SECTION II

Creating an environment to enable the development of competitive agribusiness and food value chains

CONTENT

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Trend Analysis and Spatio-Temporal Study of Cotton Cultivation in Uzbekistan

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Abstract

Significance of the cotton growing in a country like Uzbekistan forms the base in agriculture where the majority of economic active population is employed and considerable part of GDP is produced. One can distinguish several aspects of cotton significance for the country. From political point of view, effective functioning of cotton complex provides the country with important international reputation and prestige. In social aspect, sustaining dominant position of cotton complex m economic structure provides employment and income generation to majority of rural population. The economic aspect explains essential contribution of cotton chain to national economy development and its sustainability, states role of the industry m earning foreign exchange reserves and supporting competitiveness of aggregate production.

Key Words: Cotton Production; Trend Line; Food Security; White Gold

Introduction

Uzbekistan's economy depends heavily on agricultural production, with cotton as its main output. Cotton production in Uzbekistan is known as 'white gold' and constitutes a strategic centrepiece of the country's rural economy. Cotton production accounts for 20% of the country's total export income and 40% of the gross value of agricultural production. Uzbekistan is one of the leading producers and exporters of ginned cotton in the world market. It takes sixth place in worldwide cotton production (after China-25%, USA-25%, India-16%, Pakistan-9% and Brazil-5%) harvesting 2 million tonnes of raw cotton, and second place in its export after USA (39%). The cotton sector's role is important in maintaining rural amenities and livelihoods. In areas where the rural economy has not diversified, cotton production remains the main source of income and employment and has been so for generations. Since the collapse of the Soviet Union and independence 22 years ago, Uzbekistan's agricultural structure has changed dramatically: today the number of private farms involved in cotton production is around 81,300, cultivating around 1,329,000 hectares, which represents 37% of the total irrigated land in the country.

The cotton sector is one of the most centralized in Uzbekistan's economy. It is still controlled by an administrative command system of management (a highly centralized system in which decisions are made by the government and enforced by various forms of coercion). Since independence in 1991, the Uzbek government has passed at least 55 laws, decrees and resolutions concerning agricultural land yet retained state ownership and final decision-making authority. With one of the earliest privatization reforms, the government abolished state farms to relieve itself of the financial burden of paying the large state agricultural workforce. It then introduced a system of land leasing under which farmers rent land from the government and must fulfill terms of the agreement or lose their right to farm the land. Each year the government issues mandatory targets for cotton and grain production to local governments, who in turn assign quotas to individual agricultural producers. For failure to fulfill their targets, local hokims risk losing their positions and farmers are subject to a range of economic and administrative sanctions, including criminal prosecution and the reallocation of the land they farmed to other farmers. In other words, cotton production is forced on Uzbek farmers. The government's goal is to spend as little as possible on labour so as to maximize its profits from cotton revenues, which are concentrated in the hands of the central government. Thus, every year the government mobilizes the population *en masse* for up to two months in order to harvest cotton. These draconian methods do not increase the efficiency of cotton production. Under the current system, yields in Uzbekistan have trended downward.

Agricultural review

Uzbekistan has the advantages of a warm climate, a long growing season, and plentiful sources of water for irrigation. In the Soviet period, those conditions offered high and reliable yields of crops with specialized requirements. Soviet agricultural policy applied Uzbekistan's favourable conditions mainly to cotton cultivation. As Uzbekistan became a net exporter of cotton

and a narrow range of other agricultural products, however, it required large-scale imports of grain and other foods that were not grown in sufficient quantities in domestic fields.

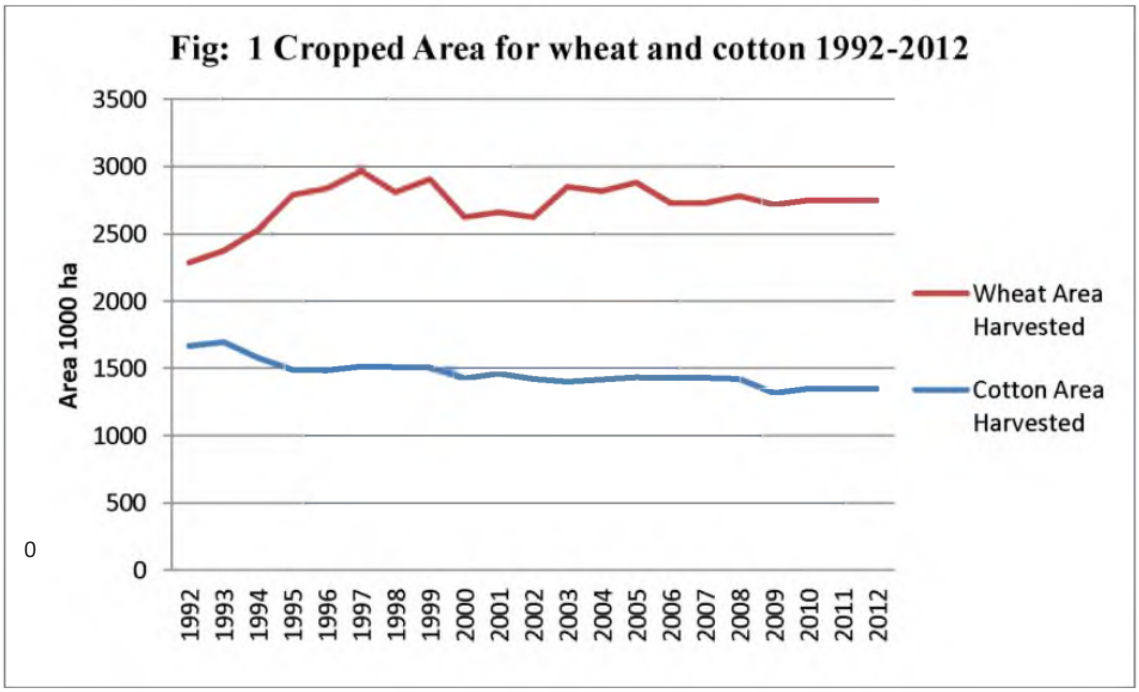
In the last decades of Soviet rule, the private agricultural sector produced about 25 percent of total farm output almost exclusively on the small private plots of collective and state farmers and non-agricultural households (the maximum private landholding was one-half hectare). In the early 1990s, Uzbekistan's agriculture still was dominated by collective and state farms, of which 2,108 were in operation in 1991. Because of this domination, average farm size was more than 24,000 hectares, and the average number of workers per farm was more than 1,100 in 1990. More than 99 percent of the value of agricultural production comes from irrigated land.

Uzbekistan's economy depends heavily on agricultural production. Approximately 60 percent of the value of agricultural production comes from the crop sector and the remainder from the livestock sector. Cotton is the most economically important crop. This "strategic crop", produced in irrigated areas throughout the country, accounts for about 40 percent of cultivated land and makes up about 40 percent of export earnings. It makes Uzbekistan the sixth largest cotton producer and fifth largest exporter of cotton in the world. Since the independence, and as a result of ***self-sufficiency food policy*** adopted by the Uzbek Government, wheat had become the second "strategic crop". It accounts for about 30 percent of cultivated area. The rest of the cultivated area is used for growing fruit and vegetables (Uzbekistan continues to be one of the major suppliers of fresh and processed fruit and vegetables in the region), in addition to potatoes, tobacco and fodder crops.

Trends Analysis in Cotton Cultivation

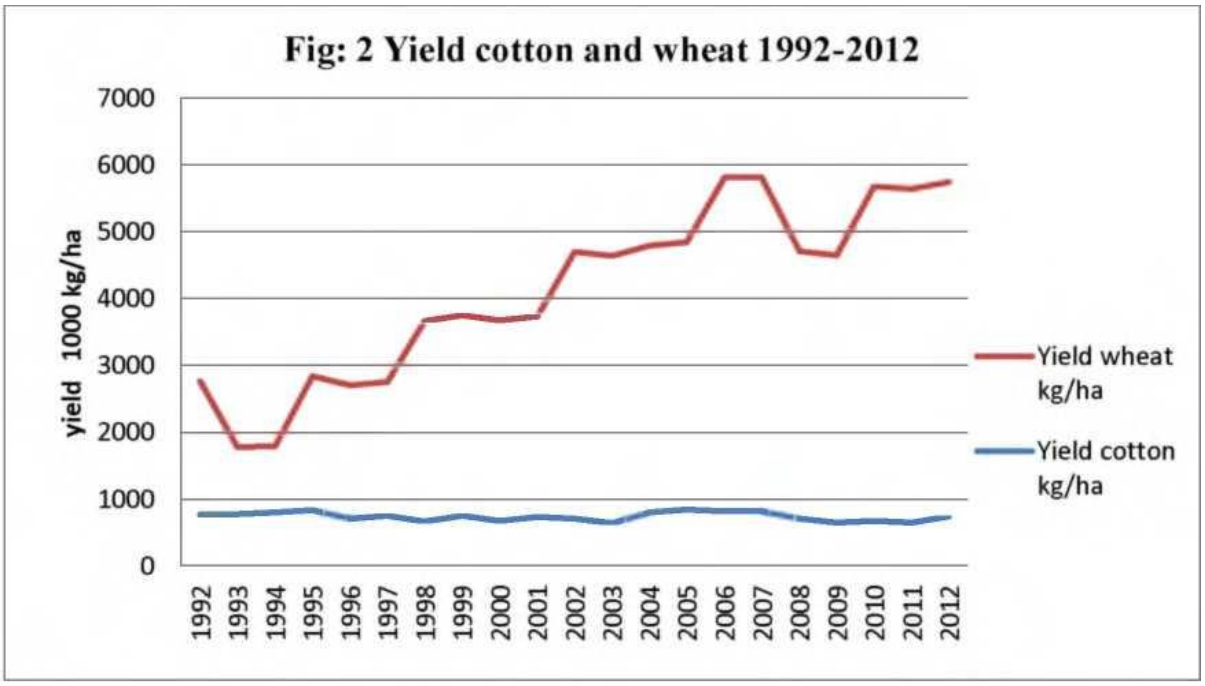
Uzbekistan's main agricultural resource has long been its "white gold," the vast amounts of cotton growing on its territory. It is a kharief crop which requires 6-8 months to mature. Its time of sowing and harvesting differs in different parts of the world, depending upon the climatic conditions. Uzbekistan always was the chief cotton-growing region of the Soviet Union, accounting for 61 percent of total Soviet production in the mid-1990s. It ranks as the sixth largest producer of cotton in the world and the world's fifth largest cotton exporter. In 1991-92 Uzbekistan produced over 7 percent of total world cotton supply of which more than 80 percent was classified in the top two quality grades. In 1987 roughly 40 percent of the workforce and more than half of all irrigated land in Uzbekistan—more than 2 million hectares—were devoted to cotton.

A major policy change introduced after independence for Uzbekistan agriculture is the adoption of self-sufficiency policy in food. Cotton was widely produced and shipped out from the Republic of Uzbekistan under the central planning system in the Soviet Union. Wheat was then produced domestically in the Republic, but was partly imported from other Republics for domestic consumption. The import substitution policy to grow wheat in Uzbekistan started right after 1991. With the introduction of the state order system to impose production quota for growing wheat, wheat production has increased. The land allocated for cotton production has declined as a result of the increasing use of arable land for wheat production. Since the government procurement prices for wheat as well as cotton have been maintained much lower than the international prices, the possibility for the improvement in profitability in agricultural production has been limited.



Source: *USDA, Foreign Agricultural'Service*

The result was an expansion of the winter wheat area from 620,000 ha in 1992 to 1.4 million ha in 2012. As much of the areas newly sown had been amongst the best quality cotton fields, the result was a reduction in the cotton area of 30-35 per cent for at least one season per year. Wheat production did increase substantially, from one million tons in 1991 to 5.2 million tons in and Uzbekistan has now become a wheat supplier with exports of some 500,000 tons annually over the last six years.



Source: *USDA, Foreign Agricultural Service*

Wheat is also a centralized crop, but the quota system for wheat is more flexible than for cotton. Farmers are only obligated to sell 50 percent of their wheat harvest to the central government at procurement prices - the rest can be consumed or sold in the free market. Farmers

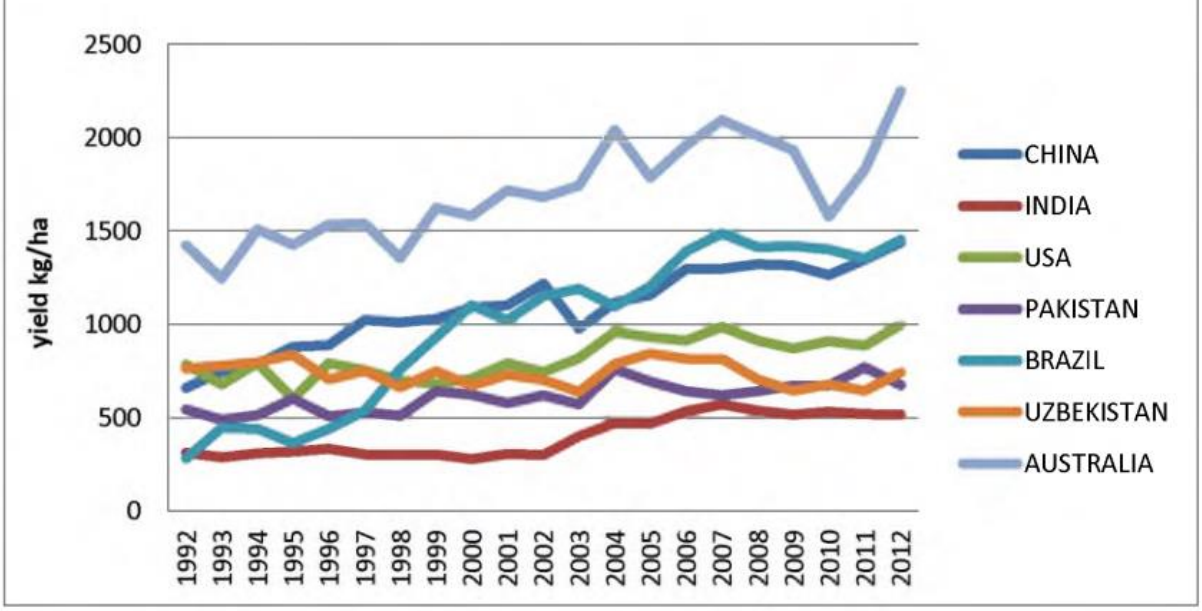
then have an incentive to pursue higher yields, so as to increase the amount of wheat they can sell at world prices. Cotton farmers do not have this privilege, and must go through the black market in order to sell cotton at world prices (Abdullaev et al 2009). As Figure above shows, wheat yields have risen while cotton yields have declined, strongly suggesting that the rigid system of cotton quotas and lack of incentives are a critical factor holding back cotton yields since wheat and cotton otherwise face similar constraints.

There is a general belief that this system is a significant factor in the overall stagnation in cotton yields, especially when compared to wheat. This belief is at least partially supported by evidence from 1992 to 1995 when cotton production was partially liberalized and only 50 per cent fell under the quota system.

Comparison in Productivity

Uzbekistan‘s yield in 2012 is estimated at 742 kg/ha. This compares unfavourably both to yields in Uzbekistan twenty years ago and those in some other major producers now. Average yield for the largest producers is at 1438 kg/ha in 2012 and yield in Uzbekistan was 841 kg/ha in 1994/95. Figure below compares the evolution of cotton yields in Uzbekistan to those of other major producing countries and regions. At the beginning of the period, Uzbekistan‘s yields were equal to the best in the world but are now far below those of China and Brazil. While Uzbek yields are still above those in Africa and India, the gap has narrowed considerably. Other Central Asian countries ‘yields have also declined since independence and remain below Uzbekistan‘s but they have recovered slightly since the mid-1990s whereas Uzbek yields have continued to trend down.

Fig: 3 Uzbekistan's cotton yield in comparison with major producer countries



Source: *USDA, Foreign Agriculture service*

The excellent performance of cotton yields in India, Brazil and China also reinforces the importance of liberalization and market incentives to foster innovation and efficiency. China‘s experience is particularly noteworthy in so far as it is a former centrally planned economy with climatic and soil conditions quite similar to Uzbekistan. China has experienced large productivity increases in cotton growing, due to dissemination of new technologies. Rising productivity of cotton production in China has occurred in a context of far-reaching liberalization of agriculture, higher prices to producers, and investments in infrastructure

India and Brazil have also made substantial progress through a combination of

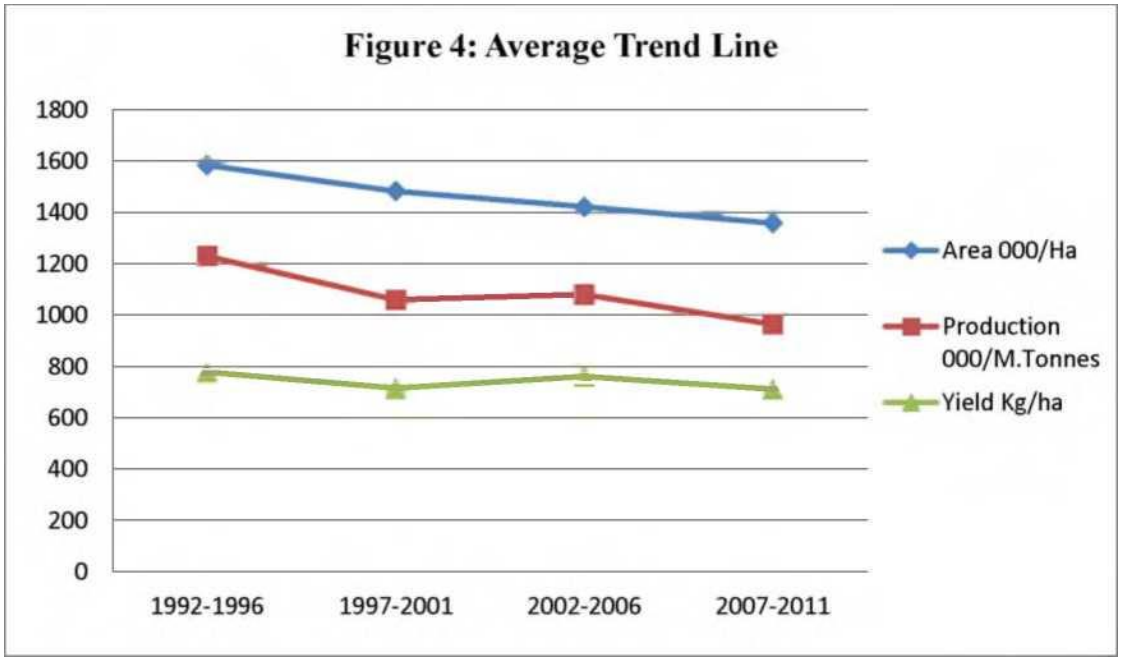
liberalization, assistance to farmers, and investment in infrastructure. In 2002, India introduced BT cottonseeds. This genetically modified variety produces much higher yields than organic varieties, and reduced the need for insecticides. Higher yields meant increased production, and therefore higher revenues. An increase in revenues has enabled Indian farmers to invest in farm equipment, further increasing their productivity. From 1992 to 2012, average yield in India almost doubled, going from 311 kg/ha to 517 kg/ha. Brazil has a similar story: farmers have invested in new technologies, new crop varieties, mechanization, soil improvements and biotechnology to increase yields and enhance productivity. The Brazilian government provides subsidized credit and price support to farmers.

There are some recent areas of progress in boosting cotton yields in Uzbekistan. Improved drainage funded by the World Bank has led to rising yields in South Karakalpakstan. Uzbek cotton breeders have been developing new varieties of cottonseeds, with potentially higher yields than organic varieties. Recently, breeders have focused on varieties that can withstand stress factors and survive harsher conditions. Also, government has been upgrading ginning plants and plans to purchase 200 new linters to replace some of the old ones, which should improve ginning efficiency. Without improving incentives, however, these initiatives are unlikely to suffice to reverse the long-term decline in yields.

Table 1: Avg. Growth in Area, Production and Yield (1992-2011)

	Area	**Production**	**Yield**	**%ge**	**%ge**	**%ge**
Year						
	000/hectares	000/M/Tonnes	Kg/Ha	Area	Production	Yield
1992-1996	1583.4	1230.084	776.862	NA	NA	NA
1997-2001	1482.6	1058.476	71232	-6.36	-125	-8.10
2002-2006	1421	1079.9	759.957	-4.15	2.02	6.44
2007-2011	1358	964.506	710.240	-4.43	-10.68	-6.54
Average	1461.25	1083.241	740.247	-4.98	-7.53	-2.73

Source: Computed on the basis of FAO statistical year book 1992-2011



From table 1 it is obvious that the highest area of 1583.4 thousand hectares was recorded

in the period 1992-1996 and the lowest area was recorded during 2007-2011 period. The average area under the cultivation of cotton from 1992-2011 has been recorded 1461.25 (Table 1). The trend during the whole period has showed a decrease in area under cultivation. The average decrease in area has been recorded (-4.98) percent.

Trend in production has also followed the same path as the area with decrease in production, except 2002-2006 period where the production increased by 2.02 percent .The highest being 1230.084 thousand metric tonnes in 1992-1996 and the lowest being 964.504 thousand metric tonnes in 2007-2011 period. The average production from 1992-2011 has been recorded 1083.241 thousand metric tonnes (Table 1).

The trend in yield kg/ha has also been in a state of fluctuation showing a negative growth. The lowest yield of 710.247 kg/ha was recorded during 2007-2011 period and the highest 776.862 kg/ha was recorded during 1992-1996 period. The fluctuating trend showed an increase in percentage of yield kg/ha with a growth of 6.44 percent during 2002-2006 period (Table 1).

In light of increasing water shortages in Central Asia and the end of the Soviet distribution system that guaranteed food imports, government leaders have proposed reducing cotton cultivation in favour of grain and other food plants to feed an increasingly impoverished population. In fact, between 1987 and 1991 land planted to cotton decreased by 16 percent, mainly in favour of grains and fruits and vegetables. But Uzbekistan's short-term needs for hard currency make dramatic declines in cotton cultivation unrealistic. Likewise, Uzbekistan's entire existing agricultural infrastructure, irrigation systems, configuration of fields, allocation and type of farm machinery, and other characteristics are geared towards cotton production; shifting to other crops would require a massive overhaul of the agricultural system and a risk that policy makers have not wished to take in the early years of independence. Under these circumstances, continued commitment to cotton is seen as a good base for long-term development and diversification

Cotton: Trend Analysis in production

For analyzing the trends in cotton production in Uzbekistan Regression Model, has been used. The trend analysis has been calculated for two different time periods e.g. from 1992 - 2000 and 2001 - 2011. By doing so the results have been carried out in a comprehensive way and plotted in graphic form.

Table 2: Trend Analysis of Cotton Production 1992-2000

Year X	Production Y	x= X-A	x^2	xy
1992	1273890	-4	16	-5095560
1993	1320920	-3	9	-3962760
1994	1258000	-2	4	-2516000
1995	1249720	-1	1	-1249720
1996	1047890	0	0	0
1997	1138250	+1	1	1138250
1998	1001520	+2	4	2003040
1999	1127800	+3	9	3383400
2000	957970	+4	16	3831880
N= 9	$\sum$y=10375960	$\sum x$=0	$\sum x^2$ =60	$\sum xy$=2467470

$$y^t = a + bx - - - - - - - - 1$$

$$\sum y = Na + b\sum x - - - - - - 2$$

$$\sum xy = a\sum x + b\sum x^2 - - - - 3$$

Putting values of $\sum y, \sum x$ and N in equation – 1, we get;

$$10375960 = 9\ a + b.0$$

$$10375960 = 9a$$

$$a = \frac{10375960}{9}$$

$$a = 1152884.44$$

Now putting values of $\sum xy, \sum x^2, \sum x$ and 'a' in equation – 3, we get

$$-2467470 = (1152884.44).0 + 60b$$

$$-2467470 = 0 + 60b$$

$$-2467470 = 60\ b$$

$$b = \frac{-2467470}{60}$$

$$b = -\ 41124.5$$

Substituting the values of 'a' and 'b' in equation – 1, we get.

$$y^t = a + bx$$

$$y^t = 1152884.44 + (-\ 41124.5)\ x$$

Table 3: Trend values 1992-2000

Year	*x*	*y'* = *a* + *bx*	Trend Value
1992	-4	1152884.44+(41124.5) (-4)	988386.44
1993	-3	1152884.44+(41124.5) (-3)	1029510.94
1994	-2	1152884.44+(41124.5) (-2)	1070635.44
1995	-1	1152884.44+(41124.5) (-1)	1111759.94
1996	0	1152884.44+(41124.5) (0)	1152884.44
1997	1	1152884.44+(41124.5) (1)	1194008.94
1998	2	1152884.44+(41124.5) (2)	1235133.44
1999	3	1152884.44+(41124.5) (3)	1276257.94
2000	4	1152884.44+(41124.5) (4)	1317382.44

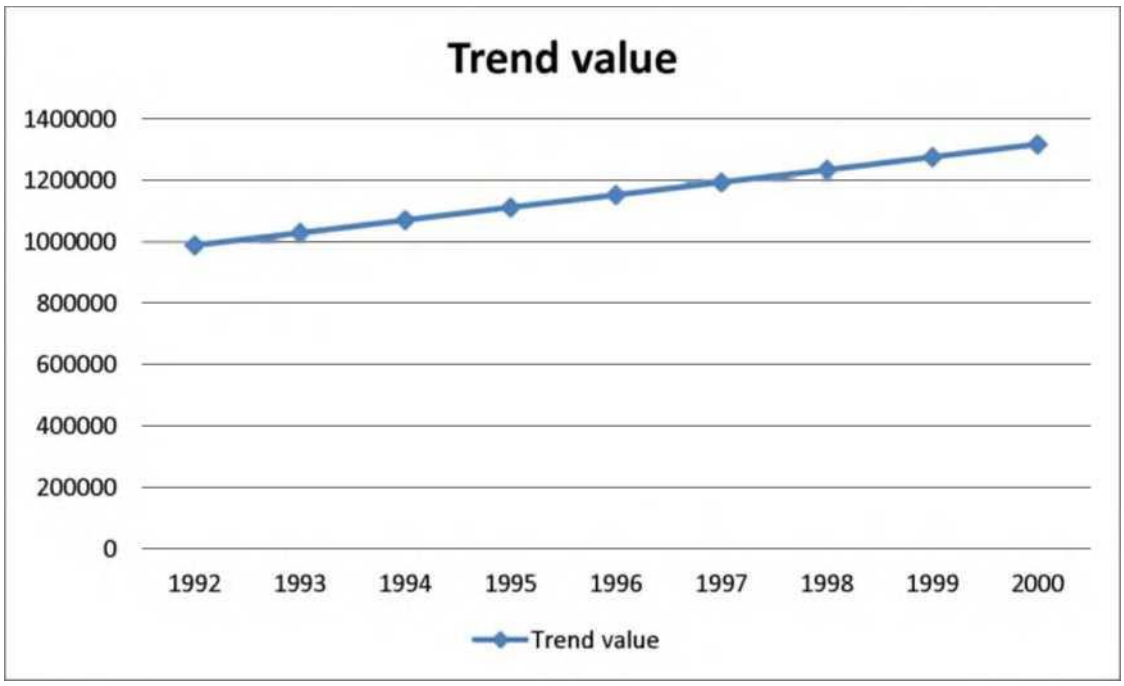


Figure: 5 Trend Line 1992-2000

Table: 4 Trend Analysis of Cotton Production 2001-2011

Year X	Production Y	□= X-A	□^{2}	□□
2001	1066840	-5	25	-5334200
2002	1001520	-4	16	-4006080
2003	892660	-3	9	-2677980
2004	1132150	-2	4	-2264300
2005	1208360	-1	1	-1208360
2006	1164810	0	0	0
2007	1164810	+1	1	1164810
2008	1001520	+2	4	2003040
2009	849110	+3	9	2547330
2010	892660	+4	16	3570640
2011	914430	+5	25	4572150
N = 11	∑y=11288870	∑ □=0	∑ □$^{□}$=110	∑□□= 6509840

$$\square' = \square + \square\square - - - - - - - - \square$$

$$\sum\square = \square\square + \square\sum\square - - - - - - 2$$

$$\sum\square\square = \square\sum\square + \square\sum\square^2 - - - - -3$$

Putting values of $\sum\square, \sum\square$ and N in equation – 1, we get;

$$11288870 = 11\ a + b.0$$

$$11288870 = 11a$$

$$a = \frac{11288870}{11}$$

$$a = 1026260.90$$

Now putting values of $\sum\square\square, \sum\square, \sum\square^2$ and 'a' in equation – we get

$$6509840 = (1026260.90).0 + 110b$$

$$6509840 = 0 + 110b$$

$$6509840 = 110\ b$$

$$b = \frac{6509840}{110}$$

$$b = 59180.36$$

Substituting the values of 'a' and 'b' in equation – 1, we get.

$$\square' = \square + \square\square$$

$$\square' = 1026260.90 + (59180.36)\ \square$$

Table: 5 Trend values 2001-2011

Year	*X*		Trend Value
2001	*-5*	1026260.90 + (59180.36) (-5)	730359.1
2002	-4	1026260.90 + (59180.36) (-4)	789539.46
2003	-3	1026260.90 + (59180.36) (-3)	848719.82
2004	-2	1026260.90 +(59180.36) (-2)	907900.18
2005	-1	1026260.90+ (59180.36) (-1)	967080.54
2006	0	1026260.90+ (59180.36) (0)	1026260.9
2007	1	1026260.90 +(59180.36) (1)	1085441.26
2008	2	1026260.90+ (59180.36) (2)	1144621.62
2009	3	1026260.90+ (59180.36) (3)	1203801.98
2010	4	1026260.90+ (59180.36) (4)	1262982.34
2011	5	1026260.90+ (59180.36) (5)	1322162.7

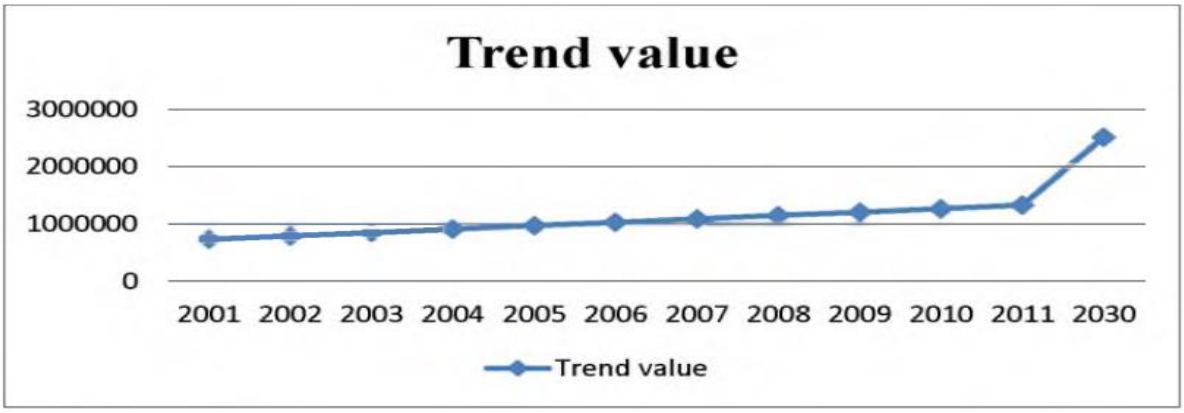
Since the year of origin is 2005, therefore the value of '□ ' for the year 2030 will be 25.

$$\square' = 1026260.90 + 59180.36(25)$$

$$02030 = 1026260.90 + 1479509$$

$$02030 = 2505769.9$$

Figure: 6 Trend Line 2001-2011



Since independence in 1991, cotton production in Uzbekistan has declined by approximately one third. This decline is primarily a result of a reduction in the area devoted to cotton and, secondarily, of a minor decrease in yields. The decline in cotton cultivation and the current area planted to cotton are first and foremost results of explicit government policy. After independence, the government allowed some cotton areas to be transferred to the private cultivation of non-cotton crops and encouraged a shift to wheat production to cope with economic and political disruption and to meet new desires for national food security. The lesser cotton area which resulted has then been maintained by a coercive quota system for both planting and procurement. Should the quota system be removed with no other change in policy, it is fairly clear that cotton cultivation would decline further. However, it must also be remembered that output and input prices as well as credit are now controlled by the government. At current world price levels, a general freeing of the cotton sector would raise the prices farmers receive for their crops but would also raise the costs of production inputs. Predicting the net effect on both cotton output and farmer well-being, at least in the short term, is less than straightforward.

The minor decline in cotton yields is partially related to the decline in the volume of land used for cultivation. For example, farmers have been able to transfer some of the most productive cotton lands to the production of other crops including wheat and vegetables. However, other factors have also been at work. Environmental problems have certainly contributed to difficulty in maintaining, or increasing, cotton productivity. The shift from large collective farms towards family organization has resulted in a vacuum of responsibility and organization for the operation and maintenance of some irrigation and drainage systems. The impact, exacerbating problems emerging by the end of the Soviet period, has been land degradation primarily in the form of water logging and salinity.

However, the true driving force in cotton productivity improvement, or lack thereof, becomes evident when comparisons are made with Uzbekistan's other major crop, wheat. Typically grown in the same irrigated fields as cotton, wheat yields have more than tripled since independence. The comparison between cotton and wheat is perhaps especially surprising given the increasing levels of salinization and cotton's relative salt tolerance. This evidence strongly suggests that it is not the natural environment which has held down cotton productivity but rather it is the policy environment which is the culprit. In particular, the stagnation in yield appears to be largely a response to a government quota system for cotton which gives little, if any, incentive to increase productivity beyond the levels required to meet production quotas.

While cotton yields have deteriorated in Uzbekistan, they have risen in other developing country producers, including China, Brazil and India. The experiences of these countries have important lessons for Uzbekistan. China in particular has climatic and soil conditions similar to Uzbekistan and also emerged from Communism. The Chinese government has substantially liberalized agriculture since the early 1980s while supporting infrastructure and assisting farmers. As a result of this more favourable environment and farmers' incentives to boost productivity, Chinese farms have invested in technologies and adopted practices that have fostered sharply rising

yields. Likewise, Braziks cotton producers have benefited from liberalization and boosted both land area devoted to cotton and productivity. The heavy-handed control of the Uzbekistan government over its cotton industry and the reliance on coercion rather than incentives are the main reasons for the unfavourable performance of Uzbekistan. This is also illustrated by the divergent performance of wheat and cotton yields in Uzbekistan. Although wheat is also subject to extensive government control, wheat farmers have substantially more flexibility than cotton farmers, and wheat yields have consequently trended upwards while cotton yields have fallen.

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Theme: the impact of local gastronomy on the development of ecotourism.

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Abstract: Local food products of each region play an important role in the development of ecotourism. The availability of facilities for the consumption of local food in places where ecotourism is located is not only to meet the basic needs of tourists, but also to improve the economic situation of the local population. Therefore, this article discusses the food-related characteristics of tourists and the benefits of local gastronomy for both the local community and ecotourism tourists around the world.

Keywords: Advantages of local gastronomy; ecotourism; individual characteristics of food; local gastronomy at the designated place.

Introduction: The concept of ecotourism emerged in the 1980s and 1990s, and as a result, various definitions have emerged by many ecotourism associations around the world. However, these definitions have the same basis. The concept of ecotourism, which treats tourism and the natural base as recreation, aims to preserve the environment in order to be sustainable. The foundation of ecotourism was laid by Ceballos-Lascurain (1996) in "Ensuring the socio-economically active participation of the local population in ecologically responsible, enlightened travel to relatively unstable natural areas for the enjoyment and appreciation of nature (past and present cultural features) that help preserve nature"[1].

Analyzing the different definitions of the concept of "eco-tourism" and generalizing it, it is necessary to distinguish the following features:

- indirect use of wildlife as a tourist destination;
- minimal damage to the environment;
- recreational and positive educational impact on the person;
- to get acquainted with new landscapes, to study samples of flora and fauna for protection;
- the use of funds from tourism for the conservation and restoration of flora and fauna of the region;
- observation of the code of respect for wildlife and local people by all tourists and service providers, etc.[2]

Summarizing the concept of "eco-tourism", we can conclude that the principles formed in the above-mentioned features of the organization of tourism are not local, but global in nature. Therefore, these principles should apply not only to certain parts of the world or parts of the land, water and air space, but to the field of tourism activities around the world.

As one of the nature-based types of tourism, ecotourism has become one of the fastest growing segments of the world tourism market. In the last few decades, many people and the world community have begun to see ecotourism as a unique economic key to supporting nature conservation. Many proponents of ecotourism also express the view that an important component of it should be environmental education or education for the participating tourists..[3] Such studies suggest that tourists can gain more knowledge about nature and be more supportive of nature conservation, as well as gain more political and financial support.[1]

While there is a lot to be gained from developing ecotourism, not all of the proposed ecotourism projects are cost-effective, they provide little or no benefit to those involved in the ecotourism business, and the level of financial risk is high. This article analyzes the advantages and disadvantages of ecotourism from the point of view of its nature conservation tool and assumptions and considerations such as further development of ecotourism by expanding the consumption of national gastronomic products.

The main part

"Ecotourism concerns the protection of the environment on the basis of lies." Such trips are out of the preliminary nature of the small group of tourists, protection of natural resources and

[1] Ceballos-Lascurain H (1996) Tourism, ecotourism and protected areas. IUCN: Gland, Switzerland
[2] O.H.Hamidov, A.N.Norchayev "Ekoturizm" TDIU-Toshkent 2011

means for the implementation of the various projects on the works. This concept - the concept of the International Ecotourism Society says, ecotourism - "responsible travel to zones of nature, where social status is the protection of the local population". The nature of the experiments showed that protection of land in different regions of the globe, especially in the mountainous areas of protection "should not go to the people with the land" or "manage the living environment of the local population, their thoughts generations sent to protect the future. In the absence of any component of these factors, there is no need to think about eco".

Picture №1 Miscellaneous of ecotourism
Source: Graduation paper from Naimova S. Bukhara SU.

2014 At present, there are four different types of ecotourism.

1. Scientific tourism. At the same time carry out monitoring works in the field of tourists, nature will take part in the study. For example, one of the Latin American countries - Colombia, to explore the rich world of birds, "birds of Colombia", which was held in ecotypes ornithologists from other countries will also participate in scientific research. The tourists are actively working methods, will be able to enjoy the natural beauty. Tourism is scientific research expedition abroad, including students, faculty and natural field practices.

2. The study of the natural history of species. This trip was to learn about the environment and local culture. They usually reserves and national parks can be created. To be established in these areas have a variety of natural phenomena. School trips for students, teachers, students nature of the stories about the history of places. Samarkand is located in the mountains south-west of the city of Karatepa on its peak in the cave of King David. This is the way to go in the cave and he can go all the revamped. However, his time in the cave appear to be a qualified cave tour was led by the head of explaining the history and identity, and presumably will be the way it would comment on the myth of the cave. In addition to eco tourists who work inside and outside the cave can be modified in view of the strong.

3. Adventure tourism. This tour includes all types of active tourism and recreation in nature, it includes trips included. Target them feel new emotions, impressions of tourists to experience physical improvements and new forms of sports success. This tour tourism and mountaineering, rock hiking, mountain, walking, water-skiing, walking and mountain skiing and horse tourism.

4. Specially protected tourism. Natural area is the main type of eco-travel.

The main difference between the ecological functions and features are ecotourism unique features:

- The territory of the local population to participate in social and economic development;

- Most of the tourist facilities in the course;
- Independent of nature;
- Low power consumption;

-Environmental knowledge in the field of tourism.

Recreation resources, eco-tourism, nature, mountains and plains, rivers, deserts and oases, and the lake are a different landscape zones. Also, based on eco-divided into the following components:

✓ Marine and ocean eco-tourism;
✓ Forest Eco-zones and parks;
✓ River and Lakes ecotourism;
✓ Mountain Ecotourism;
✓ Ancient Sites and ecotourism;
✓ Architecture Monuments ecotourism;
✓ Eco-tourism and ecological crisis zones;
✓ Separate tourism in protected natural areas.

As defined above, ecotourism plays a significant role in the last parts of the concept of ecotourism and many scientists employ only specially protected natural territories ecotourism.

The development of eco-tourism in Uzbekistan, as the use of natural resistant device Ecotourism

- travel with the nature of this responsibility.

Ecotourism activities include the following:

1. The involvement of the local population:

- Development of the local population in the field of environmental protection;
- The development of local small businesses in the tourism sector of the population, the distribution of traditional crafts and souvenirs, involved in the production of environmentally friendly products and production;

2. Information Program:

- The creation of a booklet and a Web site;
- The creation of a database;
- The distribution of information through the network;

3. National parks and reserves providing practical help:

- Recreation is allowed to determine the limits of pressure and obedience;
- The establishment of sanitary and environmental actions and conduct;
- Environmental control;

4. The structure of the state and tourism companies to work with:

- Ecotourism and protect the interest.

5. Education programs:

- Operators of Eco tour the local population and the production of scientific organization of scientific seminars, workshops and training;
- Eco management program production;
- The organization of information seminars and the involvement of the local population; Information services;
- To restore the customs and traditions of the local population;

6. International programs include:

- Eco-exchange programs;

International education and training projects;

7. The establishment of ecotourism development program.

Eco-types and their purpose.

№	Ecotourism types	The main objectives
1.	Aimed at scientific and educational tourism	Poultry, botanical, decorative, geographical, archaeological, ethnographic and other scientific research
2.	adventure tourism	On foot, traveling on horseback in the mountains and water
3.	Summer school students	Introductory practice, practice, practice diplomoldi and other summer schools
4.	Summer camps and other summer programs	Lore, botanical, zoological, archaeological, geological, and others
5.	Eco-types and their purpose	Participation in environmental conferences, symposia, friends and relativies and other.

Source: Ibadullayev N.E. Turistik resurslardan foydalanish samaradorligini oshirish imkoniyatlari. – Samarqand, 2010.

The basic assumption in using this approach is that a buyer's attitude towards an attribute of a property (physical, aesthetics, or environmental) is reflected in the willingness to pay for the property. In deciding to buy a house, one would expect its value to be equal to its construction costs plus an appropriate mark-up. In reality, decisions to buy a house are influenced by a wide range of attributes, only some of which are physical. Other considerations are location to certain amenities, distance from good schools, markets, and other general neighbourhood attributes. The property-value approach is designed to control certain variables so that any remaining price differential can then be assigned to the unprized environmental effect—either good or bad. A drop in property value may be due to increased noise or air pollution, or view obstruction; an increase in property values will occur if these undesirable environmental attributes are corrected. Benefits from an urban flood-control project could, in part, be estimated by examining price differences between housing units located in a flood-prone district and identical housing situated in less frequently flooded areas. Based on the assumption of a freely functioning and efficient price market, the approach is founded upon a sound theoretical base and is capable of producing valid estimates of benefits as long as individuals can perceive environmental changes (Georgiou, et al., 1997). In 1993, North and Griffin used the hedonic property valuation approach to assess the willingness-to-pay for water using water source as a housing characteristic. The study, from a survey of 1,903 Philippine households, developed a bid-rent function and found that households are willing to pay about half their imputed rent to have piped water.

Wildlife-based tourism can be classified into two areas: non-consumption (when seeing or watching wildlife, photography, etc.) or for consumption (hunting and fishing). Ecotourism is more related to the passive form of tourism that is not consumed. The second direction of ecotourism will develop in a sustainable way if the form of tourism carried out for consumption is properly managed and efforts are made to maintain stability. In the United States, for example, hunting organizations such as Ducks Unlimited protect ponds and lakes, providing food for migratory ducks and geese. In the Navoi region of Uzbekistan there is a project on wild breeding of Tuvaluans, which is funded by the Government of the United Arab Emirates.

A.Nigmatov, N.Shamuratova (2006, 2007), A.Nigmatov, Sh.Yakubjanova (2009) were the first to divide the territory of Uzbekistan into ecotourism and agro-tourism regions and divided the territory of the country into 14 ecotourism and 15 agro-tourism regions.

Any ecotourism activity is usually in natural areas, where it should contribute to the preservation or development of not only natural areas, but also local culture that realizes ethnotouristic potential, thereby creating added value for travelers and increasing network revenue. Such events help to appreciate cultural diversity both in the region and in the local community. Thus, the measures taken are to increase the well-being of local communities by improving their economic and social development. One of the dimensions of ecotourism listed by the Food and Agriculture Organization of the United Nations (FAO) is the economic dimension of ecotourism.

Activities related to ecotourism in this area are often in the areas of products and services, which involve a variety of stakeholders, from area managers to local communities. Among the products and services offered, food and beverages, although not the main product, play an important role. This study focused on local gastronomy and food consumption, which occurs in national parks, nature reserves, and any other protected areas.

Despite the fact that food is neophobic and food-related personal characteristics among consumers, local food can become the most important aspect of the quality of the tourist experience; as the main or partial cause of the visit and as a multiplier effect providing a gastronomic route, benefits not only tourists but also locals. Research in recent years has shown that in addition to the environmental quality of the place you visit, good local food also affects the satisfaction and experience of tourists. Many aspects are taken into account when choosing a place for a tourist to travel, including the presence of local food types. Although this may not be the main motivation, it does play an important role as a partial motivation for the visit. Local food not only serves as food, but also serves as a vehicle for tourists to understand the local community and its culture through the gastronomic route.

The advantage of consuming local food is that it helps to maintain small farms and support rural communities as the money spent remains with the local community. It also reduces travel miles spent on food, thereby reducing fossil fuel consumption and air pollution. In return, consumers will be able to better understand the process of making gastronomic products by choosing eco-friendly food to eat and talking to the people who set up the production of these products, as well as awakening the desire to buy it, bringing additional income to local producers.

It can be seen that food and beverages produced locally and in a designated area can have an impact not only on the local economy, but also on local culture and the environmental sustainability of tourist destinations. This in turn benefits both the hosts and the guests[4] (Симс, 2009). The following table provides an analysis of previous research samples related to the benefits of local food in tourist destinations.

Table 2 Opinions and comments of scientists on the combination of ecotourism and local gastronomy.

№	Authors	Thoughts
1.	Adeyinka-Ojo and Khoo- Lattimore (2013)	The slow food event at Bario in Sarawak, Malaysia has the potential of becoming a high yielding tourism destination with the cooperation between the community, organizational and other tourism stakeholders.
2.	Pratt (2013)	Growing foods locally in Fiji island do not only minimize food miles, but also decrease leakage of the local economy while preserving the quality food tradition.
3	Hjalager and Johansen (2012)	Environmental and economic sustainability with food production, services in protected area represents economic possibilities and provide higher food production and service quality which lead to exciting food experience
4.	Everett and Slocum (2013)	Selling local food to tourists to support local sustainability agendas which are the traditional industries, job development, rural economies, encouraging social justice and diversifying agriculture is endorsed by the U.K government bodies.
5.	Sims (2009)	Promoting iconic local food that can draw new tourists to a destination. Such image can be linked to traditional ‘landscapes’ of farming methods that tourists can experience.

6.	Choo and Tazim (2009)	The preliminary research in the local organic farm study shows definite parallels between tourism practice and ecotourism principle which is sustainable for the environment and the local community.
7.	Telfar and Wall (1996)	Encouraging the use of local food by the tourism industry can reduce conflict in the direction of symbiosis between local economic linkages and tourism destination.

* Summarized by the authors

In the table above you can see a generalized summary of the conclusions drawn from the work done by a number of scientists in this field. These findings also highlight the importance of local food strategies in the development of ecotourism.

There are also a number of ecotourism and tourist destinations in Nurabad district of Samarkand region.

Jarkuduk : The mausoleum of the ram father IV-V centuries. The Kochkorli ota shrine is located on the slopes of a mountain in the village of Kochkorlibobo in the Jarkuduk village of the district.

Arabota: White Mosque IX-X centuries. According to the Kufic inscription preserved on the roof of the mausoleum, the monument is a pilgrimage and ecotourism site built during the reign of Noah ibn Mansur (977-997) of the Bukhara Samanid dynasty.

Aksay : The shrine of Hazrat David in the XVII-XIX centuries. David is one of the prophets from the Children of Israel. After the death of David Tolut, he was appointed king of the Children of Israel. The flora and fauna of Aksay village can be described as a bright combination of pilgrimage, gastronomic and ecotourism sites, attracting many local tourists.

According to Table 3, significant changes in the dynamics of economic indicators were observed at 3 ecotourism facilities in Nurabad district. In particular, in Kochkorli ota mausoleum in 2019, despite the fact that the level of income increased by 8428 thousand soums or 14.9% compared to 2017, the profit increased by 11303 thousand soums or 32.6%, resulting in a decrease of 2875 thousand soums or 13.2%. In return for the decline in profits, the rate of return also fell by 21.8 points. Despite the fact that the level of income in the mausoleum of the White Mosque in 2019 increased by 5833 thousand soums or 16.4% compared to 2017, the profit increased by 9710 thousand soums or 45%, resulting in a decrease of 3877 thousand soums or 28%. In return for the decline in profits, the rate of return also decreased by 32.4 points. Despite the fact that the income level of the shrine of Hazrat David in 2019 increased by 28,864 thousand soums or 18.4% compared to 2017, the increase in expenses by 15,998 thousand soums or 18.5% led to a decrease in profits by 3,877 thousand soums or 28%. In return for the decline in profits, the rate of return also decreased by 32.4 points.

Table 3 The main economic indicators of ecotourism in Nurabad district (in thousands of soums)

№	Indicators	2017	2018	2019	Change in 2019 compared to 2017	
					Quantitative (+ ;-)	Relative %
	The Kochkorli ota shrine					
1	Income	56423	51236	64851	8428	114,93
2	Cost	34568	38514	45871	11303	132,69
3	Benefits	21855	12722	18980	-2875	86,84
4	Profitability,%	63,22	33,03	41,37	Decreased by 21.8 points	

	White Mosque					
1	Income	35421	39456	41254	5833	116,46
2	Cost	21546	25894	31256	9710	145,06
3	Benefits	13875	13562	9998	-3877	72,057
4	Profitability,%	64,39	52,37	31,98	Decreased by 32.4 points	
	The shrine of Hazrat David					
1	Income	156783	174561	185647	28864	118,41
2	Cost	86452	95648	102450	15998	118,50
3	Benefits	70331	78913	83197	12866	118,29
4	Profitability,%	81,35	82,50	81,20	Decreased by 0.14 points	

* Source: Uzbektourism based on the report

Some of the infrastructure in these areas is still in dire need of repair and investment in ecotourism. As a result of the study, the following recommendations were developed:

- It is necessary to develop ecotourism in the region in accordance with modern requirements and preserve the natural state. To do this, it is necessary to provide government subsidies and economic support to businesses that can develop this sector..
- In addition, in these regions, the creation of a gastronomic tourism business in connection with the consumption of food products can lead to an improvement in economic performance in the region.
- Based on the above economic situation, it is necessary to properly assess the potential of these regions, first to introduce it to visitors throughout the country, and then around the world (on the Internet, television, radio, etc.).
- It is also necessary to conduct appropriate research on all possible economic and social situations.

By implementing these proposals, along with the development of ecotourism in these areas, it is possible to achieve additional employment and some improvement in the social and economic situation of the population.

3. Conclusion

The popularity of the unique food products of each ecotourism destination attracts tourists to these destinations. Consumption of foods such as nuts, mushrooms, berries, herbs and fruits can cause guests to make their next visit. Ecotourism destinations can also be promoted by a particular food product if it is sold strategically. Studies show that many tourists are definitely interested in the food base of this destination when choosing a destination. In addition, among the local population, this direction will become a form of entrepreneurship.

It should be noted that another goal of ecotourism is to preserve the unique flora and fauna, to preserve it for future generations. COVID-19 has become a global problem around the world. The pandemic has caused a number of socio-economic challenges globally, led to the postponement or cancellation of sporting and cultural events, and raised concerns about shortages of medicines, electronics and food. Measures have been taken to prevent the spread of the disease, such as travel restrictions, quarantine, curfew, postponement and cancellation of events, and closure of institutions. Apparently, ecotourism trips were also limited. But we can’t say that this has been a huge loss for ecotourism. The reason is that the current restrictions on the operation of some industries, the self- isolation of people have led to the revival of the natural environment around the world, which has led to the further development of ecotourism. In this case, we can observe a decrease in the cost of rehabilitating ecotourism sites.

Thus, the organization of local gastronomy in the development of ecotourism leads to the social and economic prosperity of this region.

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Tendencies of agricultural development in Uzbekistan and directions for increasing the efficiency of farmers’ activities

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ABSTRACT

The article analyzes the trends in the macro and micro economic development of agriculture in the country and its individual regions. The factors of growth and efficiency of production of food crops and raw materials in farms of a separate region and district in conditions of limited land-water and labor resources have been revealed. Proposals have been developed to improve the structure of production in farms, to develop strategic sectors of agriculture aimed at increasing the export of food products. Recommendations are given on the development of information systems of digital services for servicing farms in districts and regions.

Key words: agriculture, farming, gross domestic product, land resources, economic models of cotton yield, information and communication technologies, digital service.

INTRODUCTION

As a result of economic reforms implemented in Uzbekistan, new economic entities based on private property- farms, have been formed and entered the stage of development. In the context of providing sustainable economic growth in Uzbekistan, one of the main tasks of farm management is to substantiate ways to further increase its contribution for the growth of the country's economy. The main purpose of this, is to ensure the competitiveness of agricultural products and increase their export potential in the world market. It should meet the needs of the population in food and raw materials produced in farms and the requirements of domestic and foreign markets of the republic's industries.

To achieve this goal, it is necessary to determine the optimal composition and prospects of production through the efficient use of labor, material and financial resources and to study in depth the trend of changing market conditions. The use of modern mathematical methods and information and communication technologies (ICT) is required to address these issues in an interconnected and coordinated manner and, as a result, to make informed decisions in farm management. On its basis, it will be possible to develop multivariate management decisions based on the creation of a database for collecting, storing, processing and transmitting information related to the activities of farms.

With the help of models and information systems, the issues of production and processing management in the network of farms are solved jointly, simultaneously and in a coordinated manner. At the same time, it is possible to resolve issues of coordinating the volume of raw materials and the capacity of processing enterprises, and as well as to develop service sectors.

An important factor in increasing the volume and quality of agricultural products in our country is the solution of issues of improving the quality and reducing the cost of products by ensuring the material interests of farmers, and at present, it is being considered as crucial problem. One of the important tasks in solving this problem is to substantiate the strategy for the future development of farming activities using modern information technologies, which is one of the actual trends of scientific and practical research.

LITERATURE REVIEW

The research of U.P.Umrzakov, A.M.Kadyrov, N.S.Khushmatov, H.T.Farmonov,

K.A. Choriev and other economists is devoted to the trends of the development of agricultural economy, as well as the issues of deepening market reforms in the industry and increasing the efficiency of production in farms.

The research work of many scientists in our country is devoted to the modeling of agricultural sectors and industries, as well as farm management and solving scientific and practical problems in the application of information and communication technologies and digital economy. The scientific work of S.S.Gulomov, B.B.Berkinov, B.A.Beglov, Sh.I.Mustafakulov, D.T Mukhamadieva and others can be included among them. In recent years, research in these areas has focused on the development of a system of methods and models for the analyzing and forecasting of management and development of farms in the context of limited land, water, labor and other resources.

On the other hand, there is a lack of research on improving the system of normative and statistical information of increasing the efficiency of farms and predicting their development. Research in these areas will accelerate the introduction of information and communication technologies and the digital economy into farm management.

ANALYSIS AND RESULTS

Agriculture plays an important role in the economy of Uzbekistan. Land fund, labor resources, machinery and technological equipment, as well as the irrigation system and a large part of other national wealth of the country are at the disposal of agriculture. Takin this into account, the government of the republic is consistently implementing comprehensive measures aimed at accelerating the adaptation of agricultural producers to market relations, as well as, increasing the efficiency of their production.

According to the statistics, more than 3.3 million people were employed in the agricultural sector in 2019. Or the number of agricultural workers increased by 7.5 percent compared to 2000. In 2019, the share of agriculture, including forestry and fisheries, in the country's GDP amounted to 28.1 percent. This is 12.0 percentage points lower than in 2000. Although this is due to an increase in the share of other sectors and industries in GDP, in practice, gross agricultural products at current prices in 2019 increased by almost 9.5 times compared to 2000.[1] The production of arable farming products increased by 20.3 times during the same period. Such positive changes have created opportunities not only to improve the supply of food to the population, increase exports, meet the demand for raw materials of processing industries, but also to increase the income of the rural population. This is confirmed by the fact that the volume of production per worker engaged in agriculture in 2019 increased by 90 times compared to 2000. In other words, if in the same period, an occupied worker produced goods worth 449 thousand soums in 2000, then in 2019, this figure amounted to 40518.7 thousand soums.

At the same time, there is an upward trend in gross agricultural output. If the production growth decreased by 1.0% in 2018 compared to 2017, then in 2019, this indicator amounted to 14% compared to the same period, or GDP growth in the industry was 2.2 percentage points higher over the same period (Table 1).

Table 1. Dynamics of changes in the main macroeconomic indicators of agricultural development in Uzbekistan, in billion soums[2]

Figures	Years				Growth in 2019 compared to 2000, either % or times
	2000	2017	2018	2019	
Share in the country's GDP,%	30,1	31,6	31,5	28,1	-2,0
The number of occupied people, in thousands	3090,2	3120,9	3247,3	3323,2	107,5
The gross output (at current prices)	1387,2	90983,1	113660,7	130599,9	95
The growth rate of GDP (in % to the previous year)	103,1	101,3	100,3	102,5	-0,6
The volume of production per employed worker, thousand soums	449,0	29152,8	35001,6	40518,7	90

It is known that as a result of gradual reforms in the agriculture of Uzbekistan, a diversified system of agricultural production with the priority of private ownership has been formed, and farms (arable farms) plays a key role in it. At present, the farms with various production specialties is developing through the cultivation of products in agriculture, animal husbandry and other areas.

According to the State Committee on Statistics, at the beginning of 2020, the number of farms in Uzbekistan amounted to 92.6 thousand, of which 40 thousand (or 43.2 percent) were engaged in the cultivation of cotton and grain, 31 thousand (or 33.4 percent) in horticulture and viticulture, 14.8 thousand (16 percent) in livestock; 5 thousand (5.4 percent) in the cultivation of vegetables and melons, and 1.8 thousand (2.0 percent) in other agricultural production. Of the agricultural products produced in the agricultural sector, 26.9 percent belong to private farms and 70.1 percent to arable farms (gardening). Farms account for 33% of agricultural production in Andijan region, and this figure is the highest among all areas of the republic.

It should be noted that the economic potential of farms has increased and has become a major productive force in the countryside. This is confirmed by the following. The total land area of farms consist of 5987.8 thousand hectares. Its 5324.1 thousand hectares (or 89 percent) are occupied by agricultural land. Of these, 3652.0 thousand hectares (2019) are arable land and this consist of 89 percent share of all arable land in the republic.

Andijan region has great potential for the production of agricultural products and their sale on the market. The products (services) of agriculture, forestry and fisheries account for 24.4 trillion soums were produced in Andijan region, in 2019. This indicator is the second largest in the country after the Samarkand region. In addition, the growth rate of agricultural production in the region during this period amounted to 3.4 percent, and this is 0.9 percentage points higher than the national average (2019).

In 2019, Andijan region has accounted for almost 11 percent of agricultural, forestry and fishery products (services) produced in the country. This is the highest rate in our country. 66.9 percent of the agricultural output in the region are arable farming products.

As of 2019, 220.5 thousand hectares of land were planted with agricultural crops in Andijan region. In 2017-2019s, Andijan region accounted for 6.4 percent of the country's average GDP. In 2019, the region produced 10 625.6 thousand soums of gross yield (GY) per capita, which is 21.8 percent more than in 2018. The growth rate of gross yield in the region amounted to 6.5 percent in 2019, which is

3.3 percent less than in 2018. This year, the upgrowth of gross yield per capita in the region amounted to 4.5 percent.

In 2019, the share of Andijan region in the gross yield structure with agriculture, forestry and fisheries amounted to 45.1 percent. The share of the region in the industrial structure for this year amounted to 22.6 percent, in the service sector - 26.8 percent, in construction – 5 percent. These figures show that Andijan region occupies a high position in the agricultural sector of the republic. In 2017-2019s, the volume of gross yield in the region in agriculture increased from 9603.3 billion soums to 14304.8 billion soums at current prices, or more precisely, the figure increased by approximately 50 percent over the same period.

The results of this analysis show that Andijan region is one of the regions with high economic potential in the country. The economic potential of the region is determined by the role of its districts in production (services). An example of such districts is Balikchi district. As of 2019, agricultural, forestry and fishery products worth 1766.0 billion soums were produced in the district and this number constitutes

7.4 percent of the region's total output. This year, 72.2 percent of the district's production falls on the arable farming sector. The share of farms in the total output of the district amounted to 43.4 percent for the case of 2019.

Table 2. Dynamics of changes in the main indicators of farm development in Balikchi district of Andijan region[3]

Figures	Unit of measurement	Years				The growth in 2019 compared to 2016, either % or times
		2016	2017	2018	2019	
Farms	In thousands	527	484	417	323	-39,0
Total land area	In thousand hectares	19325	17974	19171	19591	13,8
Agricultural products	In billions soums	289,2	363,0	571,4	754,4	2,6 м.
Crop area	In hectares	19325	17974	19171	19531	13,8
e.g., cereals	- // -	7550	7038	7519	7353	-2,0
Cotton	-// -	10594	10245	10435	10309	-2,7
Potato	-// -	67	15	108	91	1,4 м.
Vegetables	-// -	523	87	504	656	1,3 м.
Melons	-// -	43	40	38	88	2 м.
Food crops	-// -	548	546	563	1014	1,9 м.
Agricultural production: cotton	In tons	32701	29551	27973	33299	1,8
Grain (after processing)	-// -	49215	47540	50645	53753	9,2
Potato	-// -	5481	4443	6145	8002	1,5 м.
Vegetables	-// -	37865	34065	55893	56373	1,5 м.
Melons	-// -	21550	21576	22475	32617	1,5 м.
Meat (in slaughtered weight)	-// -	586	167,1	449,9	488,1	-17,0
Milk	-// -	3219	1848	2676	2708	-26,0
Egg	In millions	6527	1373	4210	4440	-32,0

In 2019, 7393 hectares of land in Balikchi district are planted with cereals and 10309 hectares with cotton. This year, 90.4 percent of land in the district has been allocated for these two crops. This shows that the district is mainly specialized in the production of grain and raw cotton. In 2019, compared to 2016, the production of raw cotton in the farms of the district increased by 1.8 percent, grain by 9.2 percent, potatoes, vegetables and melons by 1.5 times whereas meat decreased by 17 percent, milk by 22.6 percent, eggs by 32 percent.

However, in 2018, the manufacture of these products in the area increased sharply. In 2019, 99.8 percent of raw cotton, 92.7 percent of grain, 25 percent of potatoes and 50.6 percent of vegetables produced in the district account for the share of farms (Table 2). These analysis shows that the especial tendency for the development of arable farming production is observed in the farms of the Balikchi district. At the same time, the transition to intensive methods of growing cotton, grain and other agricultural products in these multisectoral farms and increasing their efficiency is considered as one of the important tasks.

Statistically, during 2008-2019s, the cotton yield in Balikchi district increased from 24.7 centners to 32.3 centners (Table 3). During this period, the income from a hectare of cotton field increased by 1,358,000 thousand soums, or almost twice. This was due to the increase in cotton yield and the purchase price of raw cotton. The average purchase price of a ton of raw cotton in 2008 amounted to 550.0 soums, and in 2019 - 4200 thousand soums, or in the same period, the average purchase price of a ton of cotton increased by 3750 thousand soums, and the cost by 3128

thousand soums. This ensured the profitability of cotton production in the district at 15 percent in 2019. In other words, in 2019, the sale of a ton of raw cotton brought an average profit of 650,000 soums to its producer. Considering that farms have grown 333 thousand tons of raw cotton this year, the profit of farmers will be about 217 billion soums.

Table 3. Dynamics of changes in the efficiency of cotton production in farms of Balikchi district, in thousand soums[4]

Figures	Years					Increase (+), decrease (-) in 2019 compared to 2018
	2008	2016	2017	2018	2019	
Cotton yield, centner/hectare	24,7	24,9	27,9	25,9	32,3	+7,6
In terms of one hectare of land: - gross income - production costs	1358 1290	2988 2838	3766 3575	9065 8158	13889 11805	+12531 +10515
A ton of product: -cost - average selling price	522 550	1140 1200	1281 1350	3150 3500	3650 4300	+3128 +3750
Profitability level of production, %	5,0	5,0	5,0	10,0	15,0	+10,0

It is known that ensuring grain independence is one of the strategic development goals of Uzbekistan. Extensive measures have been taken in Andijan region and its districts in order to implement this strategy. As a result, in 2019, more than 636.7 thousand tons of grain were cultivated in the Andijan region, including 50.6 thousand tons of grain in the farms of the Balikchi region.

According to the analysis of statistical data, the volume of grain production in Balikchi district is mainly due to an increase in its yield. If the average grain yield amounted to 55.4 centners in 2008, then in 2016-2019 this figure averaged 67.4 centners.

In line with these changes in the growth of cotton and grain production, the functions and responsibilities of each specialist-manager in the system of farm management arising from the new agrarian relations are also improving. They have been entrusted with functional tasks aimed at providing sustainable development of agriculture and increasing efficiency in the field. One of these tasks is to organize and control the effective use of water, equipment, labor, mineral fertilizers and other productive resources. In practice, this should result not only in the economical use of valuable productive resources, but also in the abundance and quality of crop yields.

From this point of view, farmers and agricultural specialists are required to have scientifically based information and knowledge about the results of land, water and other productive resources in the soil and climatic conditions of their territories. Data belonging to this category are reflected in various standards and statistical reports in the agricultural management system. A correct conclusion can be made about the efficiency of production only on the basis of objective data. However, it remains unclear to what extent each of the production resources, individually or in groups, affected the yield from the ground, and what the result might be if this continues in the future. One of the main ways to solve this problem from the point of view of information uncertainty is the creation of multi-factor or single-factor econometric models to assess the impact of expended resources on production using mathematical methods. Econometric models are used in economic analysis and forecasting future changes in dependent variables to make decisions in conditions of uncertainty in system management. The purpose of creating such econometric models is to determine the degree of quantitative impact of a single factor of production or group of them on the dependent variable (for example, cotton yield) and whether it is positive or negative.

It is known that the efficiency of resources used in agriculture is reflected in crop yields. Cotton is the main branch of agriculture along with grain production. Irrigated lands and a large part of industrial production resources are used in cotton growing. Therefore, an econometric research of the efficiency of agricultural resources can be carried out on the example of this sector. In the context of uncertainty of the information that determines the growth of cotton yield, the influence of factors is interrelated, but they cannot be considered as a simple sum of the effects of individual factors. Therefore, in the analysis of the impact of production factors on cotton yield, it is necessary to determine the quantitative indicator of the impact of each factor, taking into account the cumulative effect of all factors or taken separately. This problem is solved by creating single-factor or multi-factor econometric models of cotton yield. To study this issue, long- term statistics of the cotton industry Balikchi district of Andijan region were obtained. Multi-factor models of regression analysis were developed based on statistical data.

It is known that the cotton yield is influenced by controlled and uncontrolled factors. Controllable factors might include factors that are formed through groups of agro-technical activities that take place from plowing to harvesting. Data on the factors included in this group is reflected in the business plan, statistical reports on the financial and economic activities of the economy. At the same time, uncontrollable factors could be information on the level of humus, heat, precipitation in the soil since they are extremely uncertain and are collected from special sources as a result of long-term observations. These specific features, completeness and accuracy of information uncertainty play a key role in the development of models of yields of cotton and other crops. The selection of factors to be included in the productivity model for a particular region is also based on the availability of this information. Taking this into account, the following factors were included in the econometric model of cotton yield (Y) for the district under consideration:

x1- average land value (quality score);

x2- applied mineral fertilizers (active substances / ts);

x3- labor intensity (man-day / ha);

x4- salary (thousand soums / ha).

The result is the following linear regression equation:

$Y = 18,7 + 0,18\ x_1 + 0,75\ x_2 – 0,035\ x_3 + 0,05\ x_4$, (1)

The multiple correlation coefficient (R) of the model is -0.78. If the assessment of soil quality **(x1)** exceeds 1 point (as a factor of high uncertainty), the cotton yield might increase by 0.18 centners, and if the amount of mineral fertilizers **(x2)** is used by more than a centner, the cotton yield might increase by 0.75 centners. In the model, an increase in manual labor **(x3)** has a negative effect on the growth of cotton crop, while an increase in wages **(x4)** has a positive effect. In general, all factors selected in the model were strongly bonded with cotton yield. This is also confirmed by the value of the multiple determination coefficient (D = 0.425). This situation leads to the following conclusion: the change in cotton yield by about 42.5% is due to the influence of the factors under study. It should be borne in mind that modern software packages allow studying multicollinearity and identifying many factors that have a functional relationship. In our opinion, it is expedient to study separately the dependence of cotton yield on the cost of labor. The higher the level of wages, the higher the interest of workers in more productive and quality work and the higher the yield of cotton. To determine the dependence of the volume of cotton yield on the level of wages, a double correlation between the level of cotton yield and the level of wages was studied on the example of data from the cotton industry in Balikchi district. The regression equation of this double relationship has the following form:

Y = 12,05 +0,07 x1 **(2)**

Here, Y- the yield of cotton, c / ha,

x - the level of wage, thousand soums.

The value of the exemption limit in this (2) regression equation assumes that the yield of cotton could be 12.05 c/ha when the minimum wage costs are met. That is, such a volume of cotton yield can be described as the yield of raw cotton in biological, potential or indeterminate volume per hectare for district conditions.

Perhaps the failure to grow the expected crop is due to other (including uncertain) factors not taken into account in this model. At the same time, in case the level of wage will rise indefinitely, this will not lead to an endless increase in cotton yields. The factor of wage allows achieving the expected result only in combination with other factors affecting the yield of cotton. In determining the development of farms specializing in cotton (substantiation of the business plan), it is important to predict the expected level of cotton yield as an uncertain value. The multi-factor econometric model developed above (1) can be used to forecast cotton yields. At the same time, it has been assessed that the possibility of obtaining additional yields through the expenditure of cotton production resources due to the change in production of each factor involved in the model on farms during the forecast period. The first variable factor of the model (x1) is the assessment of the quality of irrigated lands in the district, which occurs as a result of the introduction of crop rotations of cotton and grain in farms and the enrichment of land with organic fertilizers from livestock farming. Therefore, in the forecast of the first option for farms, the land quality in points was taken at its average level - 50 points. [5]This is due to the possibility of delays in the introduction of crop rotation, and the use of organic fertilizers might only maintain the current fertility of the soil. In the second version, the probability of widespread crop rotation is high for large farms, while for medium-sized farms this possibility is relatively small. Therefore, the **x1** value for the forecast for option 2 was assumed to be 60 points for large farms and 58 points for medium farms. Due to this factor, an additional cotton yield of 9 to 10.5 centners per hectare can be obtained (Table 4).

Another important factor that positively affects cotton yields is the level of use of mineral fertilizers (**x2**) in cotton cultivation. The sharp rise in the price of mineral fertilizers limits the possibility of their use in growing cotton in scientifically based norms and ratios.

Table 4. Forecast options for cotton yield in Balikchi district on the basis of econometric model indicators[6]

Variable factors	Unit of measurement	Correlation coefficient ------ (a_1, i = 1,4)	Accepted values of variables for the future			
			Large farms		Medium-sized farms	
			1st option	2nd option	1st option	2nd option
X_1	score	0,18	50	60	50	58
X_2	hm/c	0,75	1,6	2,0	1,2	2,0
X_3	person-day/hec.	-0,035	62,5	56,8	72,5	68,7
X_4	thousand soums/hec.	0,05	1136,5	1136,5	1145,6	1145,6
a_0	c/hec.	18,7	18,7	18,7	18,7	18,7
Y	c/hec.	-	28,2	30,5	28,0	29,6

With this in mind, the full use of mineral fertilizers by farms in the cotton industry is inextricably linked with the increase in prices for raw cotton. Taking this into account, the norms of use of mineral fertilizers by farms in cotton cultivation were established in accordance with forecast options. They are 35-60 percent more than the current norms. It is now estimated that 2 people spend 8 months growing cotton on a hectare of land in agriculture (as a rule). We determined the labor cost per hectare of cotton, taking into account the high potential for mechanization of agro-technical work in the district cotton growing, as well as the cost of labor on the technological map. The level of wages in the cotton industry of the district is obtained at the levels that form the basis of the formation of cotton prices, and according to the forecast options, in large farms, they amounted to 1136.5 thousand and 1145.6 thousand soums, respectively. At the values of the factors of production included in the econometric model for the forecast period,

on large farms it is possible to get an additional 10.5 (1st option) and 12.8 (2nd option) centners of cotton per hectare. The average cotton yield in farms account for 10.3 and 11.9 centners respectively on account of production factors. In these figures, on average, it can be expected to yield 28.2 centners per hectare in 1st option and 30.5 centners in 2nd one in large farms. According to the forecast options, the cotton yield on middle-sized farms might be on average 0.2 centners in 1st option or 0.9 centners in 2nd option (per hectare) lower than in large farms. At the projected level of cotton yield (first and second options) from the cotton fields set for 2018 in the district, there can be produced 31245 tons of raw cotton in the forecast of option 1 and 33695 tons in option 2. Of this, 98.5 percent is accounted for the share of farms. At the same time, the average profitability of cotton production in the district is expected to be around 12-14 percent.

In conclusion, this level of profitability of cotton production ensures the financial and economic stability of farms in the district, which opens up a wide range of opportunities for their expanded reproduction and increased wages. The results of these calculations show that the proposed econometric models accurately reflect the modeled process and can be used by farmers and district specialists in determining the prospects for the development of cotton industry. The proposed models and the approach to their implementation can be applied in the analysis and forecasting of the efficiency of the use of production resources in cotton cultivation in other areas.

CONLUSIONS AND SUGGESTIONS

1. According to the analysis, the structure of agricultural production has been restructured in accordance with the requirements of the country's population, industries and the international market, new agrarian relations have fundamentally been formed. A middle class of landowners – farmers has been formed in the villages. Farms have become the mainstay of the country's agriculture. They had the resources they needed to produce strategically important raw cotton, grains, vegetables and other food products an this has largely laid the foundation for sustainable development in agriculture.

2. The state has introduced financial and economic mechanisms to support farmers and stimulate their development. Production of cotton, grain and other agricultural products has been stabilized, which has led to an increase in income and welfare of the rural population.

3. Increasing the efficiency of agricultural and livestock products produced by farmers in the regions, expanding infrastructural organizations serving farmers, is paving the way for the development of diversified farms based on production cooperation in the future. This will ensure the formation and development of financially and economically powerful and sustainable agro-industrial clusters.

4. For further improvement of farm activities, development and implementation of the following program measures is offered at the present stage of agrarian reforms:

- to improve the efficiency of the use of land, water, labor and other production resources;
- employment and well-being of the rural population;
- rural development;
- expansion of the rights of farmers.

5. It is necessary to improve the legislation related to the functioning and development of farms, including the transition to the optimization of the composition of farmland on the basis of criteria of high income and profitability.

6. Farmers can voluntarily establish processing and service organizations based on cooperation and it is necessary to create conditions for further development of diversified farms.

7. It is offered a gradual transition to a digital electronic system of information and communication technologies, including material and technical resources, as well as statistical, financial, tax reporting in the activities of farms, the development of an information system providing digital services to the agro-industrial complex in the regions and districts.

8. It is necessary to place agricultural crops optimally and determinate their normative value, expand and organize a network of consulting centers for legal, economic, financial, agro-

technical and other services in the regions, and as well as, to stimulate cotton production and improve the system of training and retraining of farmers.

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Opportunities insustainabilityofvertical farming: a review

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Abstract. As the world population continues to grow at a rapid rate, accompanied by a substantial growth in food demand which is expected to transpire in the next 50 years, 80 % of the population will be living in urban areas. In order to feed this growing population, there is a need for sustainable urban food. Producing sustainable urban food requires considering all factors of sustainability collectively including, environmental, social and economic advancement. A new method that has been proposed to address the issue of sustainability and to meet the growing food demand is, designing and implementing vertical farms. Vertical farming is a concept that involves cultivating plants with livestock on vertically inclined surfaces such as in skyscrapers in urban areas, where there is a lack of available land and space. Well-known advantages of growing food within the urban territory can be beneficial environmentally, socially and economically. Vertical farms can also provide solutions for increasing food security worldwide.

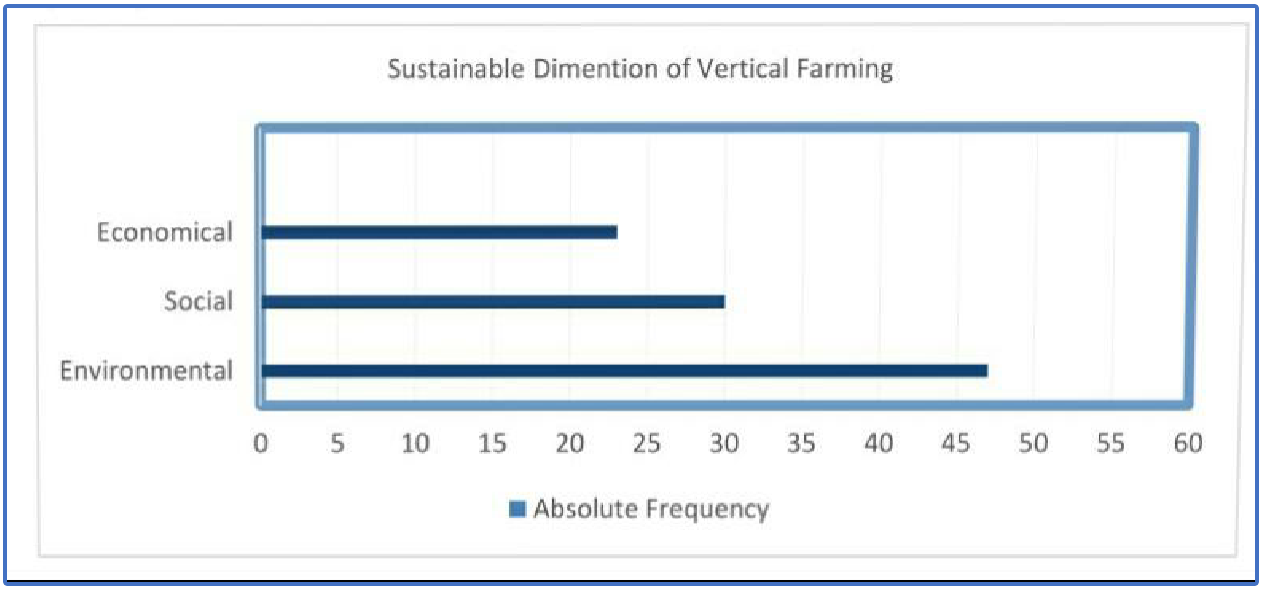
Keyword. Vertical Farming (VF), Food Security, Urban Agriculture, Sustainable Urban Food.

Introduction. Fundamental changes are predicted to occur in the upcoming 50 years accompanied by higher demand for food, all across the world as the world population continues to grow exponentially (Banerjee & Adenaeuer, 2014). The world population is predicted to reach an estimated 9 billion by 2050 (Despommier et al., 2013), and cities will be hosting about 80 % of this population Currently, there is approximately 800 million hectares of land that is designated to soil-based farming globally, which constitutes about 38 % of the total global land area. Moreover, 80 % of the total arable land is currently being utilized across the globe Due to the growing food demand, there is a need for utilizing more arable land for farming as well as intensifying farming efforts that would affect global agriculture. A new method that could potentially meet this demand, is in designing and developing vertical farms The proposed designs can be tested through new technologies, however, VF is a fairly new concept and little studies have explored the issue of integrating it in the urban context.

In theory, Vertical Farming (VF) is an agricultural technique involving large-scale food production in high-rise buildings that enables fast growth and planned production by controlling environmental conditions and nutrient solutions to crops based on hydroponics, using cutting-edge greenhouse methods and technologies. According to Perez's research (2014), VF incorporates both discplines of engineering and natural sciences, and has multiple applications in both society and the environment (Perez, 2014).

Systematic Analysis of Sustainability Dimensions. Table 1 indicates that the majority of the papers(47) looked in to at least one issue assigned to the environmental aspect. However, 30 from among 60 sources addressed topics related to issues concerning the social aspects while 23 were concerned with issues related to economics. Table 1. Absolute frequencies of sustainability dimensions in the surveyed literature (n=60)

OPPORTUNITIES OF VERTICAL FARMING



Weproceed with a list of the primary prospects as well as challenges of VF based on the review of the literature which will be discussed along with the three aspects of sustainability. Environmental Benef its As f or environmental advantages, f arming in cities conserves biodiversity, reduces wastage and loss and curtails the energy used f or producing and providing f ood f or the public. Dspommier (2010) however, comments that VF is not a panacea for all existing sustainability problems but can contribute significantly by providing solutions to existing problems. It can potentially replace industrial agriculture and could be a better alternative by minimizing damages caused by conventional open field agriculture. VF brings with it many ecological and poral benefits, and can, therefore, move agriculture towards the direction of agroecology. Other sectors that could benefit f rom VF, will be elaborated upon in the following sections.

Energy Saving.

The body of research on VF has pointed out the role of greenhouses in saving and recycling energy (Specht et al., 2014), f or example the system makes use of natural light, artificial light and energy to facilitate in environment management (temperature control), water provision (irrigation) and nutrient delivery.

The opportunity of lighting. The LED can be turned of and on as frequently as required f or the plants. It does not adversely affect the plants while it helps to f urther save energy. How Photosynthetically Active Radiation (PAR) is related to conversion and biomass is important in deciding the amount of energy required f or producing a specific amount of f ood. A relevant study conducted by NASA, identif ied a maximal of 12 % conversion ef f iciency f rom PAR to biomass. The estimated PAR conversion ef f iciency they reported was,

1.6 gram of dry mass/mol, considering the control of lighting as well as an optimal enrichment of carbon dioxide. LEDs is the preferred choice as it is easily manufactured and an ideal choice of artificial lighting f or plants. In another research conducted in Rutgers University, LEDs were recommended as they save electrical energy while simultaneously f acilitating plant growth.

Many existing VF in the world using the LED in these technologies such as Republic VF in South Korea, Nuvege plant factory in Japan and Plantlab VF in Holland.

Opportunities of Heating. Thomaier et al. (2015), suggest that the greenhouses

can be creatively used as a source of energy production, whereby excessive energy produced can be used to heat up the building itself . The problem however, is that this innovative proposal has yet to be publicized (Thomaier et al., 2015). Additionally, another advantage of growing plants indoors is that they keep the air around them and in the vicinity cool. This phenomena occurs through a process of evapotranspiration, when plantsabsorb water from the soil, which is then transferred to the plant body and leavesand is eventually released into the air, which consequently brings down the surrounding temperature. Another way plants help to cool the surrounding environment is through providing shade if they are large enough. In large buildings, the atrium f unctions as a means to adjust the temperature inside the building. It was also reported that, a hydroponic vertical gardenmanaged to cut down on the amount of energy used in a tall building up to 23 % and reduce the air conditioning up to 20 % . Thus, VF involves sustainable energy sources and power can be sent back to the grid. Furthermore, other means by which VF saves energy is in reduced transportation, temperature reduction, power saving, reduction in processing and packing as well as renewal energy among urban/local areas and industrial or agriculture areas. This can be manif ested in how they utilize surplus heat, cooling water and carbon dioxide f rom the industrial sectors in greenhouses.

Opportunities of Water Demand by Aeroponics and Hydroponic Systems: The best and most efficient method of water consumption in f arming is facilitated through two systems namely; aeroponics and hydroponics. If used together in closed loop systems, it can manage to save water up to 95 %. They can also help to eliminate f arming wastewater which is potentially hazardous to the environment and to human health.

As described by Toyoki Kozai, the manager of the NPO factory, when the air is dried and water is circulated back with the help of aeroponics and hydroponics, the efficiency of water consumption goes up to 97 % as compared to traditional agriculture. Thus, the amount of water consumed in VF f or irrigation is only 3 % that of the amount used inconventional f arming. Sauerborn (2011) states 10 hectares of agricultural field can be substituted by a hectare of a greenhouse recirculating hydroponic system. In addition, a recent study on water consumption in VF conduct ed by Despomier (2010) indicated that, new vertical f arms used 98 % less water than traditional f arms. In the Den Bosch project, almost all types of crops have been produced through VF with 90 % less water consumption than traditional farming. This amount was reported to be 70 % in another study. Despomier (2013) also stated that, less water (70- 80 %) is assumed to be used in VF as compared to conventional f arming techniques. Hydroponic and Aeroponic systems are using vastly in many existing VF pr oj ect s such as Sky Gr eens Far ms in Singapor e, Nuveg plant f act or y in Japan and Planned Vertical Farmin Sweden.

More Pr oductivity Per Unit of Area

Opportunities: Crop production can increase drastically if full-year stability is maintained during production, by implementing efficient methods during the process . The key dif f erence between VF and traditional f arming is in the variety of products that can be produced at a given time. In traditional f arming, only one crop at a time can be produced, which is ref erred to as monoculture, whereas in VF, multiple types of crops can be produced simultaneously on different floors. Another advantage of VF is, that unlike traditional f arming which can only be carried out at a particular time of the year, plants inside a VF can grow all the time throughout the year. Therefore, fewer crops are lost as compared to conventional agriculture. It is dif f icult to quantif y space efficiency in a closed environment f or f arming because some types of plant shave a better harvest than other types of plants in comparison to others. This was further demonstrated in a study carried out by Perez (2011), where they reported that products harvested annually through VF amounts to 470 tons per acre, and 23

times more lettuce is produced by VF than in the same amount of space in conventional farms. Thus in VF, space is utilized more efficiently, each closed- space acre is equivalent to 4- 6 acres of open field depending on the type of crop. For instance to grow strawberries, an acre of land that is required for a closed space, would require 30 acresof open space. According to Besthorn's (2013) report, three times more crops were produced in the Den Bosh VF project than traditional farming methods.

Resilient to Climate Change

Opportunities: There are numerous advantages of using VF over conventional farming in land soil. In VF, all the ideal conditions required for optimum plant growth can be achieved indoors such as, heating, lighting, water, humidity, amount of nutrients and suitable settings that can all be controlled and managed for a specific crop. Because the plants will be grown indoors, the changing of seasons will have noeffect on the crops. This will allow for multiple harvests during the year, unlike traditional farming which enjoys only one harvest a year. This benefit of VF highly increases production output. In this method (VF), the overall system design can be adjusted, to cater for the specific and unique physiological requirements of a particular plant. So, not only will the best- suited environment for plant growth be decided upon, but also the best and most appropriate and efficient equipment will be selected for in VF. Moreover, plants grown indoors will be protected from pests and climate change, and subsequently more crops can be harvested due to lower losses as compared to traditional farming. The utmost benefit of VF is in the ability to control all conditions required for ideal growth of a particular crop where a variety of edible plants can be grown. In these ideal circumstances, plants have the ability to grow faster and become larger which leads to an increased annual crop yield than traditional forms of agriculture. Space is efficiently utilized, where maximum gain is achieved from every square foot of space. Besides plant crops, VF can accommodate domestic animals and fowls as well . It means VF can establishes in any parts of the word without any limitation in related to various climate/geographical areas.

Job Opportunities

Opportunities: Another advantage of vertical farms is the job opportunities they provide in cities as limited job vacancies is a serious issue in many big cities. Not only are direct jobs involved in the vertical farm provided, but indirect job opportunities are provided as well. The main jobs involve working on these farms making, protecting and managing the entire farm structure. Others jobs include; managing seed production, transplant of seedlings in the VF, managing resources ranging from water to light, machinery, etc., supervising the growth of plants, pollination techniques, harvesting, managing waste, managing energy, quality control (based on lab surveillance of plant pathogens as well as pest control), distribution control, managing IT personnel and other human resources. These are only some of the work opportunities involved in the food production industry related to VF. Once the foundation of VF is established, society outreach, instruction provision as well as a business center can also be considered. Moreover, VF also includes grocery stores, food markets, and local distribution centers which provide other work- related opportunities.

Economic Benefit

The use of VF can bring about significant positive economic improvement especially in (sub) tropical countries. Currently, contrary to globalization, the concept of a highly adaptable and local economy has attracted a lot of attention. A manifestation of this local effort is VF in cities. An example is Singapore, an urban island country which has observed changes in the global market and has therefore set new goals and have focused their attention towards VF so as to decrease their dependency on foreign countries. The numerous economic benefits of VF will be elaborated on in the following

section.

1. Minimization of Energy Cost:

Opportunities: Maintaining VF involves certain high costs too, however, cutting down on costs can be carried out by implementing innovative strategies, such as using the building waste itself, using compact piece of land and depending on volunteer workers. Another way to cut down on costs is to integrate vertical farms in the current infrastructure, by sharing temperature, electricity, and finances. Amongst the numerous benefits of VF, one is the ability it has to decrease heat and decrease the overall costs associated with energy use. When less energy is consumed, the price of energy will be affected too. It is evident that if energy consumption is lowered in VF, lowprices will follow too.

2. Low Price of Food:

Opportunities: For local food, it is very efficient since food materials produced locally need not be transported to their destination. Foods usually have to be transported long distances before they are consumed. In VF, large amounts of food are produced at a low cost of fuel or transportation. The cost is so low that it overshadows the real environmental and social benefits of it. This is accompanied by continuous production which breaks the price shock in the international crop market.

3. Return of Investments:

Opportunities: The initial costs of setting up, equipping and operating a vertical farm is undoubtedly very high and is mostly due to energy use. As time passes, these costs are reduced, especially those related to energy provision. Therefore, though it is known that setting up vertical farms is very costly, to begin with, when it is running and fully functional, the price of food will come down. As argued by Despommiers (2009), in every city there are numerous appropriate sites for such projects and if used effectively, they can return and circulate a lot of money back into the city. The author believes that though it seems very trivial, evaluating all the conditions on every level is required, so as to thoroughly assess all the possibilities when deciding upon establishing a vertical farm (Voss, 2013). Moreover, the idea of VF is a promising move towards the right direction for fans of the revolutionary resource- based economy movement. Economic analysis as well as investigations of the effects of VF on post- industrial cities is needed. Further discussion and analysis is required on the implications of VF on urban life all over the world (Miller, 2011).

Conclusion. We can conclude that even a little knowledge and awareness of VF can help food security and viability greatly. New technologies such as aeroponic systems, insulation methods and pest free plant growth has not only transformed the greenhouse industry but has also paved the way for new forms of farming such as roof top farming. In apartments and office buildings, creative climate management technologies and natural light management technology helped to save energy and cut down on greenhouse gas distribution. These have all made local food production in highly populated city areas possible, where more people require more food and their needs cannot be met. VF has got numerous advantages over traditional farming, which includes more efficiency, adaptability, and environmental benefits, which is all made possible through carefully controlled systems of VF. In VF, no waste or pollution is involved, it enjoys high levels of potentiality. All the above- mentioned benefits in a single system seems rather unbelievable, but VF has made it possible. If its use becomes common and widespread across the globe, the fear of starvation will also disappear and detrimental climate change will slow down too. In addition, VF has provided new opportunities for architecture and urban designing. Urban designers have attested to the importance of making cities green, healthy and safe. By combining food production and architecture, VF helps to produce buildings capable

of multiple functions. This is accompanied by many social and ecological advantages.

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How do neighbouring adopters influence farmers' adoption of drought- tolerant varieties? Evidence from China

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How do neighbouring adopters influence farmers' adoption of drought- tolerant varieties? Evidence from China

Summary

Despite several studies showing that spatial dependence promotes the uptake of agricultural technologies, quite little is known about whether and how spatial interactions between farmers influence drought-tolerant varieties adoption, a vital practice to address climate change. To fill this gap, this study analyses the impact of spatial dependence on the adoption of drought-tolerant wheat varieties (DTWVs) in China by employing a Bayesian spatial Durbin probit model. Results show that spatial dependence significantly increases DTWVs adoption. The spatial effects arise both from the adoption decision of neighbours and information spill over of smartphone use and extension service. Our findings underscore the significance of taking spatial interactions in farmers' adoption decisions into account when designing policies for the promotion of agricultural technologies.

1 Research questions

Climate change such as increasing temperatures and higher frequency of droughts threats agricultural production and food security, and thereby increases the vulnerability of smallholder farmers as they usually have inadequate adaptation strategies. To mitigate the adverse effects, encouraging farmers to adopt new agricultural technologies such as drought-tolerant varieties to enhance their resilience is becoming critically important.

Although some studies have analysed the factors that influence drought-tolerant varieties adoption, the neglect of spatial dependence in these studies limits their implications for the formulation of policies aiming at promoting DTWVs adoption.

In this study, we analyse whether and how spatial dependence affects drought-tolerant wheat varieties (DTWVs) adoption in China, employing a Bayesian spatial Durbin probity model. In particular, we investigate the potential spill over effects of three information sources, including smartphone use, organization membership, and extension service, and we pay special attention to smartphone use. Understanding the potential information spill over of multiple sources can help identify the effective channels to disseminate information on drought-tolerant varieties.

2 Data and methods

The data for this study came from a survey conducted from June to July 2019 across three major wheat-producing provinces in China. A multistage random sampling procedure was used to select and interview wheat farmers. Overall, we interviewed 558 households, including 296 DTWVs adopters and 262 non-adopters.

To include the spatial interactions between farmers into farmers' decision process, we employ the spatial Durbin probit model to analyse how spatial dependence affect farmers' decision to adopt DTWVs. We specify two different matrices based on the driving distance and Euclidean distance between farmers, respectively. First, we construct an inverse driving distance matrix. The driving distance is defined as the car-driving distance between farmers' locations, which is collected from the Baidu Map based on the longitude and latitude of farmers' geographic location.

3 Main results

Our estimates of the spatial Durbin probit model with two spatial matrices both suggested the presence of spatial dependence in DTWVs adoption. The positive and significant sign of the spatial dependence parameter indicated that farmers' decision to adopt DTWVs are positive spatially interacted, i.e., the spatial dependence significantly increases the DTWVs adoption among wheat farmers in China.

In addition to the spatial interactions among farmers, our findings also provided valuable insights into information sources that have information spill over effects. The results showed that if a farmer uses smartphones or receives extension service to access information on agricultural

technology, the probability of neighbours' adoption decisions would significantly increase by 4.1% and 3.5%, respectively. Therefore, our results suggested that smartphone use and extension service have significant information spill over effects, which helps to promote DTWVs adoption among farmers.

With respect to the factors influencing farmers' decision to adopt DTWVs, we showed that household head's smartphone use and farming experience, extension service, machine ownership significantly increased the likelihood of farmers' adoption decisions, while household's age and road condition have significantly negative impacts on DTWVs adoption decisions.

Table 1 Estimates for spatial effects

Variables	Direct effect	Indirect effect	Total effect
Smartphone use	0.239 (0.104)**	0.041 (0.021)**	0.280 (0.123)**
Membership	0.027 (0.087)	0.004 (0.022)	0.032 (0.101)
Extension service	0.198 (0.082)**	0.035 (0.018)*	0.233 (0.096)**
Age	-0.015 (0.004)***	-0.003 (0.003)	-0.018 (0.005)***
Gender	0.069 (0.048)	0.012 (0.008)	0.082 (0.056)
Education	-0.002 (0.006)	-0.0004 (0.002)	-0.002 (0.008)
Farming experience	0.010 (0.003)***	0.002 (0.001)**	0.011 (0.004)***
Farm size	0.001 (0.002)	0.0002 (0.0005)	0.001 (0.002)
Asset ownership	0.082 (0.051)	0.014 (0.009)*	0.096 (0.058)*
Water scarcity	-0.005 (0.045)	-0.001 (0.012)	-0.006 (0.050)
Road condition	-0.006 (0.002)***	-0.001 (0.001)	-0.007 (0.003)***

Note: *, **, and *** indicate significant at the 10%, 5%, and 1% significance levels, respectively.

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Factors of the formation of local agri-food systems

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Introduction.

The ever-increasing population of Uzbekistan has enhanced the food demand in the country. Energy resources (e.g. non-renewable natural resources) have been steadily reducing. Consequently, to organize the sectors and sub-sectors of agriculture production correctly, to advance in R&D in technology increases the efficiency of using regular and safe products of consumption, and to increase fairly cheap supply is the priority. At the same time, the product can be associated with changes not only in its quantitative aspects of the system, but its sustainability and environmental safety are also matters of priority. Unfortunately, global climate change, decreasing sowing areas, soil fertility, limited water resources and exacerbation of environmental problems, part of the nutrition system, and its marketing directly affect production. Moreover, introducing cost-effective technology and the development of food and its marketing are major challenges. There are a number of shortcomings in the food value chain. In particular, the wholesale food system is yet to be shaped. For example, in agriculture, the main parts of food producers for domestic consumption (more than 65 % agricultural production) constitute the peasants (dehkans). Food is provided at the stage of transition fitting the international and local quality standards. However, there is still a need for further formation of the structure.

The efficient distribution of food products to the consumers within the frameworks of the market mechanisms is the objective of the state food policy. This system is one of the main elements in the wholesale market.

This study aims to analyze the potential ways of increasing the competitiveness of enterprises in food production systems by providing a sufficient number of food products for consumers and ensure the safety of their production, it's processing, and the developing of marketing systems.

Data and method

The study collects data from 1) Food producers – interview; 2) Interviews with an expert in respective areas including scientists; 3) secondary data collection from local and global organizations and statistics used in the collection of the annual report. Problems are based on the required information to clarify statistical monitoring and use specific methods of analysis.

Main results and conclusions

Food products wholesale market development in Uzbekistan, the formation of market infrastructure consolidation, deeper specialization, and single standardizing of products carrying out transactions with the central areas.

In the above-mentioned results were achieved by the following factors in achieving the goal of eligibility. They are:

Social factors - population throughout the year to provide high-quality food products, improved price objective manner due to the formation of prices for food products in the delivery of the resuscitation products on the sustainability of agricultural production at the expense of long-term contracts to ensure the development of contractual relations, culture, and quality of service.

Organization factors - organization and processing of agricultural commodity producers and strengthen the economic ties between the companies, the flow of goods and products to optimize the sales prices plus transport costs, production, storage and processing and sales processes to improve the quality of management, agricultural products to increase the volume and range of planning, coordination of food exports and imports, and increase the income of the manufacturers.

Technical factors - partners to facilitate and speed up the process of simplification of the books of accounts, mutual guarantee the quality of the product, and storage products.

It is focused on the development of the wholesale market of food products in Uzbekistan, the creation of centers for their expansion, deeper specialization, forming of the market infrastructure, and implementation of agreements with only standardized products.

The government has identified need to ensure food security in the wholesale markets and

the ways to address them:

Purchasing food that provides a set of products;

A source of information about supply and demand for food products; Tendency of downward trend in real market prices;

Development of advertisement services;

Effective system of quality control and certification of products;

Positive results were achieved in the development of the interstate integration process and the effectiveness of the international division of labor.

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Integrated water resource management and agricultural productivity: a cross-national analysis. Implications for Uzbekistan

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Summary

The current study examines the relationship between integrated water resource management (IWRM) and agricultural performance. Using cross-section data for 127 countries, the work tests the hypothesis that better IWRM implementation (the benchmark for good water governance in current context) enhances agricultural production. To test the hypothesis, we employ the inter-country aggregate agricultural production function based regression analysis. The findings reveal that the IWRM's dimensions as "Enabling environment" and "Finance" are the critical elements positively influencing the agricultural performance of the economies. The study recommends Uzbekistan to conduct targeted measures to foster implementation of these two dimensions.

1 Research questions

What is the effect of IWRM implementation on the agricultural performance? What are the implications for Uzbekistan?

2 Data and methods

This study uses cross-sectional data for 2017, consisting of 127 countries.

To test our hypotheses, we estimate the regression model using inter-country aggregate agricultural production function as in (1).

$$\mathbf{lnY_i} = \boldsymbol{\beta_0} + \boldsymbol{\beta_{1i}}\,\mathbf{X_{1i}} + \boldsymbol{\beta_{2i}}\,\mathbf{X_{3i}} \;\ldots\; \boldsymbol{\beta_{ni}}\mathbf{X_{ni}} + \boldsymbol{\varepsilon_i} \quad (1)$$

Where Y_i is the i country's agricultural production in constant 2004-2010 US dollars, and the explanatory variables (from $X_{1i}$to X_{ni}) of the model. β_{1i}, β_{2i} β_{3i}… β_{ni} are parameters to be estimated and ε_i - is a country-specific error term. The production function takes the most common specification, which is a Cobb-Douglass form. Explanatory variables include essential agricultural inputs (land, labor, livestock technology: machinery, fertilizer), attached IWRM implementation score: general and across its four dimensions (UN- Environment, 2018), governance indicators (World Bank Group, 2019 based on Kaufman et al. 2010). There are few control variables as countries' human capital endowment (UNDP, 2017), climate effect (FAO, 2020) and landlockedness (CIA, 2005).

3 Main results

Table 1 presents the regression results of three inter-country aggregate agricultural production regression models. Model 1 illustrates the specification that includes essential agricultural inputs, the attached general score of IWRM implementation, governance, and control variables. Model 2 replaces the general score of IWRM implementation with four dimensions (sections) of IWRM implementing scores (four variables). Model 3 keeps these four separate IWRM implementation score variables but omits the governance variables.

Table 1: Regression results

Dependent variable: Logarithm of agricultural production **Variables:**	**Model1**	**Model2**	**Model3**
Logarithm of Total amount of fertilizer in tonnes (N+P+K)	0.192*** (4.23)	0.210*** (4.92)	0.226*** (4.70)
Logarithm of # tractors	0.094*** (2.69)	0.066* (1.92)	0.056 (1.50)
LnLAND	0.439*** (9.25)	0.410*** (9.52)	0.413*** (10.16)
LnLIVESTOCK	0.215*** (4.12)	0.240*** (4.91)	0.232*** (4.60)
Average precipitation in depth	0.00049*** (4.69)	0.00048*** (4.83)	0.001*** (4.94)
LnWATER	-0.185*** (-5.38)	-0.187*** (-6.04)	-0.181*** (-5.60)
Employment in agriculture	0.005 (1.15)	0.003 (0.80)	0.002 (0.63)
Education	0.132 (0.20)	0.265 (0.39)	0.856 (1.44)
Rule of Law	-0.450*** (-2.83)	-0.403** (-2.56)	
Government Effectiveness	0.586*** (3.09)	0.530*** (2.86)	
IWRM Score	0.000 (0.00)		
IWRM: Enabling Environment		0.010*** (2.94)	0.011*** (2.87)
IWRM: Institutions and participation		-0.011** (-2.35)	-0.011** (-2.24)
IWRM: Management instruments		-0.007 (-1.48)	-0.010* (-1.98)
IWRM: Financing		0.008** (2.13)	0.010*** (2.64)
Landlocked (dummy)	-0.221** (-2.25)	-0.209** (-2.15)	-0.173* (-1.81)
Constant	3.262*** (5.10)	3.486*** (5.70)	3.010*** (5.22)
Observations	128	127	128
R-squared	0.946	0.953	0.948

Robust t-statistics in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2: Summary of recommendations

Dimensions	Recommendations
Enabling environment	• Accelerate development of National strategy for water management, it should be based on IWRM; short- med- and long-run measures are needed. • Water ministry should hasten the process of directing new Water code through Cabinet of Ministers & Oliy Majlis. • The national strategy should be tailored to the local context; the development process should involve public participation, consider gender aspects
Institutions and participation	• Strengthen the local authorities responsible for water use efficiency. • Water inspection "Suvnazorat" should be separated from the Ministry of agriculture and water resources, giving it independent status. • The government should seek ways of implementation of economic tools to reimburse costs of water services & saving • Increase prestige of the profession of water worker and improve conditions of work in the water sector (shorter working hours, higher salaries) • Enhance the role of Mahalla (neighborhood self-governance units/communities) to support WUA. Enhance the role of BAIS Councils. While mahalla could serve as proper conflict resolution institution in achieving cooperation among water users, its capacity should not be overestimated due to its current state of evolution, as Sievers (2002) rightfully describes current post-Soviet mahallas as parastatal apparatus.
Management instruments	• Uzbekistan should access to UN/ECE Convention on access to information, public participation in decision-making and access to justice in environmental matters; • Improve public participation; • Improve access to justice; • Systematize and make transparent public involving actions of the respective state organizations.
Financing	• Increase the amount of national budget so that more money is available to increase a) salaries of system workers b) technical capacity • Organize systematic and locality tailored training programs, state budget should cover the associated costs
General	• Establish a working group on IWRM's implementation at all levels, by engaging different specialist and stakeholders.

Source: adapted from UN- Environment, 2018 and enriched with the author's inputs

Agricultural development is among the foremost tasks of many developing countries along with Uzbekistan. In that regard, the economies and the development agencies devoted much effort to the stimulation of productivity via physical infrastructure and human capital. However, without good general governance, those efforts will not be sustainable (Loi&Lui, 2008). The current study adds to this line, and our analysis revealed that without good water governance, the agricultural performance improvements caused by technology or infrastructure are limited as well. Hence if countries, along with the aims as sustainable resource use, also aiming to stimulate their agricultural productivity, then they have to take targeted measures to improve IWRM implementation. While other sections also probably indirectly positively contribute, the IWRM's dimensions as "Enabling environment" and "Finance" are the critical ones positively influencing the agricultural performance in our cross national analysis. With its lower implementation scores for these very dimensions, Uzbekistan is highly recommended to conduct immediate and targeted measures (in *Table 2* and beyond).

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Some changes in farm taxation

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Annotation. The article considers some changes in the new version of the Tax Code on the taxation of farms and provides ideas for further improvement of taxation.

Keywords. Tax code, tax object, tax base, tax rates, tax period, tax report, tax deductions.

Introduction. Instead of the Tax Code approved by the Law of the Republic of Uzbekistan dated December 25, 2007, a new version of the Tax Code came into force on January 1, 2020.

In this case, instead of a single social payment, a social tax, a single tax payment, including a single land tax - turnover tax, instead of a fixed tax - on the income of individuals, retaining the privileges and tax calculation features previously granted to them in the manner prescribed by law types of taxes were introduced.

There are also exemptions from taxes and other mandatory payments, reduced rates on taxes provided and established by the Tax Code, approved by the previous law. In particular, the following are exempt from the single land tax:

a) business entities under voluntary liquidation - from the date of notification of the decision on voluntary liquidation by the state registration body of legal entities;

b) legal entities for a period of five years from the month of introduction of drip irrigation in the part of the land plot on which drip irrigation is used.

In addition, agricultural producers have the following benefits:

- newly developed lands for agricultural purposes, during the period of their development and within five years from the date of their development;
- existing irrigated lands on which reclamation works are carried out, for a period of five years from the beginning of works;
- lands occupied by newly established gardens, vineyards and mulberry groves, for a period of three years, regardless of whether the space between the rows of trees is used for planting crops.

Materials and methods. We think about how it would be beneficial to the farmer or the budget to introduce a tax without turnover instead of a single land tax. First of all, given the abolition of the single land tax under the new Tax Code and the introduction of mandatory payment of value added tax for a particular category of taxpayers, the following persons are not entitled to apply the turnover tax:

- operating legal entities and individual entrepreneurs with income from the sale of goods (services) in the tax period exceeding 1 billion UzS;
- individual entrepreneurs whose income from the sale of goods (services) in the tax period does not exceed 100 million UzS;
- importers of goods - from the first day of the month following the conclusion of the import contract;
- producers of excisable goods (services) and (or) those engaged in mining;
- Agricultural producers with 50 hectares or more of irrigated land - from the first day of the month following the date of acquisition of agricultural land, and so on.
- The procedure for determining income at the end of the reporting period is as follows:
- first of all, the share of expenses incurred from the beginning of the contract performance in the total amount of contract performance costs;

- then the figure obtained is multiplied by the total amount of income under the contract (contract price).
- In determining the income from the sale of products (services) for the current reporting period, previously recorded income under the contract is deducted.
- There is a unified deadline for all taxpayers to submit tax returns:
- no later than the 15th day of the month following the reporting period - at the end of the reporting period;
- no later than February 15 of the period following the end of the tax period - at the end of the tax period.

Results and their analysis. Under the previous Tax Code, the single land tax rate was set at 0.95 percent of the normative value of agricultural crops. According to the new version, farms will be subject to a turnover tax of 4% of gross income.

Now the question arises as to whether it is acceptable for a farmer, for our society as a whole, to apply a single land tax, or whether it is convenient to pay a turnover tax. For example, in farm named on Mansurov Muzaffar Fayzli Zamini in Jambay district, was subject to a single land tax for UzS in 2019 according to the tax code of the 2007 Tax Code, and according to the new procedure, the gross income (turnover) tax in 2019 was calculated. 2260 thousand UzS (gross income 56,500 thousand UzS, 53 million UzS from grain, 3.5 million UzS from cocoons × 0.04). Here, the turnover tax paid under the new Tax Code is 595 thousand UzS less than the single land tax. However, if we continue the analysis, the farm has a total of 15 hectares of arable land, of which grain was planted on 12 hectares, yielded 53 million UzS, fruits and vegetables were planted on the remaining 3 hectares, and there was no income from them remains invisible. A similar situation exists on other farms.

Conclusions:

- the transition from the farm turnover to the tax system may be an attempt to hide gross income in the reports or deliberately understate it in various ways, which leads to a decrease in tax revenues;
- farms specializing in crop production should pay a single land tax, as the farmer is interested in maximizing income from land productivity and increasing its efficiency;
- In the current situation, it is more effective to change the tax rate of taxes to the budget, ie to move to a system of economic management of farms, rather than "placement" or "recommendation" of what type of crop.

So land should be given to farmers not only on paper or in words, but also in life and in practice. The farmer should be instructed on what type of crop to plant, when to plant, when to harvest, or to limit activities such as having several government officials at the beginning of the harvest.

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From Andijan to Nukus: A field survey of Uzbek veterinary HEIs, dairy farms and industry

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Summary

The B-learning Uzbekistan Veterinary Network / BUzNet project is being implemented by a consortium of 4 European HEIs and 4 Uzbek HEIs. The general objective of the project is to increase the life standards of common Uzbek people through better veterinary and zootechnical teaching, which ultimately will result in better technical support for local herds' owners and safer animal products reaching the general society. To do this we first needed to be sure about what we were dealing with, and so, a country report based on available publications, a series of inquiries and local visits were done in order to have a clear idea of the exact Uzbek situation in veterinary farm animal clinic and surgery and milk quality control. In these extended abstract, we will describe the approach followed to delineate the field trip that started in Andijan region then continued to Tashkent, Nukus and finally ended in Samarkand region. The data obtained during the visits to HEI, farms, labs and milk transformation plants will be presented. Finally, we will highlight the main conclusions of this activity and how they impacted the progress of the BUzNet project.

Research question

The B-learning Uzbekistan Veterinary Network / BUzNet project is being implemented by a consortium of 4 European HEIs and 4 Uzbek HEIs. The general objective of the project is to increase the life standards of common Uzbek people through better veterinary and zootechnical teaching, which ultimately will result in better technical support for local herds' owners and safer animal products reaching the general society.

To do this we first needed to be sure about what we are dealing with. Thus, with the aim to get a deeper knowledge of the Uzbek situation regarding the Veterinary Medicine education, farm animal production and Dairy products quality control a field work with visits to Uzbek farms, dairy industries and HEIs was conducted by a team of Uzbek and European experts in order to collect direct data and have a clear idea of the exact Uzbek situation with regard to these subjects.

Data and methods

The field visits took place from the 13 until the 22 of March 2018. In figure 1, the itinerary (red line) and the locations (yellow tags) of the HEI, the farms, laboratories and the dairy factories visited are indicated. In total 4 HEIs, where Veterinary medicine or related degrees are thought, were visited: 1st - Andijan Agricultural Institute - AAI; 2nd – Tashkent State Agrarian University – TSAU; 3rd Nukus Branch of Tashkent State Agrarian University – NuTSAU; 4th - Samarkand Agricultural Institute – SamAI. In Andijan region a total of 2 dairy farms (1 bovine the other mixed bovine and goats), 2 milk processing plant facilities and 2 state veterinary laboratories were visited. In Tashkent region, we visited 4 farms (3 dairy bovine and 1 mixed dairy cattle and Hisar sheep) and 1 milk processing plant facility. In Nukus region 2 farms were visited, one of cattle and the other one with dairy cattle, goats and camels. Also, in Nukus regional a veterinary state laboratory and 1 milk processing plant facility were visited.

On the way to Samarkand, in Bukhara region we visited a traditional Karakul sheep farm (also with goats). Finally, in Samarkand we visited a traditional cattle farm and a pharmaceutical company. During the visits to the farms several questions were addressed to the farmer, such as for example number of animals, species, type of husbandry, bedding, area of arable land, number of working personnel, type of forages food preparation, daily milk production, type of parlour, bacteriology analysis availability, etc.

Figure 1. Travel itinerary done in Uzbekistan (red line) and localizations of the different sf the HEI, the farms, laboratories and the dairy factories visited (yellow tags).

Also, during the visits to the milk processing plant, a number of questions were done to the owner/responsible person. Some of the questions were: type of milk, daily processing capacity, milk transportation, milk quality control at entry, type of final products, number of working personnel, etc.

Main results

The field visit and resulting report was very useful, as it gave a precise image to all members of the consortium of the state of the art of Uzbek animal and milk production; laboratories involved in this industry and of the Uzbek HEIs involved the project. In addition, the information obtained during these visits, together with the report made from bibliographic sources gave an excellent background material for the rest of the BUzNet project. In fact, the information gathered was used for the next steps of the project, namely: purchase of equipment and up-date the local veterinary and animal production curriculum.

Although it was a complex and demanding 2 weeks of work with long days in the field visits, it was very rewarding to notice that for most of the Uzbek colleagues it was the first time that they had a chance to travel and see some parts of their own country, to visit the farms, labs and schools there.

During the field survey visits an incredible change was noticed on all the components of this industry. New farms and milk processor were appearing on a day basis and also huge changes in the governmental policies were noticed. Namely the direct import of foreign breeds and production strategies were observed. This can lead to an increase level of production but it should be accompanied by a careful protection of local breeds, the preservation of local typical productions and sound studies about the ecological capacity to install and maintain foreign production strategies. Moreover, an increase and updating of the quality control systems are required.

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Development of agrocluster based on value-added chain creation factors and its main directions

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ABSTRACT: The article describes the forms and methods of interaction between business entities within a cluster based on cooperation in the agro-industrial complex of the economy. Changes in the forms of ownership make the agricultural sector of the national economy more diversified and require its introduction into market relations. Diversification is the most effective form of business organization. At the same time, it should be noted that, since the agro-industrial complex is a combination of agriculture and industry, planning its forms and methods is rather complicated. Consequently, there are no grounds for a spontaneous, spontaneous solution to complex problems of agro-industrial production. Market governance should be aimed at stabilizing production, creating the necessary conditions for most producers to accelerate the development of science and technology, developing market infrastructure and helping weaker rural sectors. We need the tools we need to ensure that today's priorities are consistent, effective, systematic and dynamic. One of these methods is a cluster of business entities [1].

In fact, an economic cluster is a complex of enterprises united in a single technological chain, which makes it possible to deepen cooperation between science and education, showing the possibility of accelerating the introduction of new technologies into practice.

KEYWORDS: diversification, cluster, cooperation, export, infrastructure, subcontracting, leasing, franchising, interaction, modernization.

The basis of the cluster of business entities is the cooperation of business entities. Cooperation in an economic cluster reflects the voluntary association or cooperation of individuals and legal entities to achieve common goals (goods, works and services). In turn, cooperative ties create a business cluster, a technology package, a technological connection at the stage of cooperation.

As a result of the work of the cluster, raw materials go through all stages of processing and become ready-made products for export. The creation of a cluster requires the combination of best practices and the best research of scientists and economists, construction and installation organizations and construction industries, as well as infrastructure organizations. Cooperation and industrial cooperation of business entities as an objective need to improve management efficiency to solve the problems facing the relevant sectors of the economy for the production of goods, works and services. In our opinion, the development of industrial cooperation between enterprises is of great importance. This is due to the fact that enterprises in these industries are the backbone of the economy and play a decisive role in its growth.

The agro-industrial complex of the economy offers a wide range of opportunities for the creation and development of cooperative management and clusters. Cooperation and clustering of the agro- industrial complex with business entities can be expressed in various forms. At the same time, in our opinion, it is advisable to provide on the basis of suppliers of resources and processing, as well as cooperatives and clusters of business entities with enterprises specializing in the sale of subcontracts, suppliers of technological equipment and components - on the basis of leasing of small wholesale goods on the basis of franchising [2].

In turn, the specific features of an economic entity can lead to other forms of economic cooperation and clustering. The results of the preliminary study show that the development of cooperation and clustering of the main sectors of the economy in the agro-industrial complex is largely due to the restructuring of these enterprises and the separation of small and low-profit enterprises from them simultaneously with the rejection of partner status.

In the context of modernization of the economy, a number of tasks can be solved by restructuring large enterprises, namely:

- prevent production on its balance sheet of structures that are not directly related to production;
- get rid of small, low-profit and unprofitable production systems, transferring them to small

enterprises;

- to use the possibilities of privatization of state property and, on this basis, to ensure the further development of small business.

Analyzing the peculiarities of the interaction of clusters and industrial cooperation in the agro-industrial complex, it should be noted that:

- firstly, there is a wider range of cooperatives and production cooperatives in this sector than in other sectors;
- secondly, cooperation and production cooperation in this sector of the economy allows the release of new products and quality of work;
- thirdly, cooperation and industrial cooperation in this sector of the economy are a necessary structural part of the technological process of growing and processing agricultural products [3].

Each manufacturer of agricultural products must provide fuels and lubricants, mineral fertilizers, seeds, etc. Therefore, economic problems that need to be solved in cooperation with the sectors.

Interaction and cooperation of producers of fruits and vegetables and dairy products with business entities specializing in their processing ensures the production of new types of products. This creates additional jobs for the working population and also increases the total income of those involved.

Finally, as in the case of any producers of goods, works and services, agribusiness entities must combine their production cooperation with structures specializing in the sale of goods, works and services.

In connection with the current situation in the agro-industrial complex of Jizzakh region, the development of industrial cooperation of business entities in this sector of the economy should be carried out in the following areas:

- organization of timely and high-quality technological services to improve the efficiency of agricultural production;
- deepening the processing of fruits and vegetables, as well as meat and dairy products;
- improving cooperation with dealers of finished products;

When implementing these areas, it is important to take into account the total volume of fruits and vegetables produced by farmers and dekhkan farms:

- at least 10-15% should be used for own consumption;
- at least 30-35% of the products must be sent for sale, depending on medical requirements.

Therefore, when solving issues of joint production cooperation between producers of agricultural products and their processing enterprises, no less than the production of fruits and vegetables grown by farmers and dehkan farms, it is necessary to ensure the creation of 50% of the processing capacity. At the same time, in some areas of the region, there is no capacity for product processing, and the administration should support and encourage the creation of additional capacities required for these products. In addition, it is necessary to focus on the additional formation and development of agricultural producers. Clusters based on at least 2-3 single clusters in each region of the region are designed to promote mutually beneficial cooperation and industrial cooperation, to create a competitive environment and reduce transport costs for agricultural products. It is advisable to ensure the operation of the enterprise. Expert calculations show that in each region there are 2-3 enterprises during the month of November, each of which has a capacity of up to 5 tons of fruits and vegetables per day, while in each region there is one enterprise. There should be 25-30 small enterprises specializing in the cultivation of fruits and vegetables, with an area of 25-30 hectares. In addition, 300-350 people will be involved in an active labor process. Each region should have at least 20-25 meat and dairy enterprises to produce 4-5 tons of meat and 8-10 tons of milk per day. Diagram 1 shows the main forms of industrial cooperation in the agro-industrial complex.

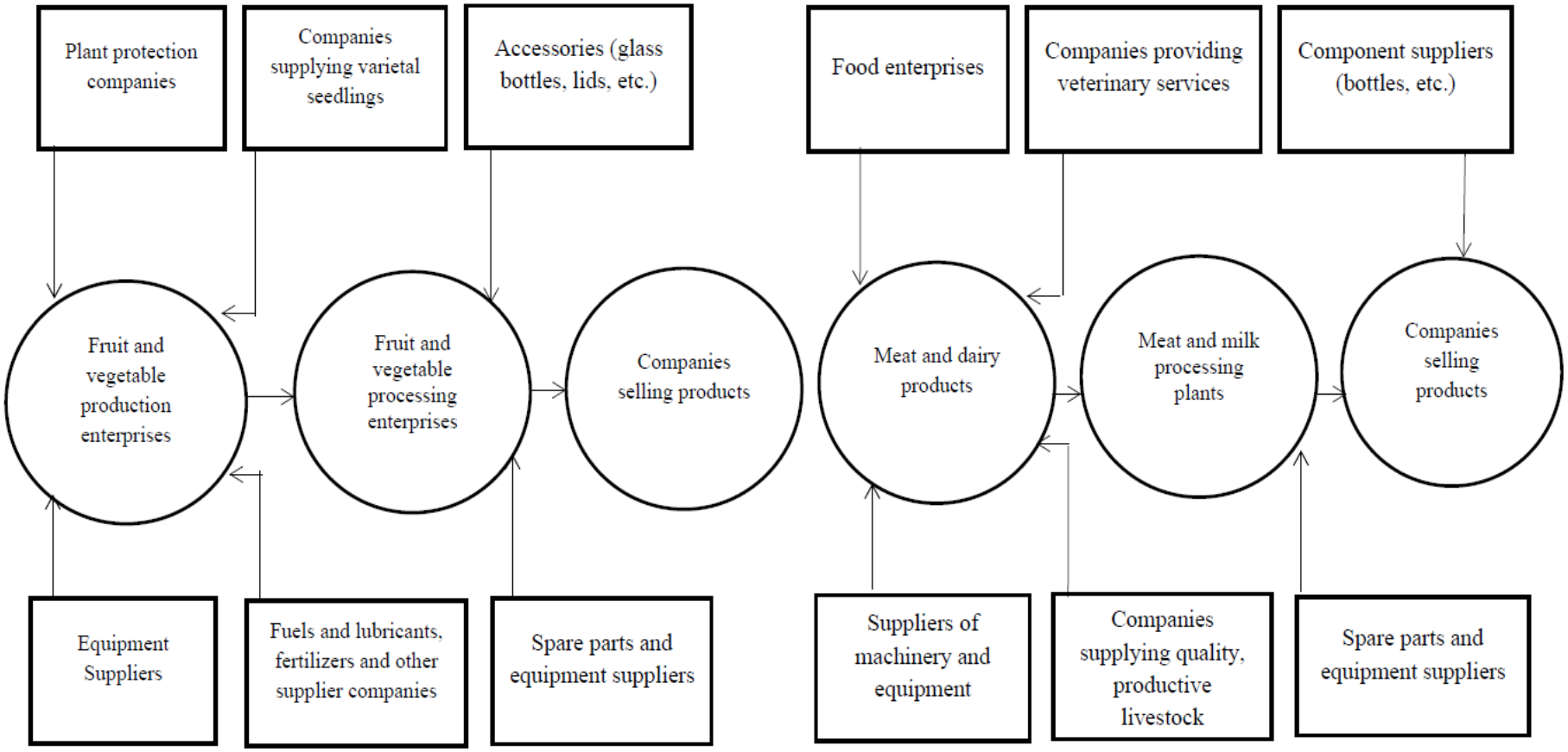
Diagram 2 shows the main stages of the development and implementation of measures to

expand the interaction of economic entities in the agricultural sector of the region.

The above methodological approach provides the following possibilities:

- intensification of cooperation and industrial cooperation between the subjects of the agro-industrial complex;
- taking into account the interests of business entities in improving the organization of production;
- management of the process of interaction of industrial cooperation;
- provide a specific goal of support and encouragement;
- control and improvement of the development process of these processes. The implementation of the proposed methodological approach to the development of industrial cooperation between the subjects of the agro-industrial complex will have a significant positive impact on production efficiency in this sector of the economy [4].

The decree of the President of the Republic of Uzbekistan dated March 24, 2013 "On the main directions of intensification of agrarian reforms" is aimed at a positive impact in the development of cooperation and industrial cooperation in the agro-industrial complex of the economy, "contracts for the supply and provision of material and technical resources and supplies of cultural agricultural products are concluded only with enterprises and organizations that produce, process and serve the farms themselves."



1-diagram. The main forms of industrial cooperation in the agroindustry complex

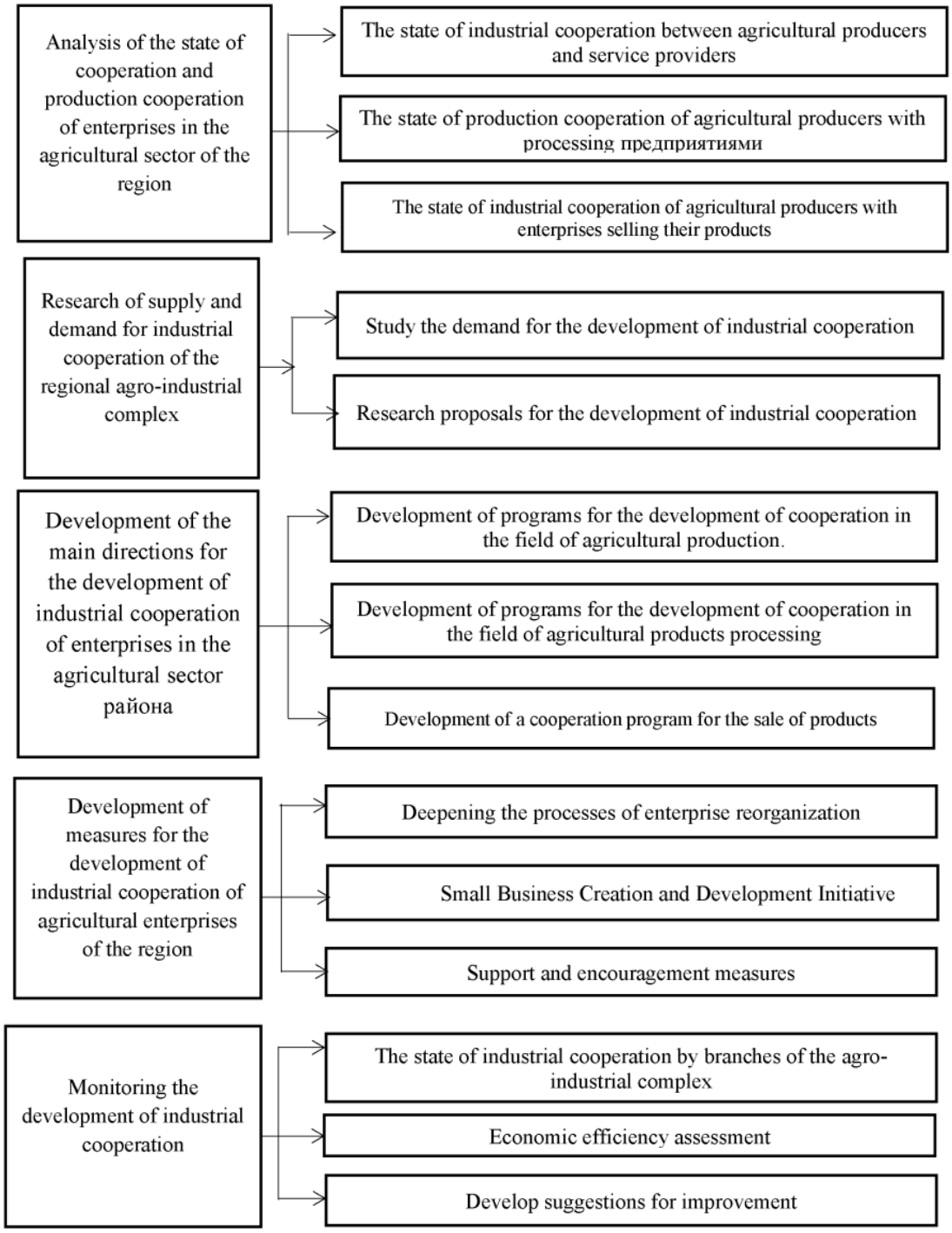


Figure 2. The main stages of production and implementation of measures to expand cooperation.

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Understanding farmers' decisions towards sustainable agriculture: Cross-country evidence from irrigated areas of Kazakhstan and Uzbekistan

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1 Session background

Agriculture plays crucial role in generating employment and income of most rural populations in Central Asia. At the same time Central Asian agriculture remains dependent on irrigation water and prone to water scarcity. The region is considered to be one of those most vulnerable to climate change, projected through water scarcity and water supply variability. The recent export boom in Central Asian agriculture has underlined the importance of policy environment to promote new technological solutions and farmers' interest in adapting them. In many parts of Central Asia, such as Kazakhstan and Uzbekistan agriculture is becoming more commercially oriented, technology-intensive and associated with increased use of costly inputs and equipment. Concerns for environmental sustainability in irrigated and degraded areas, call for the adoption of sustainable agricultural practices. There is a relative dearth of research on farmers' adoption decisions in Central Asia, particularly with economic intuition in accounting for the concepts of farmers' behavior, farm characteristics, and institutional environment. Such evidence can also contribute to the discussion of policy options for improved agricultural performance and sustainability in the study regions.

2 Objective and Structure

Against this background, the overall objective of the proposed Organized Session is to present and discuss research findings on issues of farmers' decision making in adopting new technologies and practices. A key contribution of the session is to encompass the results of several recent studies within the Uzbek-German Structured doctoral programme on Sustainable Agricultural Development in Central Asia (SUSADICA, https://www.iamo.de/susadica), by combining different empirical studies on patterns and determinants of related farmers' decisions. The presentations will consist of investigations using the cross-sectional farm survey data collected in March-April 2019 in the irrigated settings of two study regions, namely the Turkistan region in Kazakhstan, and the Samarkand region in Uzbekistan. The comparative nature of the presentations will provide better understanding of the influences of farm-level determinants along with climatic, institutional, economic, social, and environmental conditions. By using farm-level data, the studies investigate how different factors affect farmers' decisions in adoption of sustainable practices, investments and water use cooperation. The session presentations are intended to provide both an overview of the potential diversity or similarity of current developments in two regions, as well as the generalization of findings with the relevance to sustainable agricultural development in irrigated areas of Central Asia.

3Presentations

Adoption of sustainable agricultural practices in Central Asia

Presenter: Abdusame Tadjiev (IAMO, Germany, and TIIAME, Uzbekistan)

This paper examines the determinants of farmer's decision to adopt sustainable agricultural practices in irrigated areas of Central Asia. The study employs cross-sectional survey data of 963 farms collected in 2019 in irrigated areas of Kazakhstan and Uzbekistan. The determinants of farmer's adoption decision are estimated by utilizing a probit model. The empirical findings demonstrate that attitudes towards risk have contrasting relationship with adoption decisions of Kazakh and Uzbek farmers. Furthermore, if farmers care about the opinion of other farmers and colleagues they are likely to adopt SAPs in both countries. Among other factors are farmers' participation in cooperation, information source about new technology and agronomy, land tenure security, use of irrigation pump, and soil fertility. Peer networks and state credits however can favor conventional agricultural technologies. Policies targeting these factors, as well as improved extension services, crop diversification and land tenure security will promote adoption of sustainable agricultural practices.

Keywords: risk attitudes, determinants, probit model, cross-country comparison.

Investment behavior of farmers: Preliminary insights from Central Asia

Presenter: Zafar Kurbanov (IAMO, Germany, and TIIAME, Uzbekistan)

Investments by farm operators play critical role for farm income increase through modernized technological base and improved land quality. In the context of agricultural revival (e.g., farm diversification, integration into value chain, processing) in Kazakhstan and Uzbekistan, it is important to know farmers' investment behavior. In this study we employ a descriptive analysis method to the farm survey conducted in two regions of Kazakhstan (Turkistan) and Uzbekistan (Samarkand). Preliminary findings suggest that two major types of investments are common among farmers in both countries. (1) Farmers tend to invest in physical assets (e.g., irrigation pumping device) or non-physical assets (e.g., hiring agronomist) that have immediate benefit to farm operation. (2) There is a quite high variation across districts in farm business diversification. The implications of these findings are such that Central Asian farmers are not willing to invest in activities that have delayed returns. In times of increased importance of sustainable development and agricultural production, such trends observed in Central Asia inhibit meeting Sustainable development goals (SDGs). To reverse this, policymakers should make activities such as land improvement, farm trainings attractive to farmers by shifting future streams of (potential) returns to present time like advance payment.

Keywords: Farmer, investment decisions, determinants, Kazakhstan, Uzbekistan.

Social norms and farmers' cooperation in water management

Presenter: Nodir Djanibekov (IAMO, Germany, and TIIAME, Uzbekistan)

Previous research has shown how Kazakhstan and Uzbekistan have displayed different forms of post- Soviet governmentality, described as managerial governance and paternalistic regulation, respectively. In this research, we explore how these differences led to divergent forms of natural resource management. Specifically, we ask how water cooperation among farmers in Kazakhstan and Uzbekistan differs. We find that the development of formal institutions can crowd-out (informal) cooperation in water management. In more integrated market settings of Kazakhstan, farmers can be considering cooperation as risky, less-rewarding over time, and requiring punishment skills. Social norms of respect to opinion of neighbors and relatives are crucial. Respect to opinion of public authorities produces contrasting results on cooperation. In Kazakhstan, they promoted individualism, while in Uzbekistan they promoted farmers' informal cooperation. The regulatory environment which promotes farmers' more autonomous decision making (e.g., crop choice) can facilitate cooperation. Finally, local image of water supply organization matters in individual's decision to cooperate.

Keywords: informal water management, social norms, land tenure security, probit model.

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Methodical issues of management accounting for segmental reporting at enterprises

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Summary

The article examines the problems of organizing segmental accounting and reporting of enterprises that have moved to a cluster system of management. It describes the features of effective management of cotton and textile enterprises in Uzbekistan on the basis of the cluster model. In particular, the methodological and organizational issues of segment accounting and segmental reporting to determine the financial results of the participants of the cluster through a separate account of income and expenditure of sewing and knitting, spinning and weaving, primary processing enterprises of cotton and cotton farms.

The scientific article reveals the internal potential of the enterprise in economic activity using two different models of looms on the example of a specific segment using a comparative analysis. As a result of scientific research, relevant scientific proposals and practical recommendations have been provided.

Key words: cluster, segment, economical segment, geographical segment, segmental accounting, segmental reporting.

1. Introduction and research questions

The analysis of the development of the cotton-textile and sewing-knitwear industry in Uzbekistan requires the state support of the industry in the face of changes in the world market, increased competition, as well as the development and implementation of mechanisms for its more sustainable and rapid development. At the same time, systematic work is being carried out to create new high-tech jobs through the implementation of strategically important projects, technical and technological modernization of enterprises, further deepen the structural restructuring aimed at introducing an advanced "cluster model".

In order to accelerate the development and diversification of the textile and sewing-knitwear industry, increase investment in the deep processing of semi-finished textile products and increase exports of finished products, from April 1, 2019 to 2019-2021 will export at least 80% of finished products. Expenses related to the payment of interest on loans from commercial banks to enterprises will be covered by the State Fund for Entrepreneurship Development under the Cabinet of Ministers of the Republic of Uzbekistan [1].

Table 1.

Target parameters for the development of the textile and sewing-knitwear industry in Uzbekistan in 2019-2025 [17]

№	Name of products	Unit of measure-ment	2018	Forecast indicators				Growth rate in 2018
				2019	2021	2023	2025	2025
1.	Volume of production of textiles and sewing-knitwear	mln. U.S. dollars	3 140,8	4 437,4	5 666,4	10404,4	14600,1	4.6 times
2.	Production of cotton fiber	thousand tons	974,2	750,0	900,0	992,7	1 000,0	1,0 times
3.	Processing of cotton fiber	thousand tons	520,0	720,0	900,0	1 023,5	1 132,5	2,2 times
4.	Yarn production	thousand tons	442,9	608,2	738,0	843,8	940,0	2,1 times
5.	Finished fabric	mln. sq.m	462,8	517,4	626,0	1 028,5	1 425,9	3,1 times
6.	Sewing and knitwear products	mln. pieces	409,4	559,0	648,5	1 180,0	1 516,8	3,7 times
7.	Export	mln. U.S. dollars	1 602,9	1 903,4	2 590,5	4 761,2	7 073,3	4,4 times

2. Data and methods

The article uses the target parameters for the development of the textile and sewing-knitwear industry in Uzbekistan in 2019-2025, research work of foreign and domestic scientists in this field, as well as business plans and financial statements of cotton and textile enterprises operating in Uzbekistan in the cluster management system.

In writing this article, the author used financial analysis and economic-statistical methods of comparison, grouping, determination of averages and index methods.

3. Main results

Application of a cluster management system, which has a positive effect in international practice, in particular, the establishment of responsibility centers between the internal economic units that are part of the cluster, for this purpose, the division of the enterprise into economic and geographical segments, separate calculation of income and expenses. It is required to include the preparation of internal economic reports in the accounting policy of the enterprise.

Aspect of Financial Security of Industrial Enterprises Under Influence of Global Crisis investigated by Burkhanov A. [11], Tursunov B. [10; 12;13;14;15;16] and others.

At present, as an experiment, clusters have been established in twelve regions of the country on the basis of textile and light industry enterprises by leasing cotton processing enterprises through direct contracts with farming, the purpose of which is to export the finished product with final added value and the distribution of income from a single center according to economically justified norms [2., p.1].

Economist prof.Yo. Karrieva's comprehensive research on "Application of logistics in the innovative development of cluster activities in Uzbekistan" focuses on the following types of logistics as : transport-logistics, customs-logistics, industrial-logistics, innovation- logistics clusters and they have been studied.

In our opinion, it is expedient to include supply and production logistics in this management system in the cluster chain [3., p.3]

The scientist Z.Hakimov, who studied this problem, drew attention to the socio-economic efficiency of the formation of clusters in the textile industry. He noted: “Textile enterprises need financial resources, skilled labor force and high-tech laboratories to form product, technology and marketing innovations, and small enterprises do not have the capacity to integrate them all. In turn, the unite of enterprises in a cluster for the production of the final product provides the above-mentioned opportunities "[4., p.4].

A deeper understanding of the nature of management accounting in enterprises operating in a cluster system is directly related to the relationship between it and the production account and the separation of differences.

Production accounting is reflected in the management of costs and revenues of the enterprise and the identification of opportunities to increase production profitability. It should reflect in detail all issues related to the production and sale of products in the enterprise.

The relationship between management and production accounting can be expressed as follows (Table 2).

Table 2 Types of internal accounting in the enterprise and the relationship between them [5]

№	Indicators	Management account	Production account	Cost accounting and calculation of product cost
1.	Planning (budgeting)	+	+	-
2.	Estimation(prognozing)	+	+	-
3.	Internal (segmental) account and reporting	+	-	-
4.	Cost account and determine product costing	+	+	+

5.	Form transfer pricing	+	-	-
6.	Define the prospect	+	-	-

4. Discussion

As can be seen from the table, the management account is broader than the production account and includes new areas of accounting, such as internal (segmental) accounting and reporting, form transfer pricing, and define the prospect. Modern production accounting also reflects the classification of costs and revenues by centers and types of responsibility.

Uzbekistan has adopted a Presidential Decree on the gradual transition to international financial reporting standards [6]. Preparations for the above-mentioned task of the head of state began long ago. In 2014," the International Standards of Financial Statement was translated into the state language by the Association of Accountants and Auditors of Uzbekistan. One of them is the International Standards of Financial Reporting which is named No. 8 "Operating Segments". Paragraph 6 of this standard lists the segments related to operating segments and does not include the head office and some divisions related to non-profit management.

Prof.B.Khasanov admits: "The business segment is the separation of a certain part or a relatively independent division of the enterprise in order to delegate certain powers and responsibilities.

Management accounting consists of a set of different centers of responsibility (business segments), taking into account the organizational structure of the enterprise.

Geographical segment is a segregated component involved in the production of goods and services in a particular economic environment, affected by risk and profit, different from risks and benefits, specific to the segments, operating in other economic conditions "[7., p.165].

The procedure for preparing financial statements which based on segments for external users is regulated by the National Accounting Standard of the Republic of Uzbekistan named No. 1 "Accounting Policy and Financial Reporting". Paragraph 96 of this standard states: "Considering the priorities of accounting policy features for users, business leaders should consider the possibility of risk assessment and future cash flows of business entities. Accounting policies should include, but are not limited to: 96.17. determine the types of activities, geographical segments and the method of distribution of costs between segments "[8., p.50].

Segment costs do not include:

– costs of short-term and long-term financial investments (except when they are the main activity of the segment);

– income (profit) tax;

– emergency expenses (force majeure obligations).

Article 11 of the Law of the Republic of Uzbekistan "On Amendments and Addenda to the Law of the Republic of Uzbekistan" On Accounting "No. LRU (Law of the Republic of Uzbekistan) №404 of April 13, 2016 of the Oliy Majlis of the Republic of Uzbekistan states: to ensure the development of the procedure "It is stipulated that the head of the accounting entity shall ensure the development of accounting policies, internal accounting and reporting systems, internal control procedures" [9., p.3].

Segment costs are costs that can be included directly in the segment or are reflected as part of the total costs of the enterprise.

In analyzing the efficiency of segments, it is important to assess the labor productivity of the equipment used. To do this, we use the following calculations in the analysis process:

$$P_{M1} = \frac{T_P}{Q_L * M_H} = \frac{6135,9}{148 * 4156} = 9,98 \quad (1)$$

$$P_{M2} = \frac{T_P}{Q_L * M_H} = \frac{6128,3}{94 * 4156} = 15,69 \quad (2)$$

PM1, PM2 - labor productivity of looms .
TP – Volume of annual gross revenue of product , meters.
QL - Average annual number of employees.
MH - The annual working hours performed of the looms.

Table 3

Analysis of technical and economic indicators of efficiency of using looms used in enterprise segments

№	Name	Unit of measure-ment	Variant 1 for "STB-180"	Variant 2 for "COMET"
1.	Number of devices installed	piece	267	120
2.	Normative productivity of the machine	timer	5,76	12,8
3.	Annual gross product volume	meters	6 135,9	6 128,3
4.	Average annual number of employees	person	148	94
5.	Annual working hours performed by the machines	timer	4 156	4 156
6.	Labor productivity of machines, (3rd row / (4th row * 5th row))	meters / person, machine working hours	9,98	15,69
7.	The average salary of employees	thousand soums	1 500,0	2 000,0
8.	Cost of goods produced	thousand soums	33 778 129,5	31 836 518,5
9.	Including: cost of 1 meter of fabric (row 8 / row 3)	soums	5505,0	5195,0
10.	Volume of sold product	thousand soums	38 840 247,0	38 730 240,0
11.	Gross profit from product sales (row 10 - row 8)	thousand soums	5 062 117,5	6 893 721,5
12.	Current expenses	thousand soums	2 725 989,0	4 399 309,0
13.	The net benefit of the segment	thousand soums	2 336 128,5	2 494 412,5
14.	Segment profitability (13 row / 10 row *100)	%	6,0	6,4

Source: Author's development as a result of research.

The use of the data in this table in the computational and analytical processes allows for a comparative analysis of costs and revenues in terms of capacity and efficiency of the two types of looms used in the enterprise segments.

5. Conclusions

In conclusion, the role and importance of the cluster system in the context of further development and modernization of the economy is incomparable. This will create opportunities and conditions for the generalization of the producer and consumer chains in a single logistics system and to reach the level of international exports.

It is expedient to accelerate the transition to the principles and standards of segmental accounting and reporting, recognized in international practice.

Today's demand and need is that the Ministry of Finance of the Republic of Uzbekistan, in

cooperation with public organizations of accountants and auditors of Uzbekistan, should provide practical assistance in the formation of methodological, regulatory and organizational framework for segmental accounting and reporting.

The division of types and areas of activity of the enterprise into segments is based on the management policy of the entity's management. Therefore, the financial information disclosed by segments is not transparent in terms of transparency, but is a trade secret. Also, segmental reporting information cannot be used to compare the performance of different enterprises. Notwithstanding the above, information on operating segments is necessary and up-to-date for investors and other users.

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Accounting - as providing a system for managing economic information in agriculture

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1. Introduction.

In today's rapidly evolving and constantly evolving age of rapid technical and technological change, the importance of timely, timely and accurate delivery of reliable information for managers, economists, marketers, accountants and other professionals is growing. The growing attention to this issue is reflected in the liberalization of the economy. It is important to deepen reforms, modernize the economy, ensure financial stability and security for all businesses in the context of expanding innovative activities.70-80% of the total volume of economic information in agricultural enterprises falls on the share of accounting information. According to experts, until recently, the utilization rate of accounting information for management decisions was 10-12 percent. To date, this figure has been found to be even lower. The current situation is the result of poor management of the management system with accounting information, as well as the low level of application of management accounting methods. In addition, it will be possible to identify the pros and cons that reflect the right management decisions at any time, and only if information is available that allows us to predict the expected outcomes.

Of course, all management functions are based not only on normative indicators, but also on accounting data that provide accurate information about the main activities. The accounting records reflect the actual existence and movement of economic assets, economic operations carried out in the process of turnover of fixed and working capital. Accounting provides the management system with information on the current quantitative and qualitative indicators, ie the property, liabilities and business processes of the business structure.

2. Analysis and results

In the current situation, information is needed to manage the activities of agricultural enterprises, which allows you to quickly identify differences in plans and norms. It is very difficult to verify the inputs and outputs obtained using the simple form of accounting, which operates on the principle of "cost-benefit", because they do not always have a deep economic meaning, so this information is rarely used in management. To do this, more attention should be paid to the proper organization of the budgeting process, which is an important element of management accounting.

Planning in agricultural enterprises is associated, first of all, with the identification of funding sources, the most optimal use of available financial resources and the rational use of self-financing sources.

The organization of sources of self-financing, that is, income-generating activities, does not violate the principle of unprofitability of agricultural enterprises. The fact that agricultural enterprises are not specifically directed to profit does not prohibit them from engaging in entrepreneurial activities, but it does mean that the profits received should be distributed in the interests of the founders or employees. To ensure effective operation, it is necessary to plan not only at the level of long-term strategy of agricultural enterprises, but also at the level of the set of programs they implement and individual day-to-day issues for each program. The logical continuation of the work on the formation of the financial plan is budgeting.

A budget is a financial forecast of the costs and sources of funding for the security of each program and the enterprise as a whole. The budget is calculated for a certain period of time.

Although the budget is a forecast in its essence, it should be based on the most reliable data. Only in this case can it be classified as a prediction based on the highest probability.

Under the current circumstances, it is difficult for most agricultural enterprises to know exactly how much funding they can receive for the next year. Therefore, three types of budgets are required:

- Creating a minimum budget, which is based on the minimum costs required for the sustainable operation of enterprises. Funds to cover the minimum budget usually come from their own resources.
- Creating a guaranteed budget, which includes guaranteed expenditures with sufficient probability of financing. The same budget must be submitted by management for approval. It will

be a key tool of financial management for the coming year.

- Creating an optimal budget, which includes all types of activities that have not yet been funded and is used in the preparation of proposals for fundraising.

Budget items are mainly divided into revenue and expenditure components.

Revenues indicate revenues that are expected to come from sources of financing, with a distinction between external and self-financing sources.

The expenditure part of the budget is divided into daily expenditures and capital investments. The traditional budget includes the following costs:

- salaries and social benefits;
- business trip expenses;
- material costs;
- information and communication costs;
- depreciation allowances;
- services of foreign farms;
- other expenses.

A budget is sometimes referred to as an estimate of revenues and expenditures. However, the concept of "budget" corresponds to the nature of future costs and revenues of planning activities in the context of uncertainty of the revenue side.

If the budget sections are depicted in tabular form, we see that it is similar to a traditional enterprise balance sheet. The same table itself is the balance of income and expenses.

The preparation of the annual budget of agricultural enterprises begins two months before the beginning of the fiscal year and must be approved before the beginning of the year.

The process of budgeting agricultural enterprises will be in three stages:

1. Analysis of the results of previous years;
2. Analysis of the current year's budget execution;
3. Planning for the next budget year.

The analysis of the results of previous years consists of identifying sections where the current performance of agricultural enterprises is lower or higher than expected. If last year’s budget figures are close to reality, we will have incomplete data for the current year, completed last year. The analysis for the past few years will allow us to identify factors of a random nature that are not expected to be available in the budget next year and to adjust the forecast accordingly.

At this stage of budgeting, the company can have information about the planned sources of funding for the coming year, the planned programs and the costs associated with their implementation.

Planning, along with control, is one of the most important tasks of management and is the process of determining actions to be taken in the future.

Budget planning is the most detailed level of this process, the process of preparing a separate budget developed on the basis of programs approved by management for the structural units of the enterprise or by type of activity. Sometimes the term is interpreted as a complex system for choosing tactical planning goals at the enterprise level, developing a plan for the future activities of the enterprise (estimating costs and revenues) and monitoring the implementation of these plans, that is, in fact, an internal financial management system.

Uzbekistan currently has a regulatory framework for financial security of enterprises, which is regulated in 3 areas:

1. Regulatory framework of accounting regulation;
2. Tax administration;
3. Accounting policy.

The legal and regulatory framework of accounting is:

- Laws, Codes, Presidential Decrees, Government Resolutions.
- NASs, Regulations and Instructions developed by the Ministry of Finance, instructions, procedures and explanatory letters issued by the State Tax Committee.

- Instructions, guidelines, explanatory notes produced by other ministries and government agencies.

- internal normative documents representing the accounting policy of enterprises. The main regulatory framework is the Law of the Republic of Uzbekistan "On Accounting", adopted for the first time on August 30, 1996 and amended on 13.04.2016 (№404).

Also included are the Civil Code of the Republic of Uzbekistan, the "Regulations on the structure of costs of production and sale of goods (works, services) and the order of formation of financial results" adopted in 1999, legislation governing accounting and reporting and decisions of the Cabinet of Ministers.

The Law "On Accounting" is a key element of the accounting reform, defines unified accounting for all enterprises, institutions and organizations of various forms of ownership, establishes requirements for national accounting standards and provides the basic principles of the accounting system in the Republic of Uzbekistan.

The purpose of this Law is to regulate the relations in the field of organization, maintenance and preparation of accounting.

The new version of the Law "On Accounting" contains 32 articles. According to the law, "Accounting is a regulated system of collection, recording and generalization of accounting information through a complete, continuous, documentary accounting of all business operations, as well as the preparation of financial and other reports on its basis."

Accounting shall be carried out in a double-entry manner by reflecting the business transaction in at least two accounting accounts at the same time and in an interrelated manner, with monetary valuations.”

According to Article 3 of this law, continuity, reliability, comparability of indicators are defined as the basic principles of accounting. Accounting information is based on primary accounting documents, which are processed information about the objects of accounting, reflected in the accounting registers, financial statements, explanations and other documents related to the organization and maintenance of accounting. The new revised report also focused on the study of all knowledge according to accounting standards, or the minimum requirements related to the study of accounting for financial standards and the creation of financial statements. National Accounting Standards define the requirements for the organization of accounting and the creation of accounting and financial accounting. It is ensured that the accounting entities are supported in the prescribed manner in accordance with the rules that are allowed to the public by standards. Also, according to Article 7 of the Law "On Accounting", the accounting and reporting of enterprises must be organized by the head of the enterprise and the chief accountant. Methods of accounting include grouping and evaluation of evidence of economic activity, depreciation of assets, organization of document flow, inventory, methods of applying accounting records, maintenance of accounting registers and preparation of financial statements of the enterprise based on the information contained in them. The accounting policy of the enterprise is prepared by its accounting department and formalized by the head with the relevant organizational-command document. Another normative document regulating accounting in Uzbekistan is the national accounting standards. National Accounting Standards set out specific requirements for the organization, maintenance and preparation of financial statements.

The guidelines and articles of the Law on Accounting have been developed in the National Accounting Standards (NAS) and 1-24 standards have been approved to date. Each standard has its own list of rules, determines the order of accounting in business entities and is an element of the system of normative regulation of accounting in the Republic of Uzbekistan. Among the most important documents of this level is the National Accounting Standard of the Republic of Uzbekistan No. 21, approved by the Minister of Finance of the Republic of Uzbekistan on September 9, 2002 No. 103 and registered in the Ministry of Justice on October 23, 2002 No. 1181.

- Accounting plan of economic activity and instructions for its application.

The next normative document is various orders, letters and instructions of a methodological nature provided by the Ministry of Finance, the Central Bank and other central government agencies of the Republic of Uzbekistan.

Certain work is being done in the country to reform tax policy. In particular, the concept and strategy for improving tax policy have been developed and put into practice. The main directions of the strategy are to improve tax policy and reduce the level of clandestine turnover in the economy; development of service-oriented tax services; introduction of tax risk assessment system and improvement of tax accounting; further improvement of the state tax service; development of mechanisms to combat corruption in the state tax service. At the same time, the tax policy pursued in our country plays an important role in ensuring the financial stability and security of agricultural enterprises. In recent years, a number of regulations on tax policy have been adopted. In particular, a new version of the Tax Code was adopted, which today serves as an important conductor of tax policy. Also, the Resolution of the President of the Republic of Uzbekistan "On additional measures to improve tax administration" PP-4389, President of the Republic of Uzbekistan dated July 18, 2017 "On measures to radically improve tax administration, increase tax collection and other mandatory payments" Decree No. 5116, Resolution of the President of the Republic Uzbekistan dated June 26, 2018 "On measures to radically improve the activities of the State Tax Service" and other documents continue to play an important role in the implementation of state tax policy and regulation of financial activities of enterprises. The purpose of these documents is to ensure the relationship between the enterprise and the tax authorities, in particular, to prevent problems in accounting and to ensure the overall integrity of tax policy and accounting policies.

This requires that the accounting policies developed by the enterprises be perfect. In recent years, the relevance of accounting policies has taken a significant place in foreign research. Indeed, the accounting policy clarifies the rules of accounting for each business entity. Finally, the internal regulatory documents relating to the accounting of an entity that only belong to a particular business entity are considered to be the regulatory framework aimed at ensuring its financial security. This is the accounting policy of the business entity, which is one of the legal bases of the organization of accounting. National Accounting Standard №. 1 of the Republic of Uzbekistan "Accounting Policy and Financial Reporting" is an element of the regulatory system of accounting.

The entity's accounting policy is developed by the chief accountant at the beginning of the reporting year and approved by the manager and must be applied throughout the reporting year without modification. In this standard, an accounting policy is a set of methods adopted by the head of an entity to maintain accounting and prepare financial statements, financial statements are prepared in accordance with these methods and in accordance with their rules and principles.

Methods of grouping accounting and assessment of the facts of economic activity, methods of payment of assets, organization of document flow, property registration, methods of application of accounting reports, system of accounting registers, information processing and other relevant methods, methods of accounting enters. The chief accountant or other official performing accounting and financial management functions is the head of the accounting service. The head of the accounting service is directly subordinate to the head of the accounting entity.

In agricultural enterprises, too, the requirements of the head of the accounting service for the registration of business operations on the basis of documents and their submission to the accounting service are mandatory for all employees of the accounting entity.

1-National Accounting Standards are developed on the basis of the Law of the Republic of Uzbekistan "On Accounting" and are an element of the system of accounting management in the Republic of Uzbekistan on a normative basis. This standard is used in conjunction with other national standards.

One of the legal bases for the organization of accounting is the accounting policy of agricultural enterprises. National Accounting Standard №. 1 of the Republic of Uzbekistan "Accounting Policy and Financial Reporting" is an element of the regulatory system of accounting.

With this in mind, in our opinion, the Accounting Policy is an internal normative document that reflects the specific normative methods chosen by the head of the agricultural enterprise for accounting and financial reporting and serves to fully meet the information needs of users. According to National Accounting Standard No. 1, an agricultural enterprise must develop its own accounting policy for each fiscal year. Accounting policies include the grouping and valuation of business factors, the write-off of assets, the organization of document flow and inventory, the application of accounting records, the accounting system, the development of information and other relevant methods.

It is known that the accounting policy determines the order of preparation, purchase and valuation of tangible assets, the criteria for inclusion of items in property, plant and equipment or inventory and farm equipment, their obsolescence, the order of valuation and sale of finished products, the development of a chart of accounts. The accounting policy prepared for the next reporting year is a legal document after approval by the head of the enterprise.

Accounting policies represent the specific principles, conventions, procedures and practical approaches used by an agricultural enterprise to prepare and prepare financial statements. The accounting policy should be organized in such a way that the financial statements are prepared using all appropriate NASs. In the absence of special requirements, the financial statements:

- important for the needs of users;
- must be reliable in this regard:
- impartial presentation of all results of the entity's activities and financial condition;
- reflects not only the legal form, but also the economic nature of events and operations;
- impartiality and impartiality;
- be careful without compromising objectivity;
- all important aspects must be complete (complete), ie the subject must fully reflect all the facts of economic activity;
- comparable to the financial statements of other similar entities;
- should be clear.

In formulating the accounting policy of the entity in a particular area (issue), it is necessary to comply with the accounting laws of the Republic of Uzbekistan in the organization, maintenance and reporting of accounting.

The following issues are reflected in the accounting policy of the agricultural enterprise:

1. Organizational and technical issues:

- Document flow rules and schedule;
- internal reporting (composition, forms, periodicity, terms of creation and submission, users);
- internal control system (internal audit service, specialist, personally the head, the audit commission); - Regulations on accounting (or financial and accounting center) and division of responsibilities of employees of the accounting or financial accounting center (IMC);
- Inventory procedure.

2. Methodological issues:

- methods of controlling the deviation of the actual consumption of materials;
- the order of distribution of general production costs and other indirect costs;
- Procedure for writing off current expenses;
- identification of work in progress.

3. Tax issues:

- The order of organization of separate accounting (by type of activity, by goods sold, VAT at different rates, non-VAT, etc.);
- Organization of separate accounting of social facilities (in order to obtain the right to property tax benefits in the case of joint use of property in privileged and non-privileged industries). The chosen accounting policy affects not only the efficiency of the implementation of accounting methods and techniques, but also the financial condition of the enterprise, the

rational use of funds, the speed of management decisions.

At the same time, the purpose of accounting is to provide users with complete, reliable, timely financial and other information necessary to make sound business decisions.

3. Conclusion

With this in mind, the financial security of an agricultural enterprise is a system based on the differentiation and dynamics of indicators (indicators) allocated for the assessment of its status, a set of interacting elements that provide security from threats and risks, provide conditions for sustainable and secure strategic development. can be recognized.

From the above, we can see that today the economic reforms carried out in our country to ensure the security of financial resources of enterprises, their sustainable development are bearing fruit. At the same time, as a result of regulating the activities of agricultural enterprises, providing them with financial support and benefits, the strength of financial resources is stabilized and their security is fully ensured.

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Sustainable development of organic fruit and vegetable industry in Uzbekistan

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Annotation: The article describes the issues of sustainable development of the organic fruit and vegetable sector of agriculture through the modernization and reform, growing of the population needs in the current complex socio-economic and environmental conditions. The advantages and opportunities of growing organic fruits and vegetables in Uzbekistan are scientifically covered.

Key words: agriculture, organic fruits and vegetables, exports, economic reforms, transport and logistics.

Introduction. After Uzbekistan declared independence, agriculture is developing at a steady pace. The population mainly provided with domestical grown products. The specifics of the formation of market relations in the agricultural sector of Uzbekistan are characterized by the complexity of the ongoing socio-economic changes and today's dependence on supply and demand. This, in the context of the transition to market relations, requires the effective use of existing natural and economic potential, the limited development of production, the sustainable development of agriculture.

Today in the developed and developing countries of the world there are growing demand for organic and environmentally products. If you enter malls in developed countries, you can see that all food product is certified. The consumer knows that the product which buying is not harmful to health. The demand for organic products in the world is growing rapidly (3% per year), so there is a need to stimulate their global production.

The objects of research used entities engaged in the cultivation, storage, processing, export and logistics of organic fruits and vegetables are the object of research. Economic relations at the stage of the value chain of organic fruits and vegetables are the subject of research.

The aim of the study. Further increase the production of organic fruits and vegetables, substantiate the role of processing, storage, logistics and export in the development of the economy. Sustainable development of the market of organic fruits and vegetables, development of scientific proposals of practical recommendations aimed at increasing economic efficiency.

In fact, the idea of organic agriculture, including organic fruits and vegetables, is not new for our country. “This practice has a place in the history of agriculture of our country, that is, the traditional vegetable and horticultural culture formed over the centuries is based on the principles of biological farming, which involves the use of local fertilizers. This allows the cultivation of organic fruits and vegetables with high nutritional value, unique taste and consumption characteristics without the use of genetic modification technologies.

At the same time, there are the following conditions for the development of organic agriculture in Uzbekistan:

the possibility of increasing the income of the population as a result of the export of organic products grown on farms;

the possibility of increasing employment as a result of the development of agro-clusters, logistics and cooperation systems for organic production;

the ability to analyze the quality of agricultural products through the improvement of laboratories, control and certification systems;

regions free of genetically modified organisms (GMOs).

The volue of gross agricultural production is growing year by year in Uzbekistan. In particular, at the end of 2019, the population per capita vegetables was

296.2 kg (212.7% compared to 1990), fruits 81.6 kg (252.3%), but such positive results were achieved mainly through the widespread use of mineral fertilizers and chemicals. As a result, much attention has been paid to the quality and quantity of products, and the ecological system is being damaged [2].

Currently, there is not local market for organic fruits and vegetables and other food products in Uzbekistan. This is primarily due to the fact that consumers do not have complete information about organic products. Consumers do not only unaware, but most manufacturers do

not have a clear idea of which product should be considered organic, how to name the product, and what it's standards [4].

In particular, it should be noted that a number of decrees and decisions have been adopted in recent years. These include PP-5742 of the President of the Republic of Uzbekistan dated June 17, 2019 "On measures for the efficient use of land and water resources in agriculture", PP dated October 23, 2019 "On approval of the Strategy of agricultural development of the Republic of Uzbekistan for 2020-2030" - 5853, Decree No. PP-5863 of October 30, 2019 "On approval of the Concept of environmental protection of the Republic of Uzbekistan for the period up to 2030" and the Decree of the President of the Republic of Uzbekistan dated July 29, 2019 "On deep processing of agricultural products and food industry Resolution No. PP- 4406 of October 4, 2019 "On additional measures for further development", Resolution No. PP-4477 of October 4, 2019 "On approval of the Strategy of the Republic of Uzbekistan for the transition to " green " economy for 2019-2030".

Organic fruits and vegetables are safe for humans and the environment, they are not contaminated with nitrates, heavy metals, pesticide residues, herbicides and other chemically synthesized substances. Organic products are free of pathogens, parasites and allergenic ingredients.

Conclusions. Based on the above analysis, in the context of sustainable development of the industry in Uzbekistan, it expedient to pay attention to the following:

- Development of a strategy to increase exports of organic fruits and vegetables with high export potential in our country to international markets;
- allocation of subsidies from the state budget for each hectare of organic certified;
- formation of consumer demand and a positive image of organic products;
- establishment of local certification testing laboratories in accordance with the international standards "Global G.A.P.", "Halal" and Organic Agriculture and Food;
- protection of the interests of producers of organic products and the development of their cooperation;
- improving the legislation in the field management; further expansion of international cooperation.

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The problem of water and land resources management and climate change in Uzbekistan

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Abstract

This article examines the current state of water and land resources in Uzbekistan. Since the agricultural sector in Uzbekistan occupies a significant share of the national and gross domestic product value, the quality of these resources is especially important for our republic. The main problem in obtaining the high- quality agricultural products in the region is the lack of water, salinization and soil erosion, as well as their secondary salinization, which is amplified due to climate change in this region. Studies show that this affects the productivity of an agricultural products. Taking this into account we understand the necessity of reduction of the harvesting of cotton and rice for less moisture consumed fruit and vegetable products. To achieve this expected results in the management of water and land resources, it is necessary to use the international experience of other countries, applying innovative water-saving technologies in the system of irrigation of land resources incorporating the problem of climate change.

1. Introduction

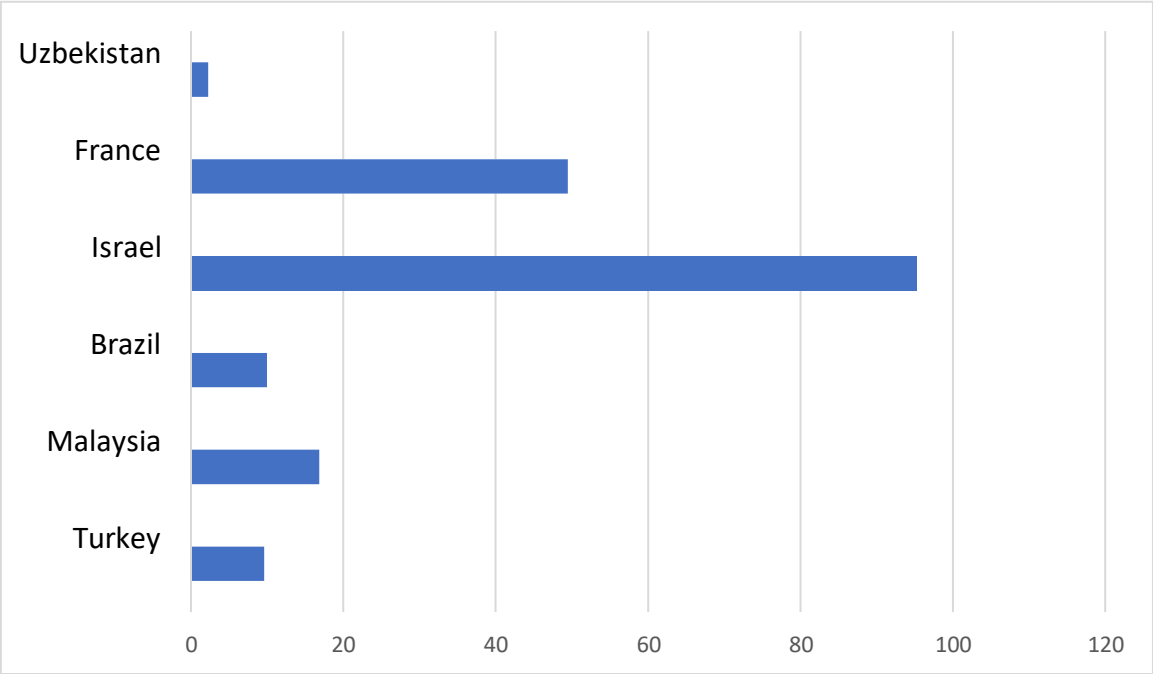
The water problem in Uzbekistan is considered to be one of the main ecological and agricultural issues. Our republic belongs to countries with limited water resources, which in the future may have a negative impact on the development of the economy and the standard of living of the population. Of all the Central Asian states, Uzbekistan is the most dependent on water resources, since it has the largest area of irrigated land (4.3 million hectares), a high rural population (over 16 million people) and the highest population density among 5 countries (54.6 people/km^2).

The main key environmental challenges for Uzbekistan of water scarcity is to meet the growing needs of the population, agriculture and industry, soil salinization and pesticide pollution, desertification of the territory against the background of deforestation, the Aral Sea crisis and climate change. Climate change carries risks in terms of cultivation with agricultural production in sufficient quantities, which may lead to changes in agricultural practices and dietary consumprion of the population.

Uzbekistan possesses considerable ground and water resources, however the land and water use system which has developed today is characterised by irrational use of resources, not proper management efficiency, ageing of irrigating and collecting-drainage systems. All it causes shortage of water and land resources degradation. The growing population and growth of requirement for water, transition of water objects of neighbouring countries with irrigational on a power mode will aggravate the situation. According to some experts if current use of water resources to be continued without any changes than in 25-30 years Uzbekistan will face sharp shortage of water for agricultural needs. In intermediate term prospect the serious conflicts of interests will arise regarding the water distribution between economy sectors at an interstate level and at the local level such as, water users from the top and bottom current of the rivers, between water consumers and ecosystems. Increase of efficiency of water use, the water savings and demand management based on fair distribution of water and achievement of compromises and this is the vital problem for Uzbekistan and other Central Asian countries.

Agriculture is a key economic sector in Uzbekistan, accounting for about 19.2% of the GDP structure, 3.6 million people work in agriculture or 27% of the employed in this sector [1]. However, despite the high employment rate of the population in agriculture sector that leads to agricultural productivity, Uzbekistan is still behind many countries by its development (Fig1).

Fig. 2 Agricultural productivity, 2017, USD / Employed

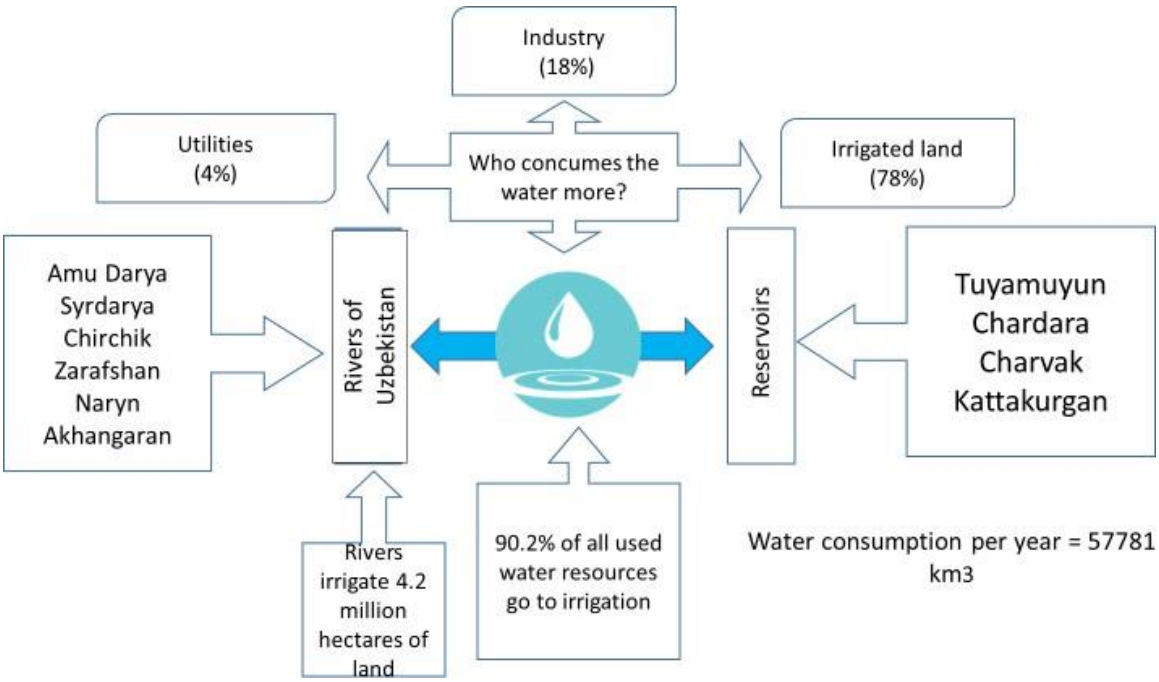


Sources: 1 - Information BUYUK KELAJAK, World Atlas, Export.gov, World Bank, State Committee of the Republic of Uzbekistan on Statistics

The share of small business in agriculture is 98.6%.

Agriculture sector is the main consumer of water resources in Uzbekistan (Fig.2).

Fig.2 Distribution of water resources in Uzbekistan



Source: The Condition of environment and use of natural resources in Uzbekistan: Statistic Committee and the State Committee on wildlife management, Tashkent, 2019

2.Materials and Methods

Uzbekistan enjoys several advantages of favorable natural and geographic conditions as its territory includes a combination of mountainous, plain, and desert terrain. In the east and south-east, sandy steppes make way for hills and piedmont areas. Mountains constitute the largest ecosystem in the region and are highly significant for the country's environmental balance and sustainability. They are an important source of land, water, bio- diversity, energy and mineral resources, and have a determining role in climate and landscape diversity. Uzbekistan's climate is subtropical, sharply continental which is hot and dry, with marked differences in day time - night time and summer-winter temperatures. Its climatic features are due to a combination of three major factors: solar radiations, general atmospheric circulation and the local terrain. Favorable climatic conditions, land and labor resources stipulated the development of cotton, rice, vegetable growing, gardening and vineyard which are characteristics of dry subtropical zone and require essential water consumption [2].

We investigated the irrigated lands of Uzbekistan, to find out what influences the reduction and salinization, and what path to choose for the rational use of water and land resources.

From the middle 80th development of the new soils almost haven't been carried out in our republic. On the contrary, there was a reduction of the soils for an agricultural purpose, and every year the lands from a turn is deduced more and more. For the period of last 15 years the area of irrigated lands was reduced for more than 5%, and counted per capita - for 22%. Area of agricultural soils was reduced from 20,9 million in hectares to 17,8 million in hectares, that means 15% decrease. Reduction of farmland occurred basically at the expense of the pastures and this area decreased for about 19%. The size of arable land during the same period increased a little bit (by 2,7 %) at the expense of expansion of crops on the dry lands. Actually, reduction of farmland occurred in all areas of Uzbekistan, but fast rates were presented in Navoi region (34%). By estimations of Asian Development Bank, if existing tendencies remain, the area of irrigated lands will be reduced by 20-25% during the following 30 years [3].

The main task of the region is the preservation and restoration of water objects:

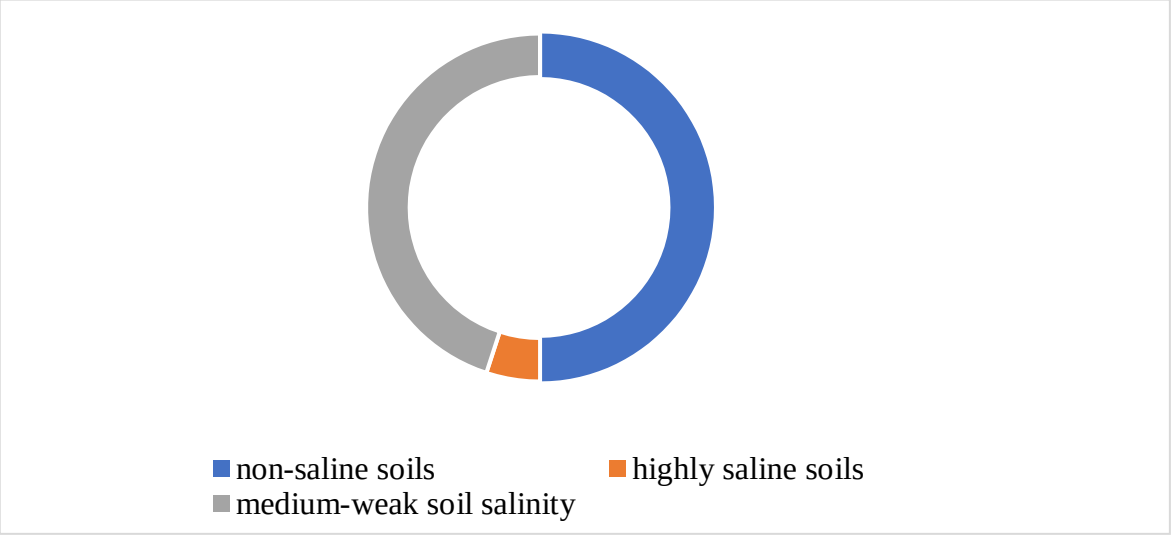
- Reduction of negative anthropogenic impact on water resources;
- Restoration and ecological rehabilitation of water resources that have lost their ability to self-cleaning;
- Monitoring of water resources, including those in border areas.

The main reasons for the decrease in water resources in the region are erosion and secondary soil salinization. In turn, the construction of reservoirs on loess massifs activates the development of erosion and landslide processes along the sides of artificial reservoirs.

The development of erosion processes is largely facilitated by human economic activity. In some areas the proportion of saline soil can reach up to 95%. In Khorezm region 95% of the used irrigated land is eroded. Erosion processes mainly happens by gully formation, it is ubiquitous along the perimeter of intensively irrigated areas. The development of ravines occurs as a result of water leaks from irrigation canals and unregulated discharge of used irrigation water.

At the moment, the share of saline soils is more than 50% (Fig.2). In Central Fergana – the most densely populated part of Uzbekistan 84% of irrigated lands are saline and underwent secondary soil salinization is a direct result of irregular irrigation. With excessive furrow irrigation, part of the water which is being filtered, replenishes the reserves of mineralized groundwater and contributes to a rise in their level. In addition, an increase in the level of groundwater in areas where reservoirs are located is observed.

Fig.2 The share of saline lands in Uzbekistan today, thousand ha



The combination of semi-desert and desert conditions of agricultural dependence on irrigation and progressive climate change means that crop failures can affect entire regions, jeopardizing alimentary crops. Soil salinity is the reason for the decline in the yield of cotton and other crops by 20-30%. A high proportion (over 81%) of crops (cotton, wheat, rice) that deplete the soil remains in the crop structure, which does not meet environmental requirements and can naturally contribute to the development of processes leading to the land degradation (Tab.1).

Table 1. The structure of cultivated areas by types of agricultural products

Name of crops	2015 y.		2016 y.		2017 y.		2018 y.	
	thousand ha	%	thousand ha	%	thousand ha	%	thousand ha	%
Sown area	3560,3	100	3609,7	100	3608,6	100	3708,4	100
Cereals	1538,5	43,2	1559	43,2	1610,7	44,6	1679,4	45,3
Grain-ear:	1431,5	40,2	1472,3	40,8	1517,7	42,1	1559,9	42,1
Wheat	1382,2	38,8	1373,1	38	1354,7	37,5	1466,3	39,5
Corn for grain	34,1	1,0	32,3	0,9	30,1	0,8	28,3	0,8
Rice	48	1,3	33,8	0,9	43,6	1,2	69,2	1,9
Pulses	20,9	0,6	15,9	0,4	14,5	0,4	17,5	0,5
Industrial crops:	1477,1	41,5	1507,2	41,7	1423,1	39,4	1417	38,2
Cotton	1451,3	40,8	1425,1	39,5	1347	37,3	1342,5	36,2
Potatoes	55,6	1,6	59,9	1,7	62,8	1,8	70,7	1,9
Vegetables	159,8	4,5	162,8	4,5	165,4	4,6	173	4,7
Melons of food	39	1,1	42,2	1,2	44	1,2	47,9	1,3
Fodder crops	290	8,1	278,5	7,7	302,5	8,4	320,4	8,6

Most of the dekhkan (farmer) farms in Karakalpakstan are in such a deplorable situation. This is one of the driest regions of Uzbekistan, where water is valuable as gold. Agriculture is irrigated here. In some areas the rainfed agriculture is practiced.

In general, the irrigated lands of the country are quite favorable in terms of amelioration; nevertheless, in some regions it is necessary to carry out an appropriate reclamation measures aimed at eliminating and preventing salinization of irrigated soils. The measures of satisfactory drainage,

leaching prevention, even vegetative irrigation will be sufficient on saline soils with deep groundwater. On soils with a close occurrence of groundwater, especially highly mineralized ones, the complex of reclamation measures will be required, such as; construction of a more frequent collector-drainage network, planning, annual capital leaching, special agrotechnical techniques etc. [4].

The elimination of cotton (by 60 thousand hectares) and grain (by 42 thousand hectares) on low-yielding lands will significantly increase the average crop yield.

Another risk is associated with food insecurity. Since the days of the Soviet Union the region has been known with its extremely high level of use of agrochemicals, and after the collapse, the use fell sharply. The agrochemicals that were in use at the time were so-called persistent pollutants, which means that the metabolites remain in the soil for many years and poison future crops. Moreover,in recent years, the use of agrochemicals has risen sharply again.

3. Results and Discussion

Uzbekistan is significantly exposed to the threat of climate change, and serious risks are already evident. Further climate change is projected to lead to higher temperatures, changes in rainfall patterns and more severe and prolonged droughts, with a corresponding decrease in water availability. The upward trend in average temperature in Uzbekistan is expected to continue and intensify in the near future. While the exact extent of the expected warming remains uncertain, the overall warming trend is clear.

By 2050, it is possible to reduce water resources in the Amu Darya basin by 10-15%. In the Syrdarya river basin, a reduction of 2-5% is possible. With a further increase in air temperatures, the river runoff decreases. Rivers of the Amu Darya basin and small streams are more sensitive to climate warming [5].

If to talk about the flow of the Amu Darya River, then recently it has been dramatically decreasing. According to the Amu Darya Basin Water Management Association, the situation with the Amu Darya river flow remains tense. So, in the third decade of July 2020, in the lower reaches, the deficit in Turkmenistan amounted to 24 percent of the water intake limit, and in Uzbekistan - 47 percent. The flow of the Amu Darya River in the section above the water intake in Garagumdary River amounted to 1807 million m^3, which is less than the forecast by 1515 million m^3. The inflow to the Nurek reservoir was less than the forecast by 598 million m^3. In the upper reaches, the actual water supply to Tajikistan was less than the limit by 59 million m^3 (12% of the water intake limit), to Uzbekistan - by 36 million m^3 (38%). In the middle course, the actual water supply to Uzbekistan was less than the limit by 84 million m^3 (20% of the water intake limit). In the lower reaches, the deficit in Turkmenistan amounted to 76 million m3 (24% of the water withdrawal limit), in Uzbekistan - 442 million m^3 (47%) [6].

Recently, the climate has been getting hot and dry. In winter, dirty water enters the irrigated fields. Soil pollution was recorded in the Syrdarya, Surkhandarya, Navoi and Tashkent regions. Farmers wash salt with this water. Further, farmers use chemical and local fertilizers. Otherwise, due to lack of water in irrigated fields, the crop will not grow. According to experts, now the resource approach prevails in the water sector, i.e. satisfying supply rather than regulating demand, which will inevitably lead to water scarcity.

At the moment, in accordance with the state of the irrigated land, more than 75% of the area requires reconstruction of drainage, construction is required on an area of more than 400 thousand hectares, a radical reconstruction of the entire complex of pumping stations is necessary (more than 70% of pumps and pressure pipelines). Currently, up to 35% of the reservoir capacity is silted up.

Water facilities are supported by the state budget; however, the observed limited budgetary funds affect their physical and moral deterioration. Practice shows that physical wear and tear exceeds the rate of their reproduction.

In these conditions, the most important and priority are issues of increasing the efficiency of the use of land and water resources, their protection and reproduction, soil fertility. One of the

tasks for 2019-2030 by the government of Uzbekistan is to reduce water loss by 10 percent and water consumption by 15 percent in agriculture.

In irrigated agriculture there are significant water losses due to low efficiency of irrigation technique (0.6-0.7%) and irrigation systems (0.75-0.86%), poor planning of irrigated areas and cases of over-irrigation of irrigated lands. On irrigation systems with a lower technical level, network losses are even more significant. For example, in the Republic of Karakalpakstan and Khorezm region, up to 48%, while in more advanced systems in Jizzakh region - 23% [7].

Conclusions

It can be concluded that an increase in food shortages will be associated with limited land and water resources and projected climate change, in which irrigation rates will increase by 5-10% by 2030. While maintaining the current model of food land and water resources management deficit will continue to grow, the land quality will deteriorate, water supply will be reduced.

To solve the problems of land degradation, it is necessary to apply water- saving and resource-saving technologies for irrigation and irrigation regimes for agricultural crops and improve reclamation regimes, irrigation, soil conditions of irrigated lands and their mutually related optimal combinations.

The goal is of course one - to solve the water problem and use water resources rationally. Reforms in agriculture are needed to improve water management in Uzbekistan. Among the reforms in the water sector of Uzbekistan, one can note such as limiting water use, step-by-step improvement of the legislative framework for water use, transition to the hydrographic basin principle of water resources management, improvement of land reclamation, diversification of crops, introduction of integrated water resources management (IWRM) and water-saving technologies, capacity improvement, large-scale investments in the development of innovative and accessible products and services responsive to climate change, etc.

One of the priorities can be called:

- Introduction of modern water supply and irrigation systems applicable in the conditions of the Republic of Uzbekistan;
- Development of water desalination technologies. In some regions of the Republic of Uzbekistan, there is a high level of groundwater (for example, Central Kyzyl Kum). In the case of the development of desalination technologies, groundwater can become the basis for a decentralized, autonomous fresh water supply system;
- Development and implementation of monitoring systems for the quantity and quality of consumed water, the qualitative composition of soils. This makes it possible to predict in the future how much water will be available for each crop, and how much water will go to a certain area;
- Introduction of innovative technologies and approaches to create water- saving technologies, improvement of pastures, adaptation to climate change, etc.

Expanding water-saving irrigation methods and maintaining the maintenance of irrigation and drainage infrastructure will improve the quality of land and cover water scarcity

In the near future, the growing demand for water can be met by improving management, rationalizing use, and searching for internal reserves of water resources. The main task is to ensure the productive use of every drop of water in all areas of water use in order to reduce water consumption per unit of production or physical consumer. Problems of sustainable water resources management require constant attention, are the task of more than one generation, and it cannot be solved by the forces of only Uzbekistan or several states of the region.

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Analysis on the Foreign Trade of Grain in Central Asian Countries: Taking Export to China as an Example

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Abstract: Agricultural cooperation is the common demand of Central Asian countries, and all countries have needs in food trade. This article analyzes the complementarity between China and Central Asian countries in grain production, and demonstrates the possibility of further promoting grain trade. In order to improve the scale and quality of agricultural cooperation, it is advisable to incorporate food trade into the international food security cooperation system. Attempts to combine trade with poverty reduction, capacity building, agricultural investment, and the construction of a common food market, put forward an effective path for China and Central Asian countries to develop agricultural cooperation, and put forward relevant policy recommendations.

Keywords: Central Asian countries; agricultural cooperation; food security; cooperation advantages

The five Central Asian countries are about 3000 kilometers long from east to west, 2400 kilometers wide from north to south, with a total population of about 73 million and a total area of about 4 million square kilometers. Food production and consumption in the five Central Asian countries are different, but as a whole, Central Asia is not short of food, and some of them can be exported. The main variety of grain production and consumption in the five Central Asian countries is wheat, and the main purpose of importing grain from outside the region is to enrich food varieties.

1. Characteristics of food production and consumption in Central Asian countries

From 2012 to 2016, the grain planting area of the five Central Asian countries has the following characteristics. First, there is little change in the annual grain planting area in the five Central Asian countries, with an average annual total area of 18.90 million hectares. Kazakhstan is 14.93 million hectares, Uzbekistan is 1.65 million hectares, Turkmenistan is 1.34 million hectares, Kyrgyzstan is 0.58 million hectares, and Tajikistan is 0.41 million hectares.

Second, from the perspective of grain planting structure, the grain planting structure of the five Central Asian countries is not much different. They are mainly wheat and barley. The wheat planting area accounts for about 82%. The barley planting area accounts for about 12%. The rest is corn, rice and soybeans.

Third, wheat is the main food crop in Central Asian countries. The proportions of wheat planting area are: Kazakhstan 82%, Kyrgyzstan 54%, Tajikistan 74%, Uzbekistan 87%, Turkmenistan 87%. Since 2000, the wheat acreage in Kazakhstan, Uzbekistan, and Kyrgyzstan has not changed much. Turkmenistan has increased by 20%-36%, mainly due to increased production and reduced imports. Tajikistan has dropped by about 20%. The purpose is to reduce the area of food planting, expand the area of fruit and vegetable planting, and increase the income of residents in the environment with limited arable land.

Fourth, the planting area of corn and soybeans in Central Asia is not large. There are only about 300,000 hectares of corn, which is mainly used for feed for domestic consumption. Soybean planting area is less than 200,000 hectares, mainly produced in the black soil belt of northern Kazakhstan. The rice planting area is about 300,000 hectares, mainly distributed in the river valleys of Kyrgyzstan and the irrigation areas of Kazakhstan, Uzbekistan and Turkmenistan.

From 2012 to 2016, the grain production and consumption of the five Central Asian countries have the following characteristics:

First, the annual grain output of the five Central Asian countries is about 30 million to 35 million tons, of which Kazakhstan is 17 million to 20 million tons, Uzbekistan is 7 million to 8 million tons, Kyrgyzstan is 1.5 million to 1.8 million tons, Tajikistan is 1.2 million to 15 million tons, and Turkmenistan is 2.5 million tones. 3.5 million tons. In terms of varieties, the main grain in Central Asia is wheat, with an annual output of about 23 million tons, accounting for more than 67%; followed by barley, with an annual output of about 3.07 million tons, accounting for 10%; the rest are corn, rice, oats, and soybeans.

Table 1 Central Asian countries' grain planting area from 2012 to 2016 million hectares

Variety	year	Kazakhstan	Kyrgyzstan	Tajikistan	Uzbekistan	Turkmenistan	Total area of five countries
grain	2012	14.78	0.57	0.41	1.61	1.06	18.43
	2013	15.59	0.59	0.42	1.62	1.32	19.54
	2014	14.59	0.6	0.39	1.64	1.18	18.39
	2015	14.54	0.58	0.41	1.65	1.46	18.65
	2016	15.14	0.57	0.41	1.71	1.67	19.51
	5-year average	14.93	0.58	0.41	1.65	1.34	18.9
wheat	2012	12.41	0.32	0.3	1.4	0.92	15.36
	2013	12.95	0.35	0.32	1.44	1.15	16.21
	2014	11.92	0.34	0.29	1.45	0.99	15
	2015	11.57	0.3	0.3	1.45	1.26	14.87
	2016	12.37	0.27	0.3	1.45	1.48	15.86
	5-year average	12.25	0.32	0.3	1.44	1.16	15.46

Source: FAO Statistical Database, http://www.fao.org/faostat/

Second, in terms of grain yield, Uzbekistan has the highest yield and Kazakhstan has the lowest. The relatively high yield in Uzbekistan is related to its long farming history, and the relatively low yield in Kazakhstan is related to its climatic conditions and low use of chemical fertilizers. In terms of quality, the quality of wheat in Kazakhstan is the best, with a protein content of 10.3% in flour; while Uzbekistan is affected by climatic conditions, and many internationally-known wheat varieties are not suitable for planting; the quality of wheat in other Central Asian countries is poor and usually not suitable Process high-quality flour. China needs to import some high-quality wheat and flour from Kazakhstan and other places every year.

Third, in terms of inventory, Kazakhstan's grain inventory has been maintained at a level of 13 million to 14 million tons throughout the year. The average annual inventory of wheat exceeds 30% of consumption, and the proportion of the other four Central Asian countries is less than 30%, but they are all higher than 17% which recognized safety line in the world.

Fourth, from the perspective of consumption, Central Asia consumes about 22 million-26 million tons of grain each year, and the remaining 4 million-10 million tons are used for export. The main export targets are the interior of Central Asia and the Middle East. The grain trade volume between Central Asian countries is about 2 million-3 million tons per year.

Fifth, from the perspective of consumption level, on the one hand, as the total population grows, the total food consumption in Central Asia continues to increase; on the other hand, as the residents' dietary structure improves, the proportion of food in the region's dietary structure gradually Decline, the per capita annual food consumption is generally on the decline, but it is still higher than the world average, and the per capita daily dietary energy intake is slightly higher than the World Bank standard. In terms of food expenditure, compared with developed countries, the food expenditure of residents in Central Asian countries still accounts for a larger proportion of their total consumption expenditure.

Grain and food price fluctuations will have a certain impact on residents' living standards, consumption structure and consumption habits. Central Asian countries all have the problem of widening the gap between rich and poor. Food and food prices may affect social stability. In addition, since the 21st century, food prices have become more and more financial in nature, which is not only reflected in the spot market, but also affects the futures market and financial derivatives.

Table 2 Wheat production in Central Asian countries from 2012 to 2016

Variety	year	Kazakhstan	Kyrgyzstan	Tajikistan	Uzbekistan	Turkmenistan	Total area of five countries
Wheat production (thousand tons)	2012	9840	540	810	6610	1200	1901
	2013	13940	820	950	6840	1600	2415
	2014	13000	570	870	6960	1200	2259
	2015	13750	700	900	6960	1410	2372
	2016	14990	660	920	6940	1600	2510
	5-year average	13100	660	890	6860	1400	2291
Wheat yield (thousand kg/ha)	2012	79.3	167.5	267.6	471.0	130.9	-
	2013	107.6	236.5	297.4	473.9	139.6	-
	2014	109.0	168.9	296.8	478.2	121.0	-
	2015	118.8	237.0	303.2	481.8	111.3	-
	2016	121.1	244.6	308.3	479.9	108.3	-
	5-year average	107.2	210.9	294.6	476.9	122.2	-

Source: FAO Statistical Database, http://www.fao.org/faostat/

Table 3 Agricultural output efficiency in Central Asian countries

Country	Land output efficiency (USD/ha)				Labor efficiency (USD/person)				Output growth rate (%)		
year	1990	2000	2010	2014	1990	2000	2010	2014	1991 ~ 2000	2001 ~ 2010	2010 ~ 2014
China	433	691	970	1 058	582	1 053	1 922	2 593	5.2	3.5	2.4
Kazakhstan	52	26	36	42	6 803	2 905	3 361	5 679	-7.2	3.1	4.2
Kyrgyzstan	152	161	177	184	2 786	1 841	2 692	2 665	0.8	0.9	0.7
Uzbekistan	259	254	431	534	2 351	2 248	3 683	4 046	-0.5	5.0	5.4
Tajikistan	313	173	320	402	1 687	697	1 035	1 250	-5.8	6.6	5.6
Turkmenistan	40	54	81	85	2 663	2 107	2 477	2 435	1.1	3.6	1.1

Source: The International Food Policy Research Institute (IFPRI), Food Policy Indicators: Tracking Change, Agricultural Total Factor Productivity(TFP)

2. The current situation and significance of grain trade between China and the five Central Asian countries

According to China Customs statistics, the grain trade between China and Central Asian countries mainly exists between China and Kazakhstan. China's grain imports from Central Asian countries all come from Kazakhstan, the main variety is wheat, and the others include flour, wheat bran, and soybeans. Imported wheat is mainly used as high-protein feed, except for some processed

into high-grade flour. The main targets of China's grain exports to Central Asian countries are Kyrgyzstan and Kazakhstan. The main export varieties are rice, and others include potatoes and beans.

In August 2009, COFCO Group Co., Ltd. purchased 10,000 tons of Kazakhstan spring wheat, marking the beginning of China's official resumption of wheat imports from Kazakhstan. Since then, wheat has been one of the largest varieties of agricultural products exported by Kazakhstan to China. The export volume accounts for about 33.3% of the agricultural product trade volume between the two countries each year, and the overall export volume has shown an increase.

Table 4 Kazakhstan's agricultural exports to China from 2016 to 2017

year	**2016**		**2017**	
country	**Quantity (thousand tons)**	**Amount (millions of dollars)**	**Quantity (thousand tons)**	**Amount (millions of dollars)**
Total agricultural trade	-	261.0	-	345.0
Kazakhstan's agricultural exports to China	-	134.4	-	180.5
wheat	281.1	52.4	306.9	57.5
Frozen fish	1.3	1.4	2.9	3.2
Sunflower seeds	73.8	18.6	123.7	32.8
Other oil crops	31.6	8.0	36.7	8.9
Sunflower oil and cottonseed oil	11.5	10.1	27.0	21.9
Soybean oil	5.8	5.0	4.2	3.4
Rapeseed oil	52.0	4.3	8.7	6.7
Cotton fiber	0.3	0.4	2.7	4.1
Soybeans	-	-	7.7	3.1
Stallion	-	-	0.1	0.2

Source: http://agroinfo.kz/kazaxstanskoj

It is generally believed that based on the balanced diet model, China's per capita annual food demand does not exceed 400 kg, but due to the unreasonable food consumption structure, the per capita food demand calculated based on the actual consumption value will be greater than the per capita food demand based on the balanced diet model the amount. Based on China’s market demand, the motivations for Central Asian countries to develop grain trade are in the following aspects:

First, a win-win model. In addition to buying and selling, food trade can extend cooperation in the upstream and downstream, expanding to the fields of planting, processing, storage, soil and water resources management, technology, facility construction, insurance, and finance. Central Asian countries can use China's market, capital and technological advantages to increase production and income, and China can use food cooperation to consolidate relations with Central Asian countries, ease pressure on food security, and achieve mutual benefit and win-win results. In addition, Central Asian countries can use China's convenient transportation infrastructure to strengthen ties with Asia-Pacific countries such as Japan, South Korea, and Southeast Asia. On February 5, 2018, 720 tons of Kazakhstani wheat had been sent to Vietnam via the Lianyungang Railway. The entire delivery time was about 20 days, marking the opening of a safe passage for

Kazakhstan's grain transit from China to the Southeast Asian market.

Second, meet diversified consumer demand and industrial raw material demand. The grain quality of Central Asian countries is relatively high. For example, Kazakhstan has high gluten content and is suitable for high-end foods such as bread and bio-energy. From the perspective of market consumption structure, the Chinese market has an increasing demand for high-quality wheat. According to market research estimates, China's annual output of high-quality high-gluten wheat is about 3.5 million-4.5 million tons, and the market demand is about 6 million-8 million tons. Kazakhstan's high-quality wheat can make up for the market gap.

3. Advantages and difficulties of food cooperation between China and Central Asian countries

First, all countries have reached a consensus. Both China and Central Asian countries face the problem of ensuring food security and accelerating agricultural modernization. In terms of adjusting the structure of food and agricultural production, limited by arable land and water resources, countries need to strike a reasonable and effective balance among the four aspects of ensuring food rations, adapting to the diversified diet of residents, satisfying the supply of industrial raw materials, and earning foreign exchange through exports. In terms of ecology, all countries need to curb soil and grassland desertification, salinization, and protect animals and plants. In terms of controlling food prices and curbing inflation, food expenditures account for a large proportion of residents' total consumption expenditures. Residents are sensitive to grain and food price fluctuations and need to guard against financial risks and avoid fluctuations in food prices. Therefore, all countries hope to seize the opportunity to deepen cooperation and ensure regional food security.

Second, in terms of geography and natural resources, countries are highly complementary. Central Asian countries are basically located in the main grain producing areas of the world. The internationally recognized global grain producing areas, especially grains, are mainly located in the black soil belt, the most fertile soil on the earth. According to the United Nations Food and Agriculture Organization, the future global agricultural resource potential is distributed as: Southeast Asia mainly produces rice, Central Asia mainly produces wheat and corn, the equatorial region mainly produces palm oil, South America mainly produces soybeans, corn and sugar, and North America mainly produces grains and Soybeans. Central Asian countries are all landlocked countries, far away from the world economic center, and more than 3,000 kilometers away from the nearest seaport. Their products need long-distance transportation to sell to Europe, America and the Asia-Pacific region. China is the closest and most promising partner for cooperation with Central Asian countries. Central Asian countries can also use China's railways, highways, pipelines, air routes and sea ports to develop the Asia-Pacific market.

Third, in terms of agricultural technology, countries have different advantages. For example, Central Asian countries have technical expertise in fields such as irrigated agriculture, cotton and wheat breeding, while China has advantages in crop breeding, cultivation technology, pest control, water-saving irrigation, facility agriculture, land improvement technology, and small agricultural machinery. As a result, China can import land-intensive agricultural products from Central Asian countries, export labor-intensive and capital-technology-intensive agricultural products to Central Asian countries, and drive the export of agricultural machinery, fertilizers, pesticides and other agricultural materials.

The 2008-2015 agricultural product trade between China and Central Asian countries shows that compared with Central Asian countries, China's agricultural products have comparative advantages, while agricultural products such as live animals and oils have comparative disadvantages. The grain trade cooperation between China and Central Asian countries may also face the following problems:

First, environmental constraints. Central Asian countries have been weighing the food security, environmental constraints, and increasing agricultural income. Based on their efforts to ensure food security, they have rationally used land and water resources to maximize economic benefits. In order to protect water and soil, all countries strictly supervise water resources, land use

conditions, and the use of fertilizers and pesticides. The decline in soil quality in Central Asia is mainly manifested in desertification, salinization and weakening of fertility, which not only affects crop yields, but also forces agriculture to use large amounts of chemical fertilizers to ensure yields. According to statistics from the Statistics Committee of the Ministry of National Economy of Kazakhstan, in 2017, the country's salinized land was approximately 0.11 billion hectares, and the land eroded by wind was approximately 24 million hectares, accounting for about 11% of the total agricultural land, which was eroded by water. Approximately 5 million hectares of land, accounting for 2% of the total agricultural land area. Approximately 26.6 million hectares of arable land has experienced severe fertility decline. About 98% of irrigated land and 63% of non-irrigated land have reduced humus. The average thickness of humus in forest areas has decreased from 0.52 meters drops to 0.47 meters.

Second, there is a shortage of water resources. Central Asian countries are located inland, and their water resources mainly depend on winter snowfall and snow melting from snow-capped mountains, but the distribution of water resources is uneven. The shortage of water resources has a great impact on the agriculture of Central Asian countries. It is necessary to adjust the planting structure and planting area upstream and downstream to reduce the planting of crops that consume a lot of water. Kazakhstan believes that with reference to the development speed and scale of water use in 2012 and 2013, plus climate change factors, it is estimated that by 2040, Kazakhstan's surface runoff will be reduced by 11.4 billion cubic meters and 25 billion cubic meters of water will be consumed annually. By then, the country's water resources can only meet half of the consumption demand, that is, 12.2 billion cubic meters of water shortage each year. In addition, the problem of transboundary rivers in China and Kazakhstan has become increasingly prominent. Kazakhstan believes that as the upstream China's economy develops too fast and water consumption is growing rapidly, it has affected the downstream to maintain ecological balance and normal production and life. China's annual water withdrawal from the Irtysh River has increased from 1-1.5 billion cubic meters to 1.5-2 billion cubic meters, and 400,000 hectares of land is irrigated from the Yili River, which may expand to 600,000 hectares in the future. The amount of water flowing into the Yili River in Kazakhstan has been reduced from 12 billion cubic meters to 10 billion cubic meters each year.

Third, higher logistics costs. Mainly manifested in three aspects, one is to be limited by the number of ports and infrastructure, most of Xinjiang's current foreign trade grains pass through the Alashankou port, and other agricultural products are mainly imported through the Jimunai and Horgos ports. The other is the agriculture in Central Asia is greatly affected by the climate and its annual output is unstable. It is difficult to meet the long-term purchase demand of Chinese companies, and it is far from the standards of the US futures market. The last is the risk of health inspection and quarantine. Central Asia is the hardest hit area of smut, and the main wheat producing area in Kazakhstan is the most severely affected area of wheat smut. The average annual incidence rate is 5%-16%, and the epidemic year reaches 30%- 54%, resulting in a 30%-50% reduction in production.

4. Policy recommendations

In order to strengthen the grain trade and cooperation between China and Central Asian countries, the focus of all countries is to carry out in-depth and extensive cooperation, incorporate grain trade into the international food security cooperation system, and integrate trade and poverty reduction, capacity building, agricultural investment, and common food market construction. Combine all fields.

First, combine trade with poverty reduction. For example, Tajikistan and Kyrgyzstan import a large amount of food every year, which is one of the targets of poverty reduction and food aid by international organizations. China can also learn from the experience of other countries. Within the framework of poverty reduction cooperation, food can be used as part of foreign aid to the two countries. Grain can be purchased from Kazakhstan. This will not only meet the needs of Kazakhstan's food export, but also help Kyrgyzstan and Kyrgyzstan. Tajikistan has improved the level of food security.

Second, combine trade with capacity building. Improve agricultural production capacity through the exchange of development experience, such as technology research and development

and promotion, manpower training, risk management, water conservancy infrastructure construction, financial credit support, market information early warning, improvement of food storage conditions.

Third, combine trade with overseas agricultural investment. In addition to the import and export trade of agricultural products, another form of the development of overseas agriculture by countries with large grain needs is the development of import by agricultural enterprises, which establish stable grain production, sales, and transportation bases or channels overseas. Start with the source of goods and logistics, let yourself take more initiative. For example, agricultural products can be obtained directly by leasing or purchasing foreign farmland, and agricultural products can be obtained indirectly by purchasing or participating in foreign agricultural production, storage and transportation enterprises.

Fourth, combine trade with the construction of a common grain market. On the basis of respecting the market mechanism, with the help of the administrative adjustment of various countries, the cost of market circulation and the risk are reduced. We can discussing grain trade rules suitable for various countries, improving product quality certification, studying the establishment of an efficient cross-regional grain transportation system, improving customs clearance, strengthening market supervision and dynamic analysis, establishing a food crisis relief fund, and playing the role of an e-commerce platform.

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