# Chapter 3
# Food Chain of Agriculture of Kyrgyzstan – Gained Experience, Learned Lessons and Development Perspectives

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**Abstract** In the given article there is a review of activity of the regulatory authorities over safety food consumption of population in Kyrgyz Republic. The scheme of product movement in food chain is shown "from farm to consumers". Problems and developments of phytosanitary and veterinary control are highlighted; methods of access permit for pesticides and veterinary drugs, as well as problems of environment persistent pollutants. Examples of problems' solution through the use of prophylactic and integrated approaches (in pasturage, provender, animal vaccination, trade by products etc.) are illustrated. Successful stories and problems combating to brucellosis, zooantroponotic diseases, mycotoxins and other poisoning elements of feeding and food consummation of people, as well as utilization of persistent pesticides are given in the document. The role of education services (Universities, extensions), information services in safety food consumption of people at present and in future is emphasized in the article.

**Keywords** Food chain • Calories • Protein • Pesticides • Phytosanitary • Zoonotic infections • Poverty • Nutrition

## 3.1 Introduction

In the beginning of the 1990s the international organizations (FAO/WHO – international conference on nourishment) have given major consideration to the nourishment of vulnerable groups of population, growth of food security of households, reduction of nutritional deficiency, and the improvement of quality and security of food.

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The quantity and quality of consumed victuals show considerable variation according to the economic development of a state. The distinction also occurs among ethnic cultures, because the consumption standard is conditioned by traditional, religious, social, climatic factors.

## 3.2 Legislation and Control System

The first laws in field of human and animals health protection in Kyrgyzstan were passed in the 1950s; likewise the proper legal texts were issued which instituted the regulations of official control over their execution. Since then the legislation and control in this sphere have continued developing and interacting. At the early stages of development in this field the main purpose was the prevention of any kind of food falsification, hygienic regulations and conditions control, protection of social and domestic cattle from epizootic diseases which could considerably impair socialist economics and the prevention of human morbidity with any kind of contagious zooanthroponotic diseases.

Regulation and control system were always on the move. The regulations concerning chemical pollutants, feed compound and harmful substances contained in it, were permanently worked out from the 1960s. In order to control the regulations compliance there were established monitoring systems which used the sampling practice, the laboratory basis of which was always altering. These are zonal and/or regional soil and agrochemical laboratories and veterinarian laboratories. There are also their central laboratories which located in Bishkek city.

By entering the different international political and economical organizations, Kyrgyzstan assumed a row of obligations. Due to this the industry standards, guidelines and instructions on production, storage and implementation of agricultural products for consumers are updated. Practical works on harmonization of our country's laws concerning food with legislation of European Union countries and other countries and WTO requirements are also being carried out.

According to Rome declaration which was accepted on 17th of November in 1996, during the worldwide high-level summit on food problems, the Kyrgyz Republic agreed "…to conduct a policy directed at poverty and inequality liquidation, provision of population with physical and economic access to sufficient and full-fledged nourishment".

At the present time, the Legislative basis concerning food security of the Kyrgyz Republic (KR) is the Law "On food security of the Kyrgyz Republic" (№ 183 from 4th of August in 2008), implementation of which is the responsibility of the Ministry of Agriculture of the Kyrgyz Republic.

After the Soviet Union had collapsed, a new law "On veterinary matters" was accepted in Kyrgyz Republic, in which the rules concerning implementation of veterinarian legislation were described and after the acceptance of law, there were issued relevant instructions.

The central toxicological laboratory of the Department of Chemicalization and plant protection was recreated and at present functions. On demand of producers and consumers, the laboratory does analysis of soil compound and phytogenic feeds.

Four phytosanitary posts of Quarantine regulations operate in Kyrgyzstan, which prevent delivery of quarantined objects and seed or plant stock diseases via food. A considerable problem is that quarantine regulations posts in all frontier points are located after the Customs survey stations. In accordance with "Plant Quarantine Law" (1996, amended in 1998) they have to be located next to passport control of arriving people and luggage. Therefore, there is a possibility of dangerous quarantine objects entering the country which may enter into food chain through agriculture.

The majority of standards and guidance on plant quarantine have to be refreshed in order to correspond with common conception and special standards of Mediterranean and European Organization on plant quarantine and protection and International Plant Protection Convention (IPPC). Kyrgyzstan as a member of WTO agreements on application of sanitary and phytosanitary measures and as a member of IPPC assumes a responsibility on harmonization of laws for accepting the substantiated phytosanitary solutions on consumers security.

Veterinarian quarantine posts exist to protect unsound and cattle-breeding products from entering the state's territory. The control is conducted in accordance with state standards and instructions.

There is a National council dealing with permits for the use of pesticides and other agrochemicals in KR under the Department of Chemicalization and Plant Protection. The Council tests pesticides, approves and then releases a list of pesticides admitted to be used in the Kyrgyz Republic territory.

## 3.3 Agriculture Production and Nourishment Condition

In Kyrgyzstan, since it has achieved independence (1991), in order to provide food security a great importance was attached to correct conservation of natural and climatic conditions of country and to output of products in required amount [2]. But from the beginning of the new century due to intensive trade with other countries, the opening of private manufacturing companies, etc., monitoring of food quality became one of the priority directions of public policy.

As in any other political and economic system, the main purpose of Kyrgyzstan is the protection of the human as a consumer and provision of his proper scale of living. There is a growth in demand by the basic mass of population for high quality food which are safe for consumption and not risky for human health. For the last 15 years, farmers of our country both supply our country with different products and export them to Kazakhstan and Russia. Examples of these exports include: potatos, milk and meat.

The annual gross output of grain varies from 800 thousand tons to 1,030 thousand tons. In most cases, the quality of farmers produced grains doesn't correspond

**Table 3.1** Balance and value of daily nutrition of Kyrgyz Republic population[a]

| # | The region and city, the population | Calories per day per capita | Proteins per day per capita, g | Fats per day per capita, g |
|---|---|---|---|---|
| Total population – **5,224,260** | | | | |
| 1. | Batken – **431,067** | 2,345 | 60.4 | 66.3 |
| 2. | Jalal-Abad – **993,761** | 2,652 | 70.9 | 65.5 |
| 3. | Issyk-Kul – **434,882** | 2,349 | 63.8 | 57.3 |
| 4. | Naryn – **271,480** | 2,183 | 59.1 | 53.4 |
| 5. | Osh – **1,339,205** | 2,297 | 59.3 | 60.4 |
| 6. | Talas – **219,410** | 2,443 | 65.4 | 65.4 |
| 7. | Chui – **762,492** | 2,485 | 66.0 | 71.2 |
| 8. | Bishkek – **823,795** | 2,519 | 69.7 | 71.5 |
| Daily consumption | | 2,434 | 64.8 | 64.7 |
| Daily needs | | 2,431 | 78.5 | 73.1 |
| Balance: (+) or (−) | | **3** | **−19** | **−8** |

[a]Data of Kyrgyz Republic National Statistic Committee (2009)

to presented standards. Therefore, annually 500 thousand tons are imported from Kazakhstan. The import of grain is 18–35% from the volume of domestic food market.

The level of health and longevity of dwellers of any country depend on supply with proteins, fats and other nourishment components.

According to FAO, the average daily human consumption of protein should be 90–100 g. In the Kyrgyz Republic (KR) in 1990, per capita daily protein intake was 65 g. In 2008 the index was 59.4 g, and in the first quarter of 2009, daily protein consumption was 64.8 g [8]. These data indicate that the dwellers of KR didn't reach world figures in protein consumption; moreover there are problems to achieve similar indicators to those of the 1990s.

Consideration of provision the Kyrgyz Republic population with food calories, proteins and fats on a scale of areas:

In a crisis period of economic development the decline and imbalance of human nutrition and feeding of protein intensifies more than usual. Higher energy prices causes a rise in food prices, which causes their inaccessibility to the general population. To a certain extent, this means that in such conditions in many countries food security already cannot be guaranteed.

The data of Table 3.1 shows that our country has concerns with regard to the second category of supply of the domestic food market. Of all the regions of the country the lowest supply with food calories and accordingly with proteins and fats occurs in the Naryn and Osh regions. High energy supply of nutrition with fats and proteins is found in the Jalal-Abad. Therefore, the public and relevant government agencies should take note to ensure protein supply in Naryn and Osh regions. Especially if one takes into consideration that in these two areas the amount of population is in majority of the whole population of Kyrgyzstan.

In other areas a good supply of food calories, fats, proteins of the population is observed in the Chui and Talas. They are followed by residents of the Issyk-Kul region. This, apparently due to a balanced maintenance of cropping and livestock and as a consequence of the existence of the balanced nutrition plant and animal proteins. In these areas soybeans, beans and peas have long been grown.

## 3.4 About the Food Chain in Crop and Livestock Production

In the Kyrgyz Republic under the auspices of the Ministry of Agriculture there are attempts to trace the movement of food through the chain [5]. Thus, in 2008 and in 2009 with the assistance of project Sida (Support Seed Industry of Kyrgyzstan) held training seminars were held under the title "seed chain": breeder ↔ seed grower ↔ farmer ↔ miller ↔ baker ↔ consumer of bread'.

The idea was that each link in the chain receives a good product from the previous level. Workshop participants – representatives of each link in the chain had no information about the products from the previous management and/or focused only on product price. Currently, there are no established contacts between the first three links of a chain. Millers haven't yet signed contracts with farmers on supply high-quality grain, and bakers are not aware of the content of protein and gluten in the flour and guided only by the price of flour. Most of the bakers and millers are not aware of the impact on the quality of grain pests such as the bedbug pest and piyavitsa. Bread consumers are not associated into groups on expression of their interests on the quality and quantity of grain in the market.

Various kinds of agrochemicals including pesticides are used in order to increase crop agriculture. Pesticides, for not respecting the regulations of their application, are involved in the food chain at the level of plants. Toxic chemicals enter the body when used by humans and animals plants or products thereof (e.g., corn). Hazardous substances are concentrated at each successive level of the food chain. Consider the following food chain: grass (grain) → Sheep or cow → Man.

In this food chain the harmful chemical compounds enter the grass from soil. A sheep or a cow gets these substances when eating grass or grain. By drinking milk or meat of animals the harmful accumulated chemicals in milk or meat enter the consumers' body and accumulate there.

Experiments confirm that the harmful chemicals found in soil, water (after spraying pesticides), concentrate at each successive level of food (plants → animals → people), with the result that the harmful substance at the top level in the food chain (e.g. man) is concentrated in the product at the most hazardous amounts.

In Kyrgyzstan, the special study on this chain is currently not available. But there are instructions for maximum allowable pesticide residues in grain, forage, fruits and vegetables. On admission to market fruits and vegetables are controlled by laboratory specialists. The main testing indicator is the content of nitrates and nitrites. Test on the content of heavy elements and radionuclides are not carried out.

There are cases of human poisoning by nitrites and nitrates in the water-melons and melons purchased in natural outlets.

Hospitals often receive people diagnosed with botulism poisoning from home processing of vegetables and also salmonellosis. So according to the Bishkek Clinical Infectious Diseases Hospital in 2009, this hospital treated 22 people from botulism poisoning and 180 from human salmonellosis. In 2010, poisoning was much smaller, i.e. 14 people were treated for poisoning from botulism, and 52 of salmonellosis.

Another challenge is to conduct risk assessment, which represents 12 chemical compounds recognized as posing the greatest danger. The list of persistent organic pollutants (POPs) include: aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, heksachlorbenzol, mirex, toxaphene, polihlorbenzol (PCBs), dioxins, furans (9 of which are pesticides).

In the Kyrgyz Republic, the situation on POPs and obsolete pesticides is not completely safe. Community of KR are well informed on environmental issues only with respect to the levels of radiation. However, on the use of crop protection chemicals, disposal of obsolete and banned pesticides, POPs and their adverse effect on the environment there is a lack of information in the country.

According to the operative data of the State Department's chemicals and plant protection in the Kyrgyz Republic in early 2000, there were about 700 tons of pesticides, of which 1.5 tons is to banned pesticides, in the warehouses of the former association "Kyrgyzselhozhimiya – Kyrgyz agricultural chemicals" and in warehouses and farms [4].

A positive factor contributing to these problems is the adoption in December 1998 Law of the Kyrgyz Republic "On The Use Of Chemicals And Plant Protection", where Article 14 provides for the termination of the implementation of pesticides and other agrochemicals and implementation of their disposal in cases where the safe use of them becomes impossible when use and transportation, etc.

According to experts of the World Federation of crops protection, if the drug is owned by a certain company, the responsibility for "life cycle" of the drug remains in the company. But the process of verification of stocks of pesticides is critical in addressing this problem and must involve other parties such as manufacturers, suppliers, donor agencies, relevant organizations, governments of exporting countries and regional bodies, as well as companies involved in hazardous waste.

The important point is to secure people's diet by regulating the presence or absence of genetically modified organisms (GMO). Under the Law "On Seeds," June 4, 2005 the use of genetically modified varieties is prohibited. The Law on "Legal Protection of New Varieties of Plants" with amendments adopted March 31, 2005 also prevents the use of genetically modified varieties.

Although grain was the main source of food, energy and protein in the world in agricultural development, as important is the production of animal products: milk, meat, fish and eggs are consumed in all countries.

In 2010, the Kyrgyz Republic 193.0 thousand tons of meat, 1357.0 thousand tons of milk produced which correspond to the minimum and physiological norms human consumption according to national standards.

In livestock in the last century there were standards and specifications of feeding farm animals. Feeding rate and forage quality controlled by specialists in animal husbandry, veterinary doctors. Pastoralists, in principle, were also interested in observing the regulations.

These days most of the population belongs to private farms. Livestock products are moving around on a chain: the food on the field (pasture) ↔ animal on the farm ↔ slaughtering at farmer ↔ market (bazar), shop ↔ consumer.

There is another chain: feed in the field (pasture) ↔ animal on the farm ↔ broker-buyer deliveryman ↔ broker-seller ↔ slaughterhouse ↔ consumer. Under the existing veterinary legislation and other regulations all owners of the product and facilitators should be supervised by a veterinary specialist: from animal care, leaving the farm for the implementation of the consumer of animal products. As a result of a lack of qualified veterinarians in rural areas there are significant animal suffering devastating diseases such as: brucellosis, echinococcosis, salmonella and anthrax.

Statistics on the incidence of these diseases in animals in the KR is available only for official use, and very rarely published in the media. The drama of these diseases is not only that they lead to lower productivity and death of animals, but that failure to observe the necessary hygiene rules and regulations can result in being transmitted to humans. In KR brucellosis caused illness in 73 people per 100 thousand inhabitants (The National Statistical Committee of KR 2009). By no official figures 70% of patients with brucellosis herd yaks [1].

As a result of research by scientists of Research Institute of Veterinary Medicine, it became known that 30% of pet dogs suffer from echinococcosis, but according to official statistics, there is no echinococcosis in these areas [3].

During the period of 1980–2009 the country recorded 156 cases of anthrax infection. These were located as follows: 73 (46.8%) in Osh, Jalal-Abad – 29 (25.6%), in Chui – 18 (12.8%), Issyk-Kul – 8 (5.77% ), in Naryn – 5 (3.21%), Talas – 4 (2.56%), and Batken – 5 (3.21%) [6].

In the complex of measures to ensure food security an important role is for the timely delivery of veterinary measures aimed at preventing the outbreak and spread of infectious diseases of animals, produce and to implement security in veterinary and sanitary products of animal origin. Veterinary specialists of the Kyrgyz Republic for 2010 held 47 170.53 various treatments for animals and birds diagnosed 7995.25; vaccinated 20 612.89 and 18 562.4 heads – number of animals are degelmintized (exterminate of parasites by using pills).

In the KR there are 1,229 centres of anthrax. Found on the ground – 583. Of these 434 are only fenced and 517 are concreted; not be found on the ground 691 lesions. In 2010, 4,952 heads of animals vaccinated against anthrax by veterinarians.

In 2010, the Veterinary Service identified 16 disadvantaged items on brucellosis of small livestock and 7 points for cattle. Since May in 2010, 896,682 heads of small livestock have been vaccinated with new – conjunctive method.

Meanwhile, the present situation of zoonotic infections in the country remains tense. Veterinary services included a lot of effort to reduce the incidence of these infections [7].

Thereupon, it's very timely for country to implement a HACCP (Hazard Analysis and Critical Control Point) system. It's necessary to adapt the monitoring and control system of the country to HACCP principals. HACCP is a risk analysis and critical strategic points – the standard which became a synonym of food security. It is a system which identifies, assesses and controls the risks that threaten seriously to food security. The system assures that Monitoring and Assessment (M&A) system on food security has been effectively implemented. It considers risks and some other factors which could influence food security, and then controls in order to prevent injury of consumers.

## 3.5 Availability of Clean Drinking Water

One of the agents present in all foods in food chain is water. And the availability of safe water to people is of great importance. The national average proportion of people without sustainable access to safe drinking water is 9,6%. In Batken region – 23.3%; Jalal-Abad region – 5.6%; Issyk-Kul region – 0.7%; Naryn region – 8.0%; Osh region – 22.7%; Talas region – 4.1%; Chui – 1.4% and in Bishkek – 0.00% [8].

Comprehensive studies on the correlation between the availability of safe water to people and the incidence of people in the food chain in agriculture are not conducted.

Determining the statistics for people suffering from food borne diseases (salmonellosis, etc.) and problems of animal feed origin, finding is difficult due to the difficulty of collecting this information and only a small portion of cases brought to the attention of official agencies. Human cases have become public only in cases of acute infection in the region (salmonellosis, anthrax, etc.) when it is possible to identify the problem by means of mass communication.

## 3.6 The Role of Educational Services (Universities, Consulting services), Information Services in a Safe Nutrition in the Present and Future

One problem is the lack of veterinary specialists (veterinary doctors, specialists, veterinary laboratories, conducting diagnostics), poorly equipped laboratories, the inability to engage more in need of specialists in the ongoing refresher courses. Virtually all training for veterinary workers are only for employees of national and regional laboratories, while the district laboratories do not have such opportunities. Provision of veterinarians in rural areas is only 40%.

Through the activities of the World Bank and the International Science and Technology Centre in Research Institute of Veterinary Medicine operates a modern

diagnostic equipment to determine the viral and bacterial infections asequencer. The device allows determination of the genomic structure of animal diseases.

Specialist training designed to ensure food safety is carried out several universities. This is the Kyrgyz Medical Academy, Kyrgyz National Agrarian University, Kyrgyz-Turkish Manas University (Kyrgyz-Turkish Manas University), and the Kyrgyz Technical University. But the competence of graduates includes only the individual links of the food chain in agriculture, but not the whole cycle of production, processing and consumption.

It is important to consider prospects for the development of infrastructure in the food chain and provision of services there. In this great assistance is provided by international organizations such as FAO, World Bank and many others. The government of Kyrgyz Republic approved a project on building a bio-safety laboratory.

Thus, there are certain legislative basis and regulation system on human nutrition security in the Kyrgyz Republic. But there is a lack of systematic approach and the responsibilities of regulatory bodies cover specific links of the food chain.

## 3.7 Prevention and Early Warning

Prevention is the best system. Therefore, the Government of Kyrgyz Republic must found a centre of crisis situation control on food chain. This means the creation of extreme prevention system on transboundary diseases of animals and plants. Institutionally, it is a standing commission between the State veterinary Department and the State quarantine regulations of Kyrgyz Republic. This centre should focus on Desert Locust – *Schistocerca gregaria* and fungi disease of Wheat Ug 99 which is able to shift by military aircraft of NATO through “Manas” airport. Because international militaries are fighting against Taliban in Afghanistan where spread desert locust and Ug 99. Government of Kyrgyz Republic and military authority do not pay attention to this problem.

## 3.8 Conclusion

The Government of Kyrgyz Republic must found a center for crisis situation control on food chain. This means the creation of extreme prevention system on transboundary diseases of animals and plants. Institutionally, it is a standing commission between the State veterinary Department and the State quarantine regulations of Kyrgyz Republic.

Ministry of agriculture and other ministries concerning to food chain shall begin to adapt a monitoring and assessment systems of food security to HACCP.

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