Study of existing situation on growing cabbage in Kosovo

(Evaluation of the current situation and proposals
for more productive cabbage production and marketing)

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Summary

Cabbage is one of the important vegetable crops for Kosovo, keeping in consideration areas cultivated and economic importance. It is generally cultivated in open field at different times of the year starting - from early spring to late autumn. In very rare cases it is cultivated in protected environments, which can be low tunnels. This production is dedicated to fulfil family needs (there is almost no production coming from cultivation of cabbage in protected environments for the fresh market).
In contrast to crops like peppers, tomatoes and watermelons (which have a more restricted distribution of cultivation within Kosovo), cabbage can be cultivated in almost all the different regions of Kosovo. In the Dukagjini Valley it is generally grown earlier, while in other regions it is cultivated as a late crop (second crop).

There are real opportunities for cabbage import substitution. The absolute majority of the cabbage imports happen during months March-June. By applying modern methods (good agriculture practices) in cabbage cultivation it is possible to have import substitution during this period of the year. On the other hand cabbage can have export opportunities.

The agro-technical measures applied in cabbage production starting with choice of seed and finishing with harvesting is still very extensive. It is necessary that farmers pay greater attention to care-taking activities. In that sense they need more technical support (different professional publications, demonstration of new techniques in cabbage cultivation).
The whole harvesting process from start to end (delivery to the market) is done manually, without any assisting equipment. In many cases classification and packaging of cabbage is not compliant with the standards applied (for these products) in countries with an advanced agriculture. Transport of cabbage production to the market is done in sacks (affecting product damage and faster crop deterioration). There is not enough organization of farmers in groups (associations). Collection centres with appropriate infrastructure do not exist. Farmers do not have sufficient knowledge on the techniques of cabbage storage after harvest.

It is necessary that farmers improve post-harvest techniques, as a very important link in the chain starting with planting and ending with the consumer.

Another important element is the urgent need for improvement of the local markets' infrastructure, because they are far from fulfilling the necessary standards. In general farmers should improve the way they market their products.
The proper application of agro-technical measures (good agricultural practices) combined with an economic reasoning would be undoubtedly the best way to improve productivity in cabbage production.
The agro-technical measures could include: the utilization of quality seed (hybrid seed), quality seedling preparation, proper plant nutrition as well as proper application of preventive plant protection. It is also imperative that production is better adapted to market demand.
The cost of production is high and the low level of mechanization is one of the reasons for this situation. An improvement in production (increased yields and earliness in the market) could have a great impact in increasing profitability.
Sales of cabbage are realized almost totally in the internal market. There are rare cases of cabbage exports. Sales are individual for each farmer; there is almost no efficient form of organized sales.

1. Background to cabbage cultivation in Kosovo

1.1 History

The head cabbage (Brasica oeraceae var. Capitata), is one of the oldest vegetable crops cultivated in ancient times. This tradition continues in our days. Cabbages are used not only for human nutrition, but also widely used for animal feed (especially leaves' leftovers after harvesting head cabbages).
For a long time head cabbage was cultivated as a second crop, especially after cereals (mostly grain). In such a case harvesting took place at the end of October and continued until early winter. The absolute majority of the cabbage quantities were used for traditional processing (preparation of pickled cabbage for family needs)
To a smaller extent this type of head cabbage home processing, continues to this day in many regions of Kosovo (in rural areas).
With the improvement of living standards, eating habits and choice of food have changed. Therefore using cabbages in pickled form is not as common as in the past, while using fresh cabbage (in salads) is becoming more popular. The structures of cultivation and cabbage varieties used have changed as a response to the demand to consume more fresh cabbage.
The areas cultivated with cabbage have continuously held a high proportion in the total vegetable cultivation in Kosovo. To this day cabbage is one of the important vegetable crops alongside pepper, tomato, watermelon and onion.

1.2. Relative importance of cabbage within Agriculture

Import

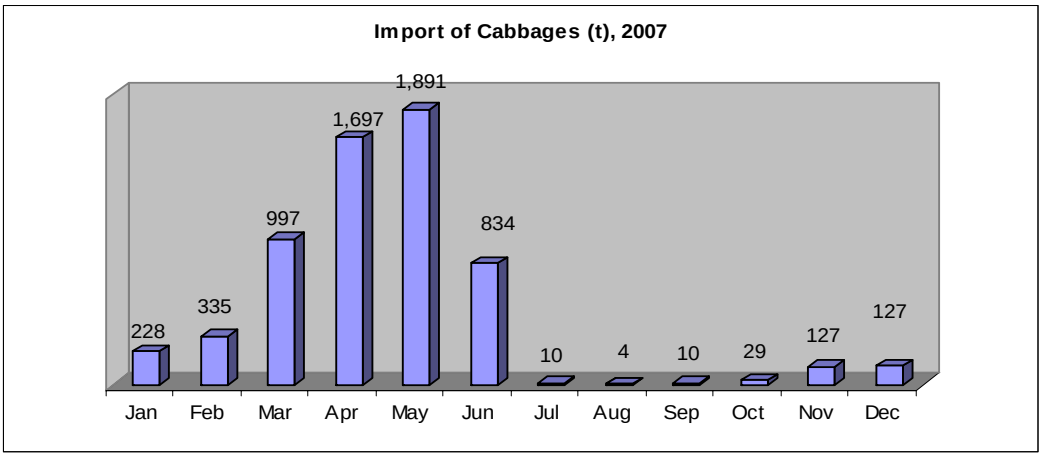
During 2007, 6,288 tons of cabbages were imported at a declared value of 591,017 €.
Out of this total quantity the quasi-totality (99 %) was imported from Macedonia.

Table 1 – Import of cabbage:

Country	Quantity (t)	Value (€)
Macedonia	6,238	580,836
Albania	21	2,825
Turkey	18	5,063
Serbia	4	598
Other	7	1,694

Source: UNMIK Customs service 2007

Graph 1 - The seasonality of imports of cabbages is presented graphically below by month:



Source: UNMIK Customs service 2007

Import of cabbages increased by 9% compared to the previous year.

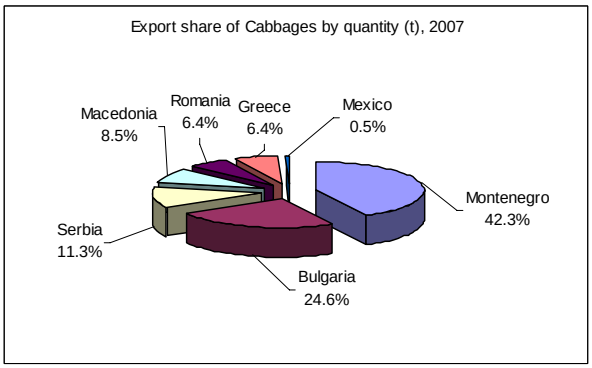
Table 2 – Change in cabbage imports

	2006 Quantity (t)	2007 Quantity (t)	Change %
Cabbage	5,771	6,288	9

Export

975 tonnes of cabbages were exported with a declared value of €68,081. Montenegro with 42.3% and Bulgaria with 24.6% of total weight, are the two main import countries.

Graph 2



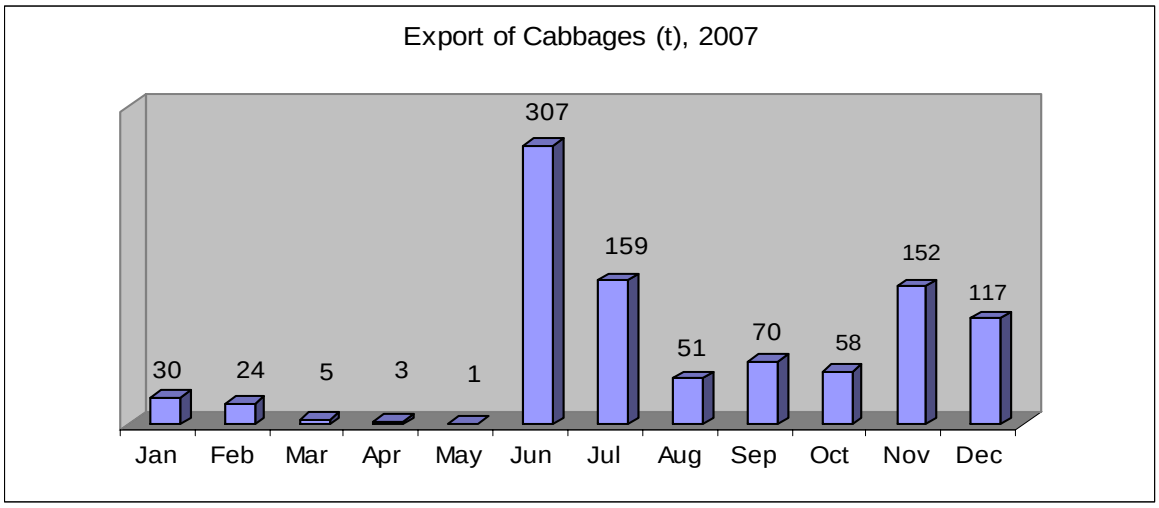
Source: UNMIK Customs service 2007

Table 3 – Export by country

Country	Quantity (t)	Value (€)
Montenegro	413	29,037
Bulgaria	240	11,954
Serbia	110	10,288
Macedonia	83	3,156
Romania	62	3,800
Greece	62	9,497
Mexico	5	350

The export seasonality of cabbages is presented in the diagram below:

Graph 3



Source: UNMIK Customs service 2007

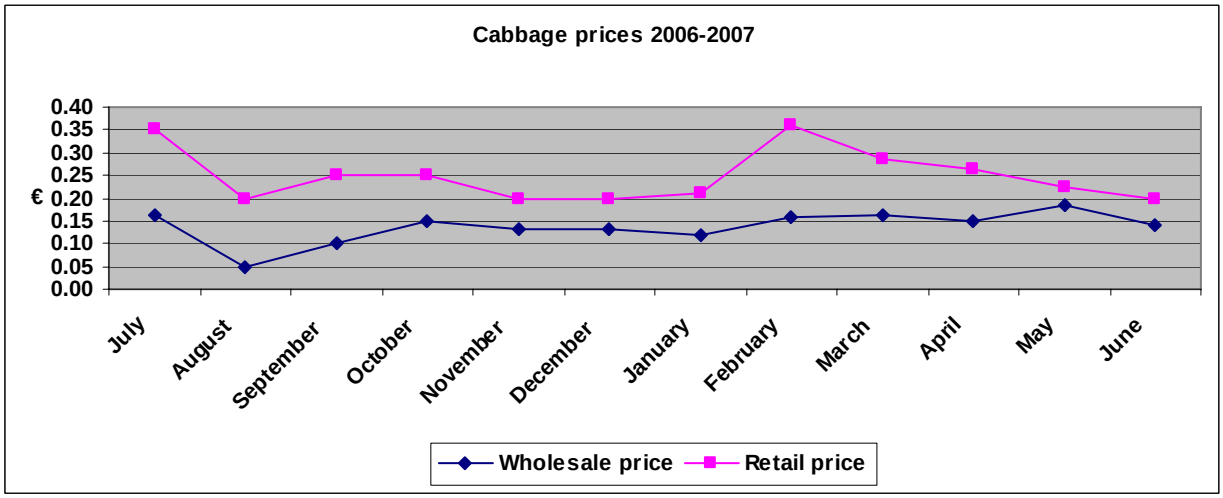
Export of cabbages increased by 0.4 % compared to previous year

	2006 Quantity (t)	2007 Quantity (t)	Change %
Cabbage	971	975	0.4

The trends of export of cabbages in the past three years

1.3 Prices

Graph 4 - Prices of cabbage



2. Description of current situation

2.1 Distribution of cultivation throughout Kosovo

In contrast to some vegetable crops cultivated only in certain regions of Kosovo, cabbage is cultivated in almost all the regions. However there are a number of differences in production type and orientation. In the Dukagjini Valley region early cultivation is more common, while in other regions medium and late cultivation of head cabbage is common. The cultivation of head cabbage is important to many producers because it can be planted during different periods, and it allows for a more rational use of land cultivated as an early crop or late crop. Cabbage cultivation in Kosovo is done through seedlings and there is no direct production from seed.

2.2 Most common cultivation techniques, typical yields, seasonality

Typology of cultivars (including size of operation)

Table 5

Main Varieties	Main Characteristics
Srpski melez 4	Early and mid-season variety. The head cabbage is green to light blue (azure), weighing an average of 2.5 kg, and suitable for pickling. It is cultivated in regions where head cabbage is planted as a second crop[1].
Futoški	A late variety. There is a general tendency not to use this variety anymore; however it is still being used by some producers. Head cabbages of this variety are rounded and pressed and firm.
Rinda F_1	A high quality hybrid. It is used as fresh for salad, and for processing to pickles. The head cabbage is rounded and of a very good structure. The durability in the field is good and weighs up to 4-5 kg. The yields are high in different conditions.
Grenadier F1	Mid-early hybrid, with rounded head cabbages weighing about 2-4 kg. It is a fresh consumption as well as processing variety.
Pruktor F1	It is cultivated as an early variety, mainly in the Prizren and Rahovec surrounding. This variety is a preferred by producers.

[1] Only this variety is used in the Carraleva village (Shtime municipality), which is well known for cabbage cultivation

Choice of seed

In the majority of cases (80-85%[2]) farmers buy the cabbage seed. In rare cases farmers use seeds that they produce themselves. Usually farmers purchase seed in the agriculture pharmacies; in some cases, non-hybrid seeds imported from the region are not of a decent quality. Traditional seed production involves the Srpski Melez 4 variety. Hybrid seeds are not used in traditional production.

Seedling production

For early production[3] planting of seed usually takes place in Mid-February. The amount of seed used is 4-6 gr/m^2 of soil bed. About 500 seedlings can be produced out of one square meter. Planting of seeds is done in warm soil beds. The preparation of soil beds is done in different ways. A layer of fresh organic fertilizer with a thickness of 25-30 cm is formed at the bottom, which serves as the source of heat. Another layer of soil (which in some cases is partly mixed with decomposed fertilizer) with a thickness of 5-10 cm is placed on top of it. The seeds are placed on the surface of this layer. They are then covered with different materials (remains of grapes after processing, mix of fertilizer and soil, decomposed fertilizer). The soil beds are covered in plastic film in a semi-arc structure. In these conditions seeds would usually germinate within 5-7 days.
Care-taking activities during seedling production involve protection from low temperatures (in some cases double plastic film covers are used), ventilation, watering, and pest protection.
Usually aeration of the seedlings is not done regularly; therefore seedlings often elongate and become more vulnerable to pests and diseases. Seedlings get transplanted bare-rooted in the ground. Watering is usually done from wells or waterways nearby to the land, and water is usually very cold. Usually preventive measures are not applied against pests and diseases, however chemicals are used after their occurrence.

For medium and late production planting of seed usually takes place during May-June. Planting of seeds is done in cold soil beds (not in organic fertilizer beds). The beds are 1.2 m wide. The amount of seed used by farmers is 7 gr/m^2 of soil bed[4]. This amount is at least 60-70% more than the preferable amount for this sort of seed planting. During this sort of seedling production, no additional or specific measures are used. Prior to transplanting, seedlings are pulled out of the soil and planted bare-rooted in the field. The seedlings produced in this way are not of good quality and their adaptation in the field is very difficult especially when transplanting occurs at high temperatures.

[2] Evaluation of the report's author
[3] Early production is mainly located in the region of the Dukagjini Valley, especially in the Prizren region.
[4] Based on the conversation with the farmers' group in Carraleva

Transplanting seedlings

Field transplantation of the seedlings for early production is done starting from the end of March. Generally cabbage and onion are the first vegetable crops to be transplanted to the field by Kosovo farmers. Transplanting is done in different distances: row distances are 40-60 cm, while plant distances within a row are 30-40 cm. For late production, transplantation of seedlings is usually done in the second half of July, usually after cereals, early potato, onion etc.

Land preparation

Land preparation depends on the time of seedling transplant. For early production, land preparation starts with an autumn ploughing. Then the area is left in the same condition during winter. In spring additional land preparation takes place as early as weather conditions allow. For late production, land preparation is done after the removal of the first crop. In this case another shallow ploughing is usually preferred.

Fertilization

Fertilizer use is based on no specific rules. Farmers usually do not make soil analyses prior to deciding about fertilization (in the field trips during preparation of this report there was no instance of any farmer who did soil analyses before fertilization).
40% of farmers use organic fertilizer[5]. Farmers add quantities of organic fertilizer during additional land preparation prior to planting. The quantity of organic fertilizer varies between 20-50 t/ha. It is interesting how farmers in the Carraleva village cultivate cabbage as a mono-crop for more than 10 years. In this case farmers use relatively high quantities of organic fertilizer (50-60 t/ha) during the main ploughing in autumn.
In spring a first crop should usually be planted, which can be a forage crop, cereal or a combination of the two (such as oats and leguminous crops). The effect of planting these crops will be to enrich the soil nitrogen content and that would help in reducing the effect of mono-cropping with cabbage. In any case the quantities of artificial fertilizer used in this region are still high (about 1000 kg NPK and about 700 – 1000 kg NAG/ha[6])
The distribution of mineral fertilizers is usually done in two or three periods. Combined fertilizers are used before planting (usually during additional land preparation). While later on N fertilizers are used for re-fertilization (they are used one or two times, until the phase when the cabbage leaves cover the area between the rows).

In the Dukagjini valley region the head cabbage is cultivated early. Generally it is planted later than other vegetable crops such as tomato, watermelon, pepper, onion etc. The quantities of mineral fertilizers used are 50% smaller than mentioned crops.
In the period when this report was prepared no farmer was found using soluble fertilizers in head cabbage production.

Irrigation

Irrigation is usually done by channelling surface water to cultivated plot. In regions where water supplying systems exist, and when farmers own suitable equipment, they use sprinklers irrigation. No instances of using drip irrigation in cabbage production were encountered.

[5] Evaluation of the report's author based on the field data
[6] NAG = 27% N, NPK (15:15:15)

Hoeing between rows (weeding – weed management)

Weeding between rows of plants is a regular activity applied by Kosovo farmers involved in cabbage production. Weeding occurs 2 times, at periods when the area between rows is covered by weeds and the aim of this process is to make the soil friable and eliminate the weeds. There is no mulching and no known herbicide use in cabbage cultivation in Kosovo.

Crop rotation

Generally cultivation of head cabbage differs considerably depending on the period of cultivation and region where it is cultivated. As an early crop it is usually planted after other vegetables. In the region of Carraleva it is cultivated as a mono-crop for more than ten years. However farmers tend to reduce the negative effects of mono cropping by first planting a forage crop in spring as well as by using organic fertilizer and high quantities of mineral fertilizers. Cultivation of head cabbage after cereals (especially grain) is also common.

Protection from diseases, pests and weeds (plant protection)

Protection from diseases, pests and weeds is done without prior planning by farmers. The biggest problem for cabbage producers is the cabbage fly (Pieris brassicae). Farmers are informed on how to fight this pest at agriculture pharmacies, where they buy insecticides (as well as other inputs). In very rare cases farmers use fungicides and herbicides.

Yield

Generally farmers do not keep records regarding their yields. The average yield from cabbage production in the main cultivating regions is 30-40 t/ha (based on data collected from farmers) [7].

Based on MAFRD data, the head cabbage yield is 41.352 kg/ha. These data should be used carefully because yields differ considerably year after year, and the official records (for cabbage as well as for other vegetable crops) may not represent exactly the situation with head cabbage yields in Kosovo. In relation to this fact, in 2002 the average yield was 15 t/ha, while five years later it is three times higher. The present situation in cabbage cultivation does not guarantee such yields, which are more common in countries with an advanced agriculture.

Based on these elements it can be concluded that the average yield for cabbage in Kosovo is at least 40-50% lower than the data presented by MAFRD.

Indoor production of cabbage

In Kosovo head cabbage is cultivated in the open field. Only in rare cases are cabbages cultivated in tunnel greenhouses (made of plastic) without heating; this allows being present in the market for two weeks earlier. The cultivation of head cabbages as well as other leafy vegetables (salad, spinach), which do not require increased temperatures,

[7] The differences depend on the cultivation time – early or late cultivation.

allows for the rational use of the greenhouses. These crops can be planted during winter as secondary crop in the greenhouses where it is planned that another crop (tomato, pepper, cucumber etc.) will be the main crop. In this way the market will be supplied with fresh vegetables at a time when the range of fresh vegetables is very poor.

2.3 Harvesting, packaging and transport of cabbage

Harvesting takes place when head cabbages are ripe enough. Usually not all plants will be ripe at the same time. For this reason harvesting is done in phases. Harvesting of early cabbage in some regions of Kosovo (especially in the Anadrini region) starts at the end of April and beginning of May. Early cabbage is usually packaged in different types of sacks (made of plastic). In such form it is delivered to the market. Late cabbage is usually not packaged by farmers. After harvest the late cabbage quantities are placed in the tractor or cultivator trailer and then transported to the market or to storage places (improvised environments where cabbages are stored for a few weeks). Leftovers from cabbage leaves are used for animal feed.

2.4 Marketing

Marketing is one of the problems of the whole vegetable production sector. Poor marketing and lack of commercial production development are the main problems in relation to the cabbage crop. In regions where production is mainly oriented for the market, the sale of the products is done in different ways.

2.5 Marketing channels

The cabbages produced are sold almost entirely in the local market. Exports of head cabbage to other countries occur in rare cases. Sale of the products is individual.

Farmers use three marketing channels:

- direct marketing,
- retail marketing, and
- wholesale.

In most of the cases sale of cabbage is done in the villages, where wholesale traders buy farmers' products which are sold in retail to the wider urban centres. In some rare cases producers send their own product to the urban markets. In many cases packaging and grading of vegetables is not in compliance with standards applied for these products in countries with an advanced agriculture.

The whole marketing is done on an individual basis, there is almost no organized form. Another problem is the extremely poor infrastructure of markets (especially local ones), which does not offer the minimal conditions for cabbage (and other vegetable) marketing.

Direct marketing channel

This channel of marketing implies farmers selling products directly to the final consumer. It is carried out in different forms. Some farmers sell their products in the village market or in other cases they sell along the main roads close to the land plots where cabbages are cultivated. Passers-by or wholesale buyers can find (or purchase) the products being sold in the mentioned locations. This type of marketing occurs in locations well known for their cabbage production; farmers will tend to expose their products. Product exposing is very simple – a few head cabbages are placed along the road, sometimes just on the ground, and a few times on a small improvised bench.
Many farmers use their own transport means to deliver their products to different markets within Kosovo.

Retail channel

Even though this sort of marketing is very attractive for a few types of vegetables, it is not popular in the case of cabbage. Marketing through this channel implies supplying restaurants, supermarkets and small retail shops.
However this type of marketing is not interesting for cabbage farmers in Kosovo. It could be a good choice for small and medium producers.

Wholesale channel

It is estimated that more than half of the total cabbage production is sold through wholesale traders. Producers expose their products in different parts of the village, or along the roads, close to the areas with cabbage cultivation. Wholesale buyers come to these places to buy the products in order to sell them in retail to more populated urban areas.
Farmers sometimes sell their products through wholesale markets, where their products are purchased by wholesale traders.

2.6 Cost of production

The economic calculation of cabbage production should be done keeping in mind the fact that the price of cabbage is very variable (depending on the year and on the period within the same year). From conversations with farmers[8] while this report was being prepared (in September-October 2008), it was observed that they were extremely unsatisfied with the sale of their crop during the year. The price of cabbages (according to the farmers) fell to about 0.07 Euro/kg. During the same period of the previous year the price had been three times higher. The price fluctuation problem is a proof of the difficulties and risks that vegetable producers in Kosovo are faced with.

Data from the following table show that the cost of production for the traditional cultivation is relatively high and the profit from one hectare is low. Sale price at 0.12 Euro/kg was used based on the data for the average cabbage price for the past two years (look at the graph at the beginning of the report).

[8] From the farmers group in the region of Anadrini and Pristina vicinity

Generally there exist no big difference between the cost of production of early and late production of cabbage. However there is a difference in seedling production (which is more costly for the early production), anyhow the number of irrigations in the early production is lower[9].

Table 6 - Economic calculations in traditional cabbage production[10]

	Considerations	**Yield (tons)**	**Price (Euro/ kg)**	**Revenue (Euro)**	**Fixed costs (Euro)**	**Variable costs (Euro)**	**Family Labour (Euro)**	**Income from land, capital (Euro)**	**Income from land, capital and family labour**
cabbage	*(1 ha) 90% family labour*	**35**	**0.12**	**4.200**	**400**	**2.389,66**	**850**	**1.360,34**	**2.125,34**

For more details on the cost of production look at annex 1 of this report.

2.7 Processing industry, capacity and trends.

Cabbage does not have an important usage in the processing industry. During this year it is predicted that only 60 tonnes of cabbages are going to be used for industrial processing[11]. However cabbages are widely used for family traditional processing (pickles) a one used for family needs only.

2.8 Input suppliers

In general the agricultural input market is relatively well-organized. The prices of inputs are a little higher than in the countries of the region. Almost no big seed or agriculture inputs company has a direct distribution to Kosovo. The supply of inputs for the Kosovo market is usually done through big companies present in the region's countries. However in spite of the way they are supplied in the market of Kosovo there are some very good quality seeds from companies such as "Semennis" s'p, "Nicersonzwan"s'p, &"Close"s'p.

Suppliers of inputs have not been as active as they should in promoting their products. In contrast many input supplying companies in other countries of the region have achieved leading positions in the respective markets by promotion of their hybrids or new cultivation techniques (example countries are Albania, Serbia). It is important that in the future agriculture input suppliers should be involved in more activities of promotion for the new hybrid seeds and new cultivation techniques.

[9] Usually in early spring there is more rainfall
[10] There was no instance of farmers using a machine totransplant seedlings. The utilization of this type of machine through service providers would cost about 80 Euros, which means 50% cheaper than the traditional method.
[11] Data from "Progresi" company management

2.9 The involvement of different NGOs, farmer organisations and other institutions in cabbage production.

A considerable number of projects have been involved in supporting the vegetable sector within horticulture. There has not been any specific project dedicated to cabbage production. Intercooperation has been the longest project in the vegetable sector. Other projects that have directly or indirectly been involved in cabbage production are USAID projects, "Anadrini", some EAR projects etc. The main problem with the activity of these projects has been the lack of continuity and as a result most of the progress achieved has stopped with the termination of the projects.

Different farmer associations have been formed during this period with the assistance of various projects implemented by different NGO-s. One of the components of most active projects in the vegetable sector has been the establishment of farmer associations. However the activities of the associations established have ended with the termination of the projects.

Even though there are some attempts to "keep them alive", nevertheless these associations are not able to play an active role in the sector, because of organizational and functional difficulties. Small associations or informal groups of farmers have been formed in some regions.
Better farmer organization is an important precondition in strengthening the farmer's position. The key to do this is capacity building of associations (especially direction boards), in order to have a better organization and management. Specific programs should be initiated in order to build association capacities.

3. Best Agricultural Practices

Choosing quality seeds (hybrids) to plant

There is still a need to promote more new hybrid seeds in cabbage production. In any case as compared to other vegetables, in cabbage production there is some progress in the selection of quality seeds from appropriate hybrids. First, farmers should be oriented towards choosing hybrid seeds offered in the market. The choice of qualitative seed is an important precondition in the production of cabbage. Out of some experiences from cabbage producers some cabbage hybrid seeds (such as Rinda F_1) have yields of 70-80 tonnes[12]. Good results had also other hybrids such as Minoris F_1 (early variety), Bravo F_1 (late variety), Coronet F_1 (late variety suitable for long storage). However choice of qualitative seed is only one of the important conditions for the achievement of high yields.

Proper preparation of seedlings

Poor cabbage seedling production is one of the main reasons for low yields and late harvesting. Proper seedling production implies using modules and appropriate substrate according to each type of vegetable. Other care-taking activities (such as maintaining temperature, lighting, humidity and plant nutrition) should be in line with the needs of the

[12] From the conversation with a producer, Ismet Dragusha

seedlings. It is very important that transplanting of seedlings be done together with the soil (not bare-rooted as it is common now). The measures mentioned above are important during the whole cabbage growth and development phase (including the seedling production phase). However these measures do not involve a lot of effort.

Proper land preparation before seedlings transplant

The appropriate soils for cabbage cultivation include medium-heavy soils to medium-light soils. The pH of the soil should be neutral to slightly acidic (pH 6 – 7). Land preparation should be such that an optimal ratio of air and water is present. A proper land preparation is an important precondition in the successful cabbage cultivation. In order to be able to plant seedlings in early spring, the land should be ploughed immediately after the removal of the previous crop. If this ploughing takes place prior to autumn, then it is necessary to have another autumn deep ploughing. In spring if the land is considered to be denser than it should, another shallow ploughing would be preferable, followed by additional land preparation (tilling, disking etc.)
For cultivation of cabbage as a second crop (post-crop), land preparation should occur immediately after removal of the main crop. Keeping in mind that usually during this time (in July) temperatures are high and rainfall is less, a proper time should be found to prepare the land (specific care should be paid to the optimal soil humidity, at the time of preparation).

Keeping in consideration the cabbage high need for nutritive substances[13], it is very important to be careful with crop rotation. The cultivation of cabbage in the same soil for a number of years would increase the risk of disease and pests incidence and will influence in the non-uniform utilization of the nutritive elements.

Irrigation, Utilization of drip irrigation

Drip irrigation is the most appropriate method to use for any crop irrigation, and it is also very good for vegetable cultivation. By using drip irrigation the producer has the possibility to exactly control the amounts of water and fertilizer that are going to the plants. As a result, there is a higher possibility to have increased yields and quality products. Other effects of drip irrigation are reduced possibility of having denser soil, erosion and washing out of nutritive elements in the soil. However in the case of cabbage production, utilisation of drip irrigation should be economically analysed and based on the time of production.

The water demand of cabbages is high, especially in the phases:

- After seedlings transplant
- Head formation phase
- Growing of heads phase

Based on this water demand it is important that irrigation be adapted. The dosing and frequency of irrigation should be decided in each specific case, based on climate conditions, type of land and the condition of the plants. The optimum norm of irrigation is approximately 40 l/m^2.

[13] Vegetable producers in Kosovo have a saying: “cabbage is heavy for the soil”

Proper nutrition of the plants (including basal fertilization and nutrition with high-solubility fertilizers through the irrigation system),

It is imperative that soil analysis is made prior to fertilization, in order to decide correctly on the dosing of fertilizers. Cabbage's need for nutritive elements is high in all the phases of growth and development. The crop grown well with organic fertilization. In the early cultivation the distribution of organic fertilizer (at 40-60 t/ha) is done prior to the main ploughing. In the late cultivation organic fertilization could be used (at 20-30 t/ha), however the fertilizer should be decomposed.

The use of organic fertilizer improves the physical, chemical and biological conditions of the soil, which allows a successful cultivation. Head cabbage requires fertilizers in the proper amount and furthermore fertilization should be balanced. In cases when the ratio between nutritive elements is not suitable, head cabbages might be soft and lack compactness, which can also influence on the sale value. For every 100 kg of cabbage, the following elements in specific quantities are absorbed from the soil: 0,35 kg N, 0,15 kg of P_2O_5 0,50 K_2O (approximately in the ratio 2 : 1 : 3) and 0,07 kg of MgO. Based on the time of cultivation and planned yield different authors recommend different amounts of fertilizers: 130 – 310 N, 45 – 100 P_2O_5, 160 – 400 K_2O, 75 – 165 CaO and 25 – 55 MgO kg/ha (Lesic et al, 2004).

Application of proper preventive protection methods,

Proper protection of head cabbage from diseases pests and weeds is the basis of successful production. It is important to have preventive protection, which means optimal application of agro-technical recommendations (proper crop rotation, good land preparation). Biological and chemical integrated protection can be applied in cabbage production (as in other vegetables). However presently chemical use is very common among farmers.
Some chemicals can be used as preventive measures. The advantage of these chemicals is that they manage to kill almost all insects, pathogens and weeds. However in recent years there has been an increased cost of the chemicals and this has been one of the reasons why farmers are being directed towards integrated production. Integrated plant protection is important to produce a healthier product and is based on the timely and correct application of agro-technical recommendations, proper variety choice and minimum chemical use.

Adaptation with the market demands,
Based on the above presented data it is observed that the highest level of imports is during months March to June, while the month with maximum import is May. There is a real possibility for cabbage producers to be able to be present in the market (especially in the month of May). This is mainly possible in the region of the Dukagjini Valley and in the region covered by the triangle Gjakova – Rahovec – Prizren.
In order to fulfil the market demand for cabbages prior to May (in March and April), simple tunnels of a low cost would be needed. Furthermore hybrid seeds of short vegetation and appropriate for this type of cultivation should be chosen. Such seeds include Minoris F_1, Hunter F_1 Balbro F_1, Pruktor F_1. Upon the application of the above mentioned recommendations it will be possible to have at least a doubling of the present yields.

The improvements that these measures

In order to achieve better revenues farmers should increase yields and be present in the market early enough.
In best practice cabbage cultivation there is a considerable increase in revenues through lower unit production costlinked to the higher yields. Earlier production may kach to higher prices. During visits to different farms it was noticed that the measures proposed here were not applied correctly. This means that there is a need to demonstrate to farmers modern cultivation methods in cabbage production in order for them to be able to apply the same in their farms.
Usually projects working in promoting improved practices have only focused on the issue of introducing and promoting new varieties of cabbage. However the best practices introduced with some farmers were not widespread to other farmers. The reason for this situation is that the promotion of new varieties was done in small areas. Generally no wide impact promotion (in the form of a field day) of the work being done was organized. In many cases farmers were not properly informed, and they gradually started to believe that the new cultivation method would be too costly for them and would not increase their revenues.

It is important that in the future such activities to be organized in such a way that they build farmer's capacities, so they become able to apply the new techniques. Furthermore demonstration fields and field days should be organized. These activities should be continued for at least two or three years to have a widespread effect.

Keeping in mind the considerable difference between early and late production (not only within different varieties) it is imperative that the demonstration of best practices be done separately.

The approach to this problem should include technical measures (training, demonstrative fields) and economic recommendations:

- Utilization of hybrid seed
- Improvement of the seedling production (**hardening**) prior to transplant
- Transplanting seedlings including substrate (not bare-rooted)
- Proper plant nutrition including utilization of high solubility fertilizers
- Improved protection from diseases, pests and weeds
- Improved packaging of final product
- Adaptation of production to market demand
- Improved market approach

Almost none of these recommendations are presently applied by actual cabbage producers.

The application of these recommendations (by farmers) would result in achieving three main objectives for them and for Kosovo agriculture in general:

- Earliness of harvesting (by 15-20 days)
- Doubling of present yields
- Reduction in the unit cost of production
- Increase in farmers' income

3.2 Cost of Production (gross margins for BAP)

The data presented in the following table show that the application of modern agro-technical and care-taking practices, result in an increase (doubling) of yields, and in a considerable increase in the revenue per unit of area.

Table 7 - Economic calculations for BAP cabbage production[14]

	Considerations	**Yield (tons)**	**Price (Euro/ kg)**	**Revenue (Euro)**	**Fixed costs (Euro)**	**Variable costs (Euro)**	**Family Labour (Euro)**	**Income from land, capital (Euro)**	**Income from land, capital and family labour**
Cabbage	*(1 ha) 90% family labour*	**80.000**	**0.12**	**9.600**	**400**	**5.378**	**1.020**	**4.222**	**4.717,80**

The variability in prices of the product during different years should always be kept in consideration. Farmers usually do not record their own family labour as an expense; therefore usually this part of expenses is calculated as profit.

For more details on the cost of production for cabbage look at Annex 1 of this report.

4. Market demand

The analysis of the present cabbage market situation shows that there is a real possibility of import substitution for cabbage. On the other hand, this crop could have export opportunities.

By analyzing the import data represented in Graph 1, it is evident that the absolute majority of cabbage imports occur during months of April - June. Based on the analysis and the characteristics of cabbage cultivation, import substitution for cabbage is possible in the above mentioned period of the year through application of modern cultivation methods.

It is possible to significantly impact in cabbage imports substitution based on the Total imports April - Jun = 4,422 t. Whole sale prices = 0.15 €/kg. Value of import substitution = € 0.66 m/anum recommendations of this report and considering the favourable agro-ecological conditions as well as an excellent tradition in pepper cultivation.

The case of exports is more delicate and requires stronger intervention in order to improve a number of deficiencies, especially in the post-harvest phase. Keeping in mind the relatively high quantities and the diversity of cabbages produced in Kosovo as well as the statistical data for exports in the recent years, it can be stated that there is a good possibility for cabbage exports.

[14] There was no instance of farmers using a machine to make the transplant of seedlings. The utilization of this type of machine through service providers would cost about 80 Euros, which means 50% cheaper than the traditional method.

5. Comparison of traditional cultivation with best agricultural practices

5.1. SWOT of cabbage production (Strengths, Weaknesses, Opportunities and Threats)

Strengths:

- Very favourable agro-ecological conditions
- A tradition in head cabbage cultivation
- The existing market demand for this crop
- Private approach in farm management
- Cheap labour

Weaknesses:

- The domination of traditional production
- High credit interest rates
- Low yields which result in high production cost
- Low investment capacity from producers
- Old-fashioned marketing system of farmer associations (regarding export)
- Underdeveloped extension services compared to sector needs
- Lack of an internationally recognized certification system for export
- Lack of institutional support to the sector

Opportunities:

- The high internal demand
- The possibility to better utilize the land (cultivation as a secondary crop prior or after having another main crop during the year)
- The possibility to contribute in job creation for family members (especially women)
- The possibility to substitute imports and to export
- The development of the processing industry

Threats:

- Lack of financing
- Insufficient grace period for production development
- Lack of institutional support
- Migration of population from villages to urban areas.
- Lack of extension service development

5.2 Compare gross margins

The cost of production in the advanced method of cabbage cultivation (best agriculture practices) is lower in term of cost/kg than in the traditional method of cabbage cultivation.
In the first option (traditional cultivation method) the net profit per hectare is 2.125,34 Euro, including 90% of un-deducted expenses for family labour. With application of best agriculture practices, the revenue per area unit is twice as high (4.717.80 Euro).

Table 8 - Comparison of production costs in the traditional and best practice methods of cultivation

Cultivation method	Cost of production (€)	Income from family labour (90% of total labour) (€)	Net Profit (€)	Income for family[15] (€)
Traditional	2.839,66	765	1.360,34	**3.165**
BAP	9,806	3,501	3.114	**7.115**

In order to make the calculation and comparison easier and considering an average of prices of cabbage for early and late cultivation, the price used for both options (traditional and BAP) was 0.12 Euro/kg. However in some cases when proper agro-technical recommendations are followed, with early production of cabbages, the average price of sale could be higher (at around 0.15 Euro/kg[16]).

5.3 Reasons why farmers do not adopt BAP

Even though there are positive examples of improved cabbage cultivation technology (especially with the use of hybrid seed), cabbage production is still far from achieving parameters of a modern production based on best agriculture practices.

There are different reasons which discourage the adoption of best agriculture practices in cabbage production. The two main reasons are:

1. Lack of knowledge
2. Economic reasons

It is evident that farmers do not have proper knowledge in implementing best agriculture practices. There is a need to learn more about the advantages of this cultivation method. This can be achieved through the methodology described previously in this report.

The application of best agriculture practices requires some investments, especially in the initial phase. This is one of the reasons why farmers are hesitant in applying these practices. However it is very important for farmers to understand that the net profit could be much higher (look at section 5.2). Furthermore the application of these practices would allow farmers to rationally use land, because the same production would be achieved in smaller areas. This would allow for better crop rotation as well.

[15] Land rent is not included
[16] Estimation of the author.

The difficulty in the sale of the cabbage product (the example of this year) is one of the reasons why farmers hesitate to invest more in this production.

Recommendations

- One of the priorities in vegetable production in Kosovo should be improved cabbage production keeping in mind this crop's importance (considering areas, and the possibility to use it as food).

- Head cabbage is a very important crop because it can be cultivated in times of the year (autumn and early spring) when the range of fresh vegetables available is very narrow.

- Keeping in consideration the cabbage crop durability in low temperatures, its cultivation has the possibility to be present in much wider areas within Kosovo as compared to tomatoes and peppers. This element should be considered during planning of activities to promote modern cabbage cultivation methods. Such promotion of measures to improve cabbage cultivation should be organized in five locations.

  The locations which were mentioned above could be:

  - The triangle Gjakova – Rahovec – Prizren (for early production)
  - Peja (Logjë) (for early and late production)
  - Carraleva (late production)
  - Prishtina or Podujeva region, (mid-early and late production)
  - Anamorava (mid-early and late production)

- There is a need to start with promotion of modern techniques in cabbage cultivation (quality seedlings, hybrid seeds of high potential yields, proper fertilizer use, preventive protection from diseases and pests).

- Another element to be considered is that different activities should be taking place at different times depending on the time of planting and cultivation. Therefore it is advised that production timeline should be demonstrated separately so that farmers will be able to better understand the modern cabbage cultivation techniques.

- Farmers should be encouraged to make soil analyses regularly. This will help them increase their yields and improve their revenue.
- There is a need to build farmer's capacities in order for them to be able to implement the new cultivation techniques in practice. In order to do that there is a need for technical support (different professional publications and the demonstration of new techniques in cabbage cultivation).

- It is necessary that farmers improve post-harvest techniques in general. Furthermore marketing should be improved for cabbage; market research should be considered. There is a need to improve packaging labelling in compliance with the consumer demand (size of the heads, shape, colour, firmness). Also the quality of the products should be improved.

- Another important element is the (urgent) need for improvement of the market infrastructure, because in their present condition they are far from fulfilling the necessary standards. In general farmers should market their products better.

- There is a real possibility to substitute imports. On the other hand this crop can have export potential.

- The processing industry is using only a small portion of head cabbage. There is potential to increase the quantities of cabbages dedicated for processing in coordination with the processing industry.

- The cost of production is high. One of the reasons for the high cost is the low level of mechanisation in cabbage production. Further mechanisation of cabbage production is necessary.

ANNEX 1

Table 1 Cost of production for traditional cabbage cultivation

Traditional cabbage production				
Area 1 hectare				
	Quant. (kg)	*Price €/kg*	*Total*	
Revenue	**35000**	**0.12**	**4200**	
	Unit	*Price*	*Quantity*	*Total €*
Inputs				
Seedlings	pieces	0.01	41.666	416,66
Organic fertilizer				250
NPK fertilizer				288
Soluble fertilizer				0
Fungicides				
Insecticides				15
Black mulch				0
Agrofleece				0
			Total	**969,66**
Labour				
Irrigating				80
Transplanting				180
Applying pesticides				20
Care-taking, etc.				450
Harvesting	working days	10	12	120
			Total	**850**
Mechanisation				
Ploughing				60
Disking				70
Tilling				30
			Total	**160**
Packaging and market				
Packaging				210
Transport (including inputs)				250
			Total	**460**
Fixed costs				
Rent				400
Depreciation				0
			Total	**400**
Total cost of production				**2.839,66**
Net profit				**1.360,34**
Income with family labour (90% of labour costs)				**2.125,34**

Best practices cabbage production	

Area 1 hectare				
	Quant. (kg)	*Price €/kg*	*Total*	
Revenue	**80.000**	**0.12**	**9.600**	
	Unit	*Price*	*Quantity*	*Total €*
Inputs				
Pepper Seedlings	pieces	0.03	41.666	1.249
Organic fertilizer				250
NPK fertilizer				276
NAG				180
Soluble fertilizer				750
Fungicides				30
Insecticides				30
Black mulch				250
			Total	**3.015**
Labour				
Irrigating				200
Transplanting				180
Applying pesticides				40
Care-taking pruning etc.	working days	12	20	420
Harvesting	working days	12	15	180
			Total	**1.020**
Mechanisation				
Ploughing				60
Disking				70
Tilling				30
			Total	**160**
Packaging and market				
Packaging				533
Transport (including inputs)				250
			Total	**783**
Fixed costs				
Rent				400
			Total	**400**
Total cost of production				**5.378**
Net profit				**4.222**
Income with family labour (90% of labour costs)				**4.717,8**