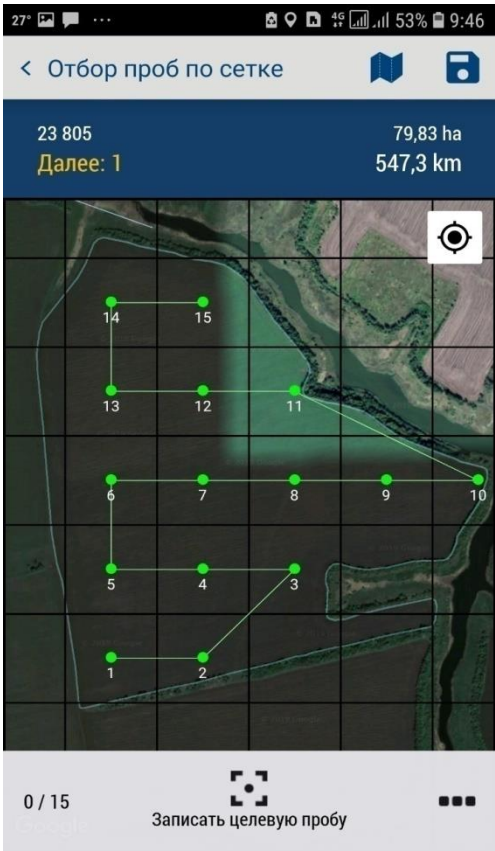
Sowing area of Bukhara region

67 732 **pc**
Contours
(Fields)



Cultivation



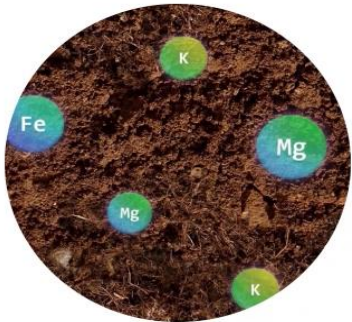


Determining soil sampling points in contours

Export the map to the mobile application for soil sampling

Creating input maps based on agrochemical tests

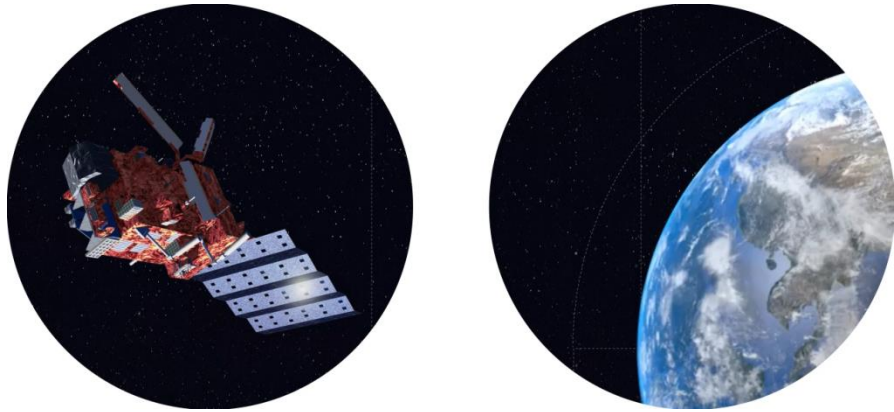
Module of agrochemical analysis - forms contour maps based on agrochemical analysis of soil and helps to determine the quality of contours



Cultivation



Cotton Value Chain: Cultivation

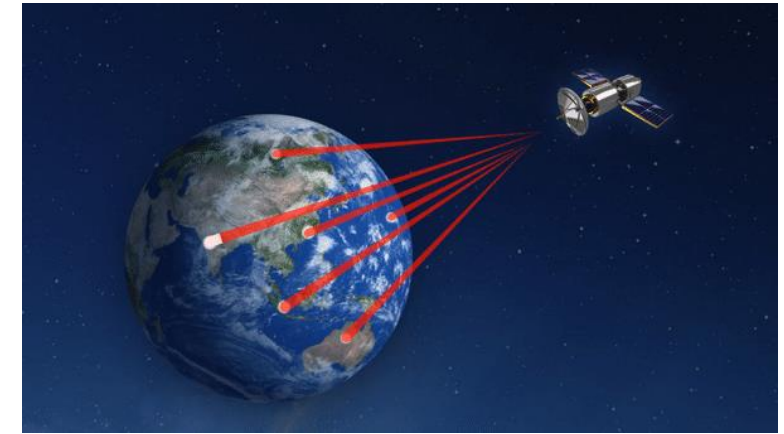


- ✓ Detection of changes in contours (Analysis of plant development by NDVI imaging with the help of Sentinel 2 Satellite)
- ✓ General and detailed information about each contour is obtained:
 - Contour size (ha)
 - Crop vegetation
- ✓ Zoning of contours, statistical analysis and comparison by zones
- ✓ Instructions for agrotechnics

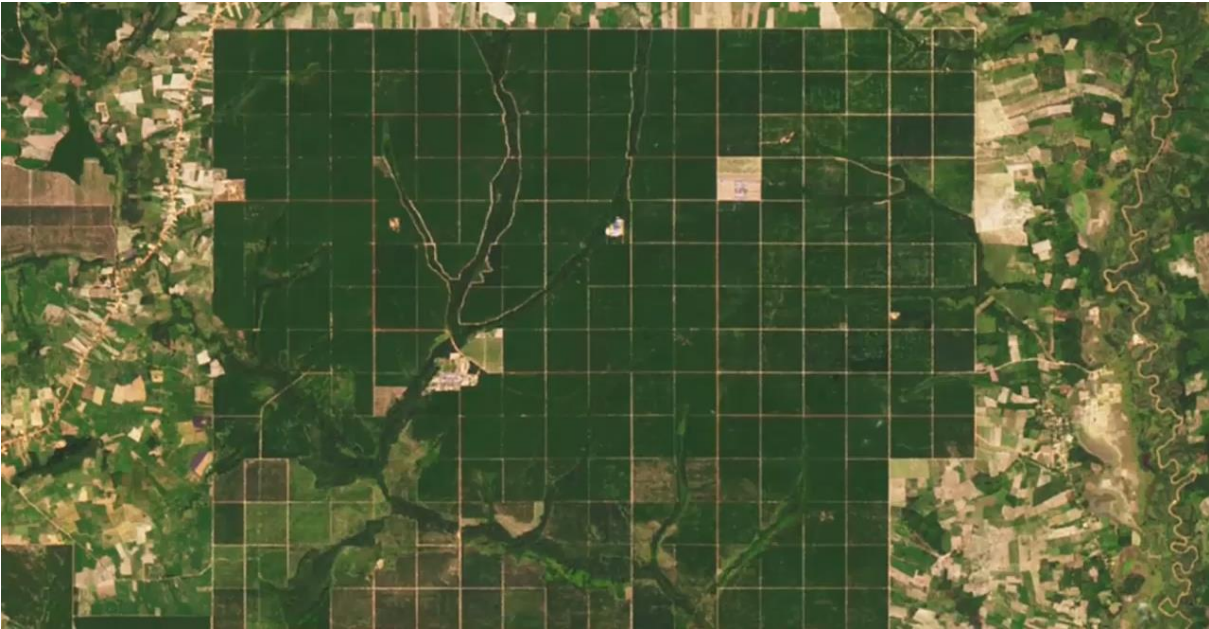
The program analyzes the biomass vegetative growth index using NDVI photographs taken from satellites and automatically colors based on a scale from 0 to 1.

Cultivation

FIELD MONITORING WITH SATELLITE



Cotton Value Chain: Cultivation

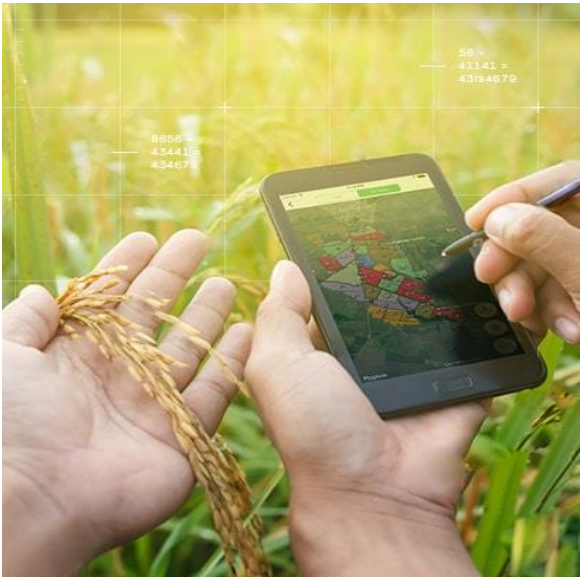
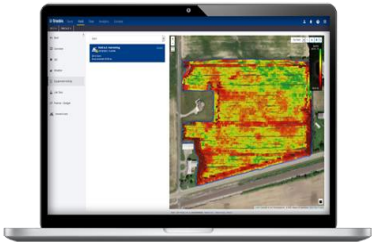


Cultivation

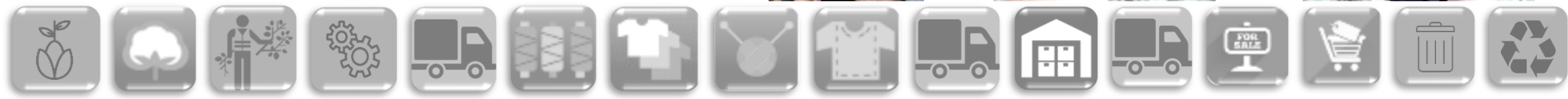
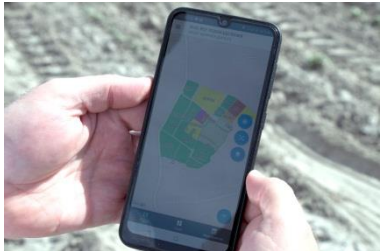
MONITORING SYSTEM

Analytic
Center

Operators



Agronomists



Cotton Value Chain: Cultivation

AGRO-SCOUTING REPORTS



The agro-scouting module collects information about the condition of the contours and crop development.



СЕЗОНЫ

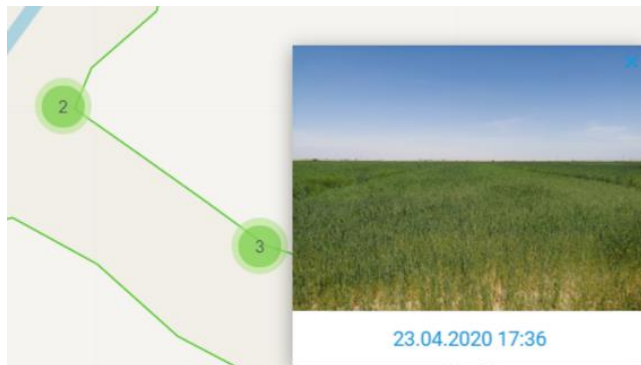


ОТЧЕТЫ

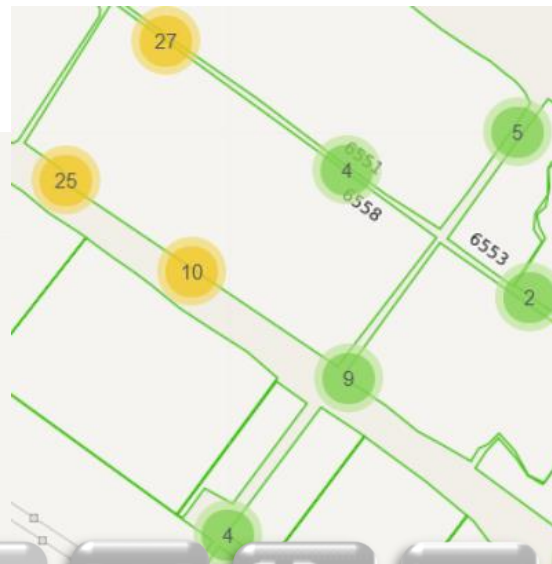


СКАУТИНГ

- Through mobile applications, agronomists take photos and identify problems identified by the results of the vegetative NDVI index.
- The system allows agronomists to measure and photograph the current state of the fields using mobile devices, and data and images are automatically entered into the system.



Cultivation



Cotton Value Chain: Cultivation

Monitoring of agrotechnical operations

Equipment and transport control module - GPS increases the efficiency of equipment and saves fuel

Reflect the work of machinery in the field in a specific time mode

Automatic detection of equipment operations in the field

Control the speed mode of the machine
Calculation of area on the fields for each operation done

Calculation of consumption for 1 hectare: fuel, fertilizers, seeds, salary



Automatic refueling

GPS systems



35 pc

283 pc

Cultivation



Погодная метеостанция Агрокластер Бухар
Ж К П 01.01.2020 Ж Ж RU
Пользователь

2020-05-17

люцерновый долгоносик

2я генерация: личинки 1-го возраста

2020-05-17

Яблонная плодовая комка (МЗ)

2я генерация: начало откладки яиц

2020-05-16

фруктовая полосатая моль

2я генерация: начало выхода гусениц 1-го поколения из яиц, 20% лета имаго 1й генерации

2020-05-16

Хлопковая совка

1я генерация: имаго

2020-05-16

Красный плодовой клещ

4я генерация: личинки 1-го возраста

Вредитель

Хлопковая совка

САТ НАСЕКОМЫХ = 487.11°C

Обновить

31/03 00:00

температура воздуха [°C]

16.95

риск

25.00

17.03.2020 1я генерация: откладка яиц

05.04.2020 1я генерация: личинки (1-3) возраста

25.04.2020 1я генерация: личинки (4-5) возраста

12.05.2020 1я генерация: имаго

17.05.2020 2я генерация: откладка яиц

Weather stations

12 pc

Cultivation

Predicting disease development based on software algorithms

```
graph LR; WS[Weather stations] --> PC[12 pc]; PC --> C[Cultivation]; C --> V[ ]; V --> PA[Predicting disease development based on software algorithms];
```

Погодная метеостанция Агроклостер Бульж

ИН

М

18.05.2020

М

ИН

час

▼

RU

Пользователь

2020-05-17
Лещинковый долгоносик
2я генерация: личинки 1 возраста

2020-05-17
Яблонная плодовая корка (M5)
2я генерация: начало откладки яиц

2020-05-18
Фруктовая полосатая моль
2я генерация: начало выхода гусениц 1-го поколения из яиц, 20% лета имаго 1-й генерации

2020-05-18
Хрущовая совка
1я генерация: имаго

2020-05-16
Красный плодовой клещ
4я генерация: личинки 1-го возраста

ТЕМПЕРАТУРА ВОЗДУХА

— Температура [°C] —+ Влажность [%] — Точка росы [°C]

ОСАДКИ

● Осадки [mm] —+ Влажность [%] ● Влажность листа [%]

СКОРОСТЬ ВЕТРА

— Ветер мин. [m/s] — Ветер макс. [m/s] ● Атм. давление [mmHg]

БАТАРЕЯ

— Батарея [mV] ● Солнечная активность



Cotton Value Chain: Harvest & Procurement of seed cotton

Block number 3. Harvest and procurement of seed cotton
Information for each lot (truck) of seed cotton:

- Region
- Farmer
- Contour (field)
- Cotton picking type (manual, machine)
- Variety
- Grade (colour)
- Class (moisture and trash content)
- Reproduction
- Technical cotton or for sowing purposes
- Price

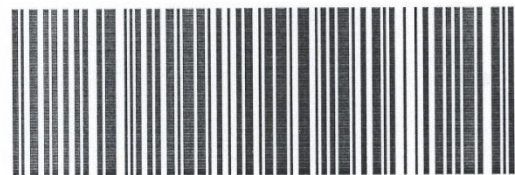


Harvest



Cotton Value Chain: Harvest & Procurement of seed cotton

Procurement center



003162018-8589143614

№ 2 рақамли юк ҳати учун

Фермер хўжалиги: "ILG'OR HOSIL" ФХ

Транспорт тури: трактор, рақами: 1234

Прицеп сони: 1 ракам(лар)и: (1234)

5-ХЛ

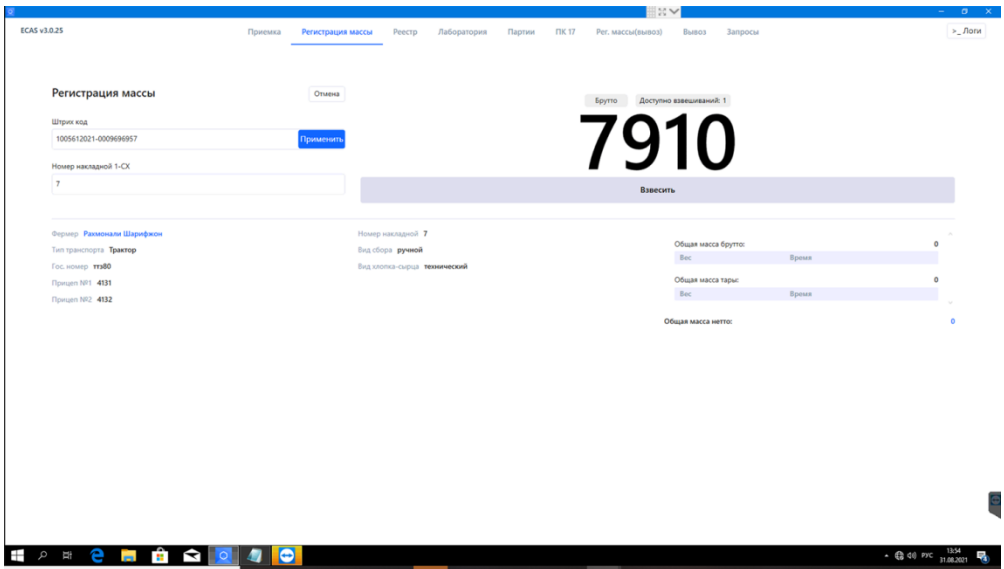
2018 йил 27 сен 23:10

Пахта тозалаш корхонаси: АО "O'ZBEKISTON PAHTA TOZALASH"(Toshkent)
Пахта тайёрлаш пункти: Жума-Бозор ПТМ



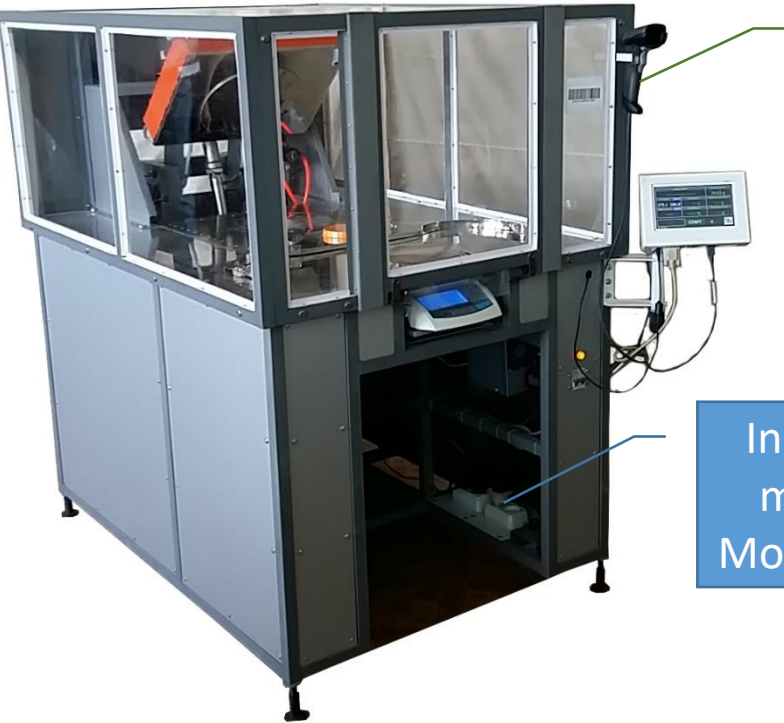
Upon arrival of the vehicle carrying the cotton, the operator reads the farmer's ID card. The software loads the required indicators from the directory. The operator enters information on the type of transport, number of trucks. The balances – indicate the weight of seed cotton (netto).

Harvest

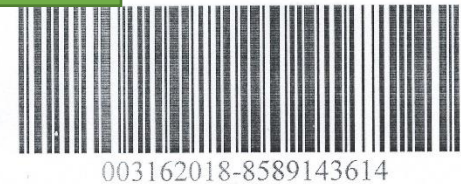


Cotton Value Chain: Harvest & Procurement of seed cotton

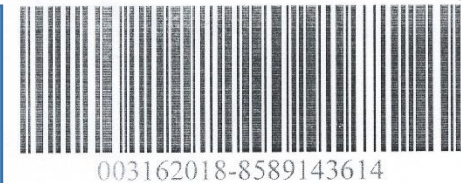
Laboratory analyzes



Bar code scanner



Instrument for measuring of Moisture content



The laboratory scans a 2XL barcode submitted to the laboratory along with the seed cotton samples. The software of the automated instruments transmits the results to the database.



Пахта тозал

Instrument for measuring of Trash content



2-XЛ

2018 йил 27 сен 23:10

Harvest



Cotton Value Chain: Harvest & Procurement of seed cotton

ECAS v3.0.25

Приемка **Регистрация массы** Реестр Лаборатория Партии ПК 17 Рег. массы(вывоз) Вывоз Запросы >_ Логин

Регистрация массы

Отмена

Штрих код
1005612021-0543420270 **Применить**

Номер накладной 1-СХ
3

Фермер **Чайматалов Санжирбек**

Тип транспорта **Трактор**

Гос. номер **41380**

Прицеп №1 **4185**

Прицеп №2 **4186**

Номер накладной **3**

Вид сбора **ручной**

Вид хлопка-сырца **технический**

Общая масса брутто: 7200

Вес: 7200

Время: 8/31/2021 1:57:56 PM

Общая масса тары: 0

Вес: 0

Время: 0

Общая масса нетто: 7200



The transport is weighed a second time after seed cotton has been unloaded (tara). The operator scan barcode 1 SX and 5 XL forms signed by the classifier. The camera fixes the trolley number on the scales and compares them with the numbers on the 5-XL Permit. If the data on the numbers match, the data on the scales is stored in the software, the cameras fix the time the weight is measured, and the photograph is stored in the directory with a process barcode. Data on Tara, Netto, Brutto, Conditioned masses, quality indicators are recorded in the database.

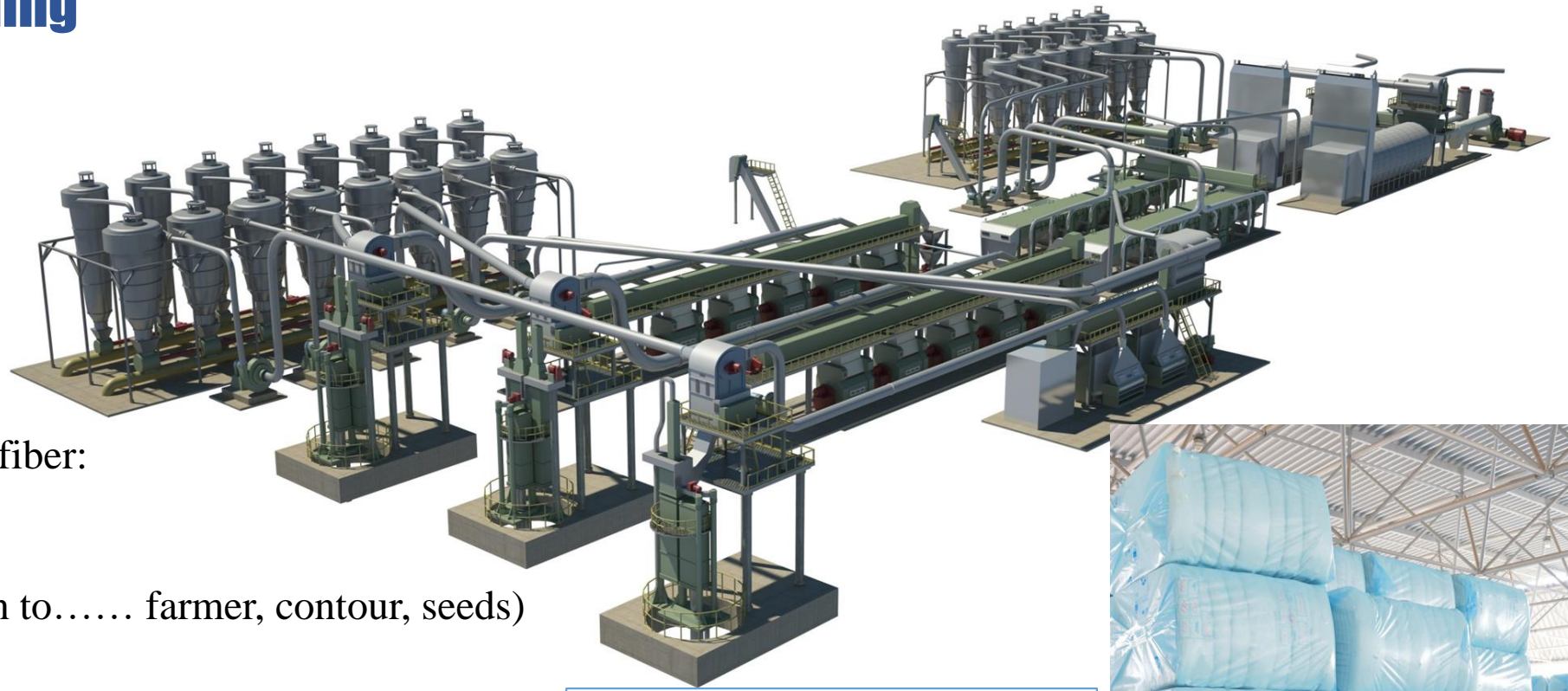




Harvest



Cotton Value Chain: Ginning



Block number 4. Ginning

Information for each bale cotton fiber:

- Region
- Ginnery
- Lot of seed cotton (connection to..... farmer, contour, seeds)
- Variety
- Grade (colour)
- Class (trash content)
- Weight (netto, tara, brutto)
- HVI indicators
- Price



**** DO NOT REMOVE ****

UZBEKISTAN
COTTON IDENTIFICATION COUPON

Gin Code 02110

BRUTTO 220,5 КН

Gin Bale 0043395

NETTO 219,3 кг

DATE 2019-09-28



0043395

BUCHORO AGROCLUSTER

Ginning



Cotton Value Chain: Ginning



Ginning



Cotton Value Chain: Ginning

Electronic scales (balances)



Scales for seed cotton

Installation of bunker electronic scales for weighing of seed cotton, cotton seeds.
Obtaining online information about the volume of seed cotton provided to the process, produced seeds.
Automatic transfer to the Databases.

Scales for cotton seeds



Ginning



Cotton Value Chain: Ginning



Packing of cotton lint



Ginning





Consoles of PBI system at ginneries

The console function is to print barcode tags with information about the bale number, weight and date of production.

The system provides identification and accounting of each bale produced in the ginnery, which is traceable from the cotton gin to the textile mill.

The tag number consists of a 2-digit region code, a 3-digit gin code and a 7-digit bale number (permanent).

Barcode: Code 128 subset C

5 year cycle provided

** DO NOT REMOVE **

UZBEKISTAN
COTTON IDENTIFICATION COUPON

Gin Code 02110

Gin Bale 0043395

BRUTTO 220,5 KH

NETTO 219,3 KR

DATE 2019-09-28

0043395

BUCHORO AGROCLUSTER

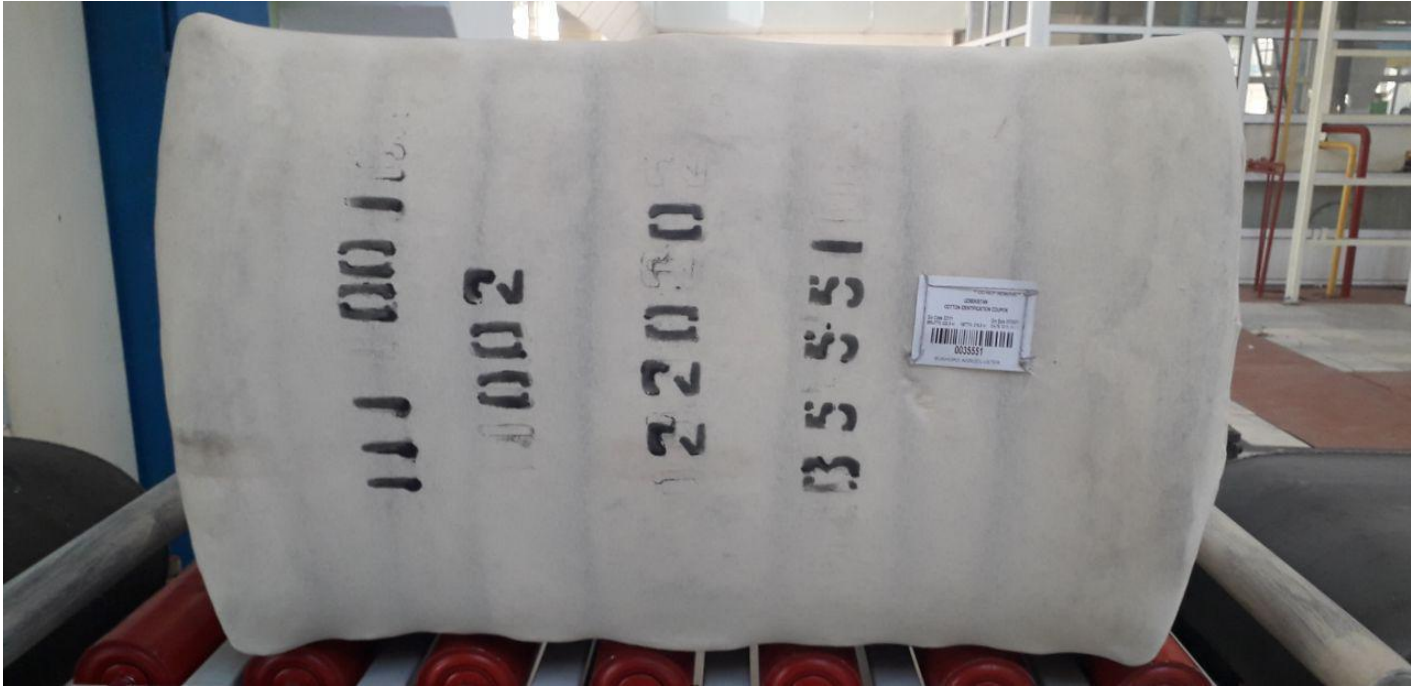
Ginning



Available

Attached to each bale

Attached to each sample selected for certification



Ginning





100
%

- Controls the quality and weight of each bale

100
%

- 100% bale-by-bale certification since 2001

100
%

- Database of all lots and varieties of cotton fiber

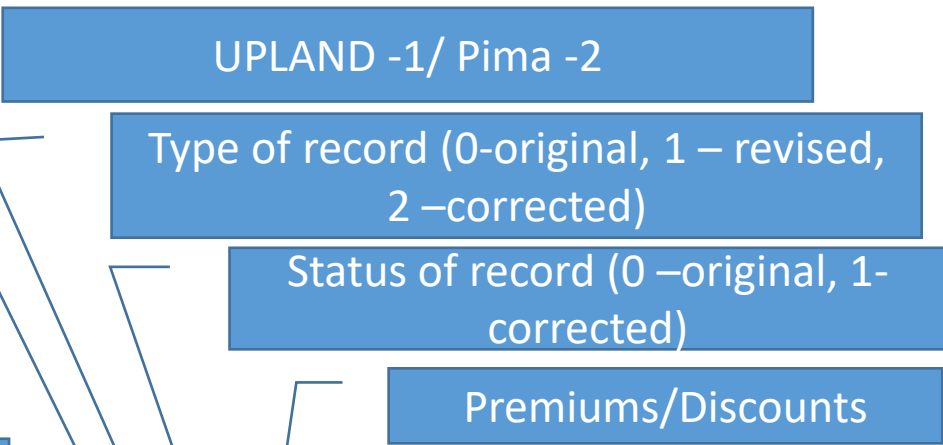
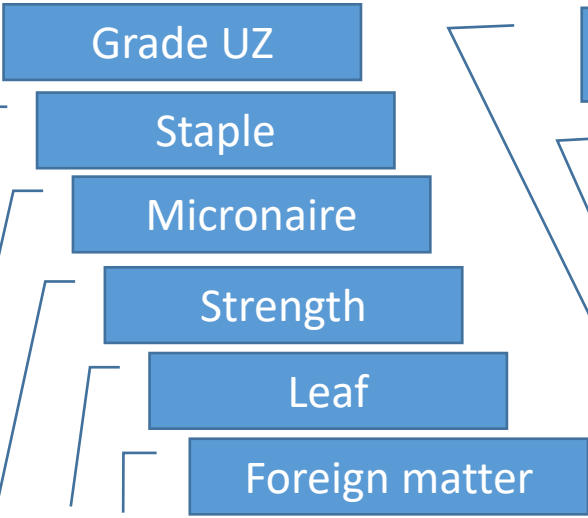
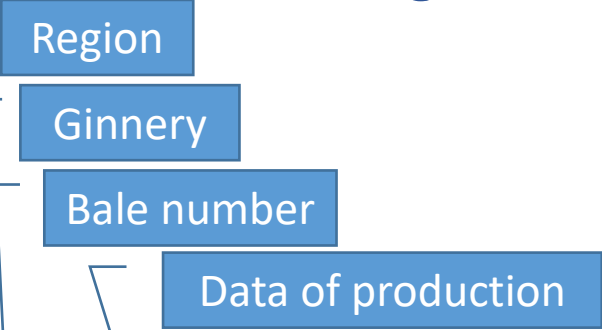


Ginning



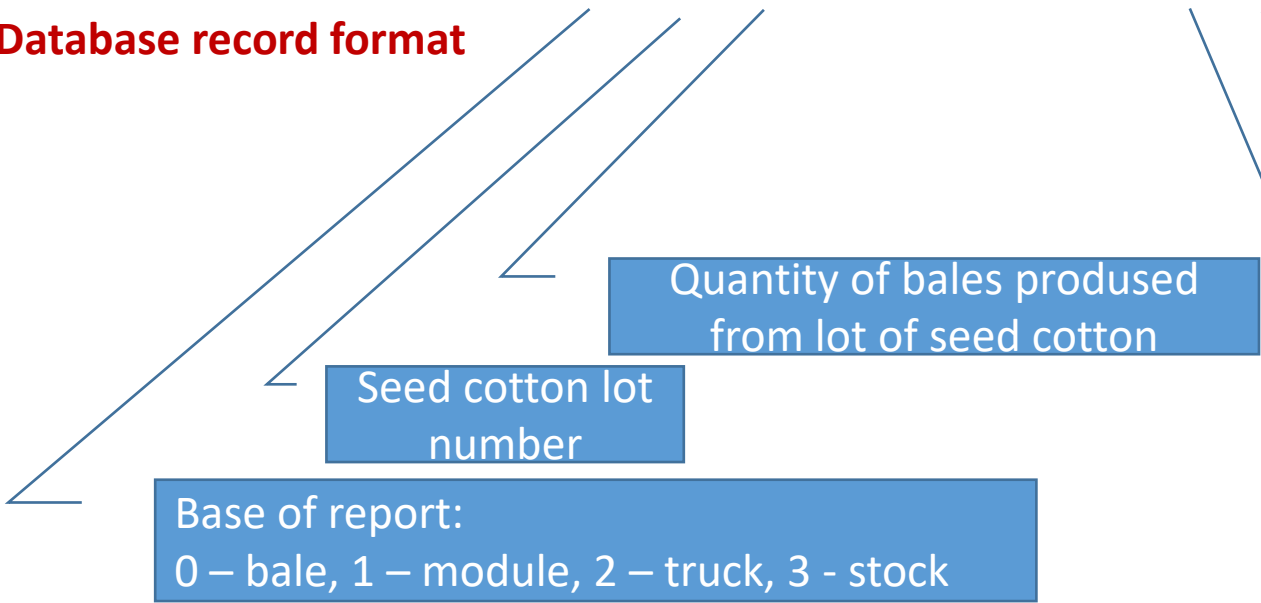
Cotton Value Chain: Ginning

CSITC (HVI) Quality Indicators for each Bale



02 110 0043370 20201109 1 32487 12 21 37 41 339 1 00 00 211 828 078 02 114 828 1 0 0 +0790

Database record format



Cotton Value Chain: Ginning

Available

Accounting of production

«UZPAXTA-1C» Software Database (UZCOTTON – 1 C)

The screenshot displays the «UZPAXTA-1C» Software Database (UZCOTTON – 1 C) interface, which is a comprehensive system for managing cotton production and accounting. The interface is divided into several main sections, each with a specific function:

- Производственное задание (28-ХЛ) 110-00001 от 19.11.2018 15:25:12**: This section shows the production order details, including the number (110-00001), date (19.11.2018), and time (15:25:12). It includes a table for production data with columns for Kupa №, физ. масса, and other metrics.
- Отвес готовой продукции 29-ХЛ 105-00001 от 15.11.2018 19:07:07**: This section displays the weighing data for finished products, including the number (105-00001), date (15.11.2018), and time (19:07:07). It includes a table for weighing data with columns for Kupa №, физ. масса, and other metrics.
- Акт приемки хлопководства на АО "Узпактасанот" ВТ000001416 от 14.12.2018 16:00:00**: This section shows the acceptance act for cotton production, including the number (ВТ000001416), date (14.12.2018), and time (16:00:00). It includes a table for acceptance data with columns for N, Код, Партия, Марка, and other metrics.
- Акт приемки и отборки хлопководства 000-0004398 от 14.12.2018 12:00:59**: This section displays the acceptance and selection act for cotton production, including the number (000-0004398), date (14.12.2018), and time (12:00:59). It includes a table for acceptance and selection data with columns for N, Код, Партия, Марка, and other metrics.

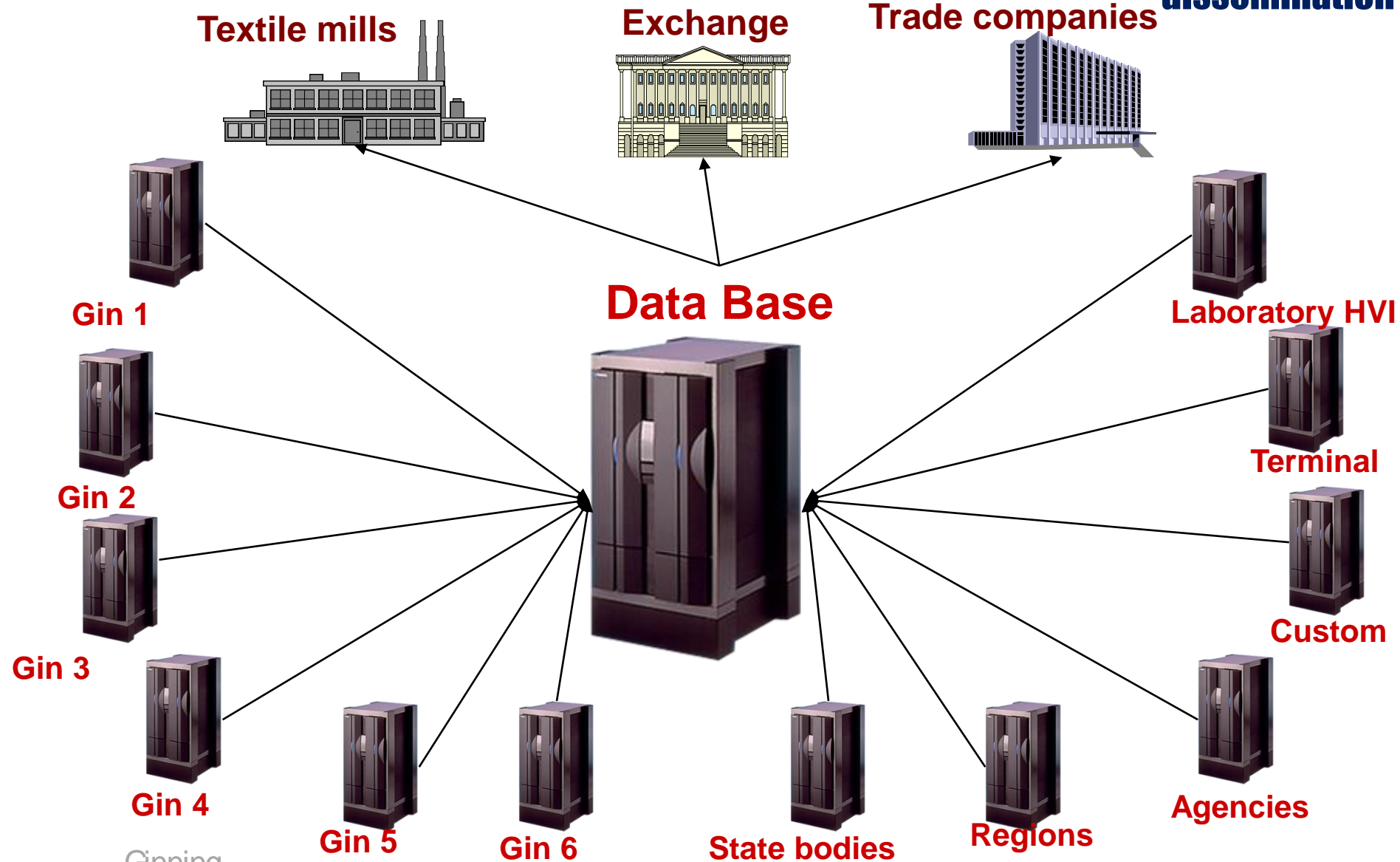
The interface also features a navigation bar at the top with icons for various modules: Главная, Основные средства, Производство, Банк и касса, Учет номенклатуры, Учет номенклатуры продаж, Бухгалтерские отчеты, Агромониторинг, and Вспомогательное производство. The bottom of the interface shows a taskbar with icons for various applications and a system clock.

Ginning



Cotton Value Chain: Ginning

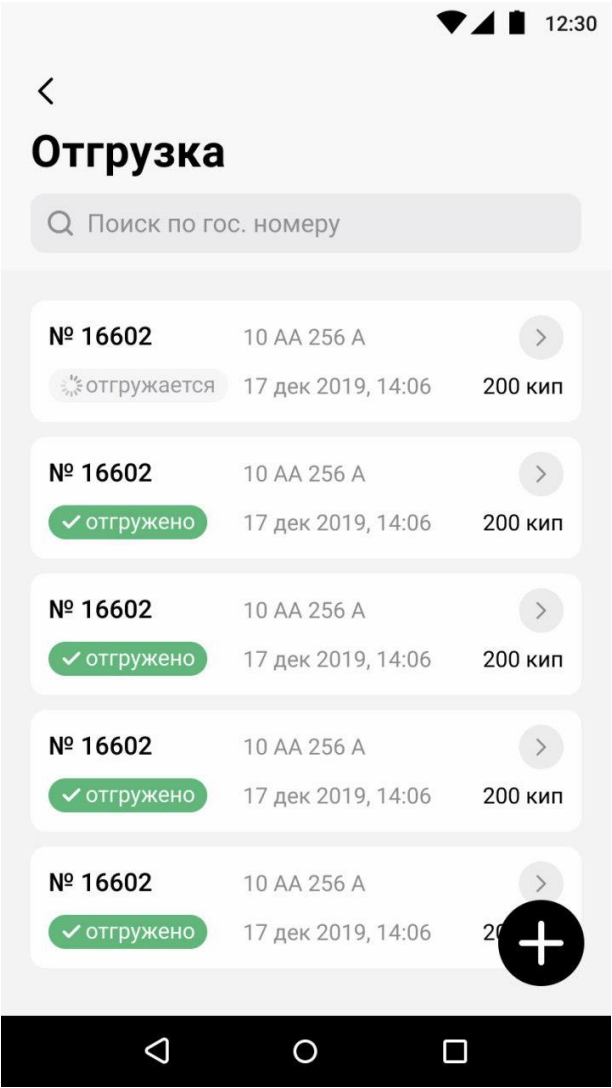
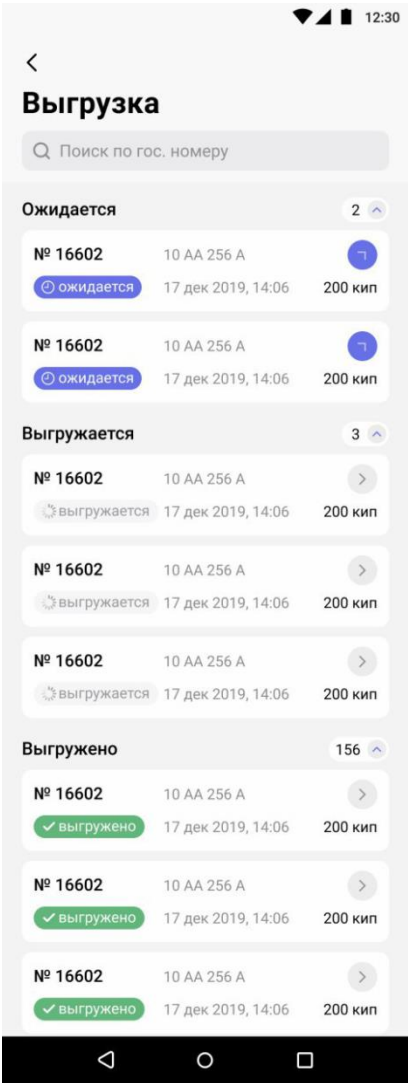
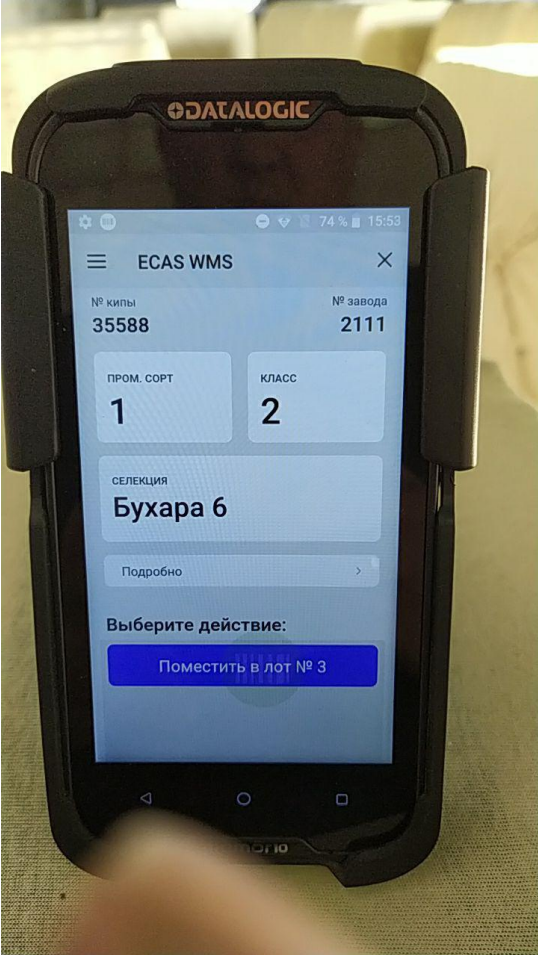
Collection, processing and dissemination of data



Cotton Value Chain: Ginning

Separation of bales to uniform lots (Grade/class)

Available



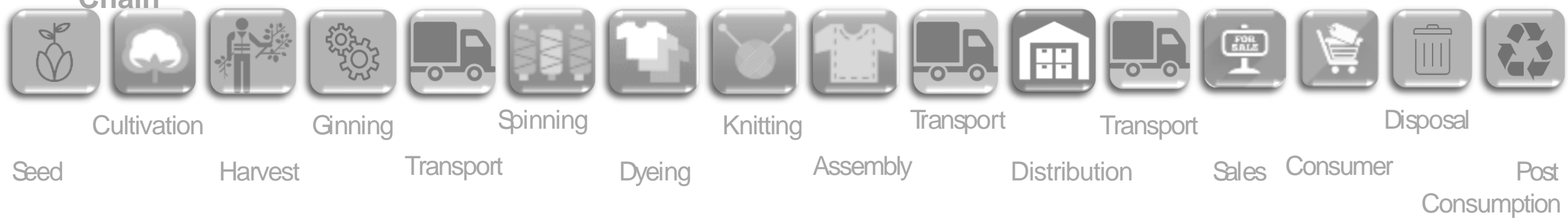
Ginning



Cotton Value Chain

PLANS FOR FUTURE (TEXTILE MILL)

Example for a Cotton Value Chain



Stage #1

Stage #2

Stage #3
(existed)

TEXTILE COMPLEX

КОМПЛЕКС ПАСПОРТИ

Placement	Bukhara region, Vobkent
Project initiator	Bukhara Agroklaster
Project period	2 quarter 2021 – 4 quarter 2023
New jobs	7 000 киши (охирги босқичда)

The total amount of planned investments

1 stage: Spinning

mln. Euro

156,2 | **99,6**

ЛОЙИҲА НАТИЖАЛАРИ

Cotton lint	40,995 tn
Technology	Advanced technological equipment imported from Europe and Japan
Export	200 mln Euro, 75% Export, 25% Local market
Profit	30,5 mln. Euro per year
Payback period	5 years
Consulting	"Gherzi" (Swiss) international consulting company

Cotton yarn

36 205 tn

Knitted fabric

15 985 tn

Yarn Dyeing

10 324 tn



Tights

1,970 mln. pc

Fabric dyeing

21 828 tn

Garments

6,916 mln. pc



Amir Textile project envisages creation of technological chain for production of high value-added products "From cotton fiber to finished goods"

Area

58 ha

Construction area

157 700 m²

Cotton lint

10x

Modern garments



Thank you for attention



Ministry of innovative
development of the
Republic of Uzbekistan



Cotton Science-Innovation
Center



Bukhara Agrocluster