

# FAO TECHNICAL REPORT

## Assessment of pepper value chain in Strumica region, North Macedonia

Pavel Kiparisov, Yutong Zhang

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### 1 General information

#### 1.1 Trade and value chain

Vegetable production of North Macedonia makes up about 30 percent of total agriculture output of the country and is export-oriented. Almost 80 percent of the vegetable production is exported either as fresh, preserved or processed food. The production of vegetable crops is concentrated in the southern and eastern parts of the country, because of the favourable climate. Over 75 percent of production is in open fields, while 20 percent is in plastic tunnels and the rest in glass greenhouses. The top five vegetable crops are potatoes, peppers, tomatoes, cabbage and melons.

This report focuses on pepper. Harvested area of pepper in the country was decreasing from 1996 to 2005 (See Figure 1). From 2005 until recently there is a growing trend with minor deviations. In 2012 the harvesting area for pepper reaches the level of 1992, and gradually continues to grow.

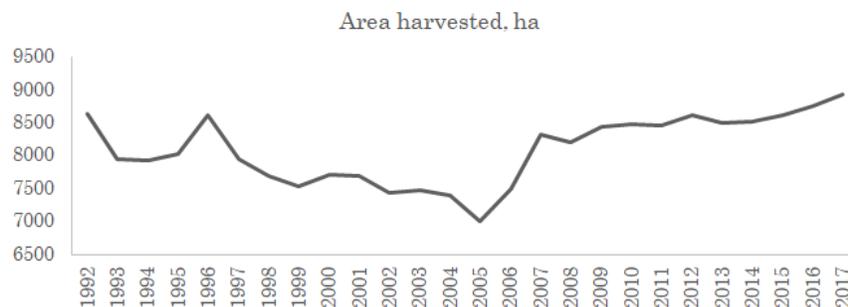


Figure 1: Change of area of pepper harvested in North Macedonia

North Macedonia has been a net importer of the pepper in 2010-2019 (See Figure 2). Only two times over this period the country exported more in terms of value than it imported (in November 2012 and August 2013). The highest exporting prices are usually observed in November-December, June-July, and sometimes in March-April, which corresponds with high seasons of harvesting in North Macedonia

(See Figure 3). Import price variation is much higher with three to five peaks a year (usually in the beginning of the year, in summer, and in autumn).

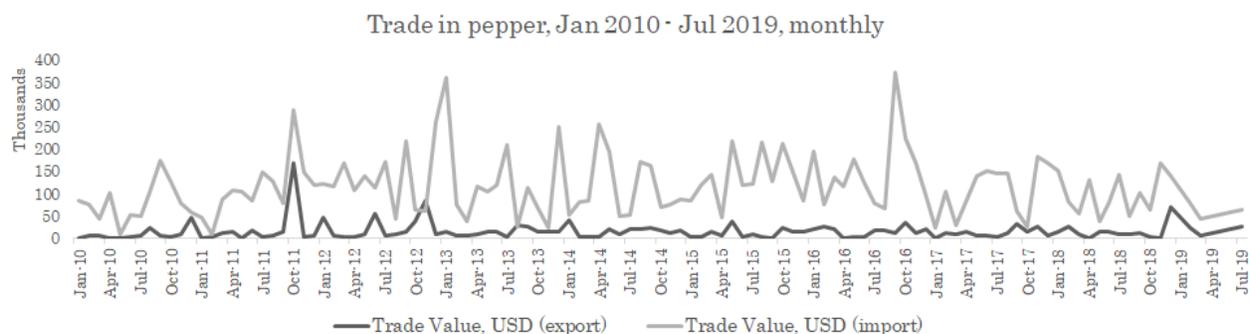


Figure 2: Export and import value

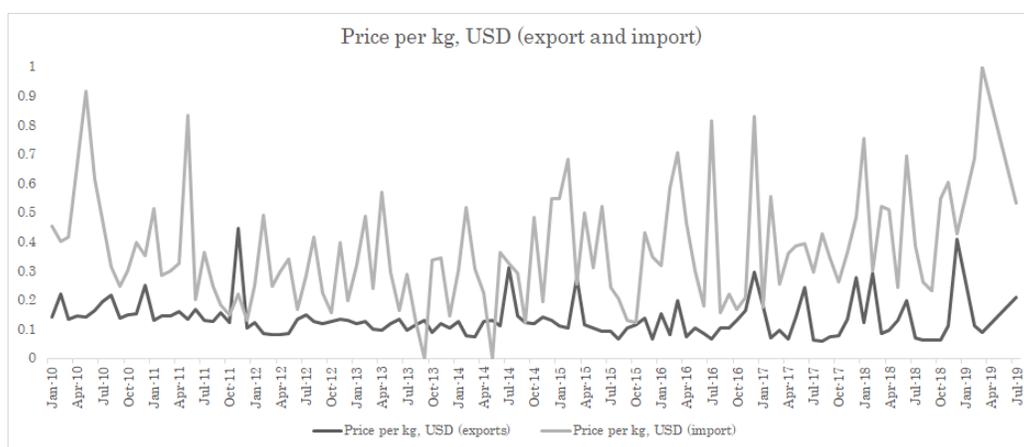


Figure 3: Price dynamics for exported and imported pepper

Top export destinations in 2018 were Serbia, Australia, Albania, USA, Canada, Germany, Republic of Slovenia, Czech Republic (See Table 1). In recent years peppers were also exported to Austria, Ireland, Montenegro, New Zealand, United Kingdom, Belgium, Bosnia Herzegovina, Italy, and Norway (UN Comtrade).

Exports to	Netweight (kg)	Trade Value (USD)
Serbia	43,323	168,604
Albania	1,920	9,766
Australia	1,586	1,3698
USA	260	2,446
Canada	130	931

Table 1: Major destinations of pepper exports in 2018

Most of the imports of pepper in North Macedonia accounted for Vietnam, China, Bulgaria, Serbia, Brazil, Croatia, India, Germany, Indonesia, USA (See Table 2). The pepper is believed to have a competitive advantage on the EU market based on its trade competitiveness index (Ambroziak, 2016).

Imports from	Netweight (kg)	Trade Value (USD)
China	205,837	184,439
Bulgaria	140,513	182,899
Vietnam	91,942	351,794
Brazil	49,032	147,064
Serbia	34,261	158,825
India	26,328	30,140
Uzbekistan	20,980	13,160

Table 2: Major destinations of pepper imports in 2018

Availability of pepper for human consumption in the country is moderate – 0.08 kg per person registered in 2013 by FAOSTAT. Compare this to availability in some other countries: Netherlands (0.27 kg), Ireland (0.19 kg), Slovakia (0.11 kg), Montenegro (0.04 kg), Bulgaria (0.02 kg).

Food processing is a significant industry in North Macedonia. Processed foods include both semi-finished products (frozen, dried and concentrate) and finished products (canned and preserved). Pepper is a valuable crop because of the multiple ways it is used in the processing industry. It has a crucial importance in the value chain of 'ajvar', a relish that originates locally, and some other value chains. In addition, presence of nutrients and bioactive matters in pepper makes it a particularly healthy product for human consumption.

Main geographical focus of this report is Strumica region. Strumica region is the main agricultural center in the country. It has food industry, textile factories and a developed domestic and international trade network.

## 1.2 Climate and environment

Literature suggests that climate change effect on vegetables production in North Macedonia is expected to be tolerable even under medium and high scenarios (Hristov, 2018). However pepper production already suffers from growing temperatures. It is reported that plots with pepper growing in the open fields have significantly less output because of pepper sunburns. Appropriate measures should be taken into account, because even minor changes in production may cause negative implications on small scale farmers, and may cause interruptions in the value chain. Regarding diseases, researchers report the presence of cucumber mosaic virus, alfalfa mosaic virus and potato virus Y in North Macedonian peppers (Oreshkovikj et al. 2018).

There was no focused study on *food losses and waste* (FLW) situation in the pepper value chain, as well as its comprehensive assessment, therefore REU FLW team leads research efforts on collecting and analysing relevant data in North Macedonia with help of the local NGO Ajde Makedonija.

## 2 Field trip – Pepper value chain analysis in Strumica region

The ROs supported Ajde Makedonija team in their study of pepper value chain with focus on the food losses and waste in Strumica region. During the field trip, the project team interviewed five farmers, three collectors, one agropharmacy, and one processor (one more processor cancelled the meeting; the questionnaire was sent via e-mail). The initial surveying method was semi-structured questionnaires,

developed by FAO and Ajde Makedonija. The surveys were complimented with questions on detailed amounts and costs to be congruent with the EX-ACT methodology. Single interview could have lasted up to two hours. The interviewees were selected before the mission by Ajde Makedonija through the Rural Development Network. The research team also observed farms, open fields, waste dumps and greenhouses.

## 2.1 Farmers

All farmers interviewed are smallholders with plots of size 0.4–1.5 ha. They grow pepper in open field and in self-made greenhouses. Some of them use only greenhouses. The self-reported yield vary from 8 to 43 tonnes per ha. Farmers usually do not do bookkeeping, which may explain this range in reported numbers. The more realistic figures are 30-40 t per ha. External literature estimates pepper yields to be on average 17-20 t per ha, depending on the year and weather conditions in the country. There are several wide-spread varieties of pepper and three quality classes. 60 to 80 percent of pepper produced by farmers is attributed to the first class. Farmers rarely use consultants, and rely mainly on friends' advice and conversations with sellers in agropharmacies. Some farmers annually conduct soil analysis in local labs but some do not do it at all. Farmers do not usually plan their production because of uncertainties concerning weather and market demand. They grow what has proved to be successful in the previous year. Farmers' costs include fertilisers, pest management, irrigation, spray pesticides, labour, packaging, tools, depreciation and interest, repair and maintenance. Losses during production are caused by weather conditions (frosts, heat, strong wind), diseases and pests. At this stage 10-20 percent of crop may be lost. Setting greenhouses helped farmers decrease a number of sunburned pepper that grow in the open filed (See Annex 1, Figure 4). Adequate applications of pesticides and chemicals usually solve the problems with pests and diseases.

The crop is harvested from August to November. Some farmers have early harvest in April-July. During harvesting they should hire three to six more people; the rest of the time they involve only their families. They report that it is becoming more difficult to find workers. After harvesting, the pepper is usually moved under the roof for sorting and cleaning (See Figure 5). Farmers use plastic and paper boxes or net-bags for packaging. At harvesting and sorting stage the losses amount to 3-5 percent (caused by physical damage).

After sorting farmers immediately sell pepper to collectors or processors. Some of them dry harvest for further processing (See Figure 6). Farmers do not have any storage. Upon delivery to sellers or processors, the pepper is assessed by its size, shape, colour, presence of injuries, and its general condition. At the post harvest stage, 10–15 percent of losses is reported by farmers (caused by physical damage and decay). In addition, losses occur at the transportation stage – during loading trucks and because of bad roads (0.5–5 percent). Some farmers prefer to sell to processors because in their view this is a more reliable option. Some farmers solely sell to collectors and informal traders. One farmer diversifies his sales – 25 percent is sold to collectors, 50 percent – to processors and 25 more percent – to informal traders. Farmers need to sell their products at least for 16 denar per kg, otherwise the production is not profitable. Some farmers reported that the price only higher than 20 denar per kg can be profitable for them. Unsold harvest (up to 5 percent) is thrown away (See Figure 7), given out to neighbours or dried for production of ajvar (for own consumption).

Farmers are not members of any cooperative or association. They usually do not trust such forms of cooperation. Only one farmer is willing to create a cooperative, trying to use support provided by a German project. The project gives out 20.000 EUR for cooperative development but the problem is that farmers should cover at least 20 percent of the project costs. There is also a state programme that pays cooperative manager 200 or 300 EUR but it is not enough to stimulate the formation of cooperatives. The farmer claims that less than 20 percent of cooperatives in North Macedonia are successful.

Farmers receive governmental subsidies that amount to 2500 den per 0.1 ha, and 3 den per kg per processor. They request technical training and advice in production and inputs.

## 2.2 Traders/Collectors

Interviewed collectors in Strumica have three to eight staff members and they hire up to ten more people in the high season. They do not experience problems with finding labour if they offer a decent salary. Close to 100 percent of their suppliers are local farmers. Farmers bring pepper to collection points themselves. Each collector works with 50–150 farmers. Collectors do not pay farmers on the spot; they pay in 5–15 days. They buy 2000–3200 t of pepper yearly. They pay 30 den for the first class pepper and 20 den for other classes. Collectors note that rejections are rare and not exceed 3 percent. They usually bring down the price in case the standard quality is not met rather than reject the product. Collectors have medium-size storages (See Figure 8) with capacity 40–60 t. One of the collectors has a cold storage. They do not keep product to wait for better price. The state supports collectors in performing food safety and quality checks. Exporting to some countries requires additional tests.

One of the collectors sells 100 percent of crops to processor; another has more diversified sales: half goes to processors, 10 percent – to wholesalers, and 40 percent – to foreign markets; the third collector specialises in exporting. Collectors who are involved in exports use trucks with refrigeration. Seasonality of exports is shown in the monthly trade graph (See Figure 1) with peaks in November-December, July-August, and sometimes in April-May, which reflects the periods of harvest. All collectors say that they do not have any governmental subsidies. They highlight a problem with informal traders, who beat off a significant share of profit.

Collectors have relatively accurate estimations of their losses. They report 0.5–10 percent of losses caused by oversupply, when they cannot sell and store more pepper and have to throw it away. The collector with cold storage has the lowest losses among others – only 0.5 percent. The collector with adequate storage room but without cooling reports 3 percent of losses and claims that cold storage will improve the situation. The collector without satisfactory storage of any type reports up to 10 percent of losses.

Collectors believe that state subsidies for farmers hinder innovations and do not stimulate farmers to use better seeds and technologies. Farmers receiving money from the Government simply use them for cultivating the same low quality variety of crops.

## 2.3 Processor

The research team visited a medium processor in the village Bansko (See Figure 9). The company has 100–110 employees and is specialised on vegetable canning and ajvar production. The company exports to the European Union, Australia, Canada and other countries. Their daily processing capacity of pepper is 20–25 t (in case of processing for ajvar – 50 t). Yearly they process 1200 t of pepper. They get crops from farmers and local markets. The representative of the company claims that 20 percent of pepper they receive from farmers is not suitable for processing. The rejected pepper is usually given out for animal feed. Losses at the storing stage are also quite high – 19 percent. Supply peaks cause the most losses, when they run out of room in storage. The processor is willing to improve cold storage capacities to better handle large amounts of supply. They find labour shortage a serious problem.

## 2.4 Agropharmacies

The economist from an agropharmacy in the village of Dabile explained the potential positive effect from proper application of inputs and shared with the research team some observations regarding pepper production. He believes that farmers mostly try to survive, they do not attempt to grow and invest. So

far the most significant innovation made by local farmers was homemade greenhouses (See Figure 10). With proper utilisation of quality seeds and fertiliser, he believes, the annual yields may reach 50 t per ha, plus the share of first class peppers will grow. Currently 90 percent of seeds used are low-quality homemade seeds or seeds that already lost their vigour. Insufficient cooperation among farmers also prevents pepper sector from growing. Among other bad practices are wrong manure application, usage of banned in the EU pesticides. Utilisation of hybrid seeds resistant to pests would decrease use of spray; utilisation of hybrids resistant to diseases would avoid losses caused by trips virus. Farmers start using small quantities of quality seeds but this is only a tiny share of production. Advanced greenhouses technologies would further improve agricultural output (e.g. glasshouses).

## 2.5 Preliminary conclusions and recommendations

The value chain of pepper in Strumica region is in general functioning but may be improved. Minor distortions are observed on every level of the value chain. Observations of a *production level* reveal ineffective utilisation of inputs. Better quality seeds will significantly improve the output and reduce the amount of chemicals used. Larger investments in greenhouses (e.g. metal constructions) may prolong their lasting, reducing the overall costs. Capacity building of farmers on production practices and chemical and fertiliser application is desired. Another currently bearable distortion is the difficult access to labour. Farmers report that the search for workers is getting more and more complicated; and their salary expectations are growing every year. Farmers have little cooperation, because of the bad historical image of cooperatives. Service cooperatives and associations of pepper producers may help them improve their storage, spread good practices, and will give farmers more leverage on collectors and processors. Governmental subsidies do not stimulate innovations among farmers. At the *sorting and cleaning level* the only concern is losses caused by physical damage. *Collectors* lack storage capacities and cooling equipment. During high season adequate storage with refrigeration will help them handle the incoming amounts of pepper. Quality pepper will better position North Macedonian products in the international market. At the *transportation level* losses occur because of the low quality segments of roads and manual damage when loading/unloading. *Processing level* also suffers from insufficient storage capacities and pepper of a quality not suitable for production.

The following recommendations to various actors could be drawn\*:

- Conduct capacity building workshops for farmers on proper use of inputs, business skills development, marketing and planning.
- Promote the formation of seed distribution associations for farmers (World Bank experience in many countries can be taken into account).
- When promoting farmers' service cooperation organisations, name them *associations* instead of *cooperatives* to avoid bad allusions to the old production-type entities.
- Focus governmental subsidies on providing quality inputs (e.g. seeds), instead of financing farmers based on produced quantities, which only stimulates more exploitation of low-quality seeds, and avoiding by farmers any investments in inputs.
- Invest in creation of medium- and big-size warehouses, equipped with coolers.
- Develop food hubs based on new warehousing facilities.
- Stimulate internal consumption of locally-produced pepper to drive in-country demand for pepper (especially fresh).

- Help farmers form short value chains to link them directly to consumers. Established short value chains and higher internal demand will ease the situation with oversupply and decrease associated with it losses.

\* this does not include recommendations made by Ajde Makedonija.

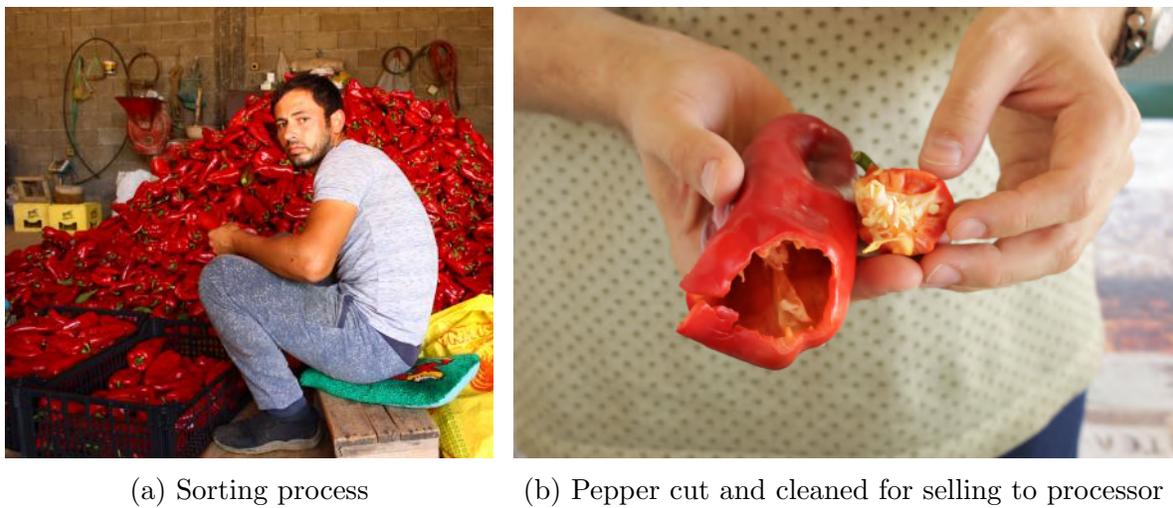
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# ANNEX 1



Figure 4: Pepper damaged by the sun



(a) Sorting process

(b) Pepper cut and cleaned for selling to processor

Figure 5: Sorting and cleaning done by farmers



(a) Pepper is dried under folio



(b) Drying uncovered

Figure 6: Drying of pepper, which is not suitable for market, to produce a local relish



(a)



(b)

Figure 7: Refuse thrown away and burned close to production site



(a) Collector's storage



(b) Transportation of the collected pepper

Figure 8: Collectors



(a) Cut and cleaned from seeds pepper queued for processing



(b) Finished products kept in the storage



(c) Transportation of pepper within the facility

Figure 9: Processor



(a)



(b)

Figure 10: Pepper grown in the greenhouses – a demonstration by the agronomist from the Rural Development Network