Food and Agriculture Organization
of the United Nations

ORGANIC AGRICULTURE IN UZBEKISTAN:

Status, practices and prospects

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Aziz Nurbekov, Uygun Aksoy,
Hafiz Muminjanov and Alisher Shukurov

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Preface

Agriculture is one of the foremost and largest sectors in Uzbekistan contributing to the national economy. Its diverse topography reveals the most favorable regions for growing various agricultural as well as industrial crops. Sustainable agriculture systems provide a basis for conservation and sustainable use of natural resources and for environment and food security and safety. Due to rapid intensification of practices, there is increasing concern worldwide among consumers about inputs used, the environmental impact of agri-food production and social welfare. Quality standards developed due to globalized markets are not solely based on the final product but also target the inspection of the whole chain including inputs and methods used. Agri-food quality systems are governed by both official sets of standards as well as private standards required by respective sectors.

The Ministry of Agriculture and Water Resources carried out the noteworthy measures on development of organic agriculture (OA) in Uzbekistan within the framework of the project TCP/ UZB/3501 "Institutional capacity building to develop organic agriculture and to promote good agriculture practices (GAP) in Uzbekistan" in close cooperation with the UN Food and Agriculture Organization (FAO).

The project outputs are already contributing to strengthening national capabilities in OA and other quality assurance systems in Uzbekistan as the drafted Law on organic agriculture, strategic development documents, developed training manuals based on guidelines suited to local conditions, conducted training sessions and demonstrations for farmers, researchers, program managers and technicians and study tours abroad. The book on "Organic Agriculture in Uzbekistan: Status, practices and prospects" is prepared as an outcome of the project to multiply the knowledge accumulated through the project to all stakeholders.

The expected long-term impact of the project is improved rural livelihoods and food security through increased sustainability, productivity and market access of high-value crops through strengthened institutional capacity and principles and practices of sustainable farming systems namely GAP and OA. It is expected that sustainable management techniques and measures will be sufficiently validated by a core

group of farmers and an expanded program be prepared for farmers of other districts. The outputs will also contribute further in achieving sustainable land, water and biodiversity management, increasing the potential for high-va-lue crops and traceability through the value chain and developing trade by harmonizing national legislation with international rules and regulations.

Samarkand, Tashkent and Qashqadaryo regions are selected as the pilot areas of the project. Uzbekistan is at a very early stage of development of organic production system where the national stakeholders have very little experience in organic production. Organic agriculture combines traditional farming methods, innovative technologies and modern scientific and technical achievements that are beneficial to the environment and ensure their favorable development.

This book was prepared under the framework of TCP/UZB/3501 "Institutional capacity building to develop organic agriculture and to promote good agriculture practices in Uzbekistan" to provide guidance to the stakeholders. This book brings together the status of organic agriculture in Uzbekistan including, market, legal standards, methods, experiences and useful methods and basic information that can be of immediate use for identifying problems and for formulating, executing and evaluating actions so as to benefit and improve organic production. The publication can also serve as a reference that will allow researchers, specialists and farmers to discover jointly, ways to adopt organic agriculture practices and solve the problems and the limitations created by traditional agriculture. This book is meant for researchers, agricultural specialists, extension personnel as well as farmers, and deals with the management and conservation of agricultural land. It is hoped that the book will help to attain the ultimate objective of increasing quality of agricultural products and improving the productivity of the soils and water in a rapid, efficient and sustainable manner.

Acknowledgments

As per the approved work plan of the TCP/UZB/3501 "Institutional capacity building to develop organic agriculture and to promote good agriculture practices in Uzbekistan", this book entitled "Organic agriculture in Uzbekistan: Status, prospects and practices" has been prepared.

Strong technical cooperation of the Ministry of Agriculture and Water Resources of the Republic of Uzbekistan and FAO for implementation of the project are highly appreciated. This book has been prepared using results of the project as well as experiences of many national consultants of the project. Thanks are due to Mr. Anvar Jumanov, Mr. Oybek Soatov, Dr. Alisher Saydaliev, Mr. Abdurazak Khujabekov, Mr. Aziz Rasulov, Mr. Shukhrat Khaydarov and Mr. Makhsed Bauetdinov for providing information on application of organic agriculture, standards, regulation, market and methods in Uzbekistan. In addition, the excellent cooperation received from Ms. Shakhzoda Alikhanova, Mr. Furqat Ibragimov (FAO office in Uzbekistan) and Mr. Jamshid Kudratillaev are gratefully acknowledged.

Special thanks go to FAO staff in the Subregional Office for Central Asia, Development Law Service and FAO office in Uzbekistan for providing continues support to the implementation of the project and preparation of this book. The role of FAO international consultants Prof. Dr. Uygun Aksoy, Ms. Raushan Zhazykbayeva, Prof. Dr. Ismet Boz and Mr. Levent Yildiz is significant to successfully achieving project outputs.

Strong support provided by the Government authorities of Uzbekistan, particularly the Department of Agriculture and Water Economy Standardization at the Ministry of Agriculture and Water Resources the driving force behind the success of this book.

Finally, the authors are grateful to all government officials, farmers and private companies involved in this project for their active and sincere participation and provided information for the book.

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Abbreviations

AQIS	Australian Quarantine and Inspection Service
ALARA	As Low As Reasonably Achievable
C	Carbon
CO_2	Carbon dioxide
ESCR	Tropical and Horticultural Products Service
EU	European Union
FAO	Food and Agriculture Organization of the UN
FAOSEC	Subregional office for Central Asia of the Food and Agricultural Organization of the United Nations
FIBL	Forschungs Institut für biologischen Landbau
FLO	Fairtrade Labelling Organizations International
GAP	Good Agricultural Practices
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GMBH	Gesellschaft mit beschränkter Haftung (GmbH) is a type of legal entity very common in Germany (where it was created in 1892), Austria (adopted in 1906; legal abbreviations are GmbH, GesmbH, Ges.m.b.H.), Switzerland, and other Central European countries
GMO	Genetically Modified Organisms
IFAD	International Fund for Agricultural Development
IFOAM	International Federation of Organic Agriculture Movements
ISO	International Standard Organization
JV	Joint Venture
LMIC	Lower-middle-income country
MAP	Modified atmosphere packing
masl	meters above sea level
MAWR	Ministry of Agriculture and Water Resources
MFN	Most Favored Nation
MLAs	Multilateral Recognition
mm	millimeter
MRAs	Mutual Recognition Arrangements

MT	metric tons
N	Nitrogen
NGO	None Governmental Organization
NOP	National Organic Program
O'z DSt	Uzbek State Standard
OA	Organic Agriculture
OFPA	Organic Foods Production Act
SAI	Social Accountability International
SNAS	Slovak National Accreditation Service
t/ha	ton per hectare
TBT	Technical Barriers to Trade
TCP	Technical Cooperation Program
'000/ha	thousand per hectare
TURKAK	Türkiye Akreditasyon Kurumu (Turkish Accreditation Agency)
UN	United Nations
UOA	Uzbekistan Organic Association
USA	United States of America
USD	United States Dollars
USDA	United States Department of Agriculture
UZB	Uzbekistan
WHO	World Health Organization
WTO	World Trade Organization

Introduction

Uzbekistan is located between longitude 64°E and latitude 41°N and bordered by Kazakhstan in the west and north; Afghanistan and Turkmenistan in the south, and Kyrgyzstan and Tajikistan in the east. Uzbekistan has a total area of 44.8 million hectares (ha). About 4.5 million hectare is arable, of which 4 million hectares under irrigation. Agriculture plays a major role in the economy, employing 44% from a total population of 33 million, with 1.7% annual growth rate, contributing 18% to the GDP and providing employment for some 15 million people, many of whom are underemployed. Uzbekistan has extreme continental type climate, with hot dry summers, unstable weather in winter, and a wide variation in seasonal and daily temperatures. The desert and steppes are characterized by short winters with thin and unstable snow cover, and hot dry dusty summers The mountains (over 600 masl) have high rainfall (up to 800 mm per year).

Uzbekistan's economy has been one of the world's best performers in recent years, with economic growth driven primarily by state-led investments, and exports of natural gas, gold and cotton. Uzbekistan is now a lower-middle-income country (LMIC), with per capita gross national income rising to US$2 160 in 2015 (World Bank, 2015). On the other hand, lower global commodity prices and economic slowdowns in its neighboring countries – the Russian Federation and China – have undermined its trade and investment, remittances, and mineral and energy exports. Inflation rose to over 9 percent in 2015 (World Bank, 2015).

The main crop grown in Uzbekistan is cotton, followed by wheat, barley, rice, maize, potato, vegetables, and fruits. However, cotton and winter wheat occupies 80% of the total irrigated area. During the first six years of independence, the area under cotton was reduced from 2.0 to 1.4 million ha, and mainly replaced by wheat. In order to attain food security, wheat became the second important crop to cotton; the area under irrigation increased substantially, currently reaching over 1.4 million ha, including rain-fed production. The increase in cultivated areas stimulated the use of modern production techniques such as improved varieties, certified seed and better agronomic management practices. The average wheat yield is 5.5 t/ha, almost three times higher in 2016 than in 1992. Annual average wheat grain production has reached

8 million tons, and the country is now self-sufficient in grain production.

In 1996, the Government of Uzbekistan adopted an agricultural development policy (Resolution of the Cabinet of Ministers No. 157) to achieving food security and economic development. The policy enabled rapid economic growth in the agricultural sector, particularly in the development and adoption of modern wheat and cotton varieties. In view of the increasing population, further advances are required in agricultural research to achieve increased production and productivity. There has been a recent surge in investment in intensive horticultural production of both fruit and vegetables. The latest agricultural policies, in Uzbekistan, aimed at promotion of crop diversification and environment friendly production systems offering high quality products with better access to the markets. In this regard, development of organic agriculture is accepted as promising direction for improving competitiveness of domestic products and the development of export potential. The Government has set out a longer-term strategy to diversify and intensify crop production in the country with the Presidential Decree "Measures for agricultural reform and promotion from 2016 to 2020" No. 2460 dated 29 December 2015. Between 2016-2020 about 170 000 ha of cotton and about 50 000 ha of wheat will be diversified towards cultivating potatoes, vegetables, intensive orchards, fodder, oil and other crops. Since 2010, more than 42,000 ha of new intensive fruit orchards are established. The value of fruit and vegetable exports now represents over 50 percent of agricultural export earnings. Farm incomes, and the productivity of land, water and personnel employed have all improved as a result.

As already mentioned above, Uzbekistan has progressed well in agriculture and has attained not only food self-sufficiency but also a big potential for export of many agricultural products including vegetables, fruit and wheat. Uzbekistan's diverse topography reveals the most favorable regions for growing various agricultural as well as industrial crops. However, there are significant environmental problems based on issues such as increased wind and water erosion, downstream sedimentation and losses in water quality, biodiversity, and habitat loss. The Government of Uzbekistan has acknowledged the extent of the country's environmental problems; thus, its principal objective is to enhance the agricultural sector without exhausting natural resources while

tackling structural constraints as part of the strategy for economic development. In this regard, one of the potential areas to contribute to this target is the promotion of environment-friendly sustainable production systems offering high-quality products with better access to the markets. Moreover, the development of organic agriculture (OA) and promotion of good agricultural practices (GAP) are recognized as promising paths towards improving competitiveness of domestic products and the development of export potential.

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Overview: Crop production

After achieving independence, Uzbekistan laid major emphasis on agricultural growth and efforts towards developing its own market economy. During this transition, large inefficient "shirkat" (company) farms are disintegrated and a number of small private farms have been established. Therefore, high input use technologies will not be suitable for these small farms. It is right time to look for an appropriate and realistic strategy to enhance cropping intensity and achieve diversification in agriculture. For development of this new type of farms, there are constraints associated with limited potential and abilities in cropping, tillage methods, soil fertility improvement, on-farm water management and high product quality. There is an urgent need to pilot changes in agricultural practices in order to improve agricultural production in the irrigated areas of Uzbekistan.

Crop production in Uzbekistan is significantly on irrigated and only to some extent on rain-fed agriculture. Wheat and cotton are the most important agricultural crops in the irrigated areas. Cotton and wheat are grown either continuously or in crop rotation, consecutively. In Uzbekistan, the area under irrigated winter wheat has increased to ensure national food security, so that the former, long-cycle cropping system cotton-alfalfa was largely replaced by shorter crop rotation of spring sown cotton and and winter wheat. As a result, the cereal production in Uzbekistan during the last decade has increased almost 20 times, with the main increase attributed to wheat production. In Uzbekistan, the wheat production has increased by more than 600 percent reaching around 8.1 metric tons (MT). On the other hand, cotton production went down to about 21% due to decreased planting area (Table 1). Fruit and vegetables are also becoming important in some regions as private markets expand. The absence of alfalfa in present crop rotations has diminished humus and considerable micronutrients' levels in the soil. It has also reduced the soil structure benefits derived from alfalfa's root system. Crop rotation with fodder legumes or pulses is extremely important for soil health and management of plant diseases.

Most of the achievements in cotton and wheat production are based on high input use technologies including water, seed, fertilizers, pesticides, etc., which are not sustainable on a

Table 1. Trends on area and productivity for selected crops in Uzbekistan, 1991-2016

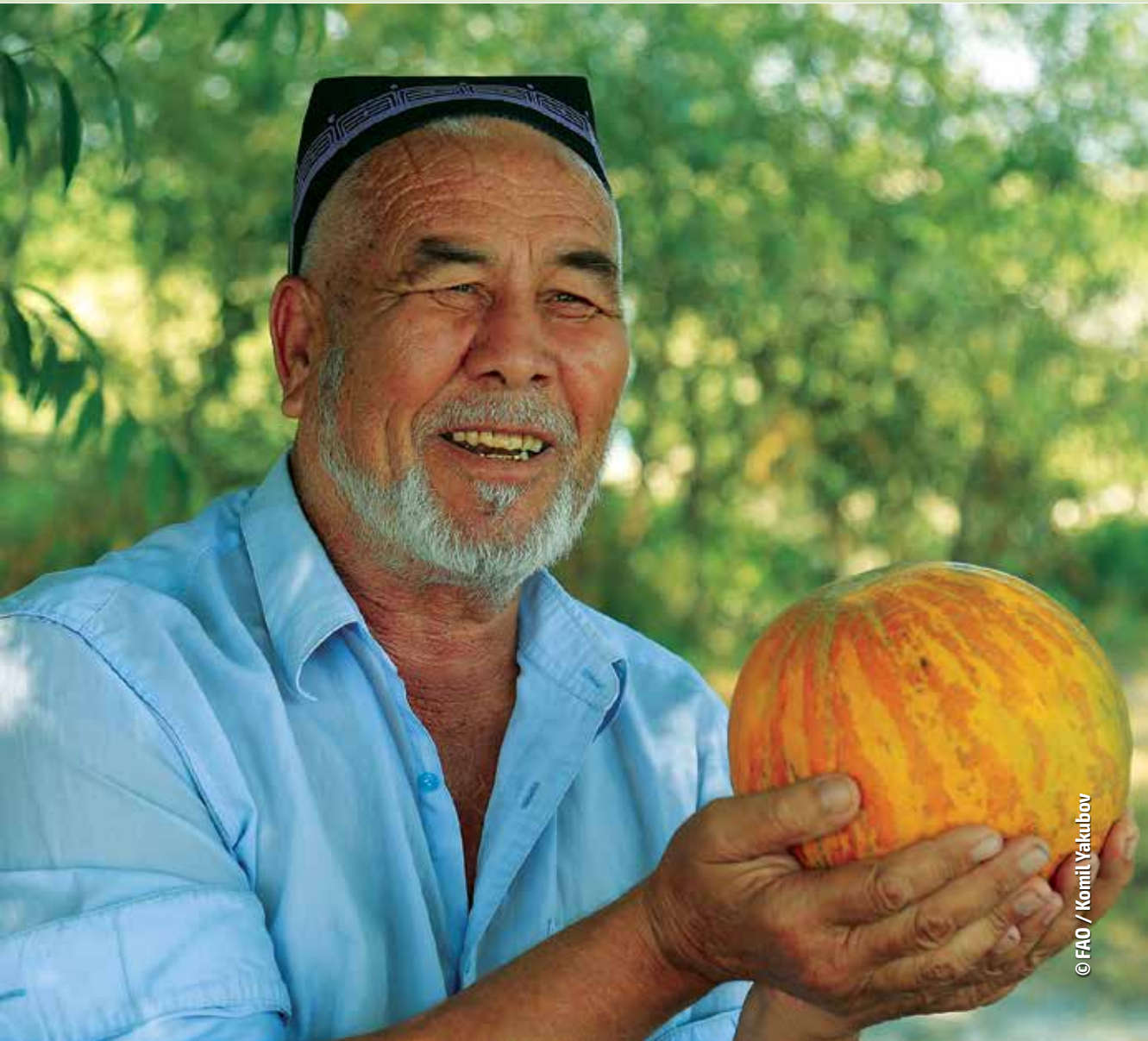
Year	Wheat		Cotton		Fruits		Intensive orchards		Vegetables	
	Area, '000 ha	Yield t/ha	Area, '000 ha	Yield, t/ha	Area, '000 ha	Yield, t/ha	Area, '000 ha	Yield, t/ha	Area, '000 ha	Yield, t/ha
1991	226.0	1.71	1 720.5	2.72	50.0	15.8	0	0	165.6	18.8
2000	1 027.8	2.76	1 444.5	2.18	139.0	5.1	0	0	34.8	18.3
2010	1 155.6	4.89	1 450.3	2.54	180.2	9.5	10.1	15.32	172.9	25.6
2015	1 145	5.81	1 444.5	2.18	261.9	12.4	36.9	21.41	194.0	30.2
2016	1 135	5.92	1 423.1	2.61	266.9	11.8	40.5	24.24	205.4	27.1

Source: Ministry of Agriculture and Water Resources, Uzbekistan, 2016

long-term basis. Now land is being privatized and holdings are getting smaller. Therefore, high input use technologies will not be suitable for all of these small farms. It is the right time to look for an appropriate and realistic strategy by which the cropping intensity could be enhanced and diversification achieved. The Qashqadaryo province was selected as a pilot site in the project to promote sustainable practices through organic agriculture and diversify production with high value crops because agricultural input of the province makes slightly more than 10 percent of the Uzbekistan's total agricultural production. Technologies which are sustainable and effective using low/optimal level of inputs could help in saving seed, water, fertilizers, etc. and reducing production cost. In addition to these, by adoption of cotton-wheat rotation by planting winter wheat in standing cotton using minimum tillage equipment could spare land for growing other crops especially legumes such as chickpea, lentil, field pea for food or alfalfa for fodder.

Timely policy support is critical for any breakthrough in agriculture through adoption of any appropriate technology. Farmers need adequate support for seeds or other propagation materials of new crops and inputs (like fertilizers, pesticides, etc.) for crop diversification. Furthermore, there should be appropriate pricing support and procurement policy for these crops. Farmers also need credit for buying various inputs and machinery, which should be available to them at affordable low interest rates through rural banks. Multiplication of prototypes of less costly machinery

and implements in another area requires Government support. As an example, raised bed planters and no-till drills, flame weeders or similar tools have to be manufactured and popularized. Their import is a costly affair and hence promoting their manufacture in Uzbekistan is critical. Similarly, policy support for use of water saving technologies such as sprinkler, drip and plastic mulching of furrows in cotton or wheat are urgently needed in the national interest. Promotion of these technologies would require appropriate subsidies and Government intervention, beside on-going efforts on land privatization, crop diversification and capital investment in agriculture for linking farmers to markets.



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Overview: Livestock production

Uzbekistan experienced a dramatic decline in livestock flocks including production following collapse of the former Soviet Union. Destruction of state supported input supply chains, farm restructuring, lack of state subsidizing, and high inflation rate all contributed to this downward trend. Increased number of smallholder flocks and the lack of self-organization led to the breakdown of the transhumance system, while households that could not manage their herds and afford the winter fodder eventually lost their animals. With independence, farmers who were before workers became managers responsible for all activities and decisions of their own farm as well as disease control of animals, winter fodder and access to markets (Hughes et al., 2011).

During the progressive privatization, large state farms and cooperative holdings were distributed among small unproductive households, in most cases consisting of a handful of animals (FAO, 2007). This led to a decline in livestock productivity and stagnation of livestock production, as many traditional products no longer had a reliable market (IFAD, 1999). FAO (2006) report indicates that the slump in the transition countries in the 1990s reduced the global livestock products' consumption rate from 2% to 1%.

Livestock production in Uzbekistan is distinguished by its richness and variety. Each animal type is characteristically distributed in its own agro-ecological zone. Dairy cattle is mainly raised in irrigated croplands near industrial centers; beef cattle – in mountain zone pasture areas. Karakul sheep production systems are mainly in deserts; meat-wool and ram production systems and horse husbandry are concentrated in mountain zones of the Ferghana valley, while poultry production industries are near cities and industrial centers (Makhmudov, 2017; personal information provided by the Uzbek Research Institute of Karakul Sheep Breeding and Ecology of Deserts). Livestock are crucial for the livelihoods of resource poor people in these production systems, as they are usually one of the limited assets they have. In grassland-based systems, farmers keep ruminant livestock to produce meat and milk for consumption and sale (FAO, 2004).

Area of rangelands of Uzbekistan accounts for about 50% of its territory and serves as the main source of forage for livestock.

Presently, the total grazing land is 23 800 000 ha, including almost 17 million ha of Karakul desert pasture areas. Pastures in highlands elevation zones are divided as follows: rain-fed foothill plains (Adyr) comprise 2 850 000 ha, and mountainous pastures 680 000 ha (The State Committee of the Republic of Uzbekistan on Statistics, 2015).The grassland-based livestock production systems of Uzbekistan use rangelands that are only suitable for grazing since rainfall is inadequate for sustainable rain-fed crop production (FAO, 2007). Effective use of pasture is the basis for maintaining and supporting the natural potential of arid grazing, ensuring diversity of forages, and raising their productivity.

The role of state bodies includes organization and investment policy aimed at systematic reconstruction and phyto-reclamation of lands with low productivity, maintenance and repair of water resources, and guaranteed water supply systems. With varying degree of success in accomplishing these objectives, privatization process of pastures through auctions has started very recently. In addition, a new Law on Pasture Management, which is currently under consideration, is expected to have major implications for the seed supply chain, pasture management and etc.

Fodder is grown in irrigated areas for dairy stock. Dairy rations are composed of maize as silage, alfalfa for hay and green feed; roots and grain legume crops (*Pisum sativa*, *Glycine hispida*, or *Vicia sativa*) as catch crops used in double cropping. The required bulk fodder is provided by straw and other residues of cereals as well as coarse and rich fodder (barley, brassica, oats, triticale and, in summer, sorghum) grown after harvesting cereals. Alfalfa is a fodder crop of very ancient cultivation dating back at least 2 500 years, and Uzbekistan is part of its area of domestication.

Although intensive cultivation techniques were developed for alfalfa for making hay, maize for silage and beet for fodder, current productivity in irrigated areas is limited due to the use of old varieties, absence of an organized seed supply chain, and often poor agronomic practices. The cultivation of alfalfa has diminished drastically due to change in crop rotations where it was once used. The estimated cultivation of forage crops on irrigated lands represents around 320 000 ha with maize (67%) and alfalfa (25%) being predominant.

General overview of world and Uzbekistan organic agriculture

1

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Definitions, principles and basic concepts of organic agriculture

Organic agriculture started as a movement in early 20th century mainly by practitioners to overcome problems arising from intensification. After 1980s, standards and nationally established systems were introduced in most of the developed countries. The main reason of setting standards was due to enlarging European especially German market and organic product flows from all over the world because of the strong demand. Standards aimed at "facilitating trade" by providing a common language between the producer and the distant importer and at protecting consumers from misuse of the term "organic". As of 2017, there are about 88 countries having an official national standard, which regulate the production and the market (Willer and Lernoud, 2017). Among these 88 countries, there are relatively few reciprocal equivalencies between countries (especially regarding major markets as USA, EU, Canada, Japan, or South Korea) based upon bilateral agreements. In all other cases, products must be certified according to the rules of the importing country in order to have access to the international market. The leading international or national standards may define organic agriculture from different perspectives and may have minor differences, however in all cases they base on common principles (Figure 1).

IFOAM has combined common basic principles under 4 key words as health, ecology, fairness and care in 2015.

Principles of Organic Agriculture are as follows:

1. **Health:** Organic Agriculture should sustain and enhance the health of soil, plant, animal, human and planet as one and indivisible.
2. **Ecology:** Organic Agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them.
3. **Fairness:** Organic Agriculture should build on relationships that ensure fairness with regard to common environment and life opportunities.
4. **Care:** Organic Agriculture should be managed in precautionary and responsible manner to protect the health and well-being of current and future generations and the environment.

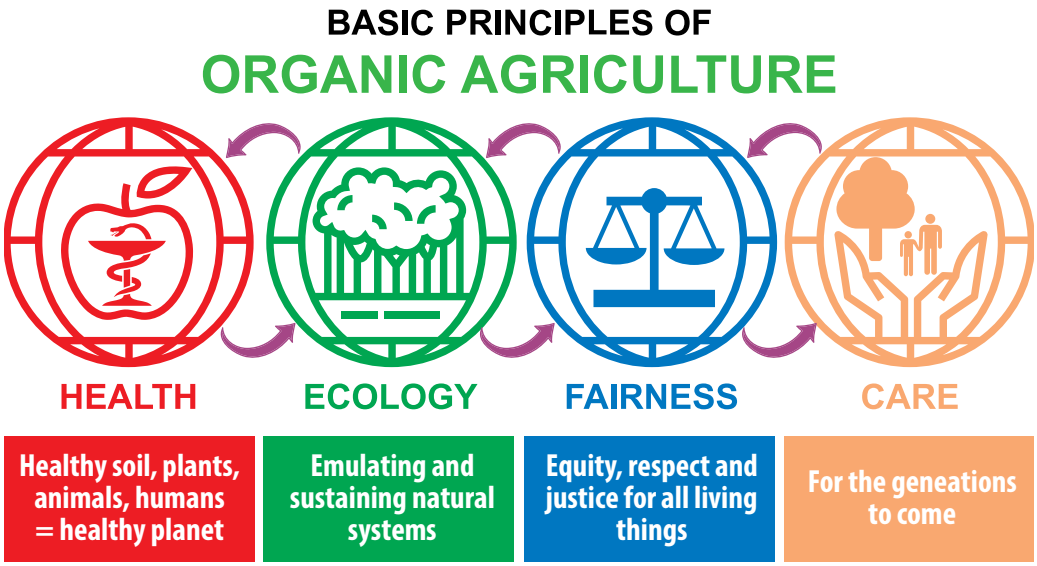

Figure 1. Basic principles of organic agriculture (IFOAM)

International Federation of Organic Agriculture Movements (IFOAM) is the umbrella organization established in 1972 to unite the organic movement at world wide level.

The first basic guidelines, which were later developed into basic standards was prepared by IFOAM. IFOAM's definition of organic agriculture embraces human and social aspects and quotes that "organic agriculture is a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation, science to benefit the shared environment and promote fair relationships and a good quality of life for all involved" (www.ifoam.bio).

In 1970s and 1980s, there were few national and state legislations as France and California and Oregon in the USA, however the major impact came with the European Union Commission regulation from the European Union, first for plant based products in 1991 (EEC 20 C 1235/2008 92/91) and then production methods of animal products was added in 1999. It had a multiplier effect on developing countries to develop their national organic systems since this regulation obliged countries exporting to the EU to prepare their own legislation, which was later postponed and finally

removed. In due time, the scope of the regulation was widened. The latest major changes for the basis and implementing regulations occurred in EC 834/2007 (Basic requirements), EC 889/2008 (implementing regulation), E (import requirements to the EU) and then on the use of EU logo in 2010.

Codex Alimentarius, a joint initiative of the Food and Agriculture Organization (FAO) and the World Health Organization (WHO) approved the Codex on organic production on 28 June 1999 that sanctions international guidelines to cultivate, process, market, and label organic foods. Codex states that "Organic agriculture is a holistic production management system which promotes and enhances agroecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems" (www.codexalimentarius.org).

The National Organic Program (NOP) of the United States is a regulatory program housed within the United States Department of Agriculture (USDA) Agricultural Marketing Service. Within the USDA, they are responsible for developing national standards for organically-produced agricultural products. All products sold, labeled, or presented in the United States as "organic" must comply with the USDA's NOP. The NOP also accredits third party certifying agents (foreign and domestic) to inspect and evaluate organic production and handling operations and certify businesses that meet the National Organic Standards. Once a certification body is accredited according to NOP, they can carry out inspection and certification in any country all over the world. Producers may become certified organic through any accredited certifier (www.ams.usda.gov/nop). In the EU, the authorization is given to control bodies only if they are ISO 17065 accredited and authorization specifies the country and content (e.g. plant production & processing or livestock etc.).

Organic agriculture can be defined as "a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved" (Dittrich, 2010).

As could be seen in the above examples of definitions, solutions for organic agriculture needs to be designed according to the local conditions by implementing allowed methods and inputs considering both the ecosystem functions and socio-economic circumstances. The benefits provided are not limited to clean environment and safe food, but organic management also allows stewardship of natural resources for the current and future generations. The core focus in definitions of organic agriculture may shift from a more technical approach as in the US to a more ecosystem management based and holistic one as in the Codex. Despite the differences in the standards valid at national and/or international levels and the enclosed definitions/approaches, they rely on same basic principles. Organic agriculture theory and practice should be built on these principles.

The common approach of organic agriculture – ban or severe restriction for use of pesticides and chemical inputs including herbicides, fungicides etc., and relying on crop diversifications, nature protection – have probably been practiced in traditional forms for centuries. All above mentioned practices were replaced, during the first half of the 20th century, with the beginning of engine-powered tractors and synthetic farming chemicals. Some, however, remained critical of the trend and potentially harmful effects of such chemicals on food and the environment. Organic agriculture implies considerable restriction of

General approaches and concepts in organic production can be summarized as follows:

- Ensuring that organic plots are managed according to the valid standards, their conformity is inspected by independent parties and if appropriate then certified;
- Use production technologies that prevent or minimize environmental pollution and ban use of genetic engineering, ionizing radiation and sewage sludge;
- Utilize and recycle wastes as well as plant and animal based by-products;
- Prevent mixing or intermingling of pesticides and agrochemicals in the territories where organic products are produced, stored and transported;
- Ensure preservation and improving long-term soil fertility;
- Provide healthy environment for livestock and use feeding strategies suitable to their natural behavior;
- Whenever possible use minimum processing and shorter marketing channels.

mineral fertilizer use, chemical agents to control pests, disease and weeds, antibiotics or growth regulators as well as processing aids and cleaning agents, which have a negative effect on the environment or residues of which may accumulate in agricultural products. Organic agriculture has restrictions for natural inputs, as well. It restricts the application of manure, even if it is an organic material, to a certain level (mostly at 170 kg N/ha) to overcome leaching of excess nitrogen. Some plant extracts are not allowed either since they may also kill the beneficial insects. Organic agriculture conserves the natural foundations of life, natural processes and obtaining organic products is a promising form of management in the agricultural sector, especially in the farming enterprises and dekhkan farms and other small farms.

The history of agriculture dates back more than 12 000 years but organic agriculture started in the previous century. Time span for organic agriculture can be measured almost as 100 years. The first phase of organic agriculture started during the beginning of 20th century farmers produced food using natural means, controlling pests naturally and feeding the soil using traditional farming practices that conserved and regenerated the land. Starting from 1950s of the 20th century, the use of commercial fertilizers and pesticides increased, significantly. The application of the mentioned chemicals had positive effect with increasing crop productivity.
The pioneers of the early organic movement started looking into new, alternative ways to heal problems of soil depletion, low food quality, and livestock feed, which was followed by the rural poverty, erosion and decline of crop varieties, to name a few. After analyzing the ecological cycles and relationships in nature, they started mimicking in agricultural management. IFOAM identified this phase as Organic 1.0. The goal of organic farming is to reconnect people with nature, finding a sustainable method or producing agricultural and food products while nurturing the ecosystem and biodiversity. The history of organic agriculture represents the journey towards that goal.

The second phase (Organic 2.0) started in the 1972 and was defined by codifying organic agricultural systems / certification systems along with government regulations as well as the development of organic technology and organic market. IFOAM established in 1972 by several grassroots organizations who were working on different aspects of agriculture to decrease chemical use, an international

umbrella organization for the movement, nowadays, became the unique umbrella with over 750 member organizations in 108 countries. Its goal is the worldwide adoption of ecologically, socially and economically sound systems based on the principles of organic agriculture. Through international conferences, meetings and other fora, IFOAM facilitates an ongoing dialogue about the status and future of organic agriculture worldwide. According to 2015 Figures, 88 countries have developed national guarantee systems out of 179 countries having organic production. Nearly 50% of the countries are producing without a national legislation mainly for the export market and certified according to the rules of the importing country. Such a composite certification system creates a very complex web that leads to increased cost of certification. Previous efforts of harmonizing major standards was not fruitful. The solutions could be developing internationally validated national systems or at the beginning look for group certification or participatory guarantee systems especially for the domestic markets.

IFOAM, as an umbrella civil society organization is trying to develop and maintain the Organic Guarantee System (Figure 2), which seeks to

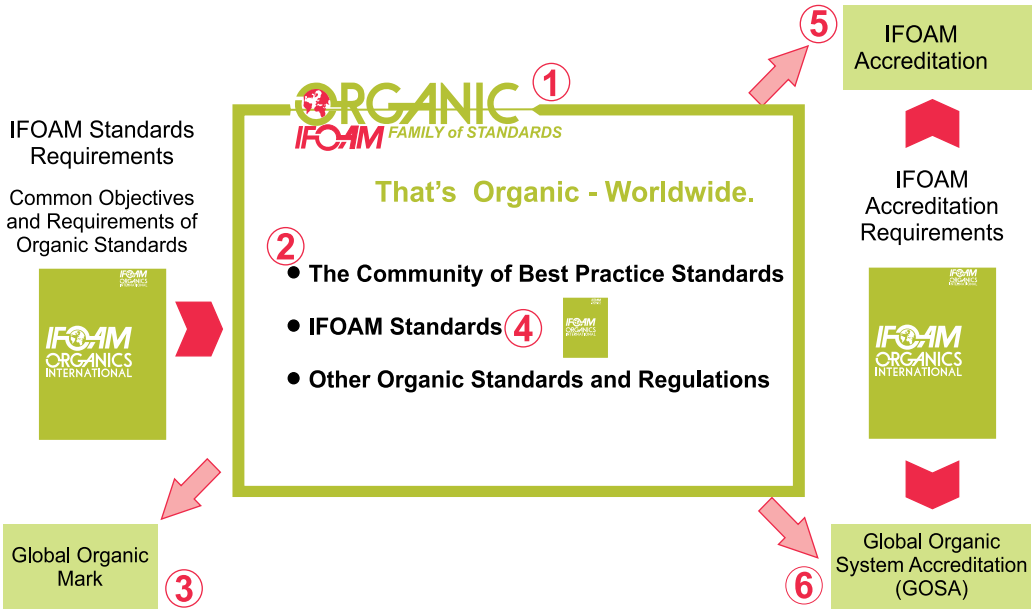

Figure 2. IFOAM organic guarantee system (www.ifoam.bio)

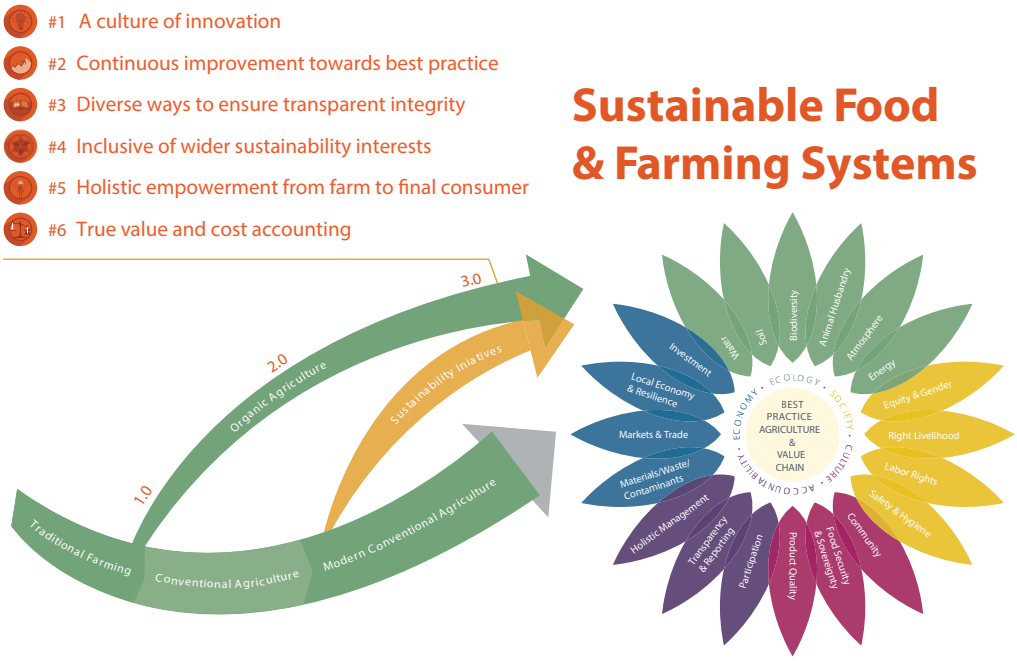

Figure 3. Sustainable food and farming system (https://www.ifoam.bio/sites/-default/files/organic3.0_v.2_web_0.pdf)

provide a common system of standards, verification and market identity for the organic world. According to the IFOAM, organic agriculture should be economically efficient, environmentally safe, and socially responsible. The organic movement is especially concerned with the quality of the food, consumer trust and assurance that production processes were similar across different farms.

In 2015, IFOAM initiated Organic 3.0 as the third phase of organic agriculture. The aim is about bringing organic out of its current niche into the mainstream and positioning organic systems as part of the multiple solutions needed to solve the tremendous challenges faced by our planet and our species (https://www.ifoam.bio/es/organic-policy-guarantee/organic-30-next-phase-organic-development). The overall goal of Organic 3.0 is to enable a widespread uptake of truly sustainable farming systems and markets based on organic principles and imbued with a culture of innovation, of progressive improvement towards best practice, of transparent integrity, of inclusive collaboration, of holistic systems, and of true value pricing (Figure 3). The strategy for Organic 3.0 includes six main features and are as follows:

1. A culture of innovation, to attract greater farmer adoption of organic practices and to increase yields.
2. Continuous improvement toward best practice, at a localized and regionalized level.
3. Diverse ways to ensure transparent integrity, to broaden the uptake of organic agriculture beyond third-party assurance and certification.
4. Inclusiveness of wider sustainability interests, through alliances with the many movements and organizations that have complementary approaches to truly sustainable food and farming.
5. Holistic empowerment from the farm to the final product, to acknowledge the interdependence and real partnerships along the value chain.
6. True value and fair pricing, to internalize costs, encourage transparency for consumers and policy makers and to empower farmers as full partners.

Overview of world organic agriculture

In mid-1980's, following market enlargements, many countries and companies in some cases started to develop clear and uniform criteria, according to which farming (production) and its output can be categorized and labeled as organic, which later turned into legislations or private standards. Implementation of these legislation/standards pertaining to organic agriculture is strictly followed by the authorities who own the rights of the standards due to oversight on the part of authorities as well as due to activities of authorized control bodies fulfilling inspection and certification services on behalf of the authority.

Organic agriculture has developed rapidly worldwide during the last decades, and practiced in approximately 179 countries of the world in 2015. Its share of agricultural land and number of farms continue to grow all over the world. According to latest FIBL survey 2017, more than 50.9 million hectares are currently under organic agricultural practices (Figure 4).

The market for organic products is also expanding and growing, not only in Europe and North America (which are the major markets), but also in many other countries, including several developing countries (see chapter on the global organic market). Figure 5 gives information about the ten countries with the largest areas of organic agricultural land in 2015. The countries with the

highest organic agriculture land are Australia (22.7 million hectares), Argentina (3.1 million hectares), and the United States (2 million hectares), Spain (1.97 million hectares), China (1.61 million hectares), Italy (1.49 million hectares), France (1.38 million hectares), Uruguay (1.31 million hectares), India (1.18 million hectares) and Germany (1.09 million hectares).

In Oceania 22.3 million hectares of agricultural land is under organic agriculture, and Oceania holds 45 percent of the world's organic land (Figure 6), followed by Europe (12.7 million hectares, 25 percent). Latin American countries are among the leaders in organic agriculture with 6.7 million hectares (13 percent). Asia has about 4 million hectare (8 percent), followed by North America (3 million hectares, 6 percent), and Africa (1.7 million hectares, 3 percent).

FIBL and IFOAM Organics International (2017) survey states that land dedicated to organic agriculture is not giving a clear picture for other organic areas dedicated to other activities. Beekeeping is the largest part of wild collection in organic agriculture, and there are other

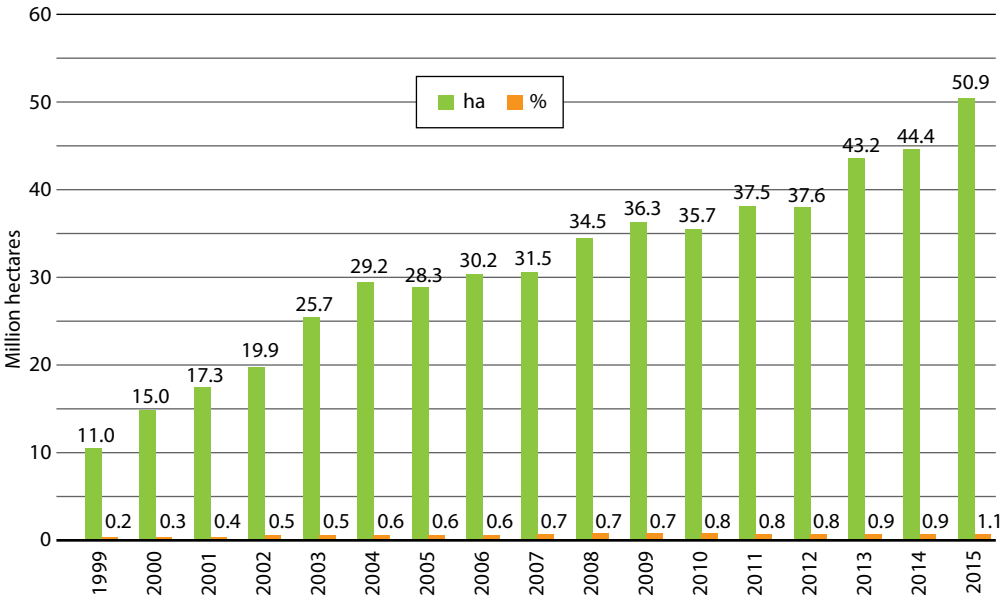

Figure 4. Growth of organic agricultural land 1999-2015 (Source: FIBL-IFOAM-SOEL-Surveys 1999-2017)*

* FIBL-IFOAM survey is updated yearly and made public in February 2017 (www.organic-world.net)

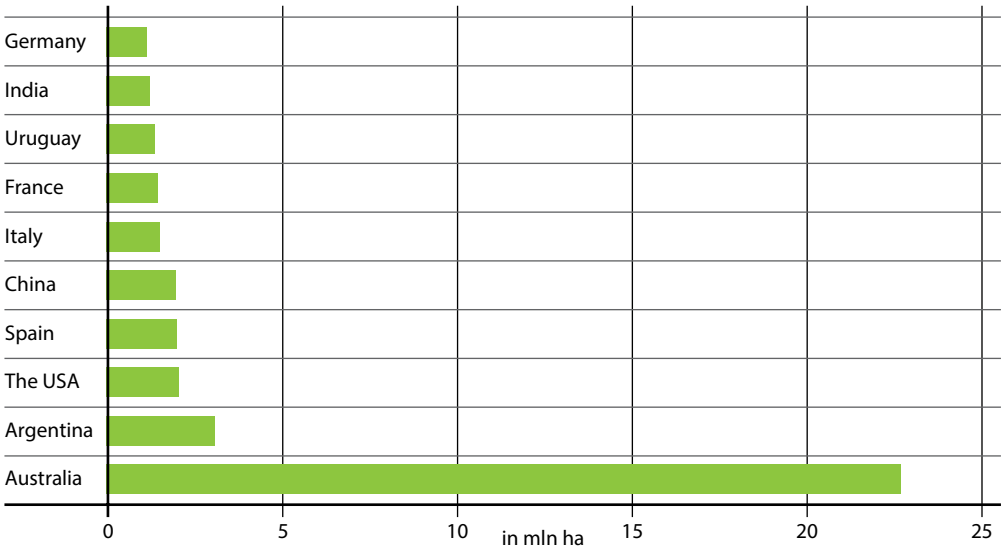

Figure 5. The top ten countries with the largest areas of organic agricultural land 2015, million ha (Source: FIBL survey 2017)

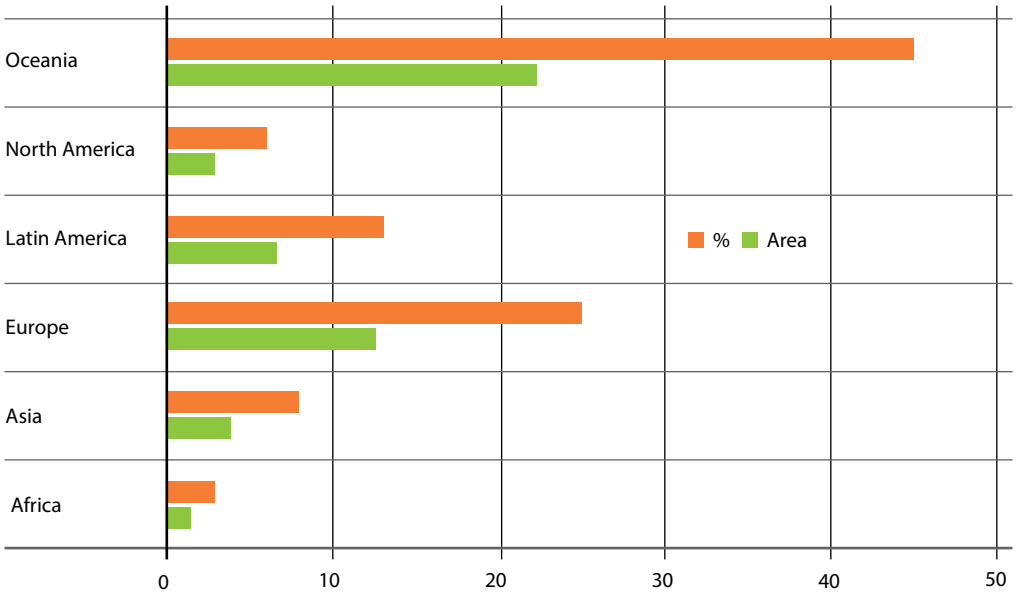

Figure 6. World Organic agricultural land (including in-conversion areas) and regions' shares of the global organic agricultural land in 2015 (Source: FIBL survey 2017)*

* Agricultural land includes in-conversion areas and excludes wild collection, aquaculture, forest, and non-agricultural grazing areas

areas used for aquaculture, and some area forests or grazing areas on non-agricultural land. These areas approximately totaled to 39.7 million hectares, and all the organic areas together summed up to 90.6 million hectares in 2015. Figure 7 describes full picture of organic agriculture worldwide where shares of wild collection, organic agriculture and other organic areas are presented. For organic aquaculture and beekeeping, other indicators (production and number of beehives) are more relevant than the area, and the significance of organic aquaculture and beekeeping cannot be measured in hectares.

When calculating the size of the world organic market, non-food and non-agricultural products as cosmetics, textiles or pharmaceuticals are considered separately from food and beverages since most standards and data collection systems apply only to organic farming and food. In this case, organic cotton is included in the data set of organic farming and food whereas organic textiles are excluded except in Mexico. The organic food and beverages market has reached to 81.6 billion US dollars in 2015 with a 10% increase since 2014. The North American countries, the USA and Canada,

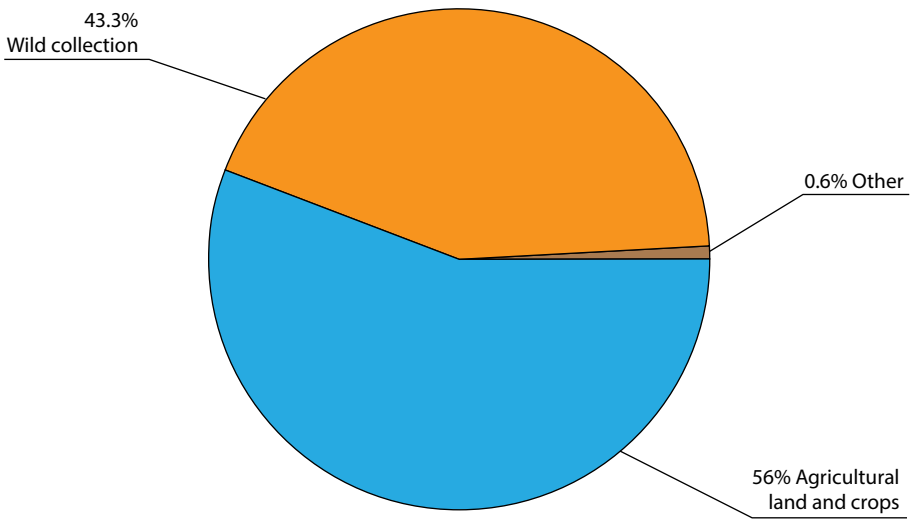

Figure 7. Distribution of all organic areas in 2015, (%) (Source: FIBL Survey, 2017)

comprise 53% of the global market. The European market is the second largest with 31.1 billion dollars. Sales in Asia, Australia and other markets have reached to 7.2 billion dollars (Sahota, 2017). Food scandals and outbreaks as the melamine case in China, dioxin in Belgium or Mad Cow disease in United Kingdom had accelerated the organic food sales in domestic markets as well as in the world. The main objective of organic agriculture is not limited to food or environmental safety but safe and nutritious food is the expected outcome of the practices and inputs applied in organic management. In addition to producing according to organic rules, all basic quality requirements expected for the conventional products in the market are demanded at the same level for organic products traded at worldwide level.

Organic agriculture in Uzbekistan

The idea of organic farming is not new for the Republic of Uzbekistan as the country has its historical trends of traditional low-input agricultural practices. Consequently, the ages-old culture of the traditional vegetable farming and horticulture in Uzbekistan were originally based on the principles of biological farming with the use of organic fertilizers and without the use of genetically modifying technology.

Uzbekistan has a strategy to develop sustainable resource management and implement agri-food quality assurance systems and to increase access to international markets. Uzbek researchers have carried out some studies and activities on organic agriculture. There are other individuals/institutions who have participated in organic agriculture-related activities, as well. In terms of production, as reported by some of the importing countries, organic products are already grown in Uzbekistan and exported. These products are certified according to the legislation valid in the importing country by foreign certification bodies authorized by the respective importing country. Some donor agencies active in Uzbekistan's agriculture also attempted to promote organic farming by application of organic rules and practices in farmers' fields. There are projects implemented with financial support from the United States, Germany and South Korea that partially deal with organics. The currently implemented FAO TCP included activities that complement

Presently, there are several approaches foreseen for the introduction of organic agriculture systems in Uzbekistan:

1. The introduction of organic agriculture systems on land plots that fall under the category of non-demanded agricultural lands;
2. The introduction of modern allowed biotechnologies in farms engaged in traditional, but essentially bio-organic small-scale low-productivity agricultural production (individual subsidiary farms and peasant farms with a small area of land);
3. Complete withdrawal from the use of chemical fertilizers and pesticides in existing farms, their replacement with biological plant protection agents, and large-scale introduction of organic soil amendments and fertilizers, including methods of rotation, cover crops, intercropping etc., natural ameliorants, energy- and resource-conserving technologies:
    a. at once, on the entire area of an agricultural enterprise;
    b. step-by-step – first, on some portion (section, crop rotation, land tract), then, followed by subsequent introduction of organic systems of agriculture in the entire farm based on lessons learned;
    c. along the lines of one area of farming activities (for example, fodder production and livestock farming, vegetable growing, and etc.);
    d. parallel implementation of the organic farming systems with traditional farming systems
4. Gradual replacement of chemical agents with management techniques, bio-formulations, and allowed biotechnologies in various areas of activity or on the entire or larger area of a farm.

the already-existing projects on similar undertakings.

Uzbekistan has great potential to introduce and widespread organic agriculture. In 2016, Uzbekistan had a total area of organic certified 563 hectares arable land while 6 000 ha of wild land was certified according to organic farming rules, up from zero ha in 2013. During the last two years, the organic area in Uzbekistan increased by about 250 hectares each year. According to the latest data from Uzbek Statistical Agency, rangeland and hayfield area amounted more than 21 million hectares, rain-fed land is 0.75 million hectares (Figure 8). All rangeland, hayfield and rain-fed are favorable environment to grow many agricultural crops starting from cereals, legumes, oil crops, to grow grape and fruit trees. In general, rangeland is a national wealth of Uzbekistan and main source of a very cheap forage resource for livestock production. Rangelands and hayfields are main sources of medicinal or

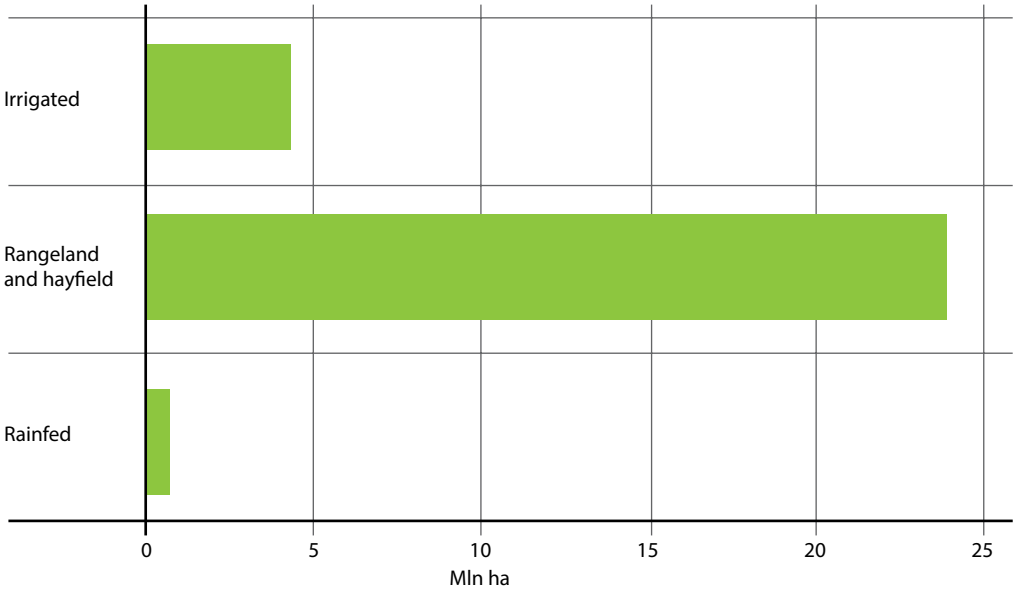

Figure 8. Irrigated, rain-fed, rangeland and hayfields in Uzbekistan, mln. ha

aromatic plants grown which can be collected according to organic rules and also form a basis for organic honey production as beekeeping offers a good opportunity for farmers to start up a small-scale business. According to the figures, organic products are already marketed. Uzbekistan produced 1 000 tons of organic raisins, 500 tons of organic dried plum and 3 000 tons of organic dried apricots in 2016 and exported to Germany and the United States of America (Figure 9). All the above-mentioned organic products are certified by an Austrian certification body named "Austria Bio Garantie GmbH".

Uzbek organic products such as almond and pistachios and certified according to the EU regulation is already on market shelves in Europe with the EU organic logo (Figure 10).

JV "Pearls of Samarkand", a private company, initiated organic fair-trade products in Uzbekistan. The JV "Pearls of Samarkand" is really a pioneer in Uzbekistan to develop organic sector. It is an export-oriented company connects Samarkand farmers with Austrian certification body "Austria Bio Garantie GmbH" through farmers' cooperatives and the importer. Farmers producing mostly peanuts, chickpeas, cherries, bee berries, mulberries,

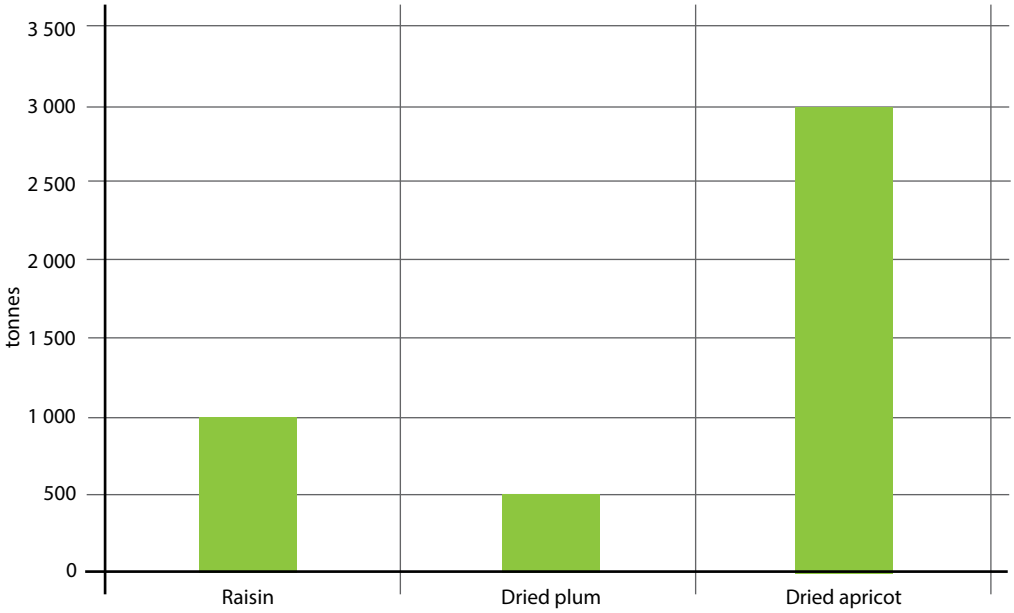

Figure 9. Organic raisin, dried plum and dried apricot production in Uzbekistan (2016)

almonds, flax seeds, and sesame seeds around Samarkand region have established their member-owned cooperatives to purchase inputs and sell their commodities collectively in reasonable prices, and to make collective contract with the processing and marketing companies. JV "Pearl of Samarkand" is the domestic contracting company, which gets technical assistance and certification support from the foreign importer company. It also provides training and advisory service to cooperative members who are the producer farmers. Training and advisory services are to ensure that farmers apply the suggested practices according to the regulations, which are predetermined for organic and fair-trade certifications. In the contracted system, input supply is provided to farmers at pre-production stage. Throughout the production chain including the post-harvest stage, methods and inputs used are selected according to organic and fair-trade rules and regulations. Harvested products are transported to the warehouse of the company. After proper sizing and quality classification and storage, products are exported to the Austrian company. The company applies proper packing for the products, and then they are transported to mainstream retailers to make them available for consumers.

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Figure 10. Organic almond and pistachio produced in Uzbekistan according to the EU logo (leaf on green background) sold in the European market

The future for organic agriculture in Uzbekistan is very positive. The growth rate, experienced over the last few years, suggests a fast and considerable development of the sector. Uzbekistan may become a central area for producing high value organic products, such as dried apricot, walnut, honey and other bee products, raisin, nuts and dried fruit and medicinal and aromatic plants. Traditionally, Uzbeks are interested in traditional products originating from the villages as so called "natural products" are favored because they are considered free from toxic chemicals, additives, artificial flavorings and colorings, and preservatives, and are perceived as having a higher quality. As seen in the above given example, private sector may play an important role to develop the organic movement in Uzbekistan to develop both the domestic and export markets, mainly because a majority of people still cannot define what organic means, and how the production differs from non-organic products. An umbrella organization, as an example, Uzbekistan Organic Association (UOA), can be established to support all households, consumers and organizations active in developing organic farming in Uzbekistan.

Organic production methods and technologies

2

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For a successful and sustainable organic production, planning is important since the conditions of every farm may be different. This plan should be based on evaluation of various factors as the selection of the site (farm) and the crops, the availability of inputs that are allowed in organic, storage, processing or packing facilities, working power, capital and market conditions. The inspection and certification system in organic production requires documentation of the inputs and methods utilized. Additionally, the NOP obliges to prepare and present the Organic System Plan before starting the certification. Since the farmer will be applying rotation and selecting the appropriate crops, he/she has to know more about the farm as soil fertility, input availability, infrastructure required and market demand to make long-term plans.

Site selection

To present examples to Uzbek farmers, a pilot organic agriculture site was selected as a demonstration in the mountainous areas of Qamashi district in Qashqadaryo province where rain-fed agriculture dominates. The selection criteria are developed by project national consultants based on local agricultural conditions and suitability to produce organic products. During the training courses and field days of the project, there were overall constructive discussions on project sites, selection criteria, crops and fruit trees to grown. The project team and local counterparts agreed on the pilot project site. The experiences gained in these sites can be used further as models to create organic farms in the region or throughout the country.

Site selection is the first step in starting organic farming as organic crop production has to avoid external pollution risks and excludes the use of many synthetic inputs associated with modern farming, most notably synthetic pesticides and fertilizers. Site should be located far from industrial and urban areas to avoid any risk of contamination on agricultural products. Mountain areas where low or no inputs used can be excellent sites to start organic farming (climate, free of certain pests and diseases, suitable soils, etc.) in Uzbekistan.

The selection of a suitable location is also important when an individual decides to go into farming, the purchase of a farm lot being

considered as a better alternative of investing hard-earned money rather than depositing it in a bank. Here one of the most important considerations is the value of the property, that is, the selling price is as low as can be reasonably possible. Other factor that could be important are water supply and those, which make the farm suitable to a wide choice of crops or intended crops and investment opportunities.

In areas where natural flora enables collection of wild species, this can be an opportunity for developing organic products. Organic wild harvested products include, fruit, nuts, berries (Figures 11 and 12), medicinal and aromatic plants, oil plants, culinary herbs, rose hip, mushrooms, bamboo and many others. According to the EU and Turkish regulations on wild harvest, there is no need for a transition period if prerequisites in the standards are fulfilled. The aim is also to provide sustainable collection and preserve natural biodiversity. For organic products harvested from nature and exported especially from developing countries, there are also private standards that have additional focus on environmental and social aspects.

For wild collection, the regulations foresee:

Figure 11. Common barberry *(Berberis vulgaris)* shrub in project demo site in Qamashi district

Figure 12. Crataegus *(Crataegus rhipidophylla)* in Qamashi district

1. Harvest area must not be treated with the products, except with those which are allowed in the legislation for organic, **within the previous 3 years as of the harvesting date.**
2. The harvesting area must not have experienced **fire in the last 2 years.**
3. The natural life balance is ensured and the species are preserved in the harvesting area.
4. The products reaped from the nature shall not be subject to transition process.

Conventional farming practices have only one major goal of producing higher yields using tillage practices, water management and all type of chemical inputs including fertilizers, growth regulators and pesticides. On the other hand, extensive use of tillage, irrigation, synthetic fertilizers and pesticides has damaged the soil structure, contaminated groundwater, accumulated toxic and carcinogenic compounds in the soil and groundwater in various regions of the world.

Organic farming practices rely on rotations, intercropping or cover crops and allow use of only organic or natural mineral soil amendments as animal manure, compost or seaweeds or dolomite allowed in the reference standard. Soil is cultivated to a depth of not more than 10 cm by using cultivators, subsurface tillers, disc

harrows without turning over the soil. Natural and traditional preparations (sulfur, lime, copper sulfate), traps and farming techniques (rotations, mulches, repellent or attractant plants) are used in managing pests, diseases and weeds. At present, many biologicals are used that are created through effective microorganisms (genetically modified organisms are not allowed) and are harmless to humans and nature.

When organic agriculture practices as minimum tillage, mulching, green manuring, composting, mixed planting or using natural substances to protect from pests and diseases are applied in obtaining safe and high-quality agricultural crops, consumers are ready to pay a price premium. Moreover, the world experience shows that using on-farm inputs and recycling results in reduction of cost and labor and increases crop quality through maintenance of long-term soil fertility.

Conversion period from traditional agriculture to a more functional organically managed agroecosystem may take more than the actual transition period that is 3 years, it may go up 10 to 15 years in a damaged ecosystem or in case of mismanagement. The transition period helps to understand the natural processes. Organic agriculture has two stages in terms of labelling, in transition and organic. The length of the conversion period, the start and the ending times, labelling of products in conversion and possible reduction of the transition period varies from one legislation to the other, and the length of the transition period also differs in different plant and animal species. There is a need to check the latest version of the reference legislation.

The two phases in organic process can be explained as follows:

- **Organic:** no chemicals or methods except those approved for use in the legislation have been used for more than three years in perennial plants and for more than two years in annuals (in the USA; it is 3 years also for annuals); and
- **Organic in transition (in conversion):** no chemicals or methods except those approved for use in the legislation have been used for a period ranging between days or months in livestock husbandry and up to two or three years for crops.

Organic farming systems also require suitable soils and climate, good-quality water, access to labor, transport and markets – the site should be relatively free of resistant

pests and diseases of the crops the producer plans to grow. Apart from all the obvious reasons for choosing a site, crop rotations, crop residues, manures (Figure 13), legumes, green manures, on-farm organic wastes, mechanical cultivation, mineral-bearing rock powders and biological pest control agents are important elements of organic farming. These components maintain soil productivity and tilth, supply plant nutrients and help to control insects, weeds and diseases. The presence of certain weeds and forage species are also of particular concern to the organic farmer. Bermuda grass (Figure 14), Couch grass and several other species can be quite problematic to farmers and are difficult to control through non-chemical means but it can be controlled by hand picking roots of Bermuda grass after ploughing.

Some perennial fruits (walnut, pistachio, peach and almond) are easier to grow organically than other fruit trees (apple, plum and others) in Uzbekistan. It should mentioned here that, successful organic fruit growing depend largely on whether the venture is for home production or for commercial sales. In the mountain areas of Uzbekistan, many households are already growing many agricultural

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Figure 13. Prepared animal manure ready for application

Figure 14. Bermuda grass field

crops without using any pesticides and fertilizers (please see some photos from households' activities). However, for the export market, quality standards as being free of blemishes, free of dead insects or mechanical damage or homogeneous size and color that apply for conventional products also apply for organic products.

Organic farming demonstration site

Qashqadaryo is located in southeast of the country, in the Qashqadaryo River Basin and on the western edges of the Pamir-Alai Mountain Range. Main agricultural crops are cotton, winter wheat, vegetables and cocoon production. The agricultural input of the province makes slightly more than 10% of the Uzbekistan's total agricultural production. Livestock farming, especially sheep husbandry is well developed in the mountainous areas.

There are several deserts and these are namely: the Karshi Desert covering the north and northwestern parts of the province; the Nishon Desert covering the south whereas the Sundukly sands - the southwestern

parts; and in the eastern part of the province Kitob-Qamashi foothills make up the landscape. There are three types of climates: continental, partly subtropical and dry. The mountain ranges that have semi-rounded the province from northwest, east and south prevent the penetration of cold weather and create a convenient atmosphere for the condensation of the western humidity. Winters are warm and summers are hot and long. Average long-term precipitation ranges widely among foothill, mountain and desert zones between 100 and 450 mm. The main river is the Qashqadaryo River with its numerous streams originating from the mountains.

The demand for agricultural production is expected to continue to grow in Uzbekistan as the Government is going to increase export potential of many agricultural crops including vegetable, fruit and others. Apricot, apple, nuts, medicinal and aromatic plants, grape (raisin) and other dried fruits are the most important commodities in the country to be exported as an organic product. However, with a trend towards organic products, apple or wild apricot could also become important. This region with very low input use and low yields has some potential for organic agriculture. Organic agriculture is good not only for the environment, soil, and human health but also possess a great potential for increasing farmers' income, to have access to the export markets and at the same time to provide services to the society by increasing employment opportunities and maintaining clean environment.

In 2016, in Qashqadaryo Region in the outshoots of the Gissar Range system, a nursery was created for rapid transition of the region and especially horticultural industry to organic production. It has the following coordinates: latitude 38°38'16"N, longitude 67°05'24"E, altitude 1 630 m, area – 1.0 ha.

Seeds for establishment of the nursery were collected in the outshoots of Tian Shan, the Pamir-Alay system of Fergana valley and offshoots of Gissar Range in Qashqadaryo and Surkhondaryo Regions of the Republic of Uzbekistan from wild trees of wild apple (*Malus sieversii* (Ledebour)), wild pear (*Pyrus regelii* Rehder), wild quince (*Cydonia oblonga* Mill), gean (*Cerasus collina* Laj), and wild apricot (*Prunus armeniaca* L.). This nursery will produce organic saplings to be distributed to the region to promote organic fruit production and also help to preserve biodiversity and wild species native to Uzbekistan (Please see Figure 15 and 16).

Figure 15. Seedlings of wild apple tree *Malus sieversii* (L, db)

Figure 16. Seedling section of wild apricot *Prunus armeniaca*

Farmers around demonstration site already producing apple, grape and peach close to organic farming conditions as they do not have applying fertilizers, pesticides in their orchards (Please see Figures 17 and 18).

Grape is the easiest crop to initiate organic farming as Uzbek farmers traditionally in very rare case use chemicals in grape production. Grape can benefit from being intercropped with cover crops or short grasses for weed control and mulch. Intercropping with legumes provide needed nitrogen for grape. A year around time frame of the organic grape production activities including agronomic practices, diseases and pest control is given in Annex 1: Table 7. Please also see Figures 19 and 20.

Organic wheat cultivation can be another good alternative as a major rotation crop in rain-fed areas. No-till wheat cultivation mostly fulfill the requirements of organic farming in rain-fed conditions where wheat is growing mostly under natural conditions. Depending on availability of precipitation, hydrological and hydrothermal conditions and the administrative division, rain-fed areas in Uzbekistan are grouped (Nurbekov et al., 2016) into the following three rain-fed zones:

- Rain-fed areas well-provided with moisture (at altitude of 600-1500 meters above sea level, precipitation level exceeds 600 mm);
- Rain-fed areas half-provided with moisture (at altitude of 350-600 meters above sea level, precipitation ranges between 300 and 600 mm);
- Rain-fed areas poorly provided with moisture (at altitude of 200-300 meters above sea level, precipitation amounts to 200-300 mm).

In rain-fed areas under conventional agriculture, the biggest problem is with open fallow when multiple tillage operations are conducted to control weeds, causing substantial soil erosion and degradation. It is established that through application of no-till practices soil moisture can be increased and conserved compared with conventional tillage. Crop rotation and relevant structure of areas under crop should be conducive to fully-fledged use of soil moisture reserves during the vegetative period and draw maximum benefit from production factors that are under management control. These include: optimal plant density, seeding methods, application of optimal amounts of plant nutrients and soil amendments among allowed ones, use of locally adapted varieties, and water-saving technologies for cereal crop production. In general,

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Figure 17. Organically grown peach in Uzbekistan

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Figure 18. Organic orchard farm in demo site in Qamashi district

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Figure 19. Grape produced under organic farming

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Figure 20. Organic raisin in Uzbekistan

in crop rotation, winter wheat comes after perennial forage legumes (alfalfa), pulses, melon and safflower.

Harvesting of cereals should be done with combine-harvesters that have adjustable high stubble cutting capacity and are equipped with straw chopper and spreader. A pattern of Recommended Models for organic winter wheat on rain-fed areas is presented in Table 8 given as Annex 2.

Soil fertility management

In organic farming systems, the main approach is to feed the soil and not the plant. In this respect, maintaining or enhancing long-term soil fertility is the major challenge. All synthetic and readily soluble mineral fertilizers are banned. Especially in areas where soil organic matter and nitrogen (N) levels are low, a short and long term strategy should be developed. Even if you apply compost or manure, N contents are relatively low and only 1/3 of the N could be available for the first year, and the rest in the following years. In this regard, integration of different available methods as crop rotation, green manures, intercropping or addition of inputs as compost, seaweed, natural rocks, some plant residues or animal manure can be considered in soil fertility management. If the farm has animals, composting plant residues with manure should be the first solution. A mature compost will have the final C/N ratio ranging between 15-25. If the compost is not mature enough, with high C/N ratio, it will utilize the soil microbiota and nitrogen for decomposition of the carbon rich compost. Composting helps waste management and all wastes will be converted into nutritive and structure building amendment for the soil. Incorporating organic matter to the soil is recommended only if there is not risk of contamination. Proper composting also eliminates the pathogenic microorganisms. In order to obtain biomass for composting, fast growing trees can be planted along the roads or on the borders, which may be cut and used for composting. Every standard on organic farming has a list of allowed soil amendments or substances. In case of deficiencies of a certain element or to complement soil practices, farmers should use the appropriate ones from such lists. Phosphorus, potassium or other primary or secondary nutrient deficiencies can be regulated by using the substances listed in the standards. Organic management requires a

preventive approach therefore even if the farmer may use animal manure, if the manure is not from his own farm, he/she has to prove from where it comes from and that it does not have any chemicals that can pollute the soil. In some standards, the amount of nitrogen applied to the soil in one year is limited to 170 kg N/ha. In case of continuous application of organic matter e.g. manure or compost for longer periods, soil N levels must be monitored in order not to cause any N leaching problems.

Crop rotation, cover crops and intercropping

In organic agriculture, crop rotation in addition to soil fertility improvement plays an important role to control pests, weeds and diseases. A well-planned crop rotation can improve the efficiency of controlling insects, diseases and weeds, and contribute to maintaining or improving soil structure and increasing the organic matter content. Pulses in crop rotation reduce the need for subsequent nitrogen introduction, so the value of legumes increases. Even if legumes increase soil N content by fixing nitrogen, consecutive sowing of legumes must be avoided since they may result in negative N levels. A good crop rotation is capable of providing more reliable and stable yields, increasing the productivity of the soil and potentially contributing to the desired yield and quality of organic agricultural products. Other crops, such as those with deep tap-root, have the ability to exploit the soil nutritive reserve from a deeper layer whereas cereals can retrieve nutrients from a wider area due to their higher total root length. Rotations may also give benefits in terms of improved soil quality (more or deeper roots; root exudates), better distribution of nutrients in the soil profile (deep-rooted crops bring up nutrients from below) and to increase biological activity (Figure 21).

Legumes – chickpeas (Figure 22), peas and beans in Uzbekistan are produced for grain and green biomass. Great interest in the production of leguminous crops in Uzbekistan is due to the volatility in grain prices and demand for pulse crops in foreign markets. In addition, legume crops are high-performance bio-plants for the fixation of atmospheric nitrogen. Steps for a successful chickpea production under rain-fed conditions is given in Table 9 (Annex 3). Legumes improve soil fertility and, accordingly, are excellent as preceding crops to many

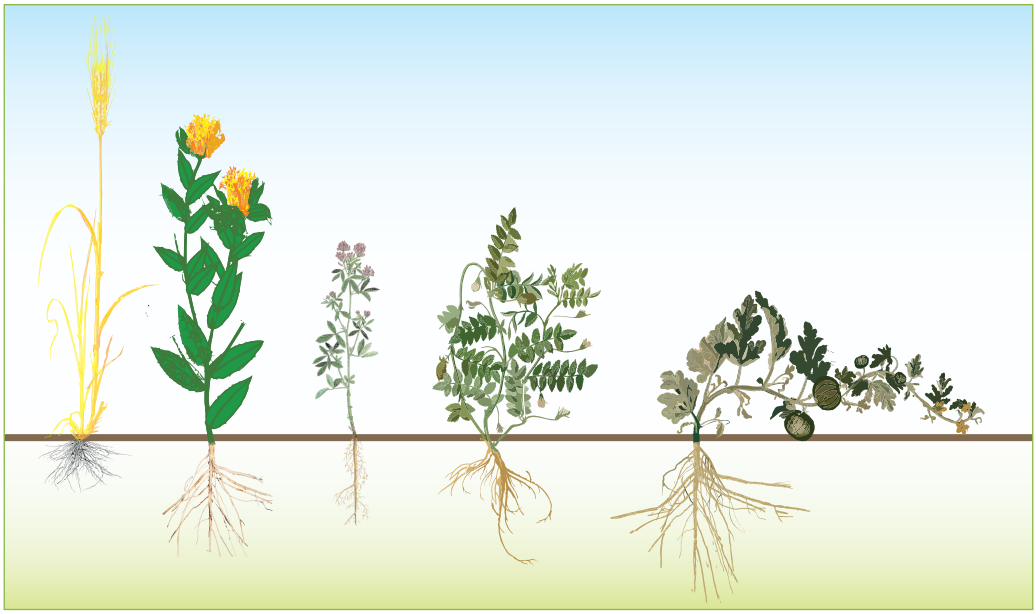

Figure 21. Possible crop rotation for organic agriculture in rain-fed conditions of Uzbekistan

Figure 22. Chickpea grown in rain-fed areas

other crops in rotations. Additionally, leguminous grain crops produce more protein per unit area, and its quality and digestibility is much higher (Figure 23).

Some crops are chosen on the basis of their ability to add to soil organic matter due to their big volume of biomass as in cauliflower. It also includes the selection of the right geographical location. With green manure crops, the aim should be to have a range of species that fulfil all of these requirements. These design considerations greatly affect a producer's ability to effectively manage pests, weeds and diseases in organic production. The rotation sequence factors considered when deciding on the rotation design include the choice of cereal crops and their relationship with one another, with fertility building and with pest and disease-breaking crops such as pastures and green manures. Other factors that should be taken into account are the market for the chosen crops, the available resources (for example, labor and equipment), the economics of the rotation and, if they are to be a part of the rotation, the role of livestock. When choosing crops for a rotation it is a good idea to have a number of uses in mind – say, processed or fresh – and in such a situation careful choice of variety is crucial. Organic certifiers

Figure 23. Organic chickpea field in the project demo site in Qashqadaryo province where fertilizer, pesticide and herbicide were not applied

might stipulate that in any three-year period at least one year should include a green manure crop, leguminous crop or pasture phase. This might not be required if compost is regularly applied for primary fertility building or where livestock are incorporated in the system.

An organic farm that is managed as a business must have access to supplies, equipment, and the markets of the selected crops. It must be provided with infrastructures (e.g. roads) and, if the product is intended to be marketed elsewhere, transportation facilities, trucks or trains or airplanes becomes a crucial element. Moreover, there is a general preference for farms in familiar locations and which are easily accessible to owner-managers. Through rotations, peak labor times may be reduced and labor better distributed throughout the year if planting and harvest times are different.

The rising cost of mineral nitrogen fertilizers and the pollution risk of underground waters have revived interest in nitrogen-fixing legumes not only in organic but also in conventional systems. In organic production of perennials as the fruit trees, cover crops or intercropping is a tool that the farmer may benefit. Since fruit trees remain in their place for decades, benefits of legumes or mixed cropping can be achieved through cover crops or intercropping. Covering the soil surface with cover crops in winter especially in deciduous tree orchards prevent soil erosion and leaching of nutrients. However, there are few major issues to consider while selecting the cover crops or intercrops, as follows:

1. These species should not be host to the diseases or pests of the tree crops;
2. It should not compete heavily for water or soil nutrients;
3. It should not hinder timely harvest practices;
4. Should be growing preferably during the period of heavy rains to prevent soil erosion and not require irrigation and
5. Should not be persistent and invasive in the soil.

Organic growers often include leguminous cover crops in order to fix nitrogen for the following crops in the rotation. Deep-rooted cover crops can bring nutrients up from deeper layer in the soil profile and contribute to the development of a network of soil biopores which improves aeration, drainage and moisture holding capacity. To benefit from different functions of the species, mixtures (e.g. vetch+barley) can be used.

The natural vegetation can also used as a cover and cut when it starts competing for water and nutrients. Natural vegetation can be enriched with nitrogen fixing legumes or with other species to increase diversity or improve their benefits to the farm.

Pest, disease and weed management methods

Pest, disease and weed management in organic farming benefits from the integrated management approach and consists of a range of activities that support each other. It is well known that the weed competition especially during the critical period reduce yields as an example presence of weeds in wheat fields reduces the wheat yield by 10-13%. The weeds can be controlled by planned crop rotation as exemplified for rain-fed areas (Figure 24). Share of cereals should be no less than 50% while other 50% should be legume crops in order to suppress weeds in wheat fields. Management focuses on keeping existing pest populations and diseases low, below the levels that will not create any important economic losses. Control on the other hand is a short-term activity

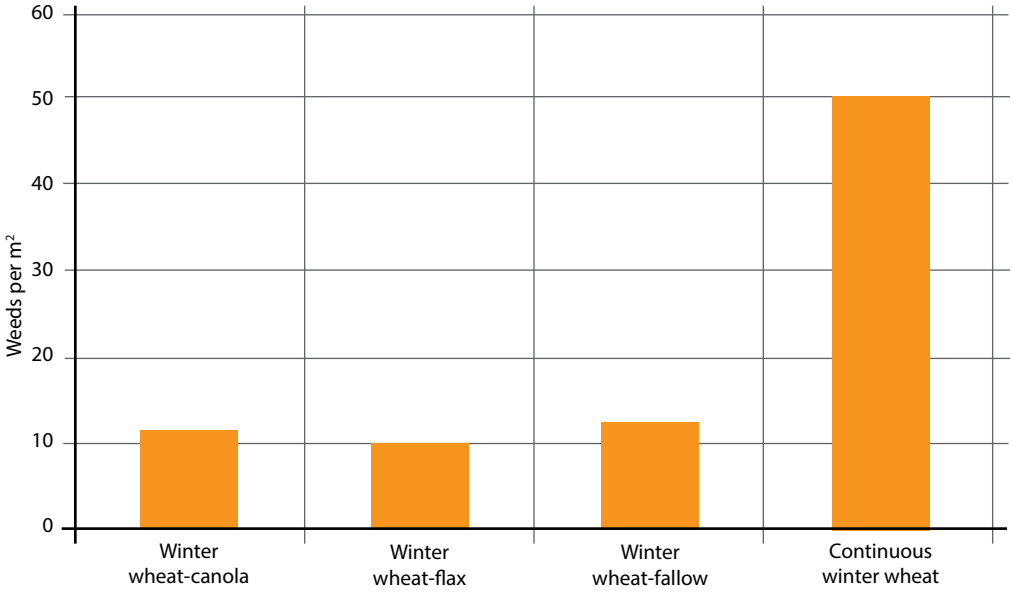

Figure 24. Effect of crop rotation on number of weeds (Source: Sydyk et al. 2008)

and focuses on eradicating pest and diseases. The general approach applied in organic agriculture to deal with the causes of a problem and prevent its occurrence rather than treating the symptoms after they appear also applies for pest and diseases. Diversification of the farm breaks the food chain of the pests and diseases and provides a natural habitat for benefials. Natural habitats can be formed by flowering strips in the fields or by managing the surrounding of the farms by green hedges or green margins.

Plant health depends on the interaction between living organisms and their environment. Plant health is more at risk in monocultures, and on-farm diversification provide a balanced interaction between different plants, diseases, weeds and pests and their predators. This is why a well-managed ecosystem can be a successful way of reducing the level of pest or disease population (Figure 25). Certain crop varieties have more effective mechanisms than others due to the adaptive nature to the environment and therefore have a lower infection risk.

Codex Alimentarius on organic production lists pest, disease and weed management methods as follows:

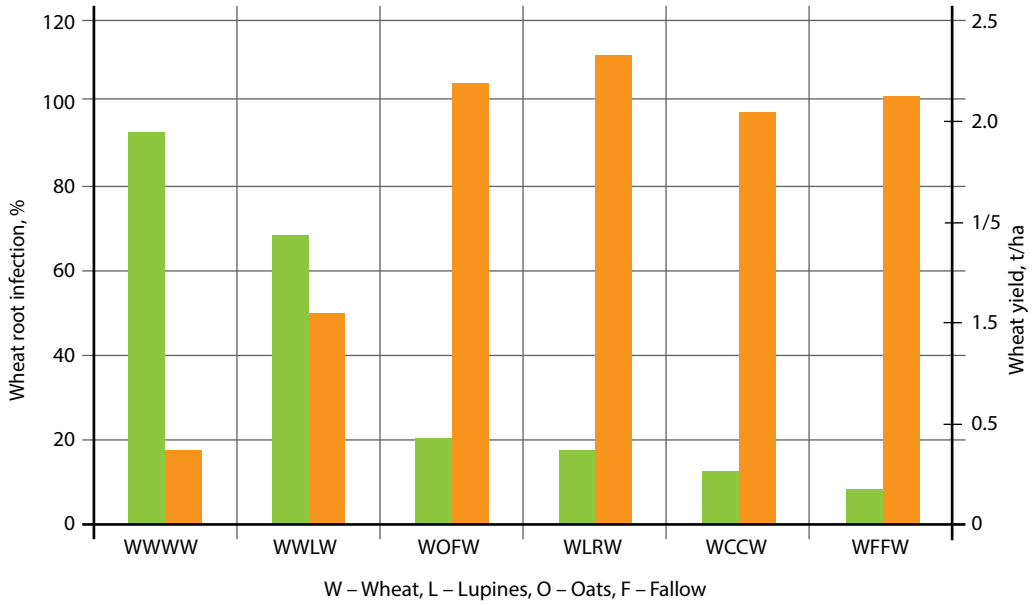

Figure 25. Effect of crop rotation on the number of wheat infections and wheat yields (Source: Reis et al., 1983)

- choice of appropriate species and varieties;
- appropriate rotation programs;
- mechanical cultivation;
- diversified ecosystems;
- flame weeding;
- natural enemies including release of predators and parasites;
- biodynamic preparations from stone meal, farmyard manure; or plants;
- mulching and mowing;
- grazing of animals;

- mechanical controls such as traps, barriers, light and sound;
- steam sterilization when proper rotation of soil renewal cannot take place.

Effective preventive crop protection measures can help farmers efficiently manage pests and diseases. In this case, farmers should know about the biology of pest and diseases. As many factors influence the development of pest and diseases, it is crucial to step in at the most sensitive points. It can be carried out through best crop management practices, a suitable combination of different methods, or the choice of a selective method. Figures 26, 27 and 28 show widely distributed wheat diseases in Uzbekistan.

Farmers must select varieties that are resistant and well adapted to the local environmental conditions (heat,

Figure 26. Wheat yellow rust *(Puccinia striiformis* f.sp. tritici*)*

Figure 27. Take-all *Gaeumannomyces graminis* (Sacc.)

Figure 28. Eyespot, Foot Rot *Pseudocercosporella herpotrichoides*

drought, pest and disease pressure), as it allows them to grow healthy and makes them stronger against infections of pests and diseases and abiotic factors.

In the previous section, information was given on crop rotation, which can reduce the chances of soil borne diseases, increase soil fertility and biological activity and enhance the presence of beneficial organisms (but also of pests; therefore a careful selection of the proper species is needed). This can be as a result of various factors but the main factor is breaking of the nutrition chain of pests and diseases by alternating the families (e.g. *Solanaceae, Cucurbitaceae, Leguminoceae)* in crop rotation.

Most pests or diseases attack the plant only in a certain life stage therefore it's important that this life stage during which the plant is weak doesn't correspond with the period of high pest or disease density or risks as rain or high humidity levels. If such risks are well noted, farmer can chose the optimal planting time taking into abovementioned life cycle of any disease or pest into consideration. Sufficient distance between the plants reduces the spread of diseases especially of fungal origin. Good aeration of the plants allows leaves to dry off faster, which hinders pathogen development and infection or enhanced air flow may remove accumulated humidity. Therefore, in grape or tree fruit and nut production, proper pruning is one of the basic practices utilized in prevention of fungal diseases.

In case disease and pest problems can not be overcome by preventive measures or cultural practices, there are plant protection agents allowed in the standards on organic farming. These include, traps, microorganisms (e.g. *Trichoderma*, *Bacillus thuringiensis* etc.), plant extracts (e.g. neem extract), and traditionally used agents like sulphur or copper. The conditions of use may differ from one country to the other, thus in case of export market it is recommended to check if the input is allowed or not. As an example, the organic standard in Russia allows the use of diammonium phosphate in traps against fruit flies whereas in Europe it is banned. In Europe, there is a restriction in the amount of copper used per ha per year.

Post-harvest handling and quality

Consumers are willing to pay a price premium for the products that fit best to their expectations. Even if the consumer preferences may vary from one country or region to the other, all look for healthy food at affordable prices. Quality standards aim at establishing a common language and understanding between the producer and the buyer but has to avoid any barriers to trade. Codex Alimentarius standards on contaminants while deciding on the allowed limits take into consideration two basic aspects: as low as reasonably achievable (ALARA) and scientifically sound (www.fao.org/fao-who-codexalimentarius/en/). The quality and safety standards are mostly voluntary at international level giving guidance to the interested parties but national legislation are compulsory at national level. Thus, in principle the national legislation or allowed maximum levels of the producer and importer countries have to be fulfilled at production and sales stages. This is also valid for organic products since the content of legislation/standards on organic governs how the organic should be practiced. As a general approach, the inputs allowed in production, storage and processing of organic food are limited and various chemicals used to extend shelf life or to prevent microbial growth are excluded. The inputs and substances allowed in organic regulations are mostly in common in the national or international standards. In some cases, as in the case of sulphur, it is allowed as a plant protection agent and also for soil applications but its use as a post-harvest agent (e.g. fresh grapes) or as a food additive is restricted. Sulphur is allowed for fruit wines but not in other products, for example you can not treat dried apricots with sulphur or use sulphur pads in storing grapes. Additionally, there could be conditions for use, limiting it only for plant products, or to animals or aquaculture. Potassium carbonate is allowed in many organic standards as a processing aid as used in dipping prior to drying of grapes. In GOST regulation, it is allowed also as a food additive for cereals (Table 2). Processing methods should be mechanical, physical or biological (such as fermentation and smoking) and minimize the use of non-agricultural ingredients.

Organic production rules focus on product and environmental safety throughout the production chain which in turn affects health of humans, animals and all living organisms. In addition to safety aspects, organic markets also demand quality products. In organic

production, substances that can be used at postharvest stage are comparatively limited compared to those in conventional post-harvest during packing, processing and storage phases. So, it is important to take precautionary measures at the farm level and produce high quality products. Even for dried or processed products, the final quality is largely determined by the quality of the raw matter. Quality of fresh products does not enhance after harvest, but deteriorate due to senescence. Quality and value can be improved by removing defected ones, sizing, quality classification, cleaning or through processing high value products, which all require a significant cost. The most important approach for organic fresh produce is to obtain clean products by providing hygienic conditions at the farm and further in storage, transportation and retail. The ideal temperature and humidity conditions should also be maintained to reduce losses due to water and quality loss and development of postharvest diseases. Dried produce like cereals, dried fruit, nuts and medicinal plants also require specific conditions. The major problems appear due to storage pests and in organic production carbon dioxide (CO_2), nitrogen (N), heat treatments and some plant extracts are used to kill live insects. However, each agent and its effective dose can be tested for the product and the pest, and then applied.

Ideal storage conditions for dried fruit and nuts as cold (4-10°C) and relatively lower humidity (60-65%) levels allows to store them for longer periods even for years without any quality deterioration. High humidity conditions may trigger fungal growth and development of mycotoxins in storage. Mycotoxins are secondary metabolites of various fungi, mainly of *Aspergillus* spp. and *Fusarium* spp. and there are hundreds of them formed in various products. Dried fruit, nuts, cereals, and oil seeds are among the substrates that are susceptible to toxin formation because of their high oil or sugar contents. In international trade, they create problems because of food safety issues. In some cases as ochratoxin A in grapes and apricots or aflatoxins in some nuts or dried produce (dried figs, dried pepper, pistachios, may form while in the orchard. The major way of reducing or preventing formation of mycotoxins at farm level is to have hygienic conditions and take some preventive measures as fastening drying by providing optimal conditions or preventing spreading of toxigenic fungi that is in the soil by tilling the soil near harvest. If dried fruit and nuts are stored with water activity (aw) levels below aw< 65 then the risk of toxin formation in storage is minimized.

Table 2. Examples of pesticides, food additives, ingredients or processing aids allowed in organic plant and animal production according to the Russian Interstate (GOST 33980-2016) and European Union (EC 889/2008) regulations

Name of the substance	Description, composition requirements, conditions of use	
	Interstate Standard GOST 33980-2016 Appendix B.4 Other substances traditionally used in organic production; Appendix H. Food additives (H 1) and processing aids (H 2) for use in organic food production	**EC 889/2008** ANNEX II Pesticides and Annex VIII. Section A – Food additives, including carriers; Section B – Processing aids and other products, which may be used for processing of Ingredients of Agricultural Origin From Organic Production
Copper in the form of hydroxide, oxichloride (tribasic), sulphate, protoxide, Bordeaux and Burgundy mixtures	The need to use it, prescription and dosage are confirmed according to the established procedure. They can be used as a fungicide, provided that the applied preparations do not lead to concentrations of copper in soil higher than the ascertained level	Copper compounds in the form of: copper hydroxide, copper oxychloride, copper oxide, Bordeaux mixture, and tribasic copper sulphate Fungicide: For perennial crops, Member States may, by derogation from the previous paragraph, provide that the 6 kg copper, limit can be exceeded in a given year provided that the average quantity actually used over a 5-year period consisting of that year and of the four preceding years does not exceed 6 kg
Lime Sulphur	(polysulphide) Fungicide, insecticide, acaricide	(Calcium polysulphide) Fungicide, insecticide, acaricide
Calcium hydroxide	NA	When used as fungicide, only in fruit trees, including nurseries, to control Nectria galligena
Ethylene	To enhance maturation of bananas, kiwi and persimmon. For citrus fruit only as a method to control fruit fly. For potato and onion inhibition of sprouting	
Fatty acids	NA	When used as fungicide, only in fruit trees, including nurseries, to control Nectria galligena
Potassium salts of fatty acids (soft soap)	Insecticide	Insecticide
Mineral powders (stone meal, silicates, bentonite)	Pesticide, Used only when the harvest is under explicit threat	Bentonite is used as a processing aid for both plant and animal products, Gelatine production
Diatomaceous earth	Same as above	Used as a processing aid for both plant and animal products, Gelatine production
Sodium silicate	Same as above	
Sodium bicarbonate	Same as above	
Ferric phosphate	Applied as a slug bait (molluscicide)	Preparations to be surface-spread between cultivated plants
Slaked lime	Used in such a way as to minimize accumulation of copper in soil	

Diammonium phosphate	In traps for pest control	Used as a processing aid or ingredient in plant and animal production, only for use in processing of fruit wines, including cider and perry and mead
Potassium bicarbonate	Fungicide	Fungicide
Hydrogen peroxide	Used only when the harvest is under explicit threat	
Carbon dioxide	Same as above	Both in plant and animal processing used as a processing aid or ingredient
Nitrogen	Same as above	Both in plant and animal processing used as a processing aid or ingredient
Ethyl alcohol	Same as above	Both in plant and animal processing used as a solvent
Potassium carbonate (see E 501)	Processing aid in drying grapes; As a food additive (E 501) in cereals	Drying of grapes
*E220 Sulphur dioxide or *E 224 Potassium metabisulphide	E 220 Used for fruit wines* without added sugar (including cider and perry) or in mead: 50 mg/dm3 or For cider and perry prepared with addition of sugars or juice concentrates after fermentation: 100 mg/dm3 (Annex H)	E 220 In fruit wines (1) and mead with and without added sugar):100 mg E224 In fruit wines (1) and mead with and without added sugar):100 mg (2)
*E 270 Lactic acid	Used for plant products as a food additive (Annex H)	Use only in animal products, for the regulation of the pH of the brine bath in cheese production as an additive
*E 290 Carbon dioxide	Used for plant products as a food additive (Annex H)	Can be used for both plant and animal products
*E 296 Malic acid	Used for plant products as a food additive (Annex H)	Can be used for both plant and animal products
*E 300 Ascorbic acid	Used for plant products as a food additive (Annex H)	Can be used for both plant and animal products, special condition: only for meat products
*E 330 Citric acid	Used for plant products as a food additive (Annex H)	Can be used for both plant and animal products Crustaceans and molluscs
E 392 Extracts of rosemary		Only when derived from organic production
*E 500 Sodium carbonate	Used for plant products as a food additive but shall not be used for coloring (Annex H)	Used for plant products (no restriction)
*E 501 Potassium carbonates	Only for plant products, for cereal-based products, cakes and pastries, confectionary	Used for plant products (no restriction)
*E 939 Helium	Can be used for both plant and animal products (Annex H)	Can be used for both plant and animal products
*E 941 Nitrogen	Can be used for both plant and animal products (Annex H)	Can be used for both plant and animal products
*E 948 Oxygen	Can be used for both plant and animal products (Annex H)	Can be used for both plant and animal products

Drying fruit and nuts to moisture levels below the critical water activity levels and store them in cold and relative humidity (< 65%) is crucial to prevent mycotoxin formation in storage (www.codexalimentarius.org; Code of Practice for Prevention/ Reduction of Aflatoxins in Dried Figs).

For organic products, control bodies inspect the whole production chain including post-harvest and processing to assess conformity to the organic standard and in case of conformity, the organic certificate is given. Labels on organic products help the consumer and show that the product is produced and certified in line with the rules of reference standard. All standards on organic have rules on labelling which are more specific in case of processed products. Labelling conditions for processed products are different in US, EU or Russian standards and may vary according to the percentage of organic or non-organic content as 100% organic, 95% organic or 70%. Therefore, before marketing labelling conditions for organic as well as for quality must be closely followed.

When it comes to the overall quality and safety of the organic product, the responsibility is beyond the inspection and certification body. Almost all actors active throughout the value chain are responsible. The farmer, packer, storage keeper, transporter or processor should all be knowledgeable about the methods and inputs allowed in reference standard not only in the producing country but also in the importer country. International standards as the Codex Alimentarius or United Nations Economic Commission for Europe (https://www.unece.org/trade/agr/standard) standards can be taken as a reference for market quality of fresh fruit and vegetables, dried produce and nuts. The specifications set by the private standards and demanded by the company are all additional to these basic standards. Inspecting and/or analyzing the process and/or the product for quality and safety at every step is time and money consuming and mostly impossible especially for fresh final produce. To obtain targeted quality and safety, risk assessment is applied both at farm level and throughout the organic production chain. One can control the production at all stages but it is not viable economically and time-wise. So major risks are identified, points at which it may occur are determined, how it should be controlled and compared to the reference levels (generally stated in the legislation of the producer and importer country and/or decided by the buyer) must be known in advance (Table 3).

For higher quality and safety in organic products, the control plan covering the whole production chain must be prepared to save time and money by controlling at every step and to satisfy the requested quality and safety conditions. Table 3 lists main factors that may create risk at different stages of organic production, as an example. Organic standards put forth conditions for being sold as organic which are based more on safety, however overall quality is not fully covered in the organic standards, therefore regular inspections of the control bodies does not cover these aspects as a whole.

Organic certification provides traceability, starting from the history of the farm and the origin of inputs and goes to who processed, who certified or to whom it is sold. Traceability is one of the advantages of organic products that help to identify the origin of safety and quality problems. The most frequent source of chemical contamination of organic products at post-harvest stage comes through

Table 3. A sample matrix for risk factors in an organic production value chain

Field/Farm	Harvest and post-harvest handling	Processing and packaging	Transportation, storage, wholesale and retail
Clean site selection	Optimum harvest maturity	Separate storage, packaging and/ or processing lines for organic	Maintain traceability
Adapted species and variety, organic seeds or propagation material	Care at harvest	Training and record keeping	Prevent mixing with conventional
Proper planting distances, buffer zones	Training of workers for harvest and post-harvest handling	Methods/practices utilized (irradiation, genetic engineering and chemical extraction methods are banned)	Prevent any other form of contamination
Proper cultural practices (pruning, irrigation etc.)	Prevent losses	Processing aids, water quality	Pay attention to mixed loads
Soil fertility management	Hygiene at the field/farm	Cleaning agents (only allowed)	Provide optimum temperature and humidity conditions
Pest, disease and weed management	Worker hygiene	Clean packaging, storage of packaging	Apply good storage practices
Prevent natural contamination or drift	Worker safety	Hygiene at facility and workers	Labelling according to the valid organic and other food labelling rules
Record all applications	Clean storage and transportation	Sanitation of the packing, processing facility; Control of flies, storage pests, rodents…	Sell as organic in the markets, prefer shorter marketing channels...

mixing of conventional products or uncleaned processing lines, storages or vehicles possessing chemical residues. In Uzbekistan, fresh grapes are stored with boxes having plastic bottles full of water to maintain humidity (Figure 29). The wooden re-used boxes or even water quality in the bottles are of utmost importance since they may cause chemical or microbial contamination. As a traditional practice, bunches are cut with 12-16 cm long wands and bunches are placed in a box with wands in one side. Special high corner-posts are needed for this method. Wands (short wooden sticks) are inserted into a dissected plastic bottle to absorb water and then lose through evaporation. Plastic bottles are filled with water as shown in Figure 30; the bottles must be refilled from time to time. In the above example, storage temperature is 2-3°C and the relative humidity is 90%, and the grapes can be stored up to eight-nine months. This method allows storing grapes or other fruit better in refrigerated cold storages without humidity controls. However, the ideal is to store under temperature and humidity controlled conditions in order to obtain longer shelf life and reduce loss rates. In Uzbekistan, sulfur pads (paper) are widely

Figure 29. "Plastic Bottle" method, filling water into the bottle to maintain higher humidity in the storage atmosphere to prevent moisture loss from grapes

Figure 30. "Plastic Bottle" method

used in non-organic grapes but sulfur pads are not allowed in post-harvest handling of organic products (Table 5) (Aksoy and Khujabekov, 2017).

For fresh fruit and vegetables, there are contamination risks from paper, wood, nails, storage room and humans (Figure 31). Storing sulphur treated conventional grapes in the same room with the organic may cause cross contamination, and sulphur residues can be detected in organic grapes. Providing ideal storage temperature, humidity and air flow rate conditions suitable for the species and variety affects the quality and length of storage and shelf life period. In case storage period is extended successfully, the products can be sold as out-of-season with higher prices.

Some of the fresh fruit and vegetables cannot be stored together either because their temperature requirements are different (apples 2-3°C; citrus fruit >10°C) or because some may release ethylene (apples, pears or tomatoes release ethylene whereas cherries do not) or aromatic compounds (apples). Those that release ethylene gas in storage enhances ripening of other products causing rotting, yellowing of vegetables, leaf drop or moisture loss at an earlier stage of storage.

Figure 31. Storing pomegranate fruit in boxes

In storage rooms, spaces (narrow corridors) must be left between the walls and boxes to allow circulation of cold air. Similarly, there should be aisles between stacks. The boxes should not be put directly on the floor and either a frame should be placed or an empty box can be turned down on which other boxes are piled. Piling up pomegranates as a heap on the storage floor, which is a general practice in Uzbekistan enhance quality loss and create safety problems. Similarly, if there are too many layers in the box, pomegranate fruit may have bruises due to friction during transportation. For long-term storage, modified atmosphere packaging (MAP) which is allowed in organic and cold conditions appropriate to the variety is recommended. Optimal storage temperature range is 5-7°C; chilling injury is possible if stored under colder temperatures. Pre-cooling is necessary to extend shelf life of fresh products.

Using boxes with labels and/or separating with colors is the easiest way to prevent mixing of organic with non-organic in storage. Identification and labelling of the organic raw material and applying traceability through the chain will minimize risk of cross contamination. Similarly, processing organic and conventional in separate lines or at different times

(preferably processing organic first) or cleaning thoroughly with allowed cleaning agents are the necessary steps to be taken. Packaging can also result in contamination therefore packaging used at all stages must be checked for suitability and re-use of bags must be strictly avoided. As in the case of Russian Interstate GOST standard on organic, there are restrictions on packaging material.

Production conforming to the organic standards minimize chemical contamination by limiting the use of synthetic chemicals. However, there are other sources that may pose threat for safety or quality due to microbial or biological risks. Therefore, all these have to be identified and prioritized for each crop and case. Small farm sizes can be a limiting factor in terms of cross contamination from neighboring conventional farms. Small farmers in the vicinity can be converted into organic as a whole to prevent any pollution risks. Organic products with high quality and safety have the market demand. Competitiveness in the market relies on quality, safety, price and their continuity (Figure 32). There is also good potential to increase organic garlic production in Uzbekistan as its post-harvest storage is already practiced in Uzbekistan (Figure 33).

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Figure 32. Good quality organic walnut is ready for market

Figure 33. Storing garlic in local facilities

Uzbekistan possess high potential for organic production however more focus is required on product quality and safety.

Thus, research, training and knowledge dissemination has to be an essential part of organic production at all stages.

Animal husbandry

In Uzbekistan, livestock plays an important role in the agricultural economies. In the country, livestock does not only contribute to the livelihoods of the most vulnerable rural sector, particularly in isolated regions and highlands, but also played a critical role in the period of transition when other sources of income were substantially reduced. However, livestock production has been severely affected by the economic transition, which resulted in the disruption of the Soviet markets for traditional products such as wool and pelts, fragmentation of large production units into small and unproductive flocks/herds, the collapse of production support services and animal health control. The productivity of the rural livestock industry however is low due to poor

feeding management, inadequate housing, animal diseases, poor market access, and lack of policy support. In particular, in the months of May to June and November to January feed deficits are high and severely limit milk and meat production. Farmers practically do not use modern veterinary practices for prevention of animal diseases and their treatment. According to the veterinary law of Uzbekistan, especially epidemic diseases are controlled by State veterinary Control Service that conducts prevention and eradication programs. The differentiation of typologies of livestock farms revealed that most of the livestock sector (80-95%) is concentrated among landless households and smallholders who are facing problems of feed shortages, and flock and natural resource management.

There is then an urgent need to reorient and diversify production. In this case organic livestock production will be one of the options to diversify livestock production in Uzbekistan. In the country, there is a good potential to produce organic meat and organic livestock production as organic livestock, management practices offer unique challenges to the livestock producer regardless of the animal species produced. Almost 100 percent of households in Uzbekistan keeping their livestock close organic requirements. However, they do not have access to good quality feed and they do not have information on feed ingredients. The availability of fodder is one of the limiting factors in animal husbandry. Unlike landless systems in conventional farming, organic husbandry should be mainly based on the fodder produced on the farm itself. As is the case with humans, there is a direct link between the quantity and composition of the food and the health status of the animals. Organic livestock production demands the integration of animal-pasture-crop production to be successfully. Organic animal husbandry means not only feeding organic food and avoiding synthetic food additives and synthetic medicines (e.g. antibiotics, grow hormones), but also focusing on satisfying the various needs of the farm animals. There are a number of considerations that need to be addressed to successful produce certified organic livestock and products. For example, seed can be treated with chemicals before planting or crop residuals and stubbles are grazed after harvest, or otherwise enter the food chain, they should also be considered as livestock feed.

Integrating animal husbandry into crop producing farms is one of the principles of organic farming. In temperate and arid zones, animal

husbandry plays an important role in the recycling of nutrients, while less emphasized in the humid tropics or in regions where tree crops dominate. Animal welfare is the basis in determining rules in organic animal production. The caring, training, and nurturing of animals is considered an art in many farming communities.

Integrating animals into a farm help creating a closed or semi-closed system where energy and nutrients are recycled and farmers' dependence on external inputs is minimized. Animals can convert non-edible biomass (e.g. grass, straw, kitchen waste) into food, while increasing soil fertility with their manure.

Many farm animals have a multi-functional role, for example:

- Produce dung, which is of great importance for soil fertility.
- Yield products such as milk or eggs for sale or own consumption continuously.
- Recycle by-products such as straw or kitchen waste.
- Serve as draught animals for tillage or transport.
- Produce meat, hides, feathers, horns etc.
- Serve, as an investment or a bank.
- Help in pest control (e.g. dugs) and weed management (e.g. grazing on barren fields).
- Have cultural or religious significance (prestige, ceremonies etc.).
- Produce young stock for breeding or sale.

The availability of organic fodder is one of the limiting factors in animal husbandry. Unlike landless systems in conventional farming, organic husbandry should be mainly based on the fodder produced on the farm itself. As is the case with humans, there is a direct link between the quantity and composition of the food, housing conditions and the health status of the animals.

If farm animals are to be productive (milk, eggs, meat etc.), it is important that they get suitable food in sufficient quantities. If the fodder production is limited (which usually is the case), it might be economically valid to keep less animals but supply them with sufficient food. Organic legislation restricts the number of animals per unit land area.

The appropriate quantity and the mix of feed items will of course depend on the type of animal, but also on its main use (e.g. chicken for meat or egg production, cattle for milk, meat or draft etc.). In milk production for example, cows producing milk should be given fresh grass and possibly other feed items of sufficient protein content.

On the same diet, draught animals would rapidly become exhausted.

A balanced diet will keep an animal healthy and productive. Whether or not a farm animal receives the appropriate amount and kind of fodder usually can be seen by the shine of its hair or feathers. For ruminants, a majority of the fodder should consist of roughage (grass, leaves). If concentrates or supplements are used (e.g. agricultural by-products and wastes), they should not contain growth promoters and other synthetic substances since they are not allowed in organic husbandry. There are variety of leguminous plants rich in protein, which can be grown in the farm as cover crop, hedges or trees. If mineral content in the available fodder is not sufficient to satisfy the animal's requirements, mineral salt bricks or similar feed supplements can be used as long as they are allowed in organic.

In many regions, favorable periods with abundant fodder alternate with less favorable periods when there is almost nothing to feed to the animals. However, keeping animals means providing fodder throughout the year. Fodder can be produced on the farm as grazing land or as grass or tree crops used for cutting.

While grazing requires less labor than shed feeding, more land is needed and appropriate measures to keep the animals away from other crops must be undertaken. Grazing may lead to a lower productivity (milk, meat) in case not well managed but usually is the more favorable option concerning health and welfare of the animals.

Shed keeping, however, has the advantage that the dung can be easily collected, stored or composted and applied to the crops. Whether grazing or shed feeding is the more suitable option will mainly depend on the agro-climatic conditions, the cropping system, and the availability of land. A combination of shed feeding and grazing in a fenced area may be an ideal combination of high productivity and animal friendly husbandry. In organic farming rules, there are specific conditions for feeds, e.g. ratio of allowed organic and non-organic feed, mineral and microbial feed additives, silage additives, vitamins, gelling agents, sensory additives, thickening agents and antioxidants. At the initial stage of organic animal husbandry, non-organic feed of known origin is allowed at a certain share (national legislation have articles setting limits on this issue). In extensive grasslands of semi-arid areas, however, grazing may be the only suitable option.

In organic animal husbandry, there are specific requirements for housing conditions and a limit for the stocking

density and the number of animals per unit area regarding outdoor and indoor management (Table 4). The reason is to prevent pollution and to provide enough space for each animal. A farmer cannot stock high number of animals, as an example 1 hectare is needed for 2 dairy cows. Table 5 shows the maximum stock density allowed and calculations are made according to the amount of N laid down by animal dung per area.

For organic poultry houses, cages are not allowed. At least one third of the floor area in the poultry house shall be solid, that is, not of slatted or of grid construction, and covered with a litter material such as straw, wood shavings, sand or turf. For laying hens, a sufficiently large part of the floor area available to the hens shall be available for the collection of bird droppings. They shall have exit/entry pop-holes of a size adequate for the birds, and these pop-holes shall have a combined length of at least 4 m per 100 m^2 area of the house available to the bird. Poultry houses shall be constructed in a manner allowing all birds' easy access to open air area. The total stocking density shall be such as not to exceed the limit of 170 kg of Nitrogen per year and hectare of agricultural area. Each poultry house shall not contain more than:

i) 4 800 chickens,
ii) 3 000 laying hens,
iii) 5 200 guinea fowl,
iv) 4 000 female Muscovy or Peking ducks or 3 200 male Muscovy or Peking ducks or other ducks,

Table 4. The indoor and outdoor areas permitted for some animal species in the European Union organic farming

	Indoors area (net area available to animals)		Outdoors area (exercise area, excluding pasturage)
	Live weight minimum, kg	m^2/head	m^2/head
Breeding and fattening bovine and equidae	up to 100	1.5	1.1
	up to 200	2.5	1.9
	up to 350	4.0	3
	over 350	5 with a minimum of 1 m^2/100 kg	3.7 with a minimum of 0.75 m^2/100 kg
Dairy cows		6	4.5
Bulls for breeding		10	30
Sheep and goats		1.5 sheep/goat	2.5
		0.35 lamb/kid	0.5

Table 5. The area required for different animal species in the European Union regulation on organic production (EC889/2008)

Class or species	Maximum number of animals per ha equivalent to 170 kg N/ha/year
Equines over six months old	2
Calves for fattening	5
Other bovine animals less than one year old	5
Male bovine animals from one to less than two years old	3.3
Female bovine animals from one to less than two years old	3.3
Male bovine animals two years old or over	2
Breeding heifers	2.5
Heifers for fattening	2.5
Dairy cows	2
Cull dairy cows	2
Other cows	2.5
Female breeding rabbits	100
Ewes	13.3
Goats	13.3
Piglets	74
Breeding sows	6.5
Pigs for fattening	14
Other pigs	14
Table chickens	580
Laying hens	230

v) 2 500 capons, geese or turkeys;
vi) the total usable area of poultry houses for meat production on any single unit, shall not exceed 1 000 m^2;

Similar prerequisites are also present for other livestock including organic beekeeping and organic aquaculture.

In most smallholder farms, fodder cultivation will compete for space with the cultivation of crops. Whether fodder cultivation (and thus animal husbandry) is economically more beneficial compared with crop production must be assessed case by case. However, there are some options for integrating fodder crops in farms

without sacrificing much land. Below are some examples:

- Grass or leguminous cover crops or intercrops in tree plantations
- Hedges of suitable shrubs
- Shade or support trees
- Grass on bunds against soil erosion
- Grass fallows or green manures in the crop rotation
- Crops with by-products such as paddy straw or pea leaves

The management of pastures is crucial for a good herd management. It is also important to practice appropriate management throughout the year. There are many different types of grasses, and every climatic region has grasses, which are specifically adapted to the conditions. In some cases it may be worth considering to till the grazing site and sow grass varieties that are more appropriate to the animals' needs.

Overgrazing is probably the most significant threat to grassland. Once the protective grass cover is destroyed, the top soil is prone to erosion. Degraded pastures or land with little plant cover is difficult to re-cultivate. Therefore, it is important that the use and intensity of grazing on a particular piece of land is appropriate to its production capacity. Sufficient time must be given to a pasture to recover after grazing. The reason to restrict number of animals per unit area is to overcome overgrazing, promote plant cover as well as preventing N pollution. For organic beekeeping, an area with a diameter of 3 km has to be certified as organic based upon the average distance bees can fly.

Fencing of areas and rotation of the grazing animals on several pieces of land is the best option for managing the farm and the overall landscape. Creating "grazing cells" restores overgrazed pastures, reduce the incidence of intestinal parasites encountered while the animals graze, and increase land productivity. The intensity and timing of grazing, as well as the cutting of the grass will influence the varieties of plants growing in the pasture.


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Current situation on world markets for organic products

Demand for organic food production is increasing from year to year, as number of farmers producing organic food have expanded exponentially in recent years, so too could the markets for many neglected foods and for the produce of organic food systems. Consumption of organic products has been growing rapidly for the last years in developed countries. Accordingly, the demand for raw materials is growing as well. Since the early 1990s, organic food sales have increased by 50% and sales continue to grow while organic fruit and vegetables have been growing the fastest compared to other organic products in agriculture.

Organic foods still comprise 1-2% of total global food sales with gradually increasing turnover in the consumer markets in developed countries (El-Hage Scialabba and Hattam 2002; Sahota, 2017). The highest share of organic food sales is 8.4% of the market in Denmark. In US retail food market, the share of organic is 5% dominated by fresh produce. Sahota (2017) reported that global sales of organic food and drink expanded by about 10 percent reaching to 81.6 billion US dollars in 2015, whereas, it was 17.9 billion dollars in 2000. The highest growth was in North America, which now accounts for over half of international sales (Sahota 2017).

According to the FIBL research of 2017, in 2015 among the rapidly growing organic products all over the world; the traditional products of the countries such as tea, rice and spices in India; milk, dairy products in Denmark; meat and meat products in Argentina, banana in Central America and African countries; dates in Tunisia; olive oil, dried and hard-shell fruits in Turkey, have stood up as top organically produced products. The number of producers engaged in organic production are more than 2.4 million. About 35% of these producers are in Asia, 30% in Africa and 19% in Latin America. India is leading with 585 200 producers followed by 203 602 producers in Ethiopia and 200 039 producers in Mexico (FIBL, 2017)

"The global market for organic production have been increased five-fold between 1999 and 2013. In 2013, global sales of organic food and drink had reached $72 billion, with Europe and the United States driving 90 percent of the world's sales. Indeed, the United States has the largest appetite for organic produce by some

distance with sales amounting to just under $27 billion in 2013. Germany is in second position with $8.3 billion. Demand is still strong across the European Union as a whole". https://www.forbes.com/sites/niallmccarthy/. FIBL 2017 survey reported that Organic Monitor, a market research company estimates the global market for organic products in 2015 to have reached 75.7 billion euros. North America is the leading market with 38.6 billion Euros (51%) followed by Europe with 29.8 billion Euros (39%) and Asia total 6.3 billion Euros (8%). As single countries, the United States market is listed top with 35.8 billion euros, followed by Germany (8.6 billion euros) and France (5.5 billion euros). In 2013 official market data was for the first time ever published for China (2.4 billion euros), making the country the fourth biggest organic market in the world and in 2015, reaching to a market size of 4.7 billion Euros (Figure 34). The highest per capita spending was in Switzerland (262 euros) followed by Denmark and Sweden near 200 Euros.

Although the market for organic product grows, it appears the organic sector is unconcerned about competing standard setters and brands making claims on sustainability (Willer and Kilcher, 2011). This position is strengthened by the protection

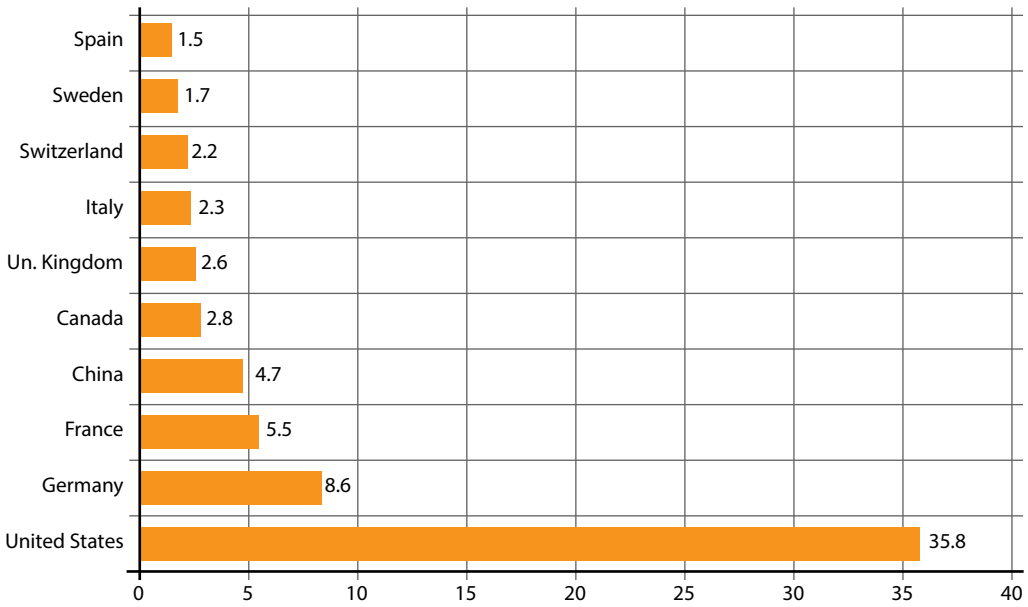

Figure 34. The total retail sales in World's largest markets for organic products, billion Euros

that the EU, USA, and other countries' regulations provide to the organic name and thus supports consumer confidence.

The sector perceives larger threats to its growth from policies that favor GMOs and the agrochemical industry.

Supply chain in Uzbekistan

It is important to note that Uzbekistan is currently increasing production of fresh vegetable and fruits as well as dried produce for the export markets. Russian bazars, which lose market share to supermarkets very quickly, are the major market for Uzbekistan's vegetable and fruits now. Unless serious fundamental policy changes are made in Uzbekistan, this situation is unlikely to change.

Currently, there is no local market for organic food in Uzbekistan. Primarily, this is due to the fact that, consumers are not fully informed about organic products. Uzbekistan has drafted law on organic agriculture and is going to adopt to set up a legal framework that regulates relations in the field of organic agriculture and organic food production as well as forms and methods of control over the production and labeling of such products. Another serious challenge that hampers the development of organic farming and organic food production are low level of awareness of most market players about the difference between organic farming enterprises, dehkan farms and their products and traditional farming enterprises and dehkan farms. Not only consumers are insufficiently aware, but also most producers do not have a clear understanding about which product should be considered as organic, how to name the product and which standards it should meet.

At the same time, the consumer market for high quality foods has increased noticeably in Uzbekistan and the market for goods labeled as "organic" is one of promising areas in the development of agriculture and consumer market in the Republic of Uzbekistan.

Uzbekistan's ultimate goal is to supply safe and nutritious food items for its citizens in the long-term span. For this reason, increasing agricultural production for the growing population seems to be inevitable, however sustainable intensification must be provided. In addition, policies to improve living conditions and welfare in agricultural sector and rural areas, supplying farm commodities to customers in

reasonable prices, and increasing the value added by processing and marketing companies are also among the priorities of the Government.

Because organic and fair trade certified commodities in Uzbekistan (peanuts, chickpeas, cherries, bee berries, mulberries, almonds, flax seed, sesame seeds) have been produced as export oriented and on a contracting base, there seems to be more marketing opportunities also in the domestic market in the future. The price of organic products, exported from Uzbekistan, varies largely, but generally ranges from 20 to 30 percent above the price for conventional products, but can sometimes reach 100 percent (Personal communication with private organic product exporter in Uzbekistan). If the organic system being established in Uzbekistan is introduced to the world organic community, and organic products of Uzbekistan origin are presented in international fairs and expos, more companies will raise their interested in making contracts with Uzbek farmers.

In big cities, such as Tashkent, Samarkand, and Bukhara, there are modern marketing bazaars for agricultural products. In smaller cities and districts, these products are mostly sold in local bazars where sometimes producers sell their own products directly. Mainstream retailers, supermarkets, and smaller grocery stories have started to open new branches in different cities and towns depending on their population and consuming potentials. However, no certified organic products were encountered in these markets. This is partly because of the higher prices and lower purchasing power of domestic consumers and because all organic production is performed under contracts. Much work needs be done to introduce domestic consumers with certified organic products and develop the domestic market.

There is lack of modern storage and processing facilities meeting the requirements for organic products and allowing stable supplies and longer marketing periods. For organic products, all the facilities where the food is stored and processed must have the required qualifications. No non-organic products or inorganic ingredients and material that may cause contamination should be stored in these facilities or strictly monitored and separated. For this reason, buildings where organic products are stored, processing facilities, ingredients used, equipment, product packaging, and final products storage buildings must all meet specific standards valid in Uzbekistan and those stated in reference organic standards.

The availability of significant land and other natural resources, as well as possessing the traditional culture of land cultivation without the use of synthetic fertilizers or pesticides provide huge opportunities for market development. Moreover, the centuries-old values of the Uzbek people, who have historically lived in harmony with nature, created public relations that are adequate to the system of ecological crop and livestock farming.

Samarkand region has steppe climate with hot, dry summers and cold winters. Because of low-level industrialization and urbanizations in the rural areas, soils are not contaminated with chemicals. Air pollution is not a major problem, either. Farming activities are closely related to nature and family farms represent the main socioeconomic structure of the rural life style. All over the world, many organic farmers share their rural life experience or local specialties with urban people through integrating agro-tourism into their farms. These may be limited to serving local food or specialty products or may have accommodation and tracking or other sports facilities. Although people living in rural areas trying to make their living from agriculture, income generated from non-agricultural sources may play an important role. Rural areas may face some problems such as electricity blackouts, lack of fresh water for household use and irrigation, and lack of transportation possibilities, the Government is trying to make every effort to develop rural infrastructure. One of the opportunities of developing rural areas, increasing rural livelihoods, improving the living conditions of rural people, and providing a sustainable rural life in the long-term span is to utilize the unique climatic and natural characteristics of the region. Organic agriculture appear as a mean of utilizing these characteristics in Samarkand region. As more farmers involve in organic agriculture, rural people, rural women, rural youth, and other stakeholders such as processors, marketing companies, and governmental agencies will benefit from this situation.

Pearls of Samarkand, a private company, initiated organic fair-trade products in Uzbekistan. Pearls of Samarkand is really a pioneer in Uzbekistan to develop organic sector. Considering the information gained from the interviews conducted with the experts of this Company, the basic value chain of their activities is simply shown in Figure 35. Pearl of Samarkand is an export-oriented company connecting Samarkand farmers with Austrian companies through farmers'

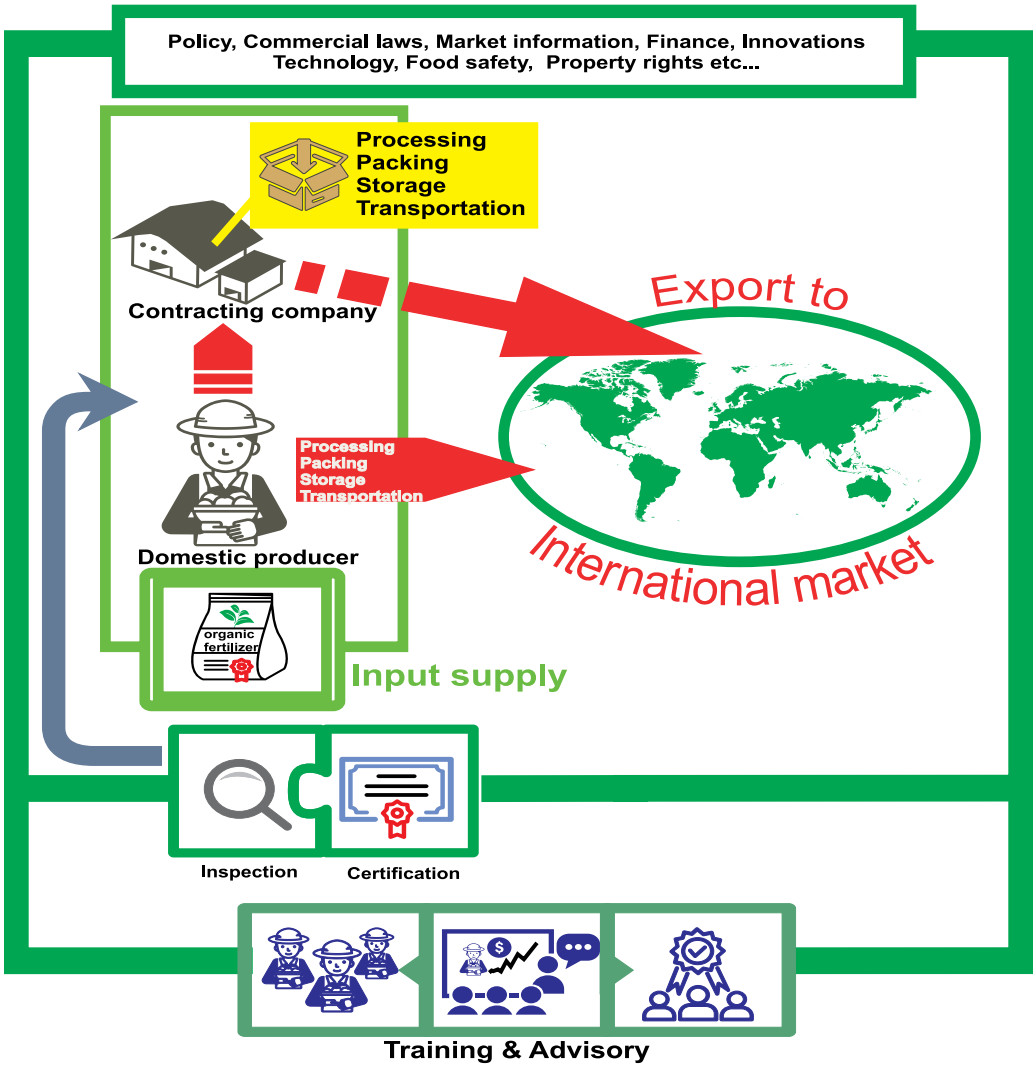

Figure 35. The current organic value chain established by private companies in Uzbekistan

cooperatives. Farmers producing mostly peanuts, chickpeas, cherries, bee berries, mulberries, almonds, flax seed, and sesame seed around Samarkand region have established their member-owned cooperatives to purchase inputs and sell their commodities collectively in reasonable prices, and to make collective contract with processing and marketing companies. Pearl of Samarkand is the domestic contracting company, which get technical assistance and certification support through the foreign importer company

(Boz, 2017). It also provides training and advisory service to cooperative members who are the producer farmers. Training and advisory services are to ensure that farmers apply the suggested practices and regulations, which are predetermined for organic and fair-trade certifications. Pre-production input supply is provided to the contracted farmers. Once commodities are produced, the post-harvest practices are also carried out according to organic and fair-trade rules and regulations. Harvested products are transported to storage house of Pearl of Samarkand. After proper sizing and quality classification for standardization, products are stored, and then exported to the Austrian company. The Company applies proper packing for the products and send them to mainstream retailers to make them available for consumers.

Domestic consumption is also very important to develop a sustainable production system and value chain for the export markets (Figure 36). To develop a long-lived domestic market for organic products, first, there must be sufficient number of consumers purchasing organic products and the product quality, range and price must satisfy their demand. In Uzbekistan, however, there is a lack of domestic

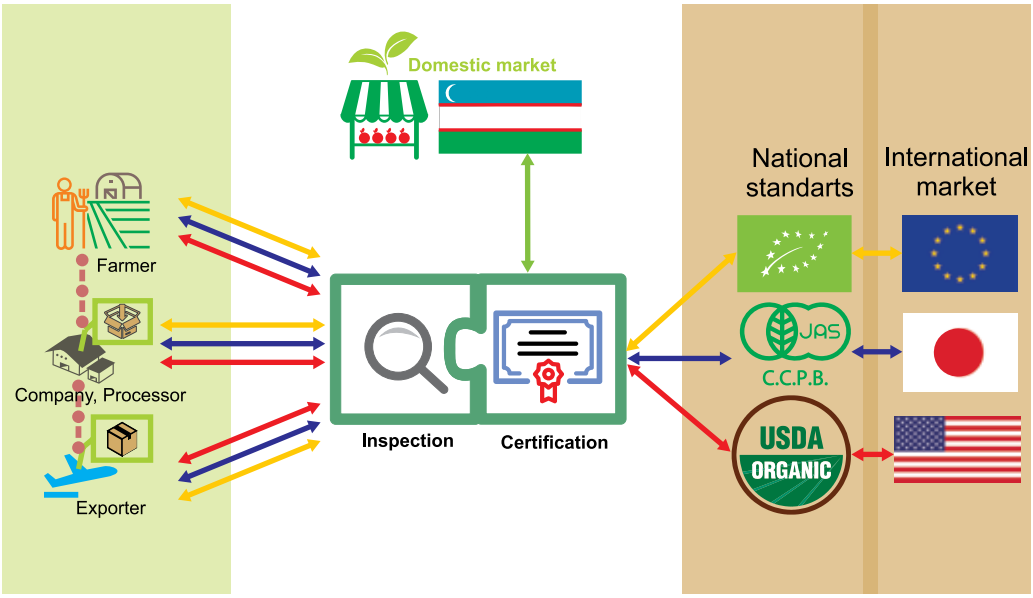

Figure 36. Production and certification process according to the standards required for organic products to be sold at the domestic and/or international markets

consumers and lack of awareness. In addition, the following limitations are observed during the interviews:

- Lack of supermarkets selling organic products
- Lack of regional organic bazaars
- Lack of sustainable supply
- Lack of awareness and information about organic products
- Lack of distribution channels between producers and consumers
- Lack of data collection and keeping system about organic products, and all stakeholders involved in organic products' distribution and marketing stages.

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Regulatory framework on organic food and farming

4

International and national legislation on implementing rules, labelling and use of the logo

According to the data of 2015, 88 countries have their own regulations governing organic agriculture out of 179 countries where certified organic farming is practiced with data collection. Almost in all countries having a legislation on organic agriculture, there is a competent authority, which is mostly the ministry of agriculture. Furthermore, other aspects of the organic system as the authorization of control bodies, inspection and certification, rules for implementation, import-export requirements, allowed inputs, substances and methods, market surveillance, and fraudulence charges are all stated within the regulatory framework.

In countries with the legislation on organic agriculture, the first difference may occur in respect to the scope of the legislation. Organic farming (agricultural food and non-food products) and food production (including processing) is common in all, whereas some may additionally include wild harvest, aquaculture, beekeeping, mushroom, yeast production, or seaweed production. Organic textiles (e.g. Global Organic Textiles Standards) and cosmetics are generally excluded in national legislation or in data collection since different standards are applied in these two subsectors.

The scope of the Codex Alimentarius standard on organic agriculture (CAC/GL 32-1999 Guidelines for the Production, Processing, Labelling and Marketing of Organically Produced Foods (latest revision available is in 2013) (www.codexalimentarius.net) take account of a) unprocessed plants and plant products, livestock and livestock products to the extent that the principles of production and specific inspection rules (in Annexes 1 and 3) and b) processed agricultural crop and livestock products intended for human consumption derived from (a) above.

"Organic" is a labelling term that denotes products that have been produced in accordance with organic production standards and certified by a duly constituted certification body or authority. "Organic" is accepted as synonymous to 'ecological' and "biological". The organic principles and rules should be applied on the farm during a conversion period of at least two years before sowing, or in the case of perennial crops other than grassland, at least three (3) years before the first harvest of products. The conversion period may only begin

Standards on organic agriculture may undergo frequent changes so please check for the final version from the below listed useful links:

1. www.codexalimentarius.net/OFFICIAL STANDARDS/Official Codex standards/List/CAC/GL s32 (Codex Alimentarius standard);
2. www.ams.usda.gov/nop (USA standards on organic);
3. www.maff.go.jp/soshiki/syokuhin/hinshitu/organic (Japanese standards on organic);
4. www.gost.ru (Russian and Interstate organic standards);
5. http://europa.eu.int/eur-lex (EU standards on organic);
6. www.organic.rules.org (general for organic standards)

when a production unit is under an inspection system. Due to the WTO/TBT agreement, Codex standards have become much more significant in international trade. Member countries signed on to WTO are obliged to accept the Codex international standard in case of disputes.

The sources that are specifically devoted to organic agriculture comprise intergovernmental approved guidelines (such as those elaborated by the Codex Alimentarius Commission), as well as standards developed by international civil society organizations (such as IFOAM).

The Codex Alimentarius Guidelines on organically produced food are an authoritative source meant to provide assistance to governments wishing to develop national organic agriculture legislation. The IFOAM Organic Guarantee System is a private endeavor to facilitate the development of quality organic standards and certification worldwide, and to provide an international guarantee of those standards and certification. The IFOAM norms are generally respected as the international guidelines for elaboration of national standards and inspection systems, and they are often used as a reference by standard setters and legislators.

Governments are generally slow to draft legislation to set these standards, however; the first such legislation appeared at state level in Oregon and California in the United States, in 1974 and 1979, respectively. Consumers created a persistent demand for organic agriculture and beginning in the 1980s, local and national governments responded to the enlarging markets by setting up regulatory frameworks with legislation on organic agriculture.

In the European Union, the first legislation on organic farming Council Regulation (EEC) No 2092/91 defined the use of certain plant protection products, fertilizers, soil conditioners, as well as certain non-organic feed materials, feed additives and feed processing aids and certain products used for cleaning and disinfection. Later, livestock production was included in the scope in 1999. This first regulation went through a thorough revision and led to the regulations (1) Regulation (EC) No 834/2007, which lay down basic requirements and it is further completed by (2) Regulation (EC) No 889/2008 of 5 September 2008 laying down detailed rules for the implementation of Council Regulation (EC) No 834/2007 on organic production and labelling of organic products with regard to organic production, labelling and control (3) Council Regulation (EC) No 1235/2008 of 8 December 2008 laying down detailed rules for implementation of Council Regulation (EC) No 834/2007 as regards the arrangements for imports of organic products from third countries (4) In 2010, with EC 271/2010 of 24 March 2010 on the use of the EU logo, leaf shaping white stars on green background became compulsory.

In 1990, USDA was mandated through the Organic Foods Production Act (OFPA) to establish a national act at federal level for all US organic products. Up through the 1990s, and before any national standards were implemented, a patchwork of State legislation existed regarding organic agriculture, with 17 states requiring certification for products labelled organic by the late 1990s. Thirteen other States had some type of regulation (although some had very minimal standards) that did not require third-party certification or inspection but each had their own certifiers. "National Organic Program" issued in 2000 is the act governing organic agriculture at federal level in the United States. It should be mentioned here that contrary to the EU laws, there is no closed list of allowed substances in the National Organic Program; instead, the legislation states that "synthetic substances" are generally prohibited, while "non-synthetic substances" are generally allowed with few exceptions in both cases. In the EU legislation, there are only "positive lists" stating the inputs and other substances allowed for use, whereas US legislation has both "positive" allowed products and 'negative' list for prohibited ones. Despite this difference in the format, the range of authorized substances is similar in the USA and in Europe. The transition period is three years for all plant products in US but in the EU, it varies as 2 years for annuals and 3 years for perennials.

US/European Union Equivalency Arrangement (NOP/EU) became effective from 1 June 2012. A "two-way" import-export agreement whereby products certified to either country's organic program can be represented and sold as organic in either country except those listed in Table 9. Country of Product Origin: The arrangement is limited to organic products of EU or US origin. This includes products that have been either (1) produced within the US or the EU or (2) products whose final processing or packaging occurs within the US or EU. Products processed or packaged in the US or EU that contain organic ingredients from foreign sources that have been legally imported as organic into the US or into the EU are also covered by the arrangement. Scope of Arrangement includes all organic products of agricultural origin included within the scope of the USDA-NOP and EU Regulations with the exception of aquaculture. Certification and Paper Work: Certification/ Attestation of compliance with the NOP and or EU organic regulations by an NOP or EU accredited certifying body is a common requirement for both countries.

The US organic products exported to the EU under the NOP/ a "Certificate of Inspection for Import of products from Organic product into the European Community" (the Certificate of Inspection') as per Article 13 and Annex V of Commission Regulation (EC) must accompany EU No.

All EU organic products exported to the US under the NOP/EU Equivalency Arrangement must be accompanied by an "NOP Import Certificate". This document must be completed by the exporter and approved by the EU Accredited Certification Body certifying the product as organic. Labeling Rules: NOP and EU logos may be used on products originating in either country for products with 95% or more content that is organic.

In the United States, the Secretary of Agriculture, assisted by the Administrator for the Agricultural Market Service, is responsible for the approval and supervision of certification bodies. Once the certification bodies are approved, they can inspect and certify organic products according to NOP in different parts of the world. In European Union, all certification bodies must be accredited according to ISO 17065 before applying for authorization to the EU. For certifying organic production in non-EU countries (except those listed in the third country list or those accepted as equivalent) certification bodies have to be authorized. Based upon EC 1235/2008 regulation, EU

Table 6. Limitations in equivalency between organic agriculture of the USA and the EU

Products Exported to the United States of America	Products Exported to the European Union
1. Agricultural products derived from animals treated with antibiotics may not be exported to the USA	Organic crops produced using antibiotics (streptomycin for fire blight control in apples and pears) may not be exported to the EU
2. Organic aquatic animals (e.g. fish, shellfish) may not be exported to the USA	

announces the certification bodies authorized to perform certification within the specified scope (e.g. plant production, processing, livestock etc.) according to the EU regulation EC 834/2007 in third countries. Thus, this list is very frequently modified therefore the latest available version has to be checked to seek authorization of any foreign certification body for a specific non-EU country. As an example, an accredited certifying body also authorized by the EU, may have the right to do certification according to the EU regulation in Kyrgyzstan but for Uzbekistan, they may not have authorization (Figure 37).

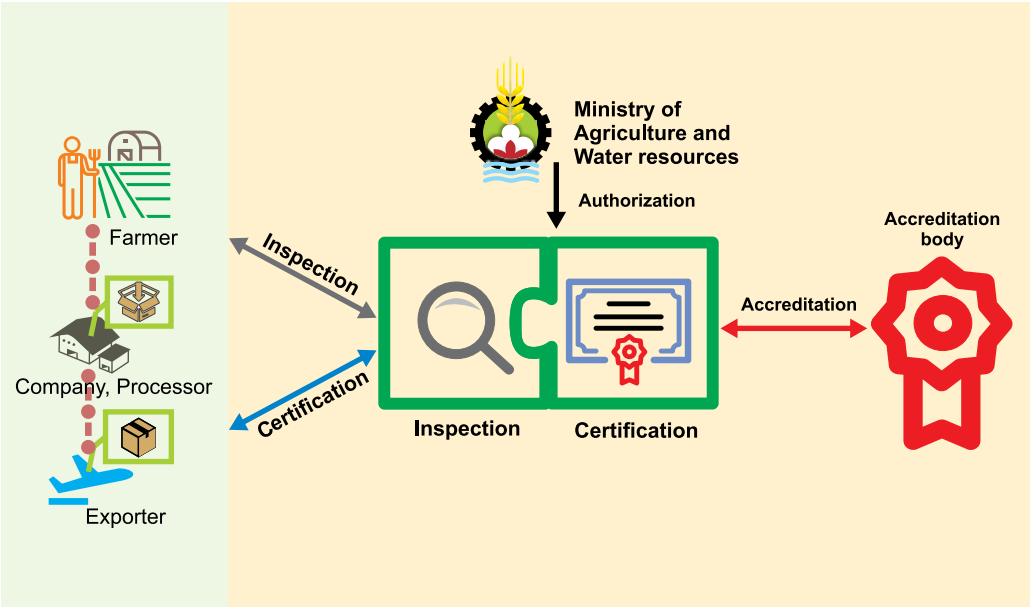

Figure 37. Inspection and certification of organic operators and accreditation and authorization of inspection and certification bodies proposed for Uzbekistan

Currently, Russia has three GOST standards for organic and one more for interstate GOST of the Eurasian Union that will take effect as of 2018 as follows:

1. GOST R 56104-2014 "Organic food products. Terminologies and Definitions";
2. GOST R 56508-2015 "Products of organic production. Rules of production, storage, transportation"
3. GOST R 57022-2016 "Products of organic production. Procedure for voluntary certification of organic production";
4. GOST 33980-2016 Interstate Standard "Products of organic production. Rules for production, processing, marking and sale" approved by Russia, Kyrgyzstan and Tajikistan.

Also a draft federal law "On production and circulation of organic products (products of organic production) and on amendments in certain legislative acts of the Russian Federation" is under consideration by the State Duma (Edwardovich, 2017).

In Australia, the Export Control Orders (Organic Produce Certification) charge the Australian Quarantine and Inspection Service (AQIS) with conducting audits of authorized certification organizations to ensure ongoing compliance with the National Standard and importing country requirements. AQIS-approved certifying organizations thus perform certification and inspection services, while AQIS itself verifies the aptitude of the certification organizations (The Australian Organic Industry: A Profile, 2004).

A product may be labeled "organic" ("bio", "eco") only after the issuance of the certificate by the accredited and authorized certification bodies after successful completion of the transition period. In the world market, developed countries are the main markets for certified products with more than 95 percent of sales, but there is a rapid increase in some other countries such as China, Brazil, Argentina, Indonesia, United Arab Emirates, Russia and Egypt. Similarly, the EU member countries account for the bulk of the European market (more than 90 percent), but increases occurred in non-European countries as well. Every country defines its strengths and advantages in developing organic production and/or markets. In Europe, Finland is the world leader with the largest area from where organic products are harvested from nature; on the other hand, Liechtenstein has the largest share of certified land and Germany the biggest market volume.

The recognition that organic agriculture could help countries achieve environmental objectives further encouraged governments to adopt agri-environmental laws to promote organic farming (e.g. 1992 reform of the European Community's Common Agricultural Policy). The only policy common to both the EU and US is government-defined organic standards, which provide information to buyers about the unobservable characteristic, "organic". At this point, the commonalities in major policies between the two regions disappear. The EU has a wide variety of policies designed to increase the amount of land farmed organically. Keeping with their notion that organic farming provides benefits to society. The program includes green payments (subsidies), demand side policies, and land targets for organic production. The US funding for organic production and marketing has been limited, and although new programs have recently emerged, government efforts have resulted from intensive lobbying by the organic industry, unlike in the EU, where the governments actively support organic agriculture.

Viewing organic agriculture as providing public goods offers and economic rationale for government intervention in the market, which many European governments do. Viewing organic food as differentiated product, created by using and ecological production system, suggest that a government should only regulate if there is concern about consumers being able to identify the product as "organic" or to reduce transaction costs of doing business, which the approach is taken by the US Government. International trade law is also very relevant when drafting national legislation on organic agriculture: there are two WTO instruments that are most relevant for national laws, namely GATT and the TBT Agreement. Although the exact implications of these WTO agreements for national or regional legislation on organic agriculture are not always clear, three general remarks can nonetheless be made. The WTO principle of non-discrimination implies that national legislation on organic agriculture needs to be drafted and applied in an origin neutral manner so as not to discriminate, neither *de jure* nor *de facto*, between organic products originating in different WTO members or against these in favor of domestically-produced ones (i.e. in application of the principles of MFN and national treatment). In addition, organic regulations and standards shall not be adopted or applied with a view to creating "unnecessary

obstacles to international trade", and thus must not be more trade-restrictive than necessary to fulfil their stated legitimate objectives. Lastly, WTO law imposes a series of ex-ante and ex-post transparency requirements on the development of national or regional organic laws, whether enacted as mandatory regulations or voluntary standards.

Draft law on organic agriculture in Uzbekistan

For agricultural commodity producers to engage in organic farming and manufacturing organic agricultural and food products in Uzbekistan, especially for export, there is a need to develop the organic system in the Republic of Uzbekistan, which should develop procedures align with the national and international requirements and build trust for the buyers.

Control bodies that carry out inspection and/or certification functions rely not only on the national standard but also on international standards as that of the importing countries. International standards on organic contain clear bans of using artificially created chemical fertilizers, products based on genetically modified organisms, plant growth regulators, animal fattening stimulators or antibiotics. No "chemicals" (except those allowed in the standards) including artificial coloring agents, flavors, preservatives, antioxidants, or thickeners may be used in organic food production. Furthermore, it is insufficient to check the finished product to determine the safety of organic goods. Certification bases on conformity of inspection of the whole production to the reference legislation.

Despite the rapid developments of organic and other certified quality assurance systems in the European Union, United States, Japan, China, Russia, Turkey and other many other countries, their development in Uzbekistan remains relatively slow. There is an urgent need to develop regulatory framework for sustainable agricultural systems by harmonizing national legislation with international standards and procedures and by adopting these systems for commodities possessing potential, such as cotton, wheat, fruit, nuts and vegetables as well as for beekeeping and wild-product harvesting. In addition, income-generating opportunities exist, especially for women, in organic fiber processing (e.g. cotton, silk), non-wood forest product, sun-dried fruit, vegetable

and herb processing. Thus, harvests from wild areas and on-farm processing will address issues such as sustainable natural resource management and empowerment of rural women.

In Uzbekistan, there are individuals/ institutions who had been participating in organic agriculture-related activities. As reported by some of the importing countries, organic products are already available in Uzbekistan certified according to the legislation valid in the importing countries. Some donor agencies active in Uzbekistan's agriculture had also attempts to promote organic farming by application of elements and practices in farmers' fields. There are projects already implemented with financial support from the United States, Germany and South Korea.

The Resolution of the President of the Republic of Uzbekistan No. PP-2460 dated December 29, 2015 "On measures to further reform and develop agriculture in 2016-2020"; The Resolution of the Cabinet of Ministers of the Republic of Uzbekistan No. 251 dated August 29, 2015 "On approval of the concept and complex of measures to ensure healthy nutrition of the population of Uzbekistan in 2015-2020".

The goals of these two legislative acts clearly state the objective of developing aforementioned clearly correspond to the objective of developing a new organic legislation in Uzbekistan in the coming years. Because these legal acts represent an important national strategy for development of sustainable agricultural policies and resources management in Uzbekistan. These regulations can also serve as a basis for development of organic production in Uzbekistan.

The concept of "organic product" was introduced into Uzbek legislation by State Standard of the Republic of Uzbekistan O'z DSt 3084:2016 "Organic Agricultural and Food Products. Terms and Definitions" developed by the Center for Standardization under the Ministry of Agriculture and Water Resources. It was approved jointly with the Agency for Standardization, Metrology and Certification of the Republic of Uzbekistan (No. 05-765 dated May 31, 2016). The aforementioned legal act includes 50 terms and definitions with respect to organic agricultural and food products, such as organic agriculture, organic production, organic food, genetically modified organisms (GMOs), humus, fertilizers, etc.

Based on studies and analysis, it should be noted that since the

Law "On Organic Agriculture and Production System" and relevant legislative framework is not yet adopted, the efficient implementation and development of organic agriculture and organic production are limited with:

- The lack of systems of coordination, standardization, certification and control of organic production;
- The need for establishing an effective system of registration and authorization for organic agriculture producers;
- The lack of successfully established marketing system;
- The uncertainty regarding a single coordinating State body responsible for development of organic legislation and a system of organic agricultural production;
- The need for adopting national policy guidelines and strategies in the field of organic agriculture and production; and
- The creation of market marking "logo" for trade of organic agricultural products.

International experience and best international practice show that the following necessary steps should be taken at the initial stage to address the aforementioned deficiencies and to ensure the development of organic production:

- Development and adoption of the Law "On Organic Agriculture and Production System" with the participation of all public and private stakeholders and other related parties, which will clearly define the tasks and responsibilities of all involved ministries and agencies;
- Development of State standards possessing implementation rules, independent accreditation and certification bodies and surveillance system in the field of organic agriculture and food production;
- Establishment of the State system for registration of production entities; production, processing, import and export of organic products and surveillance;
- Creation of domestic organic markets and export of organic products to foreign markets on the basis of efficiency of scientific and practical aspects of specific proposals and recommendations;
- Development and adoption of national policy guidelines and strategies in the field of organic agriculture and production;
- Development of "logo" for organic agricultural products;
- Adoption of a regulation governing the activities of the special Interdepartmental working group responsible for developing and adopting a national system

Preliminary draft Law "On Organic Agriculture and Production System"

A preliminary draft Law "On Organic Agriculture and Production System" has been developed based on international standards in the framework of the FAO project TCP/UZB/3501: "Institutional capacity building to develop organic agriculture and to promote Good Agriculture Practices (GAP) in Uzbekistan". The draft is based on the IFOAM Basic Standards and the Codex Alimentarius Guidelines. The draft Law contains 47 articles divided into 7 chapters, which include: (i) general provisions (scope, objectives, principles, and definitions); (ii) governance (competence of the Cabinet of Ministers, MAWR, and other bodies); (iii) rules of organic production; (iv) certification; (v) marking of organic products; (vi) import/export; (vii) enforcement. The draft Law "On Organic Agriculture and Production System" includes:

- purpose, goal and principles;
- key definitions and terms in organic production;
- institutional organization;
- requirements for production of organic products;
- rules for growing crops and livestock;
- rules for processing;
- prohibitions or restrictions on the use of certain substances or production methods, etc.;
- conversion (transformation);
- marketing and marking of organic products, creation of a national organic logo;
- system of certification of organic products, including group certification
- maintaining a register of organic farming producers;
- export / import of organic products;
- measures of State support for organic producers;
- discrepancy / violation of rules.

and relevant legislation in the field of organic agriculture and production, including the Law "On Organic Agriculture and Production System".

UZStandard plays a key role in the establishment of the national inspection and certification system. UZStandard has the necessary information and knowledge on ISO17065 Accreditation which is the basic requirement for the international control and certification of organic and Global GAP products, however, they have noted that due to their current structure they do not have the Mutual (or Multilateral) Recognition Arrangements (MRAs/ MLAs). They are making efforts

for a structural modification and for obtaining the MRAs/MLAs. In addition, they are working in coordination with international accreditation bodies for different standards and that they have been conducting accreditation activities through TURKAK and SNAS.

Private standards on or accompanying organic products

Based upon the demand of the markets, private standards are developed by companies, farmer groups or associations. Some of these standards are putting forth specific conditions above the national legislation that set up the borderline or add a complementary feature mostly in respect to social and ethical values. Some of these standards can be named as Demeter for biodynamic, Naturland, Bioland, Global-GAP, Geographic indications (especially in Europe) or Fairtrade, which are all inspected and certified according to different standards. The retail chains, especially in Europe, continue to endorse Global-GAP at wholesale level to show their support for the environment and food safety. At national level, many countries have issued regulations based on GAP and documentation of the inputs and methods utilized. GAP whether based on nationally developed legislation or the worldwide-accepted Global GAP, is different from organic. GAP allows the use of synthetic fertilizers and pesticides, irradiation and GMO in case approved by the national legislation of the producer and importer country. Therefore, there is no equivalency between these two quality standards.

The organic standards, whether official or private are more restrictive in terms of inputs and methods allowed, however national organic legislations generally do not cover social issues or environmental policies and leave it to the national laws and regulations. On the other hand, consumers in developing countries are becoming more interested in transparent value chains and local products. Market demands tend towards multi-certification such as organic products labelled also with geographic indications or fair trade. Fairtrade started mainly in commodities as tea, cacao and coffee, where products of millions of farmers were processed/ sold by only few companies. The aim was to have transparent value chains and fair sharing of the benefits among actors including farmers. Fairtrade product market has reached to 7.3 billion Euros with

a largest share in Europe (79% of the Fairtrade market). They have their own market share and specialized stores, the leading country in retail sales being United Kingdom with 2 193 million Euros, followed by Germany (978 mio Euros) and US (917 mio Euros) (Fairtrade International, 2016) in 2015. In UK, the organic market value is reported as 2 604 million Euros (FIBL survey, 2017). In the markets, more products that are organic are sold also certified as fair trade especially those from developing countries. The "Vegan Organic" is also a private standard that limits the use of all animal inputs and livestock production. The market is also enlarging in UK especially among consumers who are more concerned about more land in Europe being allocated to monocultures of feed and fodder production for animals. It can be seen as an opportunity where perennial fruit and nuts or wild collection without animal integration are predominant.

Geographic indication which is more related to the supreme quality linked to the local variety, prevailing ecological conditions or traditional processing methods are important in the European organic market primarily for wine, olive oil and cheese.

Having too many standards all for one product all requiring inspection and certification creates discussions both about its complexity and about cost. To obtain a balanced and comprehensive assessment of voluntary standards and certification, FAO invited stakeholders from a wide array of institutions to attend in their personal capacity such as farmer organizations, private companies including leading food multinationals, government agencies, donors, aid agencies, consumer associations, trade unions, research institutes, certification bodies, standard-setting organizations and many NGOs active in sustainable agriculture. Experts of the Raw Materials, Tropical, moderated sessions and Horticultural Products Service (ESCR) of FAO, many of whom have been working on issues related to environmental and social certification and have been monitoring markets for certified products since 1999. The service has also developed close working relationships with some of the leading NGOs in the field such as the International Federation of Organic Agriculture Movements (IFOAM), the Fairtrade Labelling Organizations International (FLO), Social Accountability International (SAI) for the SA-8000 standard and the Sustainable Agriculture Network/ Rainforest Alliance. These NGOs have developed an umbrella organization ISEAL.

Related Uzbekistan legislation

Organic farming and food production generally have its own legislation however many other national policies, laws and secondary legislation in Uzbekistan as well as the one of the importer country effect organic production and marketing. For example the legislation on quarantine, plant protection measures, food safety laws (e.g. maximum allowed levels for contaminants as heavy metals, microbial contamination or mycotoxins), certification, data collection, registry systems for farmers and animals, collection of wild products from forests, processing, packaging, environmental or social (working conditions, safety and security of the workers) regulations, customs regulations, certification systems, quality control standards, market surveillance measures at wholesale and retail levels are some to name. This legislative framework is being scrutinized currently for aligning to the international standards. Thus, it is recommended that once organic law is enforced other complementing legislation must go through in depth evaluation. For example, if the quarantine law obliges chemical fumigation for pest control, it has to be aligned for organic products where chemicals are forbidden.

The laws in Uzbekistan provide and encourage foreigner investments in various structures. The laws define the types of entities in which foreigners can invest, the conditions governing repatriation of profits and earnings, and the general rights and guarantees of foreign investors. The Laws on Foreign Investments and on Guarantees and Measures for the Protection of Rights of Foreign Investors adopted on 30 April 1998, the "Foreign Investment Laws", provide the legal framework for foreign investment in Uzbekistan.

The main criteria for foreigner investments are:

- Charter capital is 150 thousands USD or more;
- At least one of the participants is a foreign legal entity, and
- Foreign investor(s) own at least 30% of the total charter capital.

The implementation of charter capital differentiates between regions in Uzbekistan such as Republic of Karakalpakstan and Khorezm region. The minimum charter capital to meet

the criteria for such enterprises shall be 75 thousands USD as opposed to the above standard minimum limit. This measure is intended to stimulate investment to these distant regions of Uzbekistan. Another important issue is depending on charter capital, privileges provided by UZG such as taxation discount, taxation protection against fluctuation etc.

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The Declaration of the International Conference on Development of Organic Agriculture in Central Asia, Tashkent and Samarkand, Uzbekistan, 22-24 August 2017

The Sub-regional office of the Food and Agricultural Organization of the United Nations for Central Asia (FAOSEC) in cooperation with the Ministry of Agriculture and Water Resources of Uzbekistan organized an International Conference on Development of Organic Agriculture in Central Asia during 22-24 August 2017 within the framework of the FAO project TCP/UZB/3501 in Tashkent and Samarkand, Uzbekistan.

One hundred twenty participants, including scientists, agriculture and extension specialists, farmers and policy makers from more than 20 countries of North Africa, Europe, Middle east-Central and South Asia attended in this Conference with the aims of: exchange knowledge and best practices to raise public awareness for the development of organic production in Central Asia with regard to the latest scientific and practical advances as well as improvement of legislation and regulatory documents on organic production, whole supply chain (quality, production, processing and marketing), integration of regional agricultural economics with international requirements and overcoming of technical barriers to international trade. The Conference participants wish to declare that the following issues were raised as prerequisites to develop organic agriculture at national and regional levels. Solutions on these issues can be found on a much shorter time scale through cooperation among Central Asian and neighboring countries.

The worldwide statistics show the trends on higher increase rates in organic production systems compared to conventional methods; however, the rate of increase in the demand exceeds supply. In this respect, the world organic market is dominated mainly by developed countries. Central Asian countries are located in a very strategical location providing access to the eastern and western markets. They possess suitable climatic conditions, labor availability and are rich in biodiversity. These countries are major producers of various commodities as fruit and vegetables, cotton, nuts, pulses, oil seeds, wild harvested plants, honey, livestock production and other products. Organic farming through its requirement on crop rotation is contributing to food security and through its *eco*

production to the quality and safety of consumed products. Organic production is seen as an opportunity to reach to international markets through sustainable intensification of Central Asian agriculture. Additional certification systems especially those targeting social aspects as the Fair Trade help to build export markets.

In the Conference, the key problems identified as barriers to development of organic agriculture in the Region and disseminated to all related parties through the final declaration are as follows:

- Knowledge gap in production, processing and marketing of organic products as well as low awareness among consumers,
- Lack of harmonized of legislation and standards at regional level and problems at the implementation stage,
- Lack of government support,
- No local and only a few regional certification bodies operate,
- Inexistence of reliable and updated data on production and markets,
- Lack or unavailability of organic inputs / permitted input list,
- Lack of training programs,
- Lack of demand at domestic markets,
- Lack of research especially focusing on locally adapted organic agriculture systems addressing climate change issues.

We, as Conference participants, support that enhanced regional cooperation through involvement of FAO and national governments are required to solve these problems and develop a sustainable organic agriculture movement in Central Asia. Activities focusing on exchange of experts, organizing of training programs for farmers, processors and traders, and making training materials for capacity building, developing harmonized legislation and data collection systems will boom organic products in Central Asia. Regular regional conferences/ workshops/ training courses and implementing a regional website that allow exchange of information and data and announcements/news on relevant activities on organic agriculture will help to develop and sustain a regional network on organic agriculture.

We highly appreciate the efforts of FAO and the MoAWR of Uzbekistan for holding the Conference and hope that it will establish a strong base for a regional network, strengthen the existing ones (e.g. the IFOAM Eurasia regional group) and build up an organic cluster for all interested practitioners and activists on organic in the region, as well as, in global organic movement.


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Conclusion

The principles of organic agriculture – ban or severe limitation on synthetic fertilizers, pesticides and other chemical inputs including growth regulators, antibiotics, GMO or irradiation and promotion of crop diversification, nature protection – have probably been practiced in traditional forms for centuries. Organic agriculture implies considerable restriction of mineral fertilizer use and chemical agents to control pests, disease and weeds as well as processing aids, which have a negative effect on the environment or residues of which may accumulate in agricultural products. Organic food and farming integrate modern technology and science and seek applicable research results and innovations. However, this screening and selection is made with utmost care by evaluating their long-term effects.

The history of agriculture dates back more than 12000 years but organic agriculture started in the previous century as a solution to intensification faced during the last 50-70 years. Time span for organic agriculture is thus relatively short. The first phase of organic agriculture started in the beginning of 20th century farmers producing food using natural means, controlling pests naturally and feeding the soil using traditional farming practices that conserved and regenerated the land. Today, demand for organic food and non-food products are increasing more than the production capacity of developed countries creating opportunities for developing countries possessing a production potential.

Domestic organic market in Uzbekistan is in its infancy. The lack of organic legislation and promotion of standards, as well as the lack of support impede its growth. Reliable information on principles and mechanisms of organics, on bio-products on the scale of the country is absent, that contributes to development of greenwashing. Prices for organic in Uzbekistan, in contrast to United States and European countries, are greatly overstated. That is why domestic demand for organic, as well as domestic organic market in Uzbekistan has not yet been formed.

Demand for organic produce is rapidly increasing (worldwide by 3% each year), hence the necessity to stimulate its global production. Because of its agricultural tradition, genetic resources, work force as well as adequate environmental conditions, Uzbekistan represents a huge opportunity to contribute to global agricultural production expansion. However, some very important aspects still need to be ad-

dressed, such as international quality standards implementation, offsetting the higher cost of organic production and certification for producers and consumers and effectively market organic production.

Training and education projects are necessary to increase knowledge on all aspects of organic production, from basics to consumer demands. It is necessary to disseminate objective information in mass media and among officials about the legislation and system management as well as accreditation and certification procedures.

The International Conference on Development of Organic Agriculture in Central Asia organized by the Sub-regional office of the FAO UN for Central Asia in cooperation with the Ministry of Agriculture and Water Resources of Uzbekistan during 22-24 August 2017 in Uzbekistan created a suitable environment in Uzbekistan and in the Region that needs follow up and continuity to increase its impact.

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Annex 1. Vineyard management for organic grape production

Table 7. A year around time frame of the organic grape production activities including agronomic practices, diseases and pest control (Prepared by Dr. Saydaliev)

#	Event	Time table											
		Jan	Feb	Mar	Apr	Mai	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Winter watering	■											■
2	Prepare and repair columns and wire	■											
3	Start open covered grape trees when air temperature reaches 10°C, peeling grape arbor, clean unnecessary goods, cleaning furrows. Organize tillage practice and cultivation, weed control by hand and watering		■										
4	Infected fallen leaves, fruit nodes, residual and weeds around arbor will be a place for overwintering different pests and larva. In order to control abovementioned arbor around should be tilled at 15-20 cm.		■										
5	3% Bordeaux Mix* will be applied and cracks will be stuck with special past-glume			■	■								
6	The support can be an arbor covering a patio for shade, or can be as simple as a post in the ground to support the trunk of the vine.		■										
7	A first application 10 lime-sulfur solution can be used to control Powdery Mildew and anthracnose in vineyards.			■	■	■							
8	Green manure crops such green pea, rape, perko, vetch, cow pea at booting stage should ploughed and can provide 12-15 tonnes of organic manure			■		■							
9	Provide water-holding irrigation in order to slow down flowering phase of grape			■									
10	10 lime-sulfur should be applied three times, to control anthracnose and powdery mildew, and are as follows: first time 3% lime-sulfur late winter period, 1% vegetation and during summer period 0.5-0.3%.			■		■							
11	Provide cultivation and irrigation between grape rows, till and clean weeds around arbor				■								
12	Application of compost will help increase grape productivity				■								

* Bordo Mix is a mixture of copper(II) sulfate ($CuSO_4$) and slaked lime ($Ca(OH)_2$) used as a fungicide. In some standards on organic, there is a restriction on total amount of copper used per ha per year

13	Sulfur application rate should be about 25 kg/ha. Application should be carried-out when air temperatures varies between 18-22°C.				■								
14	Provide cultivation and irrigation between grape rows, till and clean weeds around arbor		■		■		■						
15	There are no need any technological practices during the flowering period				■	■	■	■					
16	Irrigation rate can be 300-350 m^3			■		■		■		■			
17	3% Bordeaux Mix should be applied depending on air temperature					■							
18	After flowering cutting, grapes may be propagated using leafy cuttings. Stems of recently matured growth cut about 27 cm long may be rooted if they are treated with root-inducing growth regulators and kept under high humidity. Cuts should be done 2-3 times during May-June					■	■						
19	Cultivation and irrigation. Start harvesting of early maturing varieties							■					
20	Weed management, cultivation, irrigation. Application 10 lime-sulfur solution can be used to control Powdery Mildew and anthracnose in vineyards.						■		■				
21	Weed management, cultivation, irrigation. Harvesting Kishmish variety and start drying.								■				
22	Late grape varieties such as Toyfi, Qora and Oq husayni, Nimrang will be treated 10 lime-sulfur								■				
23	Provide irrigation. Prognosis of yield potential of grape. Prepare grape trees for grafts								■				
24	Seeding green manure crops such as green pea 100-120 kg/ha, rape 80-100 kg/ha, perko 80-120 kg/ha, vetch 120 kg/ha, cow pea 120 kg/ha.									■			
25	Grape harvesting. Prognosis of yield potential of grape. Prepare grape trees for grafts										■		
26	Grape harvesting and provide cuts. Irrigation and covering grape trees. Prepare compost with microelements: boron, zinc, coper, manganese, molybdenum, iron, bentonite and others should not be excessed 90 mg/kg and including plant residues will be ploughed										■	■	
27	To prevent or reduce Ochratoxin A formation in dried grapes, it is recommended to stop soil tillage (disturbance) nearly one month before the harvest because fungi spear onto the grapes through the dust and to remove spoiled, cracked or rotten berries while spreading for sun-drying.												■

Annex 2. Organic wheat crop management

Table 8. A pattern of recommended models for organic winter wheat on rain-fed areas

#	Crop management operations	Technological Parameters	Farming Operation Date	Machine Type	
				Tractor	Tools
1	Minimum or no-till*	Minimum till with discs and manure application at 5-10 t/ha	15 October till 15 November depending rainfall	MTZ-80	Discs
2	Seeding	Direct winter wheat seeding using stubble seeders SZS- 2.1 or FANKHAUSER 2115 seeder (Brazil) at the depth of 4-5 cm	15 October till 15 November depending rainfall	MTZ-80	SZS-2,1 FANKHAUSER2115 Seeder (Brazil)
3	Winter wheat harvest	Winter wheat is harvested using direct combine harvesters through chopping and spreading straw on the soil surface	3rd decad of June and 1st decad of July	Niva, Laverd and others	Straw chopper
4	Grain transportation	Grain transportation from the field to threshing floor	June-July	Trucks ZIL 130; Kamaz	
5	Post-harvest	Storing			

Annex 3. Organic chickpea crop management

Table 9. Recommended models for organic chickpea on rain-fed areas in Uzbekistan

#	Crop management operations	Technological Parameters	Farming Operation Date	Machine Type	
				Tractor	Tools
1	Minimum or no-till1	Minimum till with discs and manure application at 5-10 t/ha	February through march depending on weather conditions	MTZ-80	Discs
2	Seeding	Direct chickpea seeding using stubble seeders SZS- 2.1 or FANKHAUSER 2115 seeder (Brazil) at the depth of 4-5 cm	15 October till 15 November depending rainfall	MTZ-80	SZS-2,1 FANKHAUSER2115 Seeder (Brazil)
3	Chickpea	Chickpea is harvested using direct combine harvesters through chopping and spreading straw on the soil surface	3rd decad of June and 1st decad of July	Niva, Laverd and others	Straw chopper
4	Grain transportation	Grain transportation from the field to threshing floor	June-July	Trucks ZIL 130; Kamaz	

* It depends on rainfall

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