

## Innovative Technologies And Modern Facilities In Beekeeping

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**Abstract.** This article discusses the features of the application of innovative technologies in beekeeping. The authors, based on years of personal experience in beekeeping and learning experience of the best apiaries in Russia and abroad, summarized materials on the topic and offered advanced modern technology in beekeeping to apply, which was successfully tested in other apiaries.

### 1. Introduction

Russian agro-industrial complex (AIC) includes industries producing agricultural products and involved in its processing and marketing. Agriculture is the foundation of the AIC, because agricultural products are created here. This industry produces 48% of fully ready-to-eat products; there are more than 68% of fixed assets, 60% of the total number of AIC<sup>1</sup>. The main objective of the AIC is full provision of citizens with quality food and consumer goods. People's quality of life is directly dependent on the level of development the AIC and its equipment and on the state of the related sectors of the economy.

Country's transition to a market economy has made changes in the activity of agriculture and it becomes even more important to optimize product prices of APC both intraindustry and in the final product. The competitiveness of the agricultural products is equally important. Besides the price for the average consumer product quality, production environment, compliance with state standards and, of course, taste, appearance, and other are important. Agriculture is particularly dependent on the climate and weather conditions. For Russia's dependence on the climate is particularly great, since more than half of its territory is located in the North zone. The effective area, according to Jean Elisee Reclus, a prominent geographer, is the one that is no higher than 2000 m sea level and where the average annual temperature is below -2<sup>0</sup>C [1]. In Russia, only 1/3 of the land area is considered to be effective, while it is the coolest in the world.

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<sup>1</sup> Moshkov Y. Composition and structure of Russian agro-industrial complex. [Electronic resource] URL: <http://ru-news.ru/sostav-i-struktura-agropromyshlennogo-kompleksa-rossii/> (date of appeal 02.03.2016)



The third part of all the products that are consumed by man, made with the help of bees, 84% of the plants necessary for human life are pollinated by bees [2].

Beekeeping is a type of agriculture. Currently, it is experiencing serious difficulties associated with a significant reduction in the production of natural bee products [3]. Basically individual beekeepers or small business representatives are engaged in this activity. Therefore, the use of innovative technologies in modern beekeeping is seen as an exception. Part of bee products, without any further processing, is the finished product, for example honey. Other products require processing, such as wax. At the same time large bee farms are in need of the dealer services and beekeeping products from large apiaries (up to 30 beehives) are sold directly by the beekeepers.

Beekeeping in Siberia is particularly difficult: the organization of wintering bees, when the temperature drops to  $-50^{\circ}\text{C}$ ; cold and rainy spring; short time of honey picking – 2-3 weeks; increasing death of bees in the world; reducing obtain of natural honey; growing adulteration, which is harmful to health; organizational and legal issues unresolved.

The research goal is the studying of modern beekeeping experience in other countries, of innovation in this area of agriculture and the use of the modern technical facilities. On the basis of the received material and of many years of experience of the authors the goal is in developing recommendations for more effective work of beekeepers in Siberia.

To accomplish this goal it is important to solve the following tasks step by step:

1. To study and systematize the experience of modern foreign beekeeping.
2. To establish the reasons adversely affecting the Russian beekeeping.
3. To analyze the possibility of using modern Russian and foreign beekeeping on the territory of Siberia.

Background of this study comes from the fact that the quality of life of citizens determined the development level of the AIC. In our country, research and publications about bees and beekeeping and their invaluable role in human life are very rare. The article analyzes the threatening situation of the death of honey bees around the world, from which not only the level of human life, but also the human life itself on Earth depends directly [4]. The article also studied the growing problem of falsification of honey.

The importance of this paper is in the fact that beekeeping has a strong relationship with other sectors: animal husbandry and plant growing. [5] Essential that the article is considering the dependence of productivity of entomophilous plants from pollination by bees exclusively.

The novelty of the article is that there is considered in the complex not only features and beekeeping problems in Russia and in the whole world, but also offered to the introduction the innovative technologies and modern technical equipment for more efficient apiaries, both in individual farms and industrial scale.

## 2. Theory

The theoretical basis of this work is based on researches of the famous beekeepers professionals, well-known scientists working in this direction, both Russian and foreign, as well as on the personal many-years experience of beekeepers authors.

For scientific research is applied a universal dialectical materialist method of cognition, which is applicable in agriculture. Beekeeping as a form of agriculture is considered in the development, in cooperation with other branches of the AIC and with related industries. In the studying of this topic the comparative analysis used, comparing the different levels of beekeeping, beekeepers working methods and more, as well as methods of induction and deduction, systematic method.

Humankind started beekeeping more than 15,000 years ago, honey in jars was found in the tomb of Tutankhamen. People were engaged in beekeeping in ancient Greece, in ancient China. Honey picking from the wild bees is considered one of the most ancient forms of human activity, and has survived to this day in some areas. The scientific study of the life of honeybees started from the XVIII century by the first scientists: Swammerdam, Rene Antoine Ferchault de Reaumur.

The construction of hives has undergone significant changes over the long period of time. In each country, the hives are arranged differently, but basically differ only in size, they all have a frames, vary in size and number too, which are placed in the hive, typically - 12, 16 or 24 frames, can be a different number. Langstroth L L is considered as the founder of the current practice of beekeeping. Francesco De Hruschka invented in 1865 the first centrifugal honey extractor. For protection from bee stings are commonly used light-colored costumes, headpiece with protective netting, gloves and smoker.

In the hive there are 3 types of bees: the queen, which is able to defer for its life, usually up to 3 years, more than 500,000 larvae - the future of bees; worker bees - 30000-50000 in the hive; male bees. Life in the hive is in a certain order: in the spring, thanks to the brood, bee family in the hive increased, usually reaching maximum to honey picking. When swarming the old queen accompanied by young bees leave the hive, the beekeeper must catch the swarm, and then put it into another hive to create a new bee family. In the old hive is still a young barren queen.

The ability to incubate the new queens beekeeper uses to expand the apiary, dividing bee family of one beehive in two. Life of bees exposed too many dangers: fungal diseases, viruses, poisons, pesticides, parasites<sup>1</sup>.

### **Innovate technologies used in modern beekeeping**

Innovative technologies increase the efficiency of the apiary. The modern beekeeping is characterized by particularistic specialization. In the absence of queens it is possible to access in special bees nurseries, where large farms are engaged in the withdrawal of queens and for themselves, and for the implementation. The large apiary serving greenhouses, kept some beehives for collection and storage of pollen, which is necessary for feeding the brood, and part of it is forwarded to the working beehives serving greenhouses. Pollen can be purchased in such farms, if necessary.

Currently, there are scientific-production associations and beekeeping complexes. So the good conditions for intensive technologies and the use of modern technical facilities are formed. The large beekeeping farms are equipped with lifting equipment, tractors, multi-frame electric extractors, special centrifuges to produce wax, furnaces for melting wax, and machines for packing honey.

More and more often we can see the multihull hives in modern apiaries; at the same time a significant increasing of the number of frames with honeycomb brings significant honey returns from each hive. It should be noted that such hives are only suitable for strong families, but in Siberia bee family not always has time to prepare to the main honey picking, i.e. grow sufficient amount of brood.

Modern beekeeping should also be maintained by the respective staff. Such personnel are trained at specialized schools, technical schools, universities; working beekeepers are retraining in special courses. Basically training programs are aimed at industrial beekeeping. At present, Russia has more than 1 million apiaries of the amateur beekeepers. Modern amateur beekeeping has half of all bee families in personal property, providing the consumers of these products by honey, wax and pollen. Bees-pollinators are significantly increase productivity of entomophilous plants. The yield of these crops increases and the sum of the implementation of additional products exceeds in 10 times the sum of realization of bee products<sup>2</sup>.

In the modern beekeeping is becoming increasingly widespread the use of mobile apiaries. The values of this method are as follows:

1. Delivery of the hives to the place of honey picking increases the harvest of honey; the bees do not spend time and energy on flights from the fields to the hive.

2. Compact placement of hives.

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<sup>1</sup> Andryushchenko B. Modern beekeeping. [Electronic resource] URL: <http://bochkameda.net/o-pchelovodstve/sovremennoe-pchelovodstvo.html> (date of appeal 12.03.2016)

<sup>2</sup> Komlatsky V.I. Innovative technology of keeping bee colonies and manufacture of bee products. [Electronic resource] URL: [http://www.kaicc.ru/content/maintenance\\_of\\_the\\_family\\_of\\_bees](http://www.kaicc.ru/content/maintenance_of_the_family_of_bees) (date of appeal 02.03.2016)

3. Easy to inspection frames.

4. A beekeeper can transport trailer with hives, to work with the bees without the smoker and masks.

5. Mobile apiary improves the pollination of crops, increasing their productivity.

This method has many good sides; it is also common in beekeeping of Canada. In Siberia, this method is effective in large apiaries, but if there are several dozen hives in a private farm and the fields are around, the cost for the purchase of equipment and its maintenance, fuel costs and other implementations would exceed the resulting of surplus product – honey.

Most believe that the swarming brings damage to beekeeping, because usually bees lost during it. Swarming also says that the hive is full; it is all right, that part of bees and the old queen fly out of the hive, to create a new bee family. Maurice Maeterlinck describes the preparation of the swarm to fly as the most beautiful time in the hive the day before the abdication, as the old queen voluntarily gives way to young queen [6].

First of all, we must decide what we want from the apiary - honey or apiary expansion. Depending on the decision we proceed to its implementation. We believe that should not fight with a swarm, it should be used for the effectiveness of apiaries, applying modern innovative technologies.

Swarming is one of the most complex and labor-intensive processes in the apiary. The solution to this problem in small apiaries, gardens, dachas takes a lot of time. The literature describes well how to work with the hive after swarming. This work takes 2-3 hours, and if there is a second hull, even more. It should be noted that beekeeper has protective clothing, a mask, and some glasses, the air temperature is + 30°C, the sun is still up, and work in such conditions is very difficult.

Many years of experience allows us to make some innovation in this important on the apiary process, which requires little or no time. In this case all the problems in the hive the bees decide for themselves, nature regulates everything itself. The main precept of the beekeeper, “as little as possible to disturb the beehive”, is running.

At the end of May in Siberia hives with frames are already full, so we need to increase the hive, to give work for bees - to put or little hull, or a second hull. Usually we practice to install a second hull with 7 frames. It should be noted that in Siberia at the end of May and in early June the extension of the hive can not be done, since the cool weather is often at this time of the year in Western Siberia: in the morning it is often no higher than 2°C and during the day – 6<sup>0</sup>-10<sup>0</sup>C. To expand the hives it is unfavorable weather, too cold. If you put a little hull or a second hull to the hive, the cool and rainy weather will brood disease, fungal diseases, most often askosferoz. The causative agent is the fungus *Ascospharea apis*, physical-chemical treatment is not very effective for this kind of infection. The spores of this fungus are very resilient and can remain on the honeycombs, in a beehive, at apiary inventory for up to 4 years, always ready, under favorable conditions, in this case the cold, hit defenseless larvae. We come to the conclusion that it is impossible to expand the hive, it is problematic.

At this time in the hive work is humming, bees are too closely and bees begin to prepare for the swarm. They begin to delay the queen cells, queen seeds eggs inside. After a few days the larvae appears, bees are feeding them by royal jelly during 6 days, then the bees seal the queen cells and after 12 days there is first queen. Due to her whistling the old queen with her retinue are preparing to fly from the hive and in a nice, warm weather the swarm with the old queen comes. Basically swarms output going from 20 June to 10 July, in other areas, these terms can be shifted.

The next day after swarming most beekeepers take apart the hive, carefully inspect each frame, all the queen cells are cut and placed in the box. Number of queen cells on the one frame, on the authors' experience, may be up to 60. At the same time there is always a chance that the beekeeper can not see the queen cells and after 9 days – all over again: the swarm, taking apart, etc. With the second hull on the hive the probability of error increases significantly. If you do not get rid of queen cells, the swarming happens continuously, after 2-3 days, until there are a handful of bees in the hive. This bee family will not bring any honey since 15 August the honey picking in Siberia ends. The death of this family is predetermined: no bees, no honey, the family will die of hunger and cold.

An innovative technology for experimental apiary is as follows. After the release of the first swarms from different hives ("premiers") beekeeper must decide how to use them. Or it, as usual, will be a new family or it is necessary to boost weak family or to connect two "premiers" from different hives together, creating thus a strong bee family. We do not taking apart the hives after the first swarm, we wait for the second swarms ("secondaries"). The connection of the first two swarms from different hives is usually used when the main honey harvest begins in a few days. In Siberia, this time runs usually from 20 July to 5 August, with a shift in one direction or another, depending on the climatic conditions, for 5 days. Further, if after the first swarms hives were not taking apart, as described above, or the queen cell was missed in process, the second swarms are out after 9 days. If the main honey harvest is close or have already started, beekeepers usually use the following known technology, so-called "medovik": the hive from which the "secondary" came transferred to a new location at least 3 meters from the place where stood the old hive. At the old place they put a new hive, which has 6 frames with honeycomb, 1-2 frames with honey and 3-4 frames of brood, cutting the queen cells. Depending on the number of bees they put a second hull with dry frames if it was in the previous, the old hive, from which the "secondary" came; or 2 little hulls. Old beehive, which was moved to a new location, complemented by a pair of honeycombs and dry frames, all queen cells are removed, except the best one.

All flying the bees fly to the old place and evening, after sunset, the beekeeper emptied into new hive a swarm that flew exactly from that place from the old hive. In the old hive in the autumn will be a good new family, and "medovik" will give no less honey than good not swarmed bee family. This is due to the fact that in the "secondary" there is a young barren queen and while she flying around and begin to seed brood, 10-12 days will be passed. Active "medovik" family will be occupied only by harvesting honey these days, as there is nobody to feed at this time.

Creating of "medovik" occurs when the beekeeper missed queen cell, not cut it down and got the "secondary". Described creation of "medovik" involves considerable time and beekeeper forces.

Innovative technology implies do not consciously take apart the hive after the departure of the first swarm and just wait the "secondary". After the "secondary" fly out, we put it in a cool dark place and wait the "secondary" from another hive. Thus swarm can be kept in such conditions up to 4 days. At this time, the hives already have the second hull or little hull. When the "secondary" comes from another hive, put it in a cool place, and after the dusk pour the first "secondary" in the second hive, and the second "secondary" in the first hive. Also we proceed with the third and fourth and subsequent "secondaries" as they departures. This does not apply any of the lattices, and it does not need to seek queens and destroy them in the "secondaries". By morning, the bees will understand which queen is the most powerful: or own, which remained in the hive, or pour into a hive "secondary". At the same time the rest of the queens and the queen cells will be destroyed. The next day at 10 a.m. we can see wonderful flying around both of bee families. Queens in both hives are young, barren purifying flying around and begin to seed, the rest of the bees are active in collecting, receiving, drying of honey and other important matters. It is only necessary to monitor the controlled weighing-machines and to put additional little hulls just in time.

Lost in time is only one night, while the bees do not understand with queens and queen cells and will put things in order in the hive, beekeeper's time spent on these treatments is 10 minutes. Compared with traditional on apiaries methods of working with swarms when during the period of the main honey harvest we lost for two days, and the hive does not get about 10 kg of honey, besides beekeeper spends about 2 hours for work on arrangement of "medovik". If the apiary has 30-40 hives, and the beginning of June the cold, then after June 20 there will be 1-2 swarm each day to the end of July.

With this new technology, some remnants of queen cells we cut off when pumping honeycombs to avoid confusion in the spring with the last year and new queen cell. Only the "secondaries" are important in this technology, at the "premiers" trials, this method has not approached. It is because in the "premier" bees kill the old queen and swarm flies again. In the "secondaries", in the course of our field research, an alien queen wins as a rule. In the study of 28 bee families in 26 cases won alien

queen. In the practical application of this technology during 4 seasons, none swarm flew away, bee families were very strong; in Siberian conditions for short honey picking we received at least 70 kilograms of marketable honey from each hive.

Our research results and know-how were discussed at beekeeping department of the Novosibirsk State Agrarian University (NSAU) in May 2015. The scientists of the University are also involved in similar studies, preparing thesis, after defending this innovative technology will be freely available. Expert-scientists (in NSAU) agreed with the results of our research.

Weather anomalies in Siberia are almost every year. Many years were to the point where it was necessary to make a decision: to extend the family with risks of freezing brood and have askosferoz as a consequence. Another way - to wait for the heat and as a result, swarms. Now the climatic conditions do not interfere, apiary is younger, because the "secondaries" always have young queens.

Research conducted on personal apiary with 30-40 bee families for 4 years. An average per season 70 kg of honey received from each hive. Beekeepers do not spend 2-3 hours to inspect the hive after swarming, do not disturb the bees, and the result is well described in the literature "medovik", but a swarm is from alien family.

By modern technical means used in beekeeping can be attributed frameless honey production. Annually bees are building their new honeycombs without a frame that prevents infectious diseases. In this method beekeeper is loaded minimally. Bees used not a frame, but only the upper bracket, which has a longitudinal groove on the underside, into which wax is poured. These grooves will guide the bees in the construction of new honeycombs. Control Varroa mites is carried out mechanically, for this purpose all the brood honeycombs removes. Mites are no longer there, and bees bring more nectar, as they do not have anyone to feed.

New honeycomb, which are easy to break away from the strip, cut into small pieces, and honey flows almost completely through a large sieve. You can use pressure when the honey picking is big. Quality of the pressed honey is much better; it is more fragrant than that obtained using the honey extractor.

Positive aspects of this method: the bees do not swarm, there are no costs for honeycombs, no time is wasted on the honeycomb stitching to the frame to the honeycomb opening, on the honey pumping by the honey extractor, do not need a place for the storage of the dry frames. [7]

A good and cost-effective method – "Backyard Beekeeping" – is really good in the conditions of the Czech Republic, where the honey picking lasts 3-4 months, and the main harvest last 1-1.5 months. In Siberia this exotic method is not suitable. Siberian bees can not spend time and effort to build their own honeycombs; they need help of the beekeeper. Summer in Siberia is short and climatic conditions not always contribute to the honey picking, and a major harvest lasts only 3 weeks.

Recently appeared in Russian plastic honeycombs and plastic frames belong to the modern technical tools. This equipment is very common among beekeepers in Canada and the United States.

The use of plastic honeycombs has many positive:

1. You do not have to weld honeycombs to the frame; stretch the wire on the frame. Wax is inserted into the frame cuts or fastened with staple gun.

2. Plastic combs during honey pumping withstand the greater load, resulting in the large quantity of pumped out honey.

3. Losses from moths are smaller.

4. Honeycells have more regular shape and do not change it under the weight of honey.

5. These honeycombs are reusable.

6. Negative points include the need for disinfection and high cost<sup>1</sup>.

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<sup>1</sup> Plastic honeycombs in Russia. [Electronic resource] URL: [http://www.pchelsar.com/staty\\_19/html](http://www.pchelsar.com/staty_19/html) (date of appeal 16.03.2016)

### **Innovative technology for the conservation of populations of honey bees**

Along with the introduction of new technologies in the beekeeping industry even more vital topic arises - the preservation of honey bees. Bees are dying all over the world: in the United States since 2007 beekeeping annually loses up to 40% of bee families; in the UK annually lose is up to 10-30 % of the bee families; in Austria - 25%<sup>1</sup>. Process of reduction of bees in Europe has lasted for two decades. In Russia lost 20% of honeybees in general<sup>2</sup>. The causes of the continuous losses bees are not fully explored; and this phenomenon is called the Colony collapse disorder (CCD). It is assumed that the cause is a dangerous disease varroaosis, which is transferred by Varroa mite. There are other opinions that bees are dying from the chemicals that are used intensively in some farms, or from fungal diseases. The migratory beekeeping has many advantages, but it is stressful for bees. Ongoing studies have confirmed that the electromagnetic radiation from antennas and mobile devices disorient bees, and they cannot find their hive. The viability of bees is also affected by a sharp change in temperature. In our opinion, all of these causes exist and all together give a horrendous effect - the mass death of bees. It should be noted that the greatest extinction of bees is noticed in industrialized countries.

The quote belongs to A. Einstein: "Man can live without oxygen for three minutes, without water for three days, and without bees for four years"<sup>3</sup>. Pollination is the main task of the bees as the most powerful pollinators. If the bees disappear, pollinate crops in the world will disappear too, seeds for crops will disappear. Food will not be enough for everyone. Selection moves forward, currently self-pollinated crops are created, which now need pollinators. However, it is known the desired properties are preserved only at created in the first line hybrids.

To preserve the bees we must limit the application of pesticides which kill not only the pests but also bees. Farmers should be able to purchase environmentally-friendly means of protecting plants from pests, to get a natural product without harmful impurities. In America, in the state of Alabama, in 1996 excellent results using organic insecticides were obtained in a pilot plant. [8] Unfortunately, this experience has not received wide acceptance, and as a result we have seen the greatest death of bees in the United States.

The problem of protection of honey bees has grown to global scale. [9] The European Commission has sent 4 million euros to study of the causes of extinction of honeybees<sup>4</sup>. Russia is still in a stable situation, but also there are cases of mass death of bees. Honeybees in our country are protected by the fact that there is much less use of chemicals. It does not come from any particular respect for environmental standards, but because of the abandoned, nowadays uncultivated millions of hectares of arable land, lack of the necessary resources to handle the cultural planting pesticides for farmers.

Modern greenhouses are starting to use domesticated bumblebees. Bumblebees show themselves well as pollinators, but they are not taught to collect honey, after honey picking it has been collected about 50 g of honey<sup>2</sup>. They live in a special house, feed by sugar syrup. Bumblebees work during the day and in the evening returned to the house.

Another substitute of bees can become a man. Due to the application of pesticides more than 20 years ago in the Chinese province of Sichuan bees have disappeared. But the hard-working Chinese people continue to be one of the largest suppliers of pears from the province. They manually pollinate flowers and a result is in the high yields pears [10].

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<sup>1</sup> Platonova T. The results of the international monitoring of the death of bees in the winter 2014/2015 years. [Electronic resource] URL: <http://www.apiworld.ru/1438623225.html> (date of appeal 15.03.2016)

<sup>2</sup> If the bees disappear - thoughts on the subject. (date of appeal 17.03.2016): <http://federal-pchelovod.ru/o-federacii/novosti/esli-icheznut-pchely/> (date of appeal 16.03.2016)

<sup>3</sup> No bees - no pollination - no food - no man. [Electronic resource] URL: <http://opchelkah.ru/category/новости/> (date of appeal 15.03.2016)

<sup>4</sup> 4 million euros will be spend on the search for the causes of the disappearance bees. [Electronic resource] URL: <http://www.fumigaciya.ru/news/472> (date of appeal 16.03.2016)

The death of the bees in the winter reaches 30% or more. Proper organization of wintering of bees in the conditions of Western Siberia, allows you to fully preserve the bee colonies to the spring – the experience in the studied apiary for many years gives that result. In the literature on beekeeping they usually write about the preparation of bees for winter the following: after the taking apart of hives and honey pumping you should start to feed the bees by sugar syrup. Such an early feeding of bees is explained by the fact that the old bees have to process the syrup and the young one, who will go in the winter, should not be tired.

In Western Siberia honey picking usually ends up to 5-8 August and many beekeepers start to put hives in the feeder with sugar syrup in 5-10 August. The hives at this time still have about 5-6 frames with brood and have nowhere to place the syrup in the required amount for the winter period. An inexperienced beekeeper decides that if the syrup remains, the bees did not eat it, they have rather food. This previously-feeding also stimulates massive theft among bees. To save the hive from invasion of alien bees, beekeeper should close the tap hole on the hive during the day and open at night. If this is not done, in the result of an attack on a hive by alien bees they will take away honey and kill the queen, thus you can lose 3-5 bee families for the winter.

Hence the rule:

Firstly, while preparing for winter it is better to feed bees by sugar syrup because it has 33% of moisture, and honey has 15-18%.

Secondly, you should start to feed bees only after the hive will have almost no brood. Normally, this work is carried out from September 5-7, at the same time the number of frames is reduced to 9-10. The syrup is processed by both old and young bees, which will spend the winter. Even if from this work part of the young bees will die, it is still better than losing the whole family, since it did not have enough food. At this time there are no attacks on the hives, because the morning temperature is between  $-3^{\circ}\text{C}$  and  $+2^{\circ}\text{C}$ .

Thirdly, in October 5-10, when the bees are already formed in compact ball, we remove frames with the syrup and without bees on it in the storage - in the spring of this frames will be useful. When the temperature at noon is between  $0^{\circ}\text{C}$  and  $+2^{\circ}\text{C}$  we treat every street in the hive by "Bipin" only once for saving from the mite. In November 10-15 we put hives in "omshanik" (the special place for hives for wintering) and do not disturb the bees until the end of March. In April 1-10 we put the hives at an apiary.

This method of preparation bees for wintering is used for many years - the safety of bee colonies after wintering is 100%. There was a case of loss of the queens, but in this case we joined two families in one hive.

### **Innovate technologies for the future of beekeeping**

Harvard University conducted experimental research on the creation of RoboBee (robotic bee). This is the smallest UAV, it can fly; can flap the wings very quickly, like bees. The project is scheduled for completion in 10 years<sup>1</sup>.

The European Union (EU) has granted 1.4 million Euros to initiators of the project on the development of devices for the remote control of bee's health; in the media it was called an accelerometer. The use of this device in the future will allow the bee-keeping in the EU and in other countries to move up to higher technology.

The accelerometer will release hundreds of thousands of beekeepers from regular inspections of bee colonies to determine their state of preparation for swarming. Millions of bee colonies will be relieved from stress due to the examinations. Beekeeper will receive information about the state of the



hives in the apiary on the Internet and make the necessary actions timely. The use of this instrument will contribute to a deeper study of the biology of bees<sup>1</sup>.

While the cause of the mass death of bees is not defined, the scientists in several countries are working together on a project, the implementation of which the cause of death of the bees will be identified. To do this, they create special micro sensors, which will be "put on" by 2.5 million of bees. Thus the scientists will receive information how bees do behave with some changes in a stressful situation. In addition 1,000 of hives all over the Earth will be placed in special Edison Intel boards to get information about the life of the bees inside the hive<sup>2</sup>.

### **Modern beekeeping and growing falsification of honey**

Modern beekeeping for the first time faced with a very serious problem - the falsification of honey. Fake honey in different countries reaches 40-80 percent<sup>3</sup>.

GOST 25629-2014 Beekeeping. Terms and definitions. The article 153 provides a definition of falsified honey: "Honey, which contains objects that are not characteristic of its natural composition". Article 172 defines the falsification of bee products: "Deliberate action, which resulted in the bee product loses its inherent natural qualities". Firstly, it is difficult to agree with the Article 153 of the State standard, where the product which is not peculiar to the natural composition of honey, forgery, called the honey. Secondly, we do not share the optimism of the author of the article "The scales of honey falsification" A.S. Ponomarev, posted on the website "The World beekeeping" that this standard "will help to clear the market from surrogate"<sup>4</sup>, if the definition of adulterated honey itself is not given correctly.

But we support the author of this article in the fact that the blocking the path of honey falsification on the Russian market can be shared with the state organizations with their authority to: "tax authorities, the Federal Antimonopoly Service, the Ministry of Agriculture, the Ministry of Industry and Trade, The Federal Service for Veterinary and Phytosanitary Surveillance, the Federal Service for Supervision of Consumer Rights Protection and Human Welfare".

Adulterated honey is not only knocks down prices, because of what diligent beekeepers are forced to leave the market and keep the bees only for themselves. The main thing is that the consumer pays for the product, which is in 3 times cheaper than natural honey, has incomprehensible content, and harmful to the human health<sup>5</sup>. The greatest number of adulterated honey which is dangerous to health comes from China. Health of the nation depends on the quality of food consumed. The national security depends on food safety.

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<sup>1</sup> Remote monitoring of bees health in the EU. [Electronic resource] URL: <http://federal-pchelovod.ru/o-federacii/novosti/kontrol/> (date of appeal 16.03.2016)

<sup>2</sup> Arslanova A. Microchips will put on the bees. [Electronic resource] URL: <http://www.russian7.ru/post/nachel-odenut-mikrochipy/full/> (date of appeal 18.03.2016)

<sup>3</sup> Ponomarev A.S. Apimondia intends to fight the falsification of honey. [Electronic resource] URL: <http://www.apeworld.ru/1444903289.html> (date of appeal 17.03.2016)

<sup>4</sup> Ponomarev A. S. The scales of falsification of honey. [Electronic resource] URL: <http://www.apeworld.ru/1435960819.html> (date of appeal 17.03.2016)

<sup>5</sup> The round table in the State Duma of the Federal Assembly of the Russian Federation on the issues of beekeeping [Electronic resource] URL: <http://federal-pchelovod.ru/o-federacii/novosti/kruglyystol/> (date of appeal 17.03.2016)

### **Festures of modern beekeeping in foreign countries**

Argentina is famous for its honey; its price increases in the world market, the main importers are the USA and Germany. Honey production in recent years has decreased since honey fields plowed under cultivation of corn and soybeans.

In the United States, in good weather in the Midwest, honey bees produce clover honey. This honey is highly prized and expensive.

In Canada the migratory beekeeping predominant, bees actively perform their main task – the pollination of crops, increasing yields in crop production.

In Brazil, honey picking has a very long lasting. In this country, they produce a lot of organic honey, which has a high demand and high prices. Organic beekeeping production depends on environmental in gathering honey place, conditions of bees' detention, storage, transporting of production and of a number of other conditions. Also Argentina, Mexico, Turkey, the EU and Italy produced organic honey. In Russia, there is no regulatory framework on organic honey.

The light amber honey is produced in Vietnam, in Europe it is in demand, increasing of the prices of that honey is projected.

An extra light amber honey is produced in India, the price of honey in this country have grown in recent years<sup>1</sup>.

In Serbia, there are excellent spring conditions for the development of bees; honey picking in spring is provided by a variety of flowering gardens. The bees spend the winter outside, as the weather allows, for this period they make 3-10 purifying flying around.

The honey quality in the world market is determined by Codex Alimentarius.

### **Conclusion**

Innovative technologies and modern technical facilities in beekeeping improve the efficiency of beekeeping, on the other hand, if you do not switch to organic products on farms, than or the bees will die, or there will not be migratory beekeeping for pollination of agricultural fields; it is possible to forecast a huge loss in crop production, in the connection with the loss of crop pollinated by bees cultures.

Innovative methods of work described in the paper, facilitate greatly the hard work of the beekeeper especially in small, backyard apiaries. Practical four-year study aimed at improving the work with swarms allowed to develop the know-how, a special technique, which is set out above. Practical recommendations for feeding and wintering bees without loss of bee colonies in Siberia, based on years of experience, are given.

There is also an overview of emerging innovative technologies on beekeeping in the future, as well as the problem caused by the falsification of honey bringing great harm to public health is designated. The problem of legal insecurity of beekeepers and consumers of bee products from counterfeiting is also shown in this article [11].

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<sup>1</sup> Prospects of the global market of honey. [Electronic resource] URL: <http://federal-pchelovod.ru/o-federacii/novosti/perspektivy-mirovogo-rynka-meda/> (date of appeal 17.03.2016)

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