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POTENTIAL OF THE GREENHOUSE INDUSTRY IN KOSOVO

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Natural Resource Management
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Kosovo climatic conditions and site suitability for greenhouse industry development

Kosovo is situated in the central part of the Balkans. The territory extends within longitudes 41° 50' 58'' and 43° 15' 42'' and within latitudes 20° 01' 30'' and 21° 48' 02''. Kosovo covers a surface area of approx. 10,900 km² and is characterized by an average altitude of 800 m above sea level, but shows vertical changes of relief and morphology.

The suitability of the Kosovo region for greenhouse industry development is clearly distinguished between two main climatic areas. The sites in "Rrafshi i Dukagjinit" (Prizren) or Ferizaj and Gjilani have the best positions for early greenhouse production. Compared to them, the Pristina area in "Rrafshi i Kosoves" is less suitable and the Peja region even less. In practical terms, there are comparative advantages of vegetable growers of the Prizren, Ferizaj, and Gjalini regions for earlier transplanting and earlier production (for no less than two weeks), compared with the rest of the country.

Kosovo does not enjoy favoured climatic conditions compared with most of the neighbour countries regarding early vegetable production. However, unlike the rest of the country, the Prizren region might be very competitive with the Western Balkans.

Importance of greenhouse industry for Kosovo economy and rural development

Kosovo is a net importer of vegetables. Large quantities of fresh vegetables are continuously imported. 41,632 tones in 2005, 42,684 tones in 2006 and 37,686 tones in 2007 of fresh vegetables were imported into Kosovo, with a declared value of € 10,8 million in 2006 and € 10,3 million in 2007. The most important imported products are tomatoes (40-42 % by weight), peppers (16 - 18 %), cabbages (13 - 16 %), cucumbers (12 %) and onions (6 – 10) %. May – June is the peak time for imports.

Actually vegetable production in Kosovo, despite the fast increase of greenhouse area in the past three years, is based on open field cultivation. Shifting the vegetable production from open field to protected structures will extend the production cycle (earlier and later production). The upgrade of the current low standard of simple greenhouses will have a similar effect.

Increasing greenhouse area is the only way that Kosovo can significantly reduce fresh vegetable imports. At the moment the fresh tomato harvests from greenhouses start by the last decade of June. By introducing better designed greenhouses and upgrading current production technologies, Kosovo has the potential to substitute tomato imports from very beginning of June until the beginning of November, but it will continue to depend on imports for the rest of year.

Peppers are actually grown almost totally in open fields, with only very few cases of greenhouse production. Due to the late transplanting date in open fields (beginning of May) and traditional production technologies, the first harvests normally start at the end of July. By introducing pepper cultivation in simple greenhouses, there is the possibility of substituting pepper imports from the second half of May, and to fully supply market demands for the other period of the year until the first frost comes (end of October or beginning of November). The same way, by increasing greenhouse area, the possibility to fully substitute cucumber imports for all of May and June is very realistic. Additionally, by applying second greenhouse cropping with appropriate cultivars, the second peak of cucumber imports (September – October) can be totally substituted.

Promoting the second crop in simple greenhouses is a simple way to reduce imports for spinach and lettuce, which are very common from November to March in present Kosovo conditions.

It is calculated that new greenhouses (60 ha for tomatoes, 50 ha for pepper and 20 ha for cucumbers) will be needed to substitute the current imports of these commodities. One can assume that there will be an increase in local market demand in the coming years (10 %), and the need for additional production area (another 10%) for protected cultivation of other less used crops (aubergine, melon, and squash). So, it seems that in order to reach the objective of import substitution in late spring and early summer, the greenhouse area in Kosovo must be increased by no less than 150 ha.

The current situation of the greenhouse industry in Kosovo and its potential for improvement

Greenhouse industry is a fast developing sector in Kosovo. Based on recent statistics the current total area of greenhouses in Kosovo is 154 ha. It has doubled since 2005, when the greenhouse area was only 73 ha.

Greenhouse construction and microclimate control

The majority of Kosovo greenhouses are composed like boxes. The aim is to maximize the accumulation of solar energy inside the structure and conserve it. However, these types of greenhouses are not able to release excess heat at certain periods of plant growing cycle. Mostly, Kosovo greenhouses are low single tunnels, with combined wooden and metal structures. There are only a few exceptions of better designed and better equipped greenhouses in the country. Actually, there is a tendency to construct improved designed greenhouses by a few small companies which are trying to develop and promote their own models.

Nursery system and vegetable seedling market

Based on the expected developments of vegetable production in Kosovo, an increased demand on good quality seedlings is expected. Actually, despite the fact that several elements of improved technologies have been introduced, the old traditional technologies of seedling production are still

dominant in many places. The response of the nursery sector to new market demands is very weak; the variety of seedlings provided by the nursery sector is limited (mainly peppers and tomatoes) and the delivery time of these products is also very limited.

The nursery sector is usually conducted by several experienced farmers. They produce seedlings for themselves, and an extra amount for salt to potential small clients (usually not previously contracted). The involvement of input supply companies in nursery production is still absent.

Greenhouse crop diversity and commercial varieties

The limited number of crops grown in greenhouses is one of the most serious problems of Kosovo greenhouse industry. Tomatoes and cucumbers are practically the only crops produced under protected cultivation. Enhancing crop diversity will be become a necessity. Peppers, eggplants, melons and French beans can options for the best growers, and it will also help to reduce large imports of these commodities.

Comparing with previous years, there is an improvement in the situation in terms of the variety of greenhouse grown crops. However, the choice of the crops is not appropriate. The farmers' decisions on variety seem not to be based on qualified advice or appropriate farm trials.

Greenhouse planting schedule and harvesting period

Most of Kosovo greenhouses are used to plant once per year. The common planting period is from the end of March to the middle of October. Sometimes, lettuce is used as a second crop during the winter time. Obviously, this is a very short period of greenhouse operation, which negatively influences its production efficiency. On the other hand, the high air temperatures inside the greenhouses during summer months, due to a lack of proper ventilation, can be considered as one of the main factors in limited fruit production and fast plant senescence, resulting in a very short reproductive life. Together with that, modest crop management practices, lack of proper crop nutrition, inefficient methods of improving fruit setting and the lack of proper combination of different successive crops or cultivars, can be identified as the most important reasons of low greenhouse productivity.

The expansion of the greenhouse exploitation period by having two crops per year, following improvements in greenhouse aeration and plant nutrition, should be considered as the main action to improve greenhouse production efficiency. Achieving longer harvesting periods will require higher quality (ie more resistant) polyethylene films.

Greenhouse crop management

Some developments in the crop management technology have recently occurred in Kosovo. Drip irrigation technology and mulching are already broadly used in the greenhouse production, there are better cultivars

already in use, and there is a clear trend to use more and better qualities of fertilizers and pesticides.

Still, there are several growing practices (plant density, plant spacing, plant training and pruning, fruit setting, fertilization and irrigation frequency and quantity) which must be improved in order to better utilize the potential yields of modern cultivars. On the other hand, among Kosovo greenhouse growers there is a clear trend of the overuse of chemical fertilizers. The fertilizer doses are empirically defined, even when they follow some soil analyses. There seems to be an overestimation of combined fertilizers and there is not enough information on the proper ratio and quantities of the basic nutrient elements needed in different stages of specific crops. The general approach of looking for a disease (i.e., a fungus, bacteria, or a virus), each time the plants show problems, and consequently spraying chemicals, was the most common practice. Very rarely, the plant disorders were considered to be linked with the non-proper climatic control, soil structure, lack, or excess of any nutrient elements, etc.

In general, farmers have little access to upgraded production technologies and do not benefit from periodical field visits from extension officers. The need exists for the establishment of an extension unit aimed at providing technical assistance for the development of market-oriented horticultural production.

Post harvest, processing and marketing of greenhouse vegetables

Kosovo growers are still not fully aware of the importance of the quality of fresh vegetable products for successful marketing. Actually the full attention of growers is on the production side. Much less attention is being paid to fruits' quality in terms of uniformity of size, shape, colour, ripening stage, shelf life, etc. Though there is a general understanding of the importance of improved vegetable marketing, there is no (working) example of simple investments for vegetable sorting, packaging and labelling.

Kosovo exports of fresh vegetables are sporadic and not sustainable. Despite the lack of export contracts, the lack of appropriate information on the international markets and international price conjunctures, and the lack of appropriate infrastructures for fresh vegetable collection, storage and processing, Kosovo exports suffer from the lack of critical mass for efficient transportation and lack of continuity of fresh vegetables supply.

Farmer's organizations in the greenhouse industry

There were several donor interventions to promote farmer's cooperatives and to encourage their establishment in Kosovo. However, none of them can be considered a real success story.

Considering the current status of greenhouse industry development, there are no foreseeable farmer's marketing cooperatives which will be created anytime soon. The size of greenhouse farms is very small and current

economic farming indicators hardly support the establishment and management costs of marketing cooperatives. Pushing farmers to quickly adopt this type of organization would not be a good idea.

However, there are good opportunities to promote and facilitate farmer cooperation. Exchange of information and farming experiences (like they do in the Greenhouse Business Development Group, supported by InterCooperation), enhancing farmer solidarity, and lobbying and advocacy of farmer interests are more realistic alternatives to a farmer's cooperative.

Greenhouse models; food safety, environmental, energy and competitiveness' issues.

The construction of better equipped and improved microclimate controlled greenhouses is a general tendency in Mediterranean countries. Finding an appropriate economic compromise, between the higher construction cost of a better equipped greenhouse and potentially higher yields with better quality that could be obtained through improved microclimate control, is something that requires specific solutions according to specific technical and socio-economic characteristics of each country.

Looking from this perspective, the current construction characteristics of Kosovo greenhouses must be significantly improved although it would be uneconomic to build highly sophisticated models. Appropriately designed greenhouses would need to reach some specific parameters in terms of volume, gutter height, span size, ventilation characteristics and quality of plastic covering films.

Low cost greenhouses versus upgraded design greenhouses; environmental and food safety issues

Out of discussions, vegetable production is quite possible in low cost greenhouses. Considering the low cost of construction and the family business character of most of the greenhouses, there is no doubt that they can be competitive in a low income market. On the other hand, because of low construction standards, the production of these greenhouses is heavily affected by the frequent fluctuations of climatic parameters in course of plant growth, both in terms of quantity, time distribution of yield and production quality.

One of the most serious problems of low cost greenhouses is their very limited capability to control the appearance and usually high infestation of different plant diseases and insects, which require frequent chemical applications.

On the contrary, better equipped greenhouses can provide a safer control of insects and diseases, primarily through temperature and humidity control, better aeration, the use of insect nets, etc. The final result of these technology interventions is the significant reduction of pesticide use, the significant reduction of environmental pollutions and the increased level of consumer's safety.

Natural production versus forced production; the alternative sources of energy

Heating a greenhouse is very expensive. With the current price of energy, growing fresh vegetables by burning fuels does not make sense in Kosovo. There are, of course, cheaper sources of energy (like the Kosovo waste water of power plant), but using them may need some high initial investments. Because of that, for the time being, some simple agricultural practices need to be adopted and used in Kosovo greenhouses.

The use of small tunnels inside the greenhouses is a very effective method. It will allow farmers to plant no less than two weeks earlier, compared with normal practices. Another effective method would be the use of passive heating systems, which can provide a difference of 1,5 to 2,5 degrees Celsius in minimum air temperatures compared to greenhouses non equipped with this systems.

Annual greenhouse production versus seasonal economic competitiveness

The traditional seasonal consumption of fresh vegetables is transformed to year-round consumption. This means that there are higher market demands for fresh vegetables and more opportunities for vegetable growers to develop their businesses.

On the other hand, due to free trade agreements, the fresh vegetable market is already open to many actors. This situation is exposing Kosovo farmers to high competition from more technologically developed countries and/or better climatic conditions for early vegetable production. The main risks they face are the low prices of imported products, compared to the higher production costs of local products at the very beginning of their entrance into Kosovo markets.

Obviously the first goal of the Kosovo greenhouse industry should be the substitution of large vegetable imports. However, the Kosovo greenhouse industry should not attempt to cover the entire year of market demands by local production. As it was already explained, it would be not feasible by agronomic point of view and very costly financially. Contrary to that, the Kosovo greenhouse industry should be focusing on increasing the production capacities in the period from end of April to the beginning of November and improving the production qualities, and addressing the increasing public demands regarding food quality and safety.

Comparative economic advantages of different greenhouse production levels

The reduction of massive vegetable imports in the late spring and early summer and autumn periods can be done by enlarging the greenhouse cultivated areas and improving the current greenhouse models and production technologies.

Generally speaking, low cost greenhouses seem to be an attractive agricultural business, at least for low income farmers. Assuming a total tomato production of 8.5 kg/sq.m, the farmer’s income per working day is calculated at about 10 euros,

and the return of modest investment for greenhouse construction (4 euro/sq.m) is calculated at about 6 years. Though, no net incomes are from a strictly economical point of view, the gross incomes for 1000 sq.m greenhouse are calculated at about 700 euro per year. Considering that growing vegetables in small scale greenhouses is a kind of self employment or a family business, the labour cost of 800 euro per year can be added, summing up the family budget to about 1500 euro per growing season.

Shifting from low cost traditional greenhouses to improved ones will mean for the farmer a higher intensive land use and the greenhouse construction itself. Improved designs will allow (demand) a shift from single crop cultivation per year to two sequential crops per year. Higher yields are expected from the main crop and due to the enlargement of the harvesting period, the total yield per year is assumed to be 17 kg per sq. m. The farmer's income per working day will remain unchanged (10 euro), but the production costs will be reduced.

However, better designed greenhouses mean higher investments, which will affect farmer decisions. Shifting to steel galvanized structures which are currently available on the Kosovo market at the price of 20 Euros/sq.m would be a hard decision. Because of considerably higher prices (5 times higher compared to low cost greenhouses), even by providing higher yields and better prices in the beginning and end of common harvesting seasons, they could not guarantee a return of investment in less than 12 years. The incomes per working day will be even less compared with low cost greenhouses (only 5 Euros, because of much higher depreciation costs), no net incomes are expected, again, but the gross incomes would be doubled (1700 Euros) compared to low cost greenhouses, and by adding the labour cost (1500 Euros) a family farm could count a budget of more than 3200 Euros per year.

The situation could be improved by planting other crops such as peppers and melons instead of planting tomatoes which is the main crop of Kosovo greenhouses. Assuming peppers are grown as the first crop (8 kg/sq. m), followed by lettuce (3 kg/sq. m), the same period of time (12 years) will be required for the full return of investments, and the same amount of gross incomes will be provided, but little net income will be collected, and the income per working day would be close to 11 Euros.

Obviously, both the high investment per square meter and the long period of return on investment would not encourage farmers to shift from traditional greenhouses to the new models. This necessary process can be facilitated by subsidising part of greenhouse construction costs or by developing less expensive models (keeping the same design, but probably by replacing part of steel structures with less expensive construction materials).

If farmers could have improved greenhouses with the cost of 15 Euros/sq. m, it would make growing greenhouse vegetables a more profitable and safer business. In the case of tomato + cucumber option, the gross incomes will be slightly improved, but the incomes per working day will be doubled, a small net income will be provided each year (300 Euros) and the period of return on

investment will go down to not more than 9 years. The situation would be even better if the second option, pepper + lettuce, is planted. In such a case, the return on investment will be 9 years, again, but the incomes per working day will increase to 14 Euros and the farmer's net incomes will go up to 500 Euros per year.

Recommendations

Kosovo must promote the development of the greenhouse industry. It will be the best way to reduce large fresh vegetable imports and to reduce poverty by increasing farmers' incomes.

Kosovo greenhouse industry must shift from low construction and management standards to improved medium level greenhouse construction and updated crop management practices.

Kosovo greenhouse producers need better financial support (subsidies for improved greenhouse design, low interest rate credit) and better access to information and know-how (agronomic assistance, crop management trainings, farm business training and assistance, market information), in order to shift from the current small scale to a more business oriented greenhouse production.

INTERCOOPERATION

Potential of the Greenhouse Industry in Kosovo

A study conducted by;

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1 Kosovo climatic conditions and site suitability for greenhouse industry development

Kosovo is situated in the central part of the Balkans. In the Southwest, it is bordered by Albania, in the West by Montenegro, in the North by Serbia and in the East and Southeast by Macedonia. The territory extends within longitudes 41° 50' 58'' and 43° 15' 42'' and within latitudes 20° 01' 30'' and 21° 48' 02''. Kosovo covers a surface area of approximately 10,900 km² and is characterized by an average altitude of 800 m above sea level, but shows vertical changes of relief and morphology. The part of Kosovo, which is characterized by wide flat areas, covers a surface of approximately 36 % of the country's territory. These basins are characterized by elevations between 400 and 700 m above sea level. The lowest point of Kosovo is located at an elevation of 297 m (Drini i Bardhë, on the border to Albania). The country rises up to its highest point in the South of Kosovo – Gjeravica at 2,565 m.

From a geographical point of view, Kosovo can be subdivided into two large regional flat units: The north-eastern part is referred to as "Rrafshi i Kosovës", the south-western part as "Rrafshi i Dukagjinit"[3]. The border between Rrafshi i Dukagjinit and Rrafshi i Kosovës forms the surface water divide between the Adriatic Sea on the one side and the Black Sea and Aegean Sea on the other side.

The climatic area of "Rrafshi i Kosovës", which includes the Ibar-Valley, is influenced by continental air masses. For this reason, in this part of the country, the winters are colder with medium temperatures above –10 ℃, but sometimes can go down to –26 ℃. The summers are very hot with average temperatures of 20 ℃, but sometimes rise to 37 ℃. This area is characterized by a dry climate and a total annual precipitation of 600 mm per year on average.

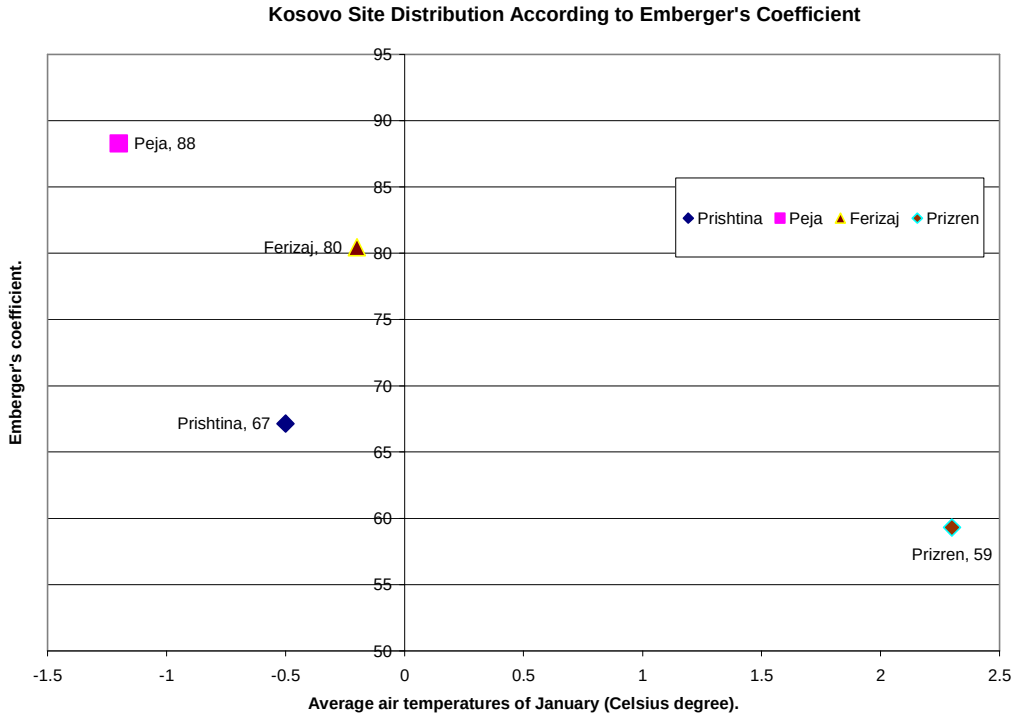
The climatic area of "Rrafshi i Dukagjinit", which includes the watershed of the "Drini i Bardh" river, is influenced by hot air masses, which cross the Adriatic Sea. Medium temperatures during winter range from 0.5 ℃ to 22.8 ℃. The ave rage annual precipitation of this climatic area is about 700 mm per year. The winter is characterized by heavy snowfalls[4].

Because of these climatic conditions Kosovo can not be considered among the best places for protected cultivation. However, there are possibilities for developing a sustainable greenhouse industry, which will support the economical development of the

[3] http://www.kosovo-mining.org
[4] http://www.kosovo-mining.org

country by providing large quantities of fresh vegetables, currently imported, and by improving farmers' incomes.

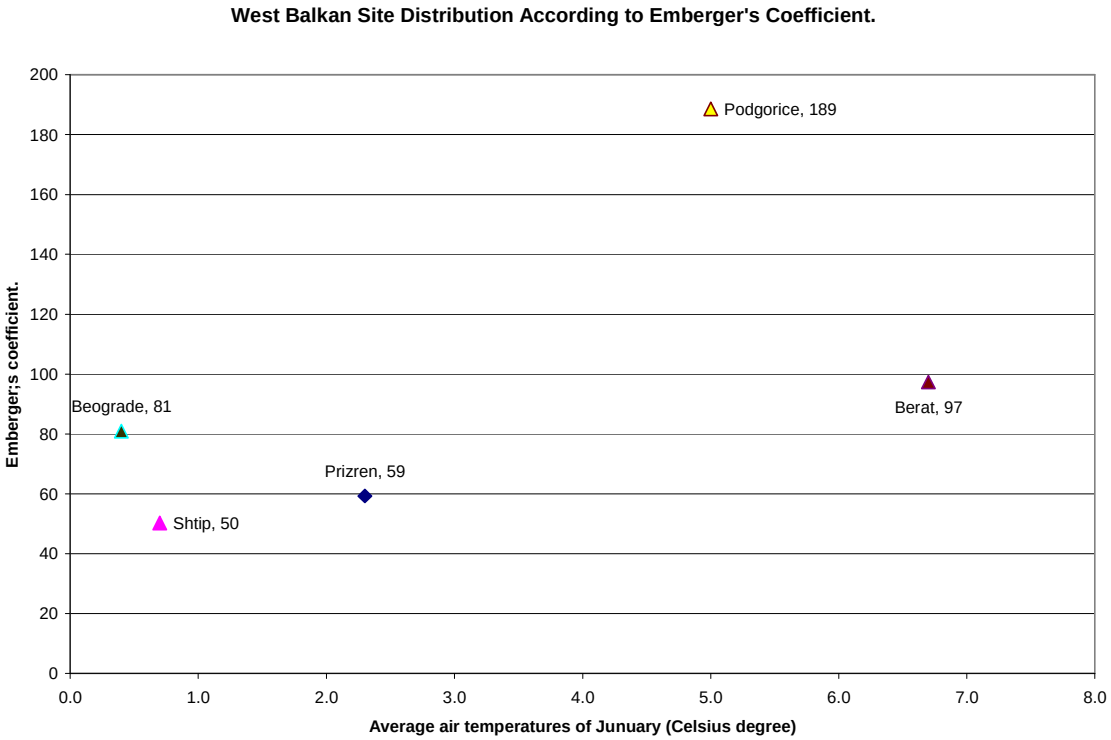
Due to diverse climatic conditions, significant differences regarding the suitability for greenhouse production can be identified among Kosovo's regions. Based on the Emberger pluviometric coefficient, the suitability of Kosovo regions for greenhouse industry development is clearly distinguished between the two main climatic regions. As expected, the sites in "Rrafshi i Dukagjinit" (Prizren) or Ferizaj and Gjilani, have better climates for early greenhouse production. Compared to them, the Pristina area in "Rrafshi i Kosoves" is less suitable and Peja region even less so. In practical terms, there are comparative advantages of vegetable growers of the above mentioned regions for early transplanting and early production (two weeks ahead of schedule), compared with the rest of the country.



Generally speaking, Kosovo does not have favoured climatic conditions compared with some its neighbouring countries regarding early vegetable production. Based on the Emberger pluviometric coefficient, Kosovo's regions are less suitable for vegetable production under protected cultivation compared with greenhouse production areas in Albania (Berat, Lushnja, and Fier) and some regions of Macedonia. Most of Kosovo's regions in "Rafshi i Kosoves" can even be considered less suitable than Beograd area (Serbia), to the North of Kosovo.

However, unlike the rest of the country, the region of Prizren could be a very competitive vegetable producer in the Western Balkans, due to its favourable pluviometric position compared with many regions in Serbia (Beograde), Macedonia (Shtip), Northern Albania, etc (see graph below). Prizren could also be competitive with Podgorica (Montenegro) in spite of its minimum air temperatures. Still Podgorica seems to be less suitable for early vegetable production because of a very high value of Emberger's

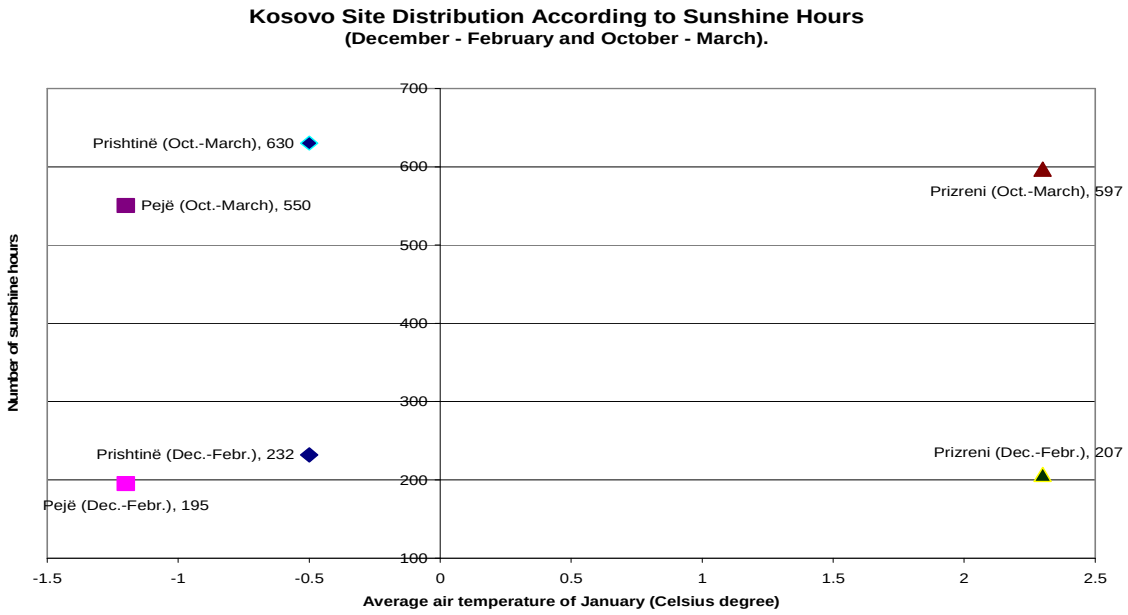
coefficient (due to very high annual precipitation). This means that there are many cloudy days in this region and consequently, low plant growth rates due to the lack of light energy.



Based on the amount of light available during the winter period, Kosovo can not be considered a suitable area for winter vegetable production under protected cultivation. The total amount of sunshine hours in the autumn – spring period (October – March) in Kosovo ranges[5] from 550 hrs (Peja) to 630 hrs (Pristina) which is considerably less than a minimum of 750 sunshine hours needed for intensive vegetable winter production, even for crops with demand less light (tomatoes). Of course, this amount of light would still allow the winter production of winter crops such as lettuce and spinach.

During the winter, there are only 195 sunshine hours during December – February period in Peja, 205 hrs in Prizren and 232 hours in Pristina. Compared with the most important greenhouse production areas in Albania (350-400 hrs), these values are almost half as much light during the day. Again, even though the Prizren area (Rrafshi i Dukagjinit) has in general less sunshine hours during the winter time, because of higher minimum air temperatures, it is more suitable for early vegetable production under protected cultivation compared to Rrafshi i Kosoves (Pristina and Peja).

[5] Syle Tahirsylaj (IHMK). Te dhena metereologjike te Kosoves. Personal communication.



The number of sunshine hours per day is another limiting factor for winter vegetable production in Kosovo because a minimum of 5 hours per day is required for the successful growth of plants under protected cultivation and Kosovo does not have that much light during the period from November to March in any its regions. However, there is a fast increase of number of sunshine hours from the first ten days of March to the next ten. Therefore, considering that it is enough light for young, newly transplanted plants, as it will be commented in other chapters of this study, shifting the transplanting date towards the beginning of March, could be one of the most effective means to increase the earliness and to extend the vegetable production period in Kosovo greenhouses.

Table 1 Monthly average of sunshine hours per day in different sites in Kosovo[6].

Stat./Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Peja	2.3	3.6	4.8	6.1	7.1	8.6	9.6	9.3	7.4	5.4	3.2	2.1
Prizreni	2.2	3.5	4.4	5.7	6.5	7.5	9.1	7.2	5	5.5	2.8	2.4
Prishtina	2.1	3.4	4.3	6	6.9	8.6	10	9.5	7.4	5.6	2.7	1.9

[6] Syle Tahirsylaj (IHMK). Te dhenat metereologjike te Kosoves. Personal communication.

2. Importance of greenhouse industry for Kosovo's economy and rural development

Kosovo is a vegetable net importer country. Large quantities of fresh vegetables are continuously imported. 41,632 tons in 2005, 42,684 tons in 2006 and 37,686 tons in 2007 of fresh vegetables were imported into Kosovo, with a declared value of € 10.8 million in 2006 and € 10.3 million in 2007. The most important imported products are tomatoes (40-42 % by weight), peppers (16 - 18 %), cabbages (13 - 16 %), cucumbers (12 %), and onions (6 – 10 %).

On the other hand, the exports of fresh temperate vegetables are very limited. In 2006, they amount to 2,260 tons and, in 2007, amount to 3,219 tons. The main products exported are cabbages, tomatoes, onions, and peppers, and Montenegro is the main country which receives exports (respectively 76% and 49% of total by weight).

Table 2 Imports of fresh vegetables by products (tons)[7] [8]

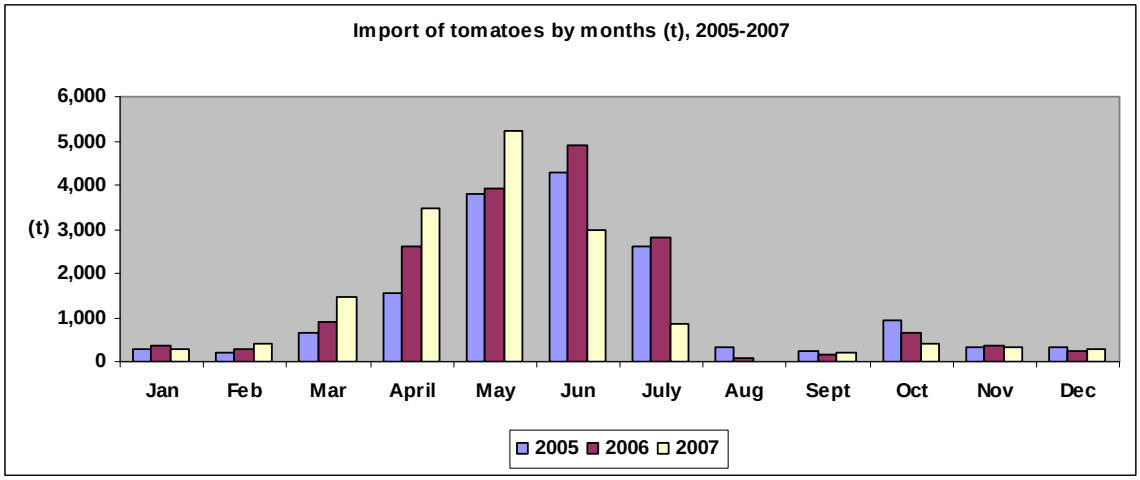
Product	Year		
	2005	2006	2007
Tomatoes	**15563**	**17313**	**15943**
Cabbage	7354	5771	6288
Peppers	**5321**	**7872**	**6330**
Cucumbers	**4672**	**5373**	**4486**
Onions	6405	4114	2486
Carrots	431	663	791
Leeks	1069	683	264
Peas	122	42	167
Garlic	103	162	189
Aubergines	**168**	**97**	**142**
Lettuce	**137**	**197**	**125**
Cauliflower	87	26	48
Spinach	**40**	**154**	**22**
Beans	160	217	141
Total imports	41632	42684	37422

[7] Intercooperation. Import-export of fresh fruit & vegetables, 2006.
[8] Intercooperation. Import-export of fresh fruit & vegetables, 2007.

Actually vegetable production in Kosovo, despite the fast increase of greenhouse area in the last three years, is based on open field cultivation. Shifting vegetable production from open field to protected structures will extend the production cycle (earlier and later production). Upgrading the current low standard of simple greenhouses will have a similar effect. In both cases however, the agronomical and economical issues need to be carefully elaborated.

Three crops (tomatoes, peppers, and cucumbers) make up 70% of total vegetable imports (by weight). May – June is the peak season for imports in general, and specifically for these three commodities. Tomatoes, peppers, and cucumbers are the most grown crops in greenhouses around the world. The explanation for the high imports of these crops in Kosovo is simple. It is due to the current situation of low greenhouse area and low production yields in Kosovo. Actually, the slight reduction of imports from 2005 to 2007 can be logically related with the doubling of greenhouse area for the same time period.

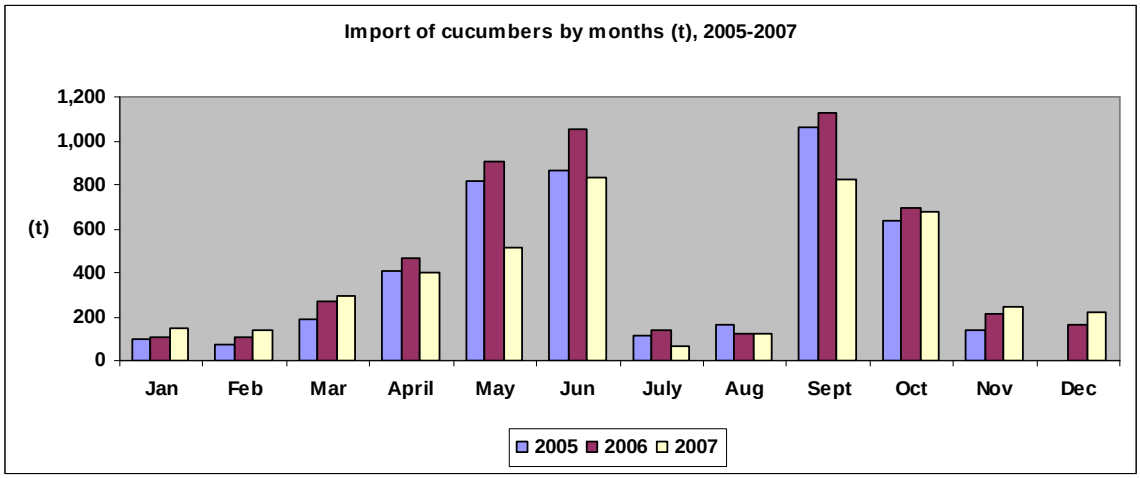
Increasing greenhouse surface area is the only way that Kosovo can significantly reduce fresh vegetable imports in May, June and July. Currently, fresh tomato harvests in greenhouses begin in the end of June. By introducing better designed greenhouses and upgrading current production technologies in Kosovo, there is the potential to substitute tomato imports from the beginning of June till the beginning of November, but it will, however, continue to depend on imports for the rest of year. Some progress can be made for earlier production in May by using more complicated climate control greenhouses (obviously much more expensive, and because of that very much questionable from efficiency point of view). Additionally, the high potential of energy from the waste waters in power plants near to Pristina could provide an interesting opportunity which needs detailed research itself.



Peppers are a popular vegetable in Kosovo's diet. Currently, it is grown almost uniquely in open fields with only a few cases of greenhouse production. Due to the late transplanting in open field (beginning of May) and traditional production technologies, the first harvest for peppers only begin in the end of July. By introducing pepper cultivation in simple greenhouses, there is the possibility of substituting pepper imports beginning in the middle of May and to fully supply market demands until the first frosts come (end of October or beginning of November).

Also, by increasing greenhouse production area, the possibility of fully substituting cucumber imports for all of May and June is very realistic. Additionally, by planting a second greenhouse cropping with appropriate cultivars, the second peak of cucumber imports (September – October) can be totally substituted.

Promoting the second cropping in simple greenhouses is a simply way to substitute the spinach and lettuce imports (respectively 22 tons and 125 tons in 2007), which are very common imports from November to March in present Kosovo conditions.



In June 2007, there were close to 3000 tons of imported tomatoes, 1500 tons of peppers, and close to 1000 tons of imported cucumbers. Therefore, taking into consideration an average yield in June of 50 t/ha (out of 100 t/ha of the total yield) for tomatoes, 30 t/ha (out of 80 t/ha of the total yield) for peppers, and 40 t/ha (out of 100 t/ha of the total yield) for cucumbers, it can be concluded that 60 ha for tomatoes, 50 ha for peppers, and 20 ha for cucumbers of new greenhouses will be needed to substitute the current imports of these commodities. One can assume that there will be an increase in local market demand in the coming years (10 %), and a certain area of protected cultivation (another 10%) will be used for other crops (aubergine, melon, and squashes). So, it seems that in order to reach the goal of import substitution in late spring and early summer, the greenhouse area in Kosovo must be increased by no less than 150 ha.

Greenhouses are not only very effective means to increase crop yield, but they also improve farmers' financial indicators. They have been proved to be important economic activities for fast and sustainable development for the different regions with proper climatic conditions around the world.

Simple calculations show that in Kosovo simple structured greenhouses could have a very positive effect on improving farmers' income. Comparing, for example, pepper production in open field (probably the most important vegetable crop in Kosovo) with pepper production in simple greenhouses, the differences are very clear. The crop production can be increased to 80 tons/ha from the 20 tons/ha which is the most common yield in open field production in Kosovo. While current practices of open field production the production cycle are very short (usually it starts middle of July and ends to the end of September), through protected cultivation the production period can be extended from the middle of May to the end of October. Consequently, the average

wholesale price is expected to increase from 0.33 Euro per kg to 0.56 Euro per kg. The production cost will be reduced from 45 Euros per 100 kg to 35 Euros per 100 kg and the farmers' incomes per working day are expected to increase from 2 Euros per day[9] to 14 Euros per day[10]. Growing peppers in the open fields is simply a farmer self-employment activity and therefore, by shifting to greenhouse production, a gross income of 2000 Euros/ha can be expected per 1000 sqm in a growing season.

3. The current situation of the greenhouse industry in Kosovo and potentials for improvement

The greenhouse industry is a fast developing sector in Kosovo. Based on recent statistics, the current total production area of greenhouses in Kosovo is 154 ha[11]. It has doubled since 2005, when the greenhouse area was 73 ha. According to the areas under greenhouse production, the most important communes are Mamusha (up to 93 ha), Suhareka (up to 11 ha), Rahovec (up to 11 ha), Prizren (up to 5.6 ha) and Gjakova (up to 4.2 ha), which are all located in Rrafshi i Dukagjinit. Obviously, the majority of greenhouses are simple walk-in tunnels, mostly constructed with wood or a combination of wood and metal, followed by improved single tunnels constructed with metal pipes, locally referred to as "medium technology level greenhouses".

Table 3 Types of greenhouses according construction features in 5 of the most important communes in Kosovo (maximum values).

Commune/Type of Greenhouse Construction	Simple tunnels	Medium technology level greenhouses	Block type greenhouses	Total (ha)
Mamusha	87	4.2	1.5	92.7
Suhareka	10.3	1.1		11.4
Rahovec	4.1	6.8		10.9
Prizren	4.3	1.3		5.6
Gjakova	2.2	0.6	1.4	4.2

3.1 Greenhouse construction and microclimate control

There is a clear tendency in Kosovo to expand the area under protected cultivation. The greenhouse area has already doubled since 2005, and the area with low tunnels (mostly aimed for early watermelon production) is growing even faster. The best example is the fast expansion rate of walk-in tunnels in the Mamusha village. However, the majority of Kosovo greenhouses are composed like "boxes". The aim for a greenhouse is to maximize the accumulation of solar energy inside and to conserve it, but unfortunately, this type of greenhouse is not able to release the excess of heat during certain periods of plant growth cycle. Low gutter height and insufficient aeration due to a lack of side windows are serious obstacles to plant growth. High air temperatures and high air humidity are common, and a poor natural fruit setting is clearly evident. The farmers understand the dangers of frost, but they do not yet understand the negative impact of high air temperatures on plant viability and yield.

[9] Appendix 1. Summary of financial calculations for open field pepper cultivation.
[10] Appendix 5. Summary of financial calculations for greenhouse pepper cultivation.
[11] Muje Gjonbalaj. 2008. Greenhouse inventorying of Kosovo.

Mostly, Kosovo greenhouses are composed as low single tunnels, with combined wooden and metal structures. Short life low quality plastic film is usually used to cover the greenhouses. Such weak structures are threatened by the atmospheric conditions. Heavy winds could be catastrophic for the whole area, causing a total destruction of tunnels and a total disruption of plant production. Currently, there are only a few exceptions of better designed and better equipped greenhouses in the country. Although, there seems to be a tendency of constructing improved designed greenhouses by few small companies, trying to develop and promote their own models.

There are several improvements, listed in the respective chapter, which must be done to upgrade the current construction standards of greenhouses in Kosovo. Improved greenhouses will provide better climatic conditions for plant growth and, due to that, healthier plants, longer harvesting periods, and higher yields.

3.2 Nursery system and vegetable seedling market

Based on expected developments of vegetable production in Kosovo, an increase in demand on good quality seedlings is expected. Consequently, the vegetable seedling market is expected to be further expanded and developed.

Actually, despite of the fact that several elements of improved technologies have been introduced, old traditional technologies of seedling production are still dominant in many places. In general, it is still a limited use of plugged vegetable seedlings. They have already started to be used in protected cultivation, but the use of plugged seedlings in open field vegetables is very rare. Instead, the bare root method of transplanting is largely used.

The response of the nursery sector to new market demands is very weak. The variety of seedlings provided by the nursery sector is very much limited, mainly peppers and tomatoes. The delivery time of these products is also very limited. All the nursery sites are simple adapted common greenhouses. Most of time, they are simultaneously used for seedling propagation and common vegetable production (mainly lettuce). Still, a very weak reaction is observed among seedling producers to produce grafted watermelon seedlings, though there is an increased amount of imported grafted seedlings from neighbouring countries.

The nursery sector is conducted by experienced farmers, who have taken a step towards seedling propagation. Usually, the farmers produce seedlings for themselves and grow a few extra for potential small clients (usually not previously contracted). The involvement of seed supply companies in nursery production is still absent.

3.3 Greenhouse crop diversity and commercial varieties

The limited number of crops grown in greenhouses is one of the most serious problems of the Kosovo greenhouse industry. Currently, tomatoes and cucumbers are practically the only crops produced under protected cultivation. Melons, eggplants, squash, or French beans are almost unknown in greenhouse production, and only rare cases of peppers are grown. The main causes for this seem to be a lack of know-how in crop management and a lack of promotion of potential profits generated by these crops. Enhancing crop diversity will become a necessity, as long as the greenhouse areas increase, in order to smooth out competition among vegetable producers. Peppers, eggplants, melons, and French beans can be good options for the best growers, and in the meantime it will contribute to a reduction in large imports of these commodities.

However, to facilitate this process, intensive technical assistance must be provided to safely guide the farmers throughout their specific crop management practices.

Compared with previous years, there has been an improved situation in terms of variety structure of greenhouse grown crops. In fact, it is different than open field production which remains very traditional for most of vegetable crops. Better, long shelf-life cultivars are already in use. Still, in many greenhouses, the variety choice is not appropriate. Especially in cucumbers many farmers are stuck to old fashioned, monoic cultivars, which do not allow the farmers to effectively exploit greenhouse production capacities. Also, the structure of tomato cultivars is still largely occupied by cultivars (most of them with big, but non uniform fruits), which neighbouring countries have long since replaced with better ones. The decisions of variety selection do not seem to be based on qualified advice or appropriate farm trials. In other cases, several cultivars have been planted in a single greenhouse, shifting its role from the commercial production to an experimental plot.

The tomato structure is totally based on indeterminate cultivars. There is no use of determinate varieties, which have been appreciated in other countries for their early maturity. Introducing determinate and semi determinate tomato cultivars will create possibilities of increasing early crop harvests. They may also be a good option for expanding the harvesting period into autumn when planted as the second crop after cucumbers, melons, or squashes. The process must follow a preliminary selection of appropriate varieties (good fruit, low intensity light setting, low temperatures, high yield, long shelf-life, appropriate fruit shape and size).

3.4 Greenhouse planting schedule and harvesting period

Most of Kosovo's greenhouses are used for one planting per year. The common planting period is from the end of March to the middle of October. Sometimes, lettuce is used as a second crop during the winter time. This is a very short period of greenhouse operation which negatively influences its production efficiency. On the other hand, high air temperatures inside the greenhouses during summer months, due to a lack of proper aeration, can be also considered as one of the main factors in limited fruit growth and fast plant senescence, resulting in a very short reproductive life. Together with that, modest crop management practices, lack of proper crop nutrition, inefficient methods of improved fruit setting and the lack of proper combinations of different successive crops or cultivars, can be identified as the most important reasons of low greenhouse productivity.

It is generally perceived that greenhouses are aimed at early production, and farmers are struggling with it. The growers are obviously attracted to the earliness of greenhouse production, but apart from dreaming about heating systems (which, due to very high fuel prices, can hardly be justified from an economic point of view), not many practical solutions have developed. Expanding the utilization period of greenhouses by planting earlier and going later than common dates and simple agronomic interventions seem to be more realistic approaches. The use of small tunnels inside the greenhouses can be an effective tool to planting earlier and to significantly increase the earliness of the greenhouse harvests.

In general, the average yield (shown in Table 4) is very low (5.5 kg/sq. m). Although sometimes different farmers report that higher yields have been achieved, the current production technologies can hardly guarantee a sustainable production. Greenhouse yields and distribution are very dependent on the transplanting time. Clearly, postponing

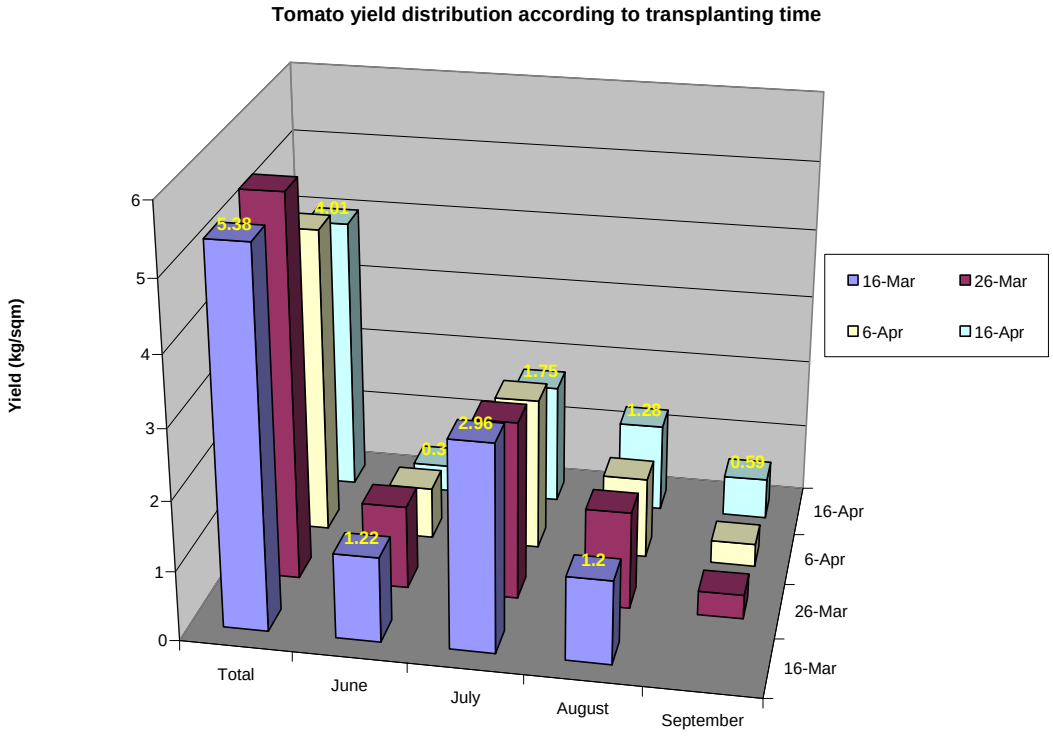
the transplanting period from middle of March to middle of April has reduced the total tomato yield by about 25 %. On the other hand, it significantly affects the yield distribution. Earlier transplanting provides a higher amount of early harvest production during June, which obviously improves farmer incomes due to higher prices during this period. Practically, moving the transplanting period to the beginning of March will potentially offer higher yields and better incomes.

No matter when the plants were transplanted, more than 50% of the total production is harvested during July. Apart from the first planting date, all other later planting leads to the production cycle being extended till end of September (Table 4). It is common for Kosovo greenhouse growers to try to keep their plants in the greenhouse as long as it is possible, till the first frost comes. However, it is important to note that the harvesting rate is sharply reduced during the second half of August and it is quite negligible during September. In practical terms, it is not a practical use of greenhouse space to keep plants much past their prime. In the case of tomatoes and most of other crops (except peppers), stopping the production cycle in the beginning of August (much earlier in case of cucumbers or melons), in order to allow a second short cropping, would be a more efficient use of the greenhouse from both an agronomic and economic point of view.

The expansion of the greenhouse utilization period by having two crops per year will need improvements in greenhouse aeration and plant nutrition. Also, a longer harvesting period will preliminary need better (more resistant) quality polyethylene film. Planting peppers or eggplants will also allow for a longer harvesting period from the middle of May to the end of October.

Table 4 Tomato yield distribution (kg/sq.m) in "Rrafshi i Dukagjinit", according to transplanting dates in greenhouses[12]

Transpl.data/month	Total	June	July	August	September
16-Mar	5.38	1.22	2.96	1.2	
26-Mar	5.51	1.2	2.56	1.4	0.35
6-Apr	4.46	0.75	2.21	1.17	0.33
16-Apr	4.01	0.39	1.75	1.28	0.59



3.5 Greenhouse crop management

Some developments on crop management technology have recently occurred in Kosovo. The drip irrigation technology and mulching are already broadly used in greenhouse production, there are better cultivars already in use, and there is a clear trend to use more and better qualities of fertilizers and pesticides. However, despite efforts to enhance greenhouse crop yields, production technology can still be considered extensive. In many cases, it is still based on empirical know-how or simple traditions.

Several growing practices (plant density, plant spacing, plant training and pruning, fruit setting, fertilization, and irrigation frequency and quantity) must be improved in order to

[12] Isuf Lushi. PhD course. Study of different aspects of tomato production technology. Personal communication.

better utilize the potential yields of modern cultivars. On the other hand, based on farm records on the variety of agricultural inputs (crop varieties, fertilizers, pesticides, etc), it seems that there are few choices. The competition among the input companies is small, and the distance between the input dealers and farmers is large. Input dealers and agricultural companies are not guiding farmers towards updated technologies and better quality inputs as they are doing in neighbouring countries.

There is a clear trend of chemical fertilizer overuse among Kosovo greenhouse growers. The fertilizer doses are empirically defined even when they follow soil analyses. There seems to be an overestimation of combined fertilizers and there is not enough information on the proper ratio and quantities of the basic nutrient elements needed during the different stages of specific crops. Because of that, soil salinity problems have become one the most prominent threats to many greenhouses. Information regarding appropriate plant nutrition, appropriate fertilizer choice, and dosage is not updated even among extension workers or input dealers. Therefore, professional training of extension workers and input dealers in combination with simple extension publications on fertilization methods and simple fertilizer calculations would help with the understanding of plant nutrition.

The general approach of looking for disease (i.e., a fungus, bacteria, or virus) each time the plants show problems and, consequently, spraying chemicals were the most common practices. Very rarely, plant disorders were considered to be linked with poor climatic controls, soil structure, lack or excess of nutritive elements, etc.

In general, farmers have little access to upgraded production technologies, and usually they lack periodical field visits of extension officers. The establishment of an extension unit aimed at providing technical assistance to innovative and market-oriented horticultural producers can contribute to reaching this need.

3.6 Post-harvest processing and marketing of greenhouse vegetables

Vegetables are an important part of the food supply world-wide due to product diversity, the possibility of local production, and health related benefits. The vegetable chains are complex systems where the actors' needs and requirements are often in conflict. Cultivation is still a fundamental part of the supply chain, but more complex market dynamics require a good knowledge of the entire chain. In the last ten years, the vegetable market has developed a rich array of new products. Consumers are more concerned about a proper diet, which has increased the demand for healthy vegetables and guaranteed products. At the same time, consumers are also looking for flavours, convenience, authenticity, and traditional produce (e.g. labelled, local, regional products), with added hedonics such as sense of exoticism, and environmental sustainability (e.g. organic food), fair trade, etc. Globalization is showing that European production needs a new approach which is focused more on terms of quality than quantity. A fully integrated and complex supply chain must be able to fulfil the consumers' needs.

Looking at the chain from this perspective, it seems that Kosovo growers are still not fully aware on the importance of fresh vegetable quality for successful marketing. The appreciation and the intention of consumers to consume local products instead of imported ones, and not enough supply of markets demands seem to be the main reasons that local producers are usually able to sell their whole production. Currently, growers give their full attention to the production side. Much less attention is being paid to fruit quality in terms of uniformity of size and shape, colour, ripening stage, shelf life,

etc. Generally speaking, there is no attention given to caring for pre harvest and post harvest factors affecting fruit quality. The variety choice is still not related to quality parameters (this explains why some big fruit, non uniform in size or colour, still have a large share of the market) and current crop management practices do not favour such parameters.

Standardization, labelling, attractive packing, and certification are important elements of fresh vegetable marketing. Though there is a general understanding of the importance of improved vegetable marketing, there are no (working) examples of even simple investments for vegetable sorting, packaging, and labelling. Despite some short term experiments (Anadrini farmers' association) conducted by different donors, none of the vegetable producers are being recognized by his own label in the market. No one has the intention having his own production certified.

The most common way of to sell vegetables is at the local market, where each of the farmers usually goes himself. At the peak of the harvesting season, some quantities of vegetables are delivered to the processing factories ("Progress" in Prizren and several small enterprises), but the price is very low. It is important to note that the processing industry must not be considered the market solution for greenhouse production. First, the quality characteristics of freshly consumed vegetables are quite different from the needs of the processing industry. Because of that, processing indexes of greenhouse vegetables will be unsatisfied. Secondly, there is normally a large gap between the production costs of greenhouse vegetables and the prices offered (or can be afforded) by the processing industry. Usually, the final price and terms of payments are not favourable for growers.

Currently, exports are sporadic and not sustainable, though several attempts have been made every year to organise exports. In fact, compared with 2006, there is an increase of 42% of exported vegetables, but this impressive increase is based on a low beginning quantity (the total amount exported in 2006, was 2260 tons). In addition to a lack of export contracts, a lack of appropriate information on international markets and international price conjunctures, and a lack of appropriate infrastructure for fresh vegetable collection, storage, and processing, Kosovo exports suffer from a lack of critical mass for efficient transportation and a lack of continuity of fresh vegetable supply. Additionally, Kosovo must compete with other countries in the region, which have similar or even better climatic conditions, cheaper labour, better road systems, and better transportation and information systems.

However, there could still be opportunities for organized exports. Montenegro, Albania, and Serbia could be potential markets for Kosovo's greenhouse products during certain periods of the year. The current trend to quickly increase greenhouse area would increase the product supply in the market and will attract the interest of potential investors for the collection, storage and marketing of fresh vegetables. Based on the current stage of farmers' organizations in Kosovo, it seems that private initiatives in marketing and exports of fresh vegetables are more realistic and will come quicker than any marketing farmers' cooperative.

3.7. Farmers' organizations in the greenhouse industry

The foundation, organization, and management of farmers' cooperatives in Kosovo are regulated by law number 2003/9, dated May 15, 2003. The law clearly defines the cooperatives as farmer business organizations. Currently, there are no farmers' cooperatives in the greenhouse industry which are operating based on that law. Mostly, the cooperation among farmers is in regards to solidarity and exchange of information. "Cooperation", in practical terms, does not mean for farmers to do business together.

There were several donor interventions to promote farmers' cooperatives and to encourage their establishment in Kosovo. However, none can be considered real success story.

Following the drastic collapse of former communist cooperatives, Kosovo farmers are still doubtful of the idea of cooperation in the new economic system. In the meantime, even though the Kosovo Government has decided to promote farmers' cooperation, nothing significant has been done to support them financially and/or organizationally.

Several farmers' organizations have been founded in Kosovo in recent years but, none of them has managed to shift to a farmers' cooperative. Some of the factors which have negatively affected this process are as follows:

- **The lack of a clear vision for the mission of a farmers' cooperation** Frequently, encouraged by different donor agencies, farmers' cooperatives were seen as preconditions for receiving donations to improve farmers' living standards. Mostly the money was addressed at investments in the rehabilitation of village infrastructure. The other economic aspects of farmers' cooperation were underestimated.
- **The lack of a proper management structure** Farmers' associations are characterized by weak internal structures, mostly due to the lack of proper organizational knowledge and by the lack of a strong leadership role of the associations' chairmen. There is almost no distinction between the board decision making process and the cooperative daily management, but according to the respective law, these tasks are clearly separated and defined.
- **The lack of necessary facilities to conduct normal marketing cooperative activities** Mostly farmers' organizations do not have access to production, marketing, or processing facilities. This is frequently a serious bottleneck to be able to proceed with successful, economically profitable initiatives.
- **The lack of financial resources to conduct economic activities** To shift from poverty alleviation or farmers' advocacy issue groups to cooperatives with economic objectives, limited basic funds are necessary. Frequently, it is the main handicap to the further transformation of farmers' associations to farmers' business organizations.

Due to these constraints, it is common to have a limited menu of poor quality services to offer to the organizations' members. These constraints cause farmers to gradually loose interest and consequently, farmer organizations gradually fade. Until now, no farmers' organization has been able to afford to build up enough capacity, in order to ensure their own sustainability after donor support has stopped.

Considering the current status of greenhouse industry development, there is little hope that an operational farmers' marketing cooperative will be created. The size of greenhouse

farms is very small and current farming economical indicators hardly support the establishment and management costs of a marketing cooperative. Pushing farmers to quickly adopt this type of organization would not be a good idea.

There are other good opportunities to promote and facilitate farmer cooperation. Exchange of information and farming experiences (such as the Greenhouse Business Development Group, supported by InterCooperation), enhancing farmer solidarity, and lobbying and advocacy of farmer interests are more realistic alternatives to a farmers' cooperative.

4. Greenhouse models; food safety, environmental, energy, and competitiveness' issues

The greenhouse can be considered as a system. The environment of the system is composed of (i) the outside climate, and (ii) the farmer, who acts on the greenhouse equipment in order to control the internal environment. Obviously, the greenhouse's yield is highly dependent on the level of its microclimatic control. By controlling the greenhouse environment, a farmer's objective is to speed up the rate of photosynthesis. To achieve this, one needs a balance of temperature, light, and CO_2 concentration control.

When the pre-defined set-points of a system can be maintained regardless of the outside climate, the control of the system is perfect, and the growth and development of the crop is optimal and corresponds to the objectives and plans of the farmer. This is the case for the sophisticated computer controlled glasshouses of Northern Europe. When only a partial control is possible, the inside environment will depend both on the changes of the outside weather and on the response of the plants to their immediate environment. In contrast with Northern Europe, in the Mediterranean area, the prevailing trend is to adapt the plant to a "non-optimized" environment.

The different approaches yield different results. So, for example, according to some researchers, the potential production of a tomato crop in the South of Spain during the summer months is 50 % higher than in the Netherlands. However, it is not possible to obtain satisfactory levels of yield and quality in the shelters of the Mediterranean countries during summer, while high yields of good quality are obtained in the North of Europe during the same period. This is because the Mediterranean protected cultivation system is characterized by a low level of energy input. Consequently, the resulting microclimate is far from satisfactory for the crop during a large part of the year. The effects of this inadequate microclimate on the production components (yield, quality) are very negative. Usually, it is not possible for the grower to take advantage of the high radiation levels in late spring and summer because of the high temperatures and vapour pressure deficit in the shelters.

Anyway, currently the construction of better equipped and improved microclimate control greenhouses is a general tendency in Mediterranean countries. Finding an appropriate economic compromise, between higher construction costs of a better equipped greenhouse and potentially better quality, higher yields, could be reached due to the improved microclimatic control. This is something that requires specific solutions according to the specific technical and socio-economical characteristics of each country.

Viewed from this perspective, the current construction characteristics of the Kosovo greenhouse industry must be significantly improved, but it would not be wise to build highly sophisticated models. Selecting and developing local medium level greenhouses would be more realistic and more profitable.

The construction material should not be a purpose in itself. The only thing it must provide is greenhouse stability, long-term use, and economic efficiency. The use of local materials and the proper combination of construction materials (for example cement pillars and metal arches) could be more reliable alternatives for a reasonable construction cost. It is important for better designed greenhouses to reach some specific parameters in terms of volume, gutter height, size, ventilation characteristics, and the quality of plastic covering films.

Because of very low gutter heights (sometimes not more than 1 m high), the average volume coefficient in the most used model of greenhouse in Kosovo does not reach 2 m^3/m^2. Because of that, the air temperature fluctuations are very high, the air humidity is beyond the technology limits, and there is not enough space for plant growth in the greenhouse. Increasing the gutter height to a minimum of 2,5 m and the volume coefficient to a minimum of 3 m^3/m^2 should be a minimum construction standard (please note that this coefficient is not less than 6 m^3/m^2 in modern greenhouses).

Figure 1 Kosovo greenhouse model

Figure 2. Improved greenhouse model

Currently, Kosovo greenhouses are dominated by the single tunnel model. Shifting to a multi tunnel model will contribute to the reduction of construction costs, especially for metal constructed greenhouses. The minimum size of individual spans must be not less than 5m wide. Being like that, they will provide better lightening of plants, better aeration and effective use of machineries inside the greenhouse. Specific problems of multi-span greenhouses related to proper ventilation should be considered and properly addressed.

Because of very high temperatures from the middle of May till the end of August, crucial construction parameters of greenhouses in Kosovo must be the window ratio to the total area of plastic. All side ventilation must be a necessity. Roof ventilation will greatly improve the ventilation rate and provide a reduction of 2 to 3 degrees Celsius of maximum air temperatures, contributing to better growing conditions and a longer active lifespan of plants. Even wooden greenhouses must be equipped with simple hand operated side windows. This will help to keep air temperatures under control consequently expand the plant life and the harvesting period.

The quick replacement of single year plastic with a film with a long life is a pre-condition to early planting and, also, having two crops per year. The use of long-life films will contribute to improving financial parameters due to its influence on the reduction of depreciation and maintenance costs.

4.1 Low cost greenhouses versus upgraded designed greenhouses; environmental and food safety issues

According to discussions, Kosovo must follow the Mediterranean model. However, vegetable production is still possible in low cost greenhouses. Furthermore, if we consider the low cost of construction and the family business character of most greenhouses than they can still be competitive in a low income market. For that reason, they will continue to be massively used by the small farmers.

On the other hand, because of low construction standards, the production of these greenhouses is heavily affected by the frequent fluctuations of climatic parameters in the course of plant growth, both in terms of quantity, and time distribution of yield and production quality.

One of the most serious problems of low cost greenhouses is their limited capability to control the appearance and high infestation of different plant diseases and insects. Because of that, the only way to control them is frequent chemical applications. The total number of chemical applications in these greenhouses can range from 8 to 12 per crop, with a total of 2-3 kg pesticide per 1000 sq. m. It is a serious threat for natural fauna and human health.

On the contrary, better equipped greenhouses can provide a safer control of insects and diseases, primarily through temperature and humidity control, better aeration, the use of thermal screens, and insect nets, etc. The final result of these technical interventions is the significant reduction of pesticide use and environmental pollutants, and the increased level of consumer's safety.

In this context, assuming the increase of public awareness regarding food safety issues, and the intention of approaching European standards for product quality and food safety, the construction of upgraded designed greenhouses, despite their higher cost, is an unavoidable need.

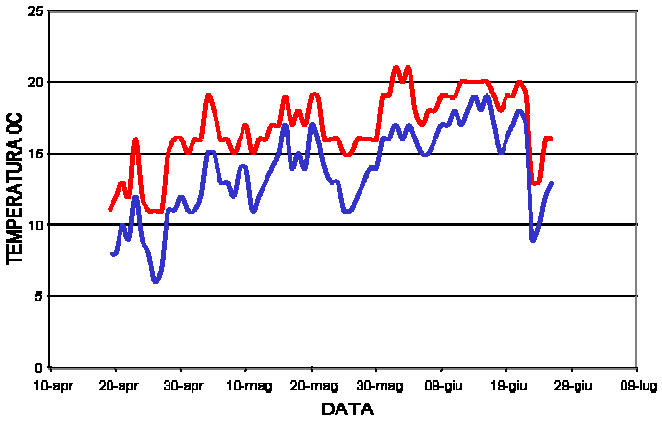
4.2 Natural production versus forced production; alternative sources of energy

Heating a greenhouse is very expensive. With the current prices of energy, growing fresh vegetables by burning fuels does not make sense in Kosovo. The heat requirements, even in Prizren, are calculated at about 150,000 kcal/hour. No less than 15 litres of diesel would be needed to be burned, in order to generate enough heat for 10 hours per day in January and February (a little less in March). At least 600 hours of heat would be needed in total. That means that the total amount of heat would cost around 10800 Euros per 1000 sq. m per single production cycle (1,2 Euros per litre of diesel). One must also consider the fact that January and February does not have enough sunlight per day for effective crop production. Consequently, there is no chance that such high heating costs can be paid by earlier production of a heated greenhouse.

There are, of course, cheaper sources of energy such as Kosovo's waste water power plant, but using them would require high initial investments in order to transport the hot water a certain distance from the source to make it available for distribution among private growers. It is, also, not convenient for small scale farms to use coal for greenhouse heating. Therefore, for time being, simple agricultural practices should be adopted and used in Kosovo greenhouses.

The use of small tunnels inside the greenhouses is a very effective method, broadly used in Albania. The method allows the Albanian farmers to plant at least two weeks earlier, compared with normal practices. Followed by the extensive use of determinate and semi determinate tomato cultivars, it makes it possible to start harvesting in the end of April and even earlier (beginning of April) for cucumbers.

Another effective method is the use of passive heating systems, which are composed of simple plastic tubes through which hot water is passed, laid down alongside the row of crops. In several experiments conducted in Albania, a difference of 1,5 to 2,5 degrees Celsius of minimum air temperatures was recorded between different greenhouses, equipped and not equipped with passive heating systems. Simple calculations may show that the temperature differences are equal to an amount of 30,000 to 50,000 kcal/hour/1000 sq. m. To obtain the same amount of energy using traditional heating methods, 3 to 5 litres of fuel would be needed to be burned per hour, which means that using passive heating systems save roughly 1,800 to 3,000 litres of diesel per 1000 sq. m per crop season.



4.3 Annual greenhouse production versus seasonal economic competitiveness

The market of fresh vegetables is blooming worldwide. This market has recently recorded a fast growth rate, thanks to the significant developments of two important factors: major improvements in transportation, which make the fast delivery of fresh products possible over long distances with a low transportation cost, and considerable improvements in post-harvest technologies and the storage of fresh vegetables. Favoured by the continuous increase in crop yield, these factors have transformed traditional seasonal consumption of fresh vegetables to year-round consumption. This means that there are higher market demands for fresh vegetables and more opportunities for vegetable growers to develop their business.

On the other hand, due to many bilateral or regional free trade agreements, the fresh vegetable market is already open to many actors. The continuous reduction of fiscal barriers between different countries followed by the increasing rate of information flow cause market prices to be very similar in large regions. This situation is exposing Kosovo farmers to high competition coming from more technologically developed countries and/or better climatic conditions for early vegetable production. The main risk farmers face are low prices of imported products, compared to higher production costs of local products, at the beginning of the vegetable growing season in Kosovo.

Obviously, the first goal of the Kosovo greenhouse industry should be the elimination of large vegetable imports. With the current production area of greenhouses and even if it were doubled with 150 ha more, the total production would be consumed by local markets. Practically speaking, in the near future, any attempts for export would only be sporadic and not sustainable. Moreover, the Kosovo greenhouse industry should not attempt to cover the entire year of market demands with local production. As it has already been explained in the previous chapters of this study, it would not be feasible by

an agronomic point of view and it would be very costly financially. However, the Kosovo greenhouse industry should be focused on increasing production capacities in the period from the end of April to the beginning of November and improving the quality of production to better address the increasing public demands regarding food quality and safety.

5. Comparative economic advantages of different greenhouse production levels

The reduction of massive vegetable imports in the late spring and early summer and autumn periods can be done by increasing the greenhouse cultivated areas and improving current greenhouse models and production technologies. By introducing upgraded greenhouse design, the crop production will be increased due to enhanced possibilities for earlier transplanting and opportunities of having two sequential crops per year.

The discussion of the efficiency of different technology models of greenhouse production is not an easy issue. The results are highly dependent on the level of investment and production incomes (results of average yield and average price per unit of yield).

Generally speaking, even low cost greenhouses seem to be an attractive agricultural business, at least for low income farmers. In Kosovo, assuming a total tomato production of 8.5 kg/sq.m, distributed from the end of June to the end of August, the production cost is calculated at 0.24 Euros/kg against an average wholesale price of 0.34 Euros/kg. The farmers' incomes per working day are calculated at about 10 Euros, and the return of modest investments for greenhouse construction (4 Euros/sq.m) is calculated at 6 years. However, no one can guarantee that the weak greenhouse structures can survive even a single year, if heavy atmospheric events occur. Although, net incomes are not calculated from a strictly economical point of view (Annexes 3), the gross incomes for 1000 sq.m of greenhouse are calculated at about 700 Euros per year. Considering the fact that growing vegetables in small scale greenhouses is a kind of self-employment or a family business, the labour costs of 800 Euros per year can be added, summing up the family budget to about 1500 Euros per season.

Shifting from low cost traditional greenhouses to improved ones will provide the farmer with a higher intensive use of land. Improved designs will allow (demand) a shift from single crop cultivation per year (tomato) to two sequential crops per year (tomato + cucumber[13], tomato + lettuce, etc). Due to better climatic controls, improved fruit setting, more intensive use of fertilizers and better crop management practices, higher yields are expected from the main crop (in these calculations the tomato yield is assumed to be 11.5 kg per sq. m) and due to the enlargement of the harvest period, the total yield per year, tomato + cucumber, is assumed to be 17 kg per sq. m. The farmer's income per work day will remain unchanged (10 Euros), but the production costs will be reduced to 0.22 Euros per kg.

However, shifting to better designed greenhouses means higher investments, which affect farmer decisions. The level of investment will significantly affect the return on investment, the gross and net incomes, and the farm's cash flow rate.

Shifting to galvanized steel structures, which are actually available on the Kosovo market for a price of 20 euro/sq. m, would be a hard decision. Because of considerably

[13] Annexes 4.1, 4.2, 4.3.

higher prices (5 times higher compared to low cost greenhouses), even by providing higher yields and better prices in the beginning and end of common harvesting seasons, they could not guarantee a return on investment in less than 12 years[14]. The income per work day would be even less compared with low cost greenhouses (only 5 Euros due to much higher depreciation costs), no net incomes are expected, but the gross incomes would be doubled (1700 Euros) compared to low cost greenhouses, and by adding the labour costs (1500 Euros) a family farm could count on a budget of more than 3200 Euros per year.

The situation could be slightly improved if other crops are planted such as peppers and melons instead of the traditional tomato crop. Assuming peppers are grown as the first crop (8 kg/sq. m) and is followed by lettuce (3 kg/sq. m), the same period of time (12 years) would be required for the full return on investment, and the same amount of gross income would be provided, but some net income would be collected, and the income per work day would be close to 11 Euros[15].

Obviously both, the high investment per square meter and the long period of investment return, would not encourage farmers to shift from traditional greenhouses to new models. The necessary process of improving greenhouse technology can be facilitated by subsiding part of the greenhouse construction costs or by developing less expensive models (keeping the same design, but replacing parts of the steel structures with less expensive constructive materials).

Assuming farmers could have improved greenhouses with the cost of 15 Euros/sq. m, it would make growing greenhouse vegetables a more profitable and safer business. In the case of tomato + cucumber[16] option, the gross incomes will be slightly improved, but the incomes per work day would be doubled, a small net income would be provided each year (300 Euros) and the period of investment return would go down to 9 years. The situation would be even better if the second planting option was used, pepper + lettuce[17]. In such a case the return on investment would be also 9 years, but the income per work day would increase to 14 Euros and the farmer's net income would go up to 500 Euros per year.

6. Conclusions

Because of its climatic conditions, Kosovo can not be considered among the best places for protected cultivation. However, there are possibilities to develop a sustainable greenhouse industry, which would support the economic development of the country by providing large quantities of fresh vegetables, currently imported, and by improving farmers' incomes.

Due to diverse climatic conditions, significant differences regarding the suitability of greenhouse production can be identified among Kosovo's regions. Sites in "Rrafshi i Dukagjinit" and especially in the commune of Prizren have the best climates for early greenhouse production.

Kosovo is a vegetable net importer country. Large quantities of fresh vegetables are continuously imported. Currently, despite the fast increase of greenhouse production area in the past three years, vegetable production in Kosovo is based on open field

[14] Annexes 4.2 and 6.2
[15] Annexes 6.1, 6.2 and 6.3
[16] Annexes 5.1, 5.2 and 5.3
[17] Annexes 7.1, 7.2 and 7.3

cultivation. Shifting vegetable production from open fields to protected structures will extend the production cycle (earlier and later production). The upgrade of the current low standard of simple greenhouses will have a similar effect.

Increasing greenhouse area is the only way that Kosovo can significantly reduce fresh vegetable imports in May, June, and July. In order to reach the objective of eliminating imports in late spring and early summer, the greenhouse area in Kosovo must be increased by no less than 150 ha. Though the primary objective of the Kosovo greenhouse industry in the next coming years should be to continue to eliminate large vegetable imports, there could also be opportunities for organized exports. Montenegro, Albania, and Serbia would be potential markets for Kosovo's greenhouse products during certain periods of the year.

The greenhouse industry is a fast developing sector in Kosovo. Based on recent statistics the current area of greenhouse production is 154 ha. It has doubled since 2005, when the greenhouse area was 73 ha. The majority of Kosovo's greenhouses are low cost traditional structures. Currently, there are several improvements which must be done to upgrade the current construction standards of greenhouses in Kosovo. The better quality greenhouses will provide better climatic conditions for plant growth and, due to that, healthier plants, longer harvesting periods, and higher yields.

Most of Kosovo's greenhouses are used to plant one crop per year. The common planting period is from the end of March to the middle of October. Obviously, this is a very short period for greenhouse operation, which negatively influences its production efficiency. Expanding the utilization period of the greenhouses by planting earlier and going later than the common dates through simple agronomic interventions seem to be a realistic approach. Also, ending the production cycle in the beginning of August (or earlier in case of cucumbers or melons) will provide the possibility of a second short crop.

The limited number of crops grown in greenhouses is another serious problem for the Kosovo greenhouse industry. Currently, tomatoes and cucumbers are almost the exclusive crops produced under protected cultivation. Growing melons, eggplants, squash, or French beans are almost unknown and only in rare cases are peppers grown in greenhouses. However, compared with previous years, there is an improvement in terms of variety in many greenhouses, but often the variety choice is not appropriate. Introducing new cultivars will create possibilities to increase both early and late production.

Kosovo growers are still not fully aware of the importance of the quality of fresh vegetables for successful marketing. Currently, the growers place their full attention on the production side. Much less attention is being paid to fruit's quality in terms of uniformity of size, shape, colour, ripening stage, shelf life, etc. Though there is a general understanding of the importance of improved vegetable marketing, there are no current examples of even simple investments for vegetable sorting, packing, and labelling. In the context of the increase in public awareness in regards to food safety issues and the intention of approaching European standards of product quality and food safety, the construction of upgraded designed greenhouses, despite the higher investment cost, is an unavoidable need.

The Kosovo greenhouse industry should not attempt to cover the market demand for fresh vegetables for the entire year. It would not be feasible by agronomic point of view and it would be very costly financially. On the contrary, the Kosovo greenhouse industry should focus on increasing production capacities from the period of the end of April to

the beginning of November and it should concentrate on improving production quality in order to address increasing public demands regarding food quality and safety.

Heating a greenhouse by conventional methods is very expensive and is not feasible for small scale Kosovo greenhouses. Because of that, greenhouse production needs to be based on natural solar energy and whenever possible by using alternative sources of renewable or cheap energy. There are cheaper sources of energy (such as the waste water of the power plant), but using them may require high initial investments in order to transport the hot water from the source to distribution to private growers. Cheaper sources of energy may not also be convenient for small scale farms (the use of coal for greenhouse heating for example). Therefore, for time being, simple agricultural practices of energy collection and conservation for greenhouses should be adopted and used.

Finding an appropriate economic compromise, between high construction costs of a better equipped greenhouses and potentially higher yields with better quality produce thanks to improved microclimate controls, is something that requires specific solutions according to the technical and socio-economic characteristics of Kosovo. Although the current construction characteristics of Kosovo's greenhouses must be significantly improved, it does not seem wise to build highly sophisticated models. Selecting and developing local medium level greenhouses would be more realistic and more profitable.

Greenhouses are effective production resources which improve farmers' financial indicators. Generally speaking, even low cost greenhouses seem to be attractive agricultural businesses, at least for low income farmers. All production and economic parameters are much higher compared with open field vegetable production. Though no net incomes are from a strictly economic point of view, the gross incomes for 1000 sq. m of greenhouse production area are calculated at about 700 Euros per year. Considering the fact that growing vegetables in small scale greenhouses is a kind of self employment or a family business, the labour cost of about 800 Euros per year can be added, summing up the family budget at about 1500 Euros per season.

Shifting from low cost traditional greenhouses to improved ones mean a higher intensive use of land. However, better designed greenhouses mean higher investments which would affect farmers' decisions. In the case of greenhouses, the level of investment will significantly affect the return on investment, the gross and net incomes, and the cash flow of family farms.

Shifting to galvanized steel structures which are currently available on the market in Kosovo with a price of 20 Euros/sq. m does not seem to be a very good idea. Because of considerably higher prices (5 times higher compared to low cost greenhouses), even with higher yields and better prices in the beginning and the end of the common harvesting season, they can not guarantee a return on investment in less than 12 years. However, gross incomes would be doubled (1700 Euros) compared to low cost greenhouses, and by adding the labour costs (1500 Euros), a family farm could count on a budget of more than 3200 Euros per year. Due to the high investment per square meter and the long period of investment return, farmers would not be encouraged to shift from traditional greenhouses to new models. The necessary process of switching from low cost traditional greenhouses to improved greenhouses can be facilitated by subsiding part of the construction costs or by developing less expensive models (keeping the same design, but replacing part of the steel structures with less expensive construction materials).

Assuming farmers could have improved greenhouses at the cost of 9 Euros/sqm, it would make growing greenhouse vegetables a more profitable and safer business.

Gross incomes would be slightly improved, but the incomes per work day would be doubled, a small net income would be provided each year (500 Euros per 1000sq. m), incomes per work day of farmers would increase up to 14 Euros and the period of investment return would go down to 9 years.

There are several farmers' organizations that have been founded in Kosovo in recent years. However, none of them have managed to shift into a farmers' cooperative. Considering the current status of the greenhouse industry development, there is little hope that any operational farmers' marketing cooperative will soon be created. The size of greenhouse farms is very small and current farming economic indicators hardly support the establishment and management costs of a marketing cooperative. Pushing farmers to quickly create this type of organization would not be a good idea. Sharing information and farming experiences (such as the Greenhouse Business Development Group), enhancing farmers' solidarity, and lobbying and advocacy of farmers' interests are more realistic alternatives to farmers' cooperatives.

In general, farmers have little access to upgraded production technologies and lack periodical field visits of extension officers. The establishment of an extension unit aimed at providing technical assistance to innovative and market-oriented horticultural producers can contribute to reaching this need.

7. Recommendations

Kosovo must promote the development of the greenhouse industry. It will be the best way to eliminate large fresh vegetable imports and to reduce poverty by increasing farmers' incomes.

The Kosovo greenhouse industry must shift from low cost traditional construction and management standards to improved medium level greenhouse construction and updated crop management practices.

Kosovo greenhouse producers need better financial support (subsidies for improved greenhouse design, low interest rate credit) and better access to information and know-how (agronomic assistance, crop management trainings, farm business training and assistance, market information) in order to shift from current small scale to more business oriented greenhouse production.

Annexes

Annex 1 Climatic data of the main regions in Kosovo

	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Prishtine													
Tmax	3.9	6.1	11.5	16.5	22.0	25.0	28.6	27.9	22.1	17.3	10.2	4.5	
Tmin	-4.6	-3.6	0.5	4.8	9.5	12.9	14.2	14.2	9.8	6.2	-0.6	-1.0	
Tmes	-0.5	1.0	6.1	10.7	15.9	19.8	22.2	21.3	16.0	11.8	5.2	2.0	
Reshjet (mm)	51.3	30.8	46.7	45.0	66.0	39.3	41.0	75.9	50.7	68.9	71.3	48.1	**634.9**
Peja													
Tmax	2.4	3.28	12.94	15.72	21.58	26.08	28.32	28.28	20.84	16.98	9.98	7.1	
Tmin	-5.1	-1.7	1.9	6.5	10.4	14.5	16.6	15.7	11.4	7.0	2.5	1.5	
Tmes	-1.2	2.7	7.6	11.3	15.3	20.6	24.0	24.3	15.7	11.9	6.6	2.6	
Reshje	89.7	87.3	58.7	62.0	79.1	58.1	45.1	62.4	58.4	65.5	75.3	97.5	839.2
Ferizaj													
Tmax	2.8	6.5	11.2	15.5	20.0	24.3	27.3	26.8	20.8	17.2	9.8	3.7	
Tmin	-2.8	-3.8	0.7	4.2	7.6	11.6	13.5	13.0	9.2	5.4	0.5	-1.5	
Tmes	-0.2	1.5	5.9	10.2	14.5	18.6	22.1	20.7	14.9	11.3	4.7	1.0	
Reshjet	61.5	31.1	42.3	46.5	65.6	55.9	54.8	66.2	47.7	96.2	49.1	76.0	692.9
Prizren													
Tmax	5.1	8.3	15.0	19.7	25.6	28.6	31.6	32.0	25.7	21.0	12.8	5.4	
Tmin	-3.6	-2.1	3.0	6.5	10.5	12.6	15.5	15.4	11.9	7.5	2.4	-2.3	
Tmes	2.3	2.6	9.8	12.1	17.6	20.1	23.6	23.7	18.4	13.8	5.7	-0.5	
Reshjet	34.6	71.3	53.5	55.4	64.1	53.3	45.3	29.8	47.3	30.6	54.6	61.3	600.9

Annex 2.1 SUMMARY OF FINANCIAL CALCULATIONS (Peppers - open field)

Total area		1000	m2	
Incomes				
Plants	6		per m2	
Total plants	6000	6000.0	plant	
Sales per plant	0.3		kg/plant	
Sales per sq.meter	2.0	2.0	kg	
Total sales	1980	1980.0	kg	
Average sale price	0.33	0.33	Euro/kg	
Average inc./sq. meter	0.65	0.65	Euro	
Incomes from sales	**648**	**648**	Euro	
Expenditures				
Direct costs				
Machinery costs	0.02			
Labour	0.05		Euro/bime	Based on respective crop budget
Seedlings	0.02		Euro/bime	Based on respective crop budget
Fertilizers	0.01		Euro/bime	Based on respective crop budget
Pesticides	0.00		Euro/bime	Based on respective crop budget
Fuel	0.01		Euro/bime	Based on respective crop budget
Electric power	0.00		Euro/bime	Based on respective crop budget
Other materials	0.02		Euro/bime	Based on respective crop budget
Total of direct costs	**0.14**		Euro/bime	
Total costs per sq.meter	**0.85**	**0.85**	**Euro/m2**	
Indirect and administrative costs				
Depreciation		0.01	Euro/m2/ year	Based on investment table
Maintenance		0.00	Euro/m2/ year	1 % of the total of investments
Administrative costs		0	Euro/year	
Non planned costs		0.04	Euro/m2/ year	5% of the direct costs

One crop; May-October

Summary

Incomes	0.65	euro/sq.meter
Expenditures	0.90	euro/sq.meter
Direct	0.85	euro/sq.meter
Interest	0.06	euro/sq.meter
Loan interests	0.00	euro/sq.meter
Critical point	2.75	kg/m2
Critical point	0.45	Euro/kg

Production cost	45	euro/kv
Farmers income	2	euro/day

Investment costs

Irrigation system	300	Euro	Based on the investment table
Other investments	0	Euro	Based on the investment table
Total of investments	300	Euro	
Investiment/m2	0.3	Euro/m2	The price of land is not included
Investor contribution	100.00	%	
Donor contribution	0.00	%	

Annex 2.2 CASH FLOW TABLE (Euros)

Planted area 1000 m2 open field pepper

		-6 Muaj	1 year	2 year	3 year	4 year	5 year	6 year	7 year	8 year	9 year	10 year	Total
A	**Annual costs**												
	Sells (incomes)	0	648	648	648	648	648	648	648	648	648	648	6480
	Expenditures	0	891	891	891	891	891	891	891	891	891	891	-1104
	Gross incomes	**0**	**-243**	**-243**	**-243**	**-243**	**-243**	**-243**	**-243**	**-243**	**-243**	**-243**	**7584**
B	**Investments**												
	Greenhouse	300	0	0	0	0	0	0	0	0	0	0	300
	Other facilities	0	0	0	0	0	0	0	0	0	0	0	0
	Total of investments	**300**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**300**
C	**Credits and debits**												
	Credits	300	0	0	0	0	0	0	0	0	0	0	300
	Donor credits	0	0	0	0	0	0	0	0	0	0	0	0
	Investor credits	300	0	0	0	0	0	0	0	0	0	0	300
	Debits	0	0	0	0	0	0	0	0	0	0	0	0
	Bank loans	0	0	0	0	0	0	0	0	0	0	0	0
	Net financed	**300**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**300**
	Total A+B+C	**0**	**-243**	**-243**	**-243**	**-243**	**-243**	**-243**	**-243**	**-243**	**-243**	**-243**	**-2427**
	Cash flow	**0**	**-243**	**-485**	**-728**	**-971**	**-1213**	**-1456**	**-1699**	**-1942**	**-2184**	**-2427**	

Annex 2.3 SUMMARY OF CROP EXPENDITURES AND INCOMES

Incomes											open field pepper
Planted area	1000	m2									
	Viti 1	Viti 2	Viti 3	Viti 4	Viti 5	Viti 6	Viti 7	Viti 8	Viti 9	Viti 10	Totali
Sells											
Pepper	648	648	648	648	648	648	648	648	648	648	6480
Total sells	**648**	**648**	**648**	**648**	**648**	**648**	**648**	**648**	**648**	**648**	6480
Direct costs											
Machinery costs	145	145	145	145	145	145	145	145	145	145	1450
Labour	326	326	326	326	326	326	326	326	326	326	3264
Seedlings	120	120	120	120	120	120	120	120	120	120	1200
Fertilizers	84	84	84	84	84	84	84	84	84	84	840
Pesticide	0	0	0	0	0	0	0	0	0	0	0
Fuel	70	70	70	70	70	70	70	70	70	70	700
Electric power	0	0	0	0	0	0	0	0	0	0	0
Other materials	100	100	100	100	100	100	100	100	100	100	1000
Total of direct costs	**845**	**845**	**845**	**845**	**845**	**845**	**845**	**845**	**845**	**845**	**8454**
Indirect and administrative costs											
Depreciation	10	10	10	10	10	10	10	10	10	10	**100**
Maintenance	3	3	3	3	3	3	3	3	3	3	**30**
Administrative costs	0	0	0	0	0	0	0	0	0	0	**0**
Non planned costs	42	42	42	42	42	42	42	42	42	42	**423**
Total of indirect costs	**55**	**55**	**55**	**55**	**55**	**55**	**55**	**55**	**55**	**55**	**553**
Incomes without interests and taxes	**-253**	**-253**	**-253**	**-253**	**-253**	**-253**	**-253**	**-253**	**-253**	**-253**	**-2527**
Bank interests costs	0	0	0	0	0	0	0	0	0	0	**0**
Taxes	0	0	0	0	0	0	0	0	0	0	**0**
Credit loans	0	0	0	0	0	0	0	0	0	0	**0**
Total expenditures	901	901	901	901	901	901	901	901	901	901	**9007**
Net incomes	-253	-253	-253	-253	-253	-253	-253	-253	-253	-253	**-2527**

Annex 3.1 SUMMARY OF FINANCIAL CALCULATIONS

Low level greenhouses

Assumptions	Tomato	Total		
Planted area		1000	m2	
Incomes				
Plants	3.5		per m2	
Total plants	3500	3500.0	plant	
Sales per plant	2.4		kg/plant	
Sales per sq.meter	8.5	8.5	kg	
Total sales	8505	8505.0	kg	
Average sale price	0.34	0.34	Euro/kg	
Incomes/sq. meter	2.93	2.93	Euro	
Incomes from sales	**2930**	**2930**	Euro	
Expenditures				
Direct costs				
Machinery costs	0.07	0.07	Euro/plant	Based on respective crop budget
Labour	0.24	0.24	Euro/plant	Based on respective crop budget
Seedlings	0.15	0.15	Euro/plant	Based on respective crop budget
Fertilizers	0.04	0.04	Euro/plant	Based on respective crop budget
Pesticides	0.01	0.01	Euro/plant	Based on respective crop budget
Fuel	0.02	0.02	Euro/plant	Based on respective crop budget
Electric power	0.00	0.00	Euro/plant	Based on respective crop budget
Other materials	0.06	0.06	Euro/plant	Based on respective crop budget
Total of direct costs	0.59	0.59	Euro/plant	Based on respective crop budget
Total costs per sq.meter	**2.08**	**2.08**	Euro/sq.meter	
Indirect and administrative costs				
Depreciation	0.82	0.82	Euro/m2/ year	Based on investment table
Maintenance	0.04	0.04	Euro/m2/ year	1 % per year of the total of investments
Administrative costs	0	0.00	Euro/year	
Non planned costs	0.10	0.10	Euro/m2/ year	5% of the direct costs
Kosto e investimit				

One crop per year (April - September)

Summary

Incomes	2.93	euro/sq.m
Expenditures	3.04	euro/sq.m
Direct	2.08	euro/sq.m
Interest	0.96	euro/sq.m
Bank interests	0.00	euro/sq.m
Critical point	8.8	kg/m2
Critical point	0.36	Euro/kg
24		
Production cost	15	euro/kv
Farmers income	10	euro/day

Greenhouse	3300		Based on investment table
Other investments	700		Based on investment table
Total of investments	4000	Euro	Based on investment table
Investiment/m2	4.0	Euro	Based on investment table
Investor contribution	4004	Euro	
Donor contribution	0.0	Euro/m2	The price of land is not included
Financimi i investitorit	100.00	%	
Financimi i projektit	0.00	%	

Annex 3.2 CASH FLOW TABLE (Euro)

Planted area 1000 m2 low level (tomato)

		-6 Month	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
A	**Annual costs**												
	Sells (incomes)	0	2930	2930	2930	2930	2930	2930	2930	2930	2930	2930	29295
	Expenditures	0	2221	2221	2221	2221	2221	2221	2221	2221	2221	2221	1924
	Gross incomes	**0**	**709**	**709**	**709**	**709**	**709**	**709**	**709**	**709**	**709**	**709**	**27371**
B	**Investments**												
	Greenhouse	3300	0	0	0	3	0	0	3	0	0	3	3310
	Other facilities	700	0	0	0	0	0	0	0	0	0	0	700
	Total of investments	**4000**	**0**	**0**	**0**	**3**	**0**	**0**	**3**	**0**	**0**	**3**	**4010**
C	**Credits and debits**												
	Credits	4000	0	0	0	0	0	0	0	0	0	0	4000
	Donor credits	0	0	0	0	0	0	0	0	0	0	0	0
	Investor credits	4000	0	0	0	0	0	0	0	0	0	0	4000
	Debits	0	0	0	0	0	0	0	0	0	0	0	0
	Bank loans	0	0	0	0	0	0	0	0	0	0	0	0
	Net financed	**4000**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4000**
	Total A+B+C	**0**	**709**	**709**	**709**	**705**	**709**	**709**	**705**	**709**	**709**	**705**	**7076**
	Cash flow	**0**	**709**	**1417**	**2126**	**2831**	**3539**	**4248**	**4953**	**5662**	**6370**	**7076**	

Annex 3.3 SUMMARY OF CROP EXPENDITURES AND INCOMES

Incomes										low level (tomato)
Planted area	1000	m2								
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Totali
Sells											
Tomato	2930	2930	2930	2930	2929.5	2929.5	2929.5	2929.5	2929.5	2929.5	29295
Total sells	**2930**	**2930**	**2930**	**2930**	**2930**	**2930**	**2930**	**2930**	**2930**	**2930**	29295
Direct costs											
Machinery costs	245	245	245	245	245	245	245	245	245	245	2450
Labour	837	837	837	837	837	837	837	837	837	837	8367
Seedlings	525	525	525	525	525	525	525	525	525	525	5250
Fertilizers	150	150	150	150	150	150	150	150	150	150	1500
Pesticide	50	50	50	50	50	50	50	50	50	50	504
Fuel	70	70	70	70	70	70	70	70	70	70	700
Electric power	0	0	0	0	0	0	0	0	0	0	0
Other materials	200	200	200	200	200	200	200	200	200	200	2000
Total of direct costs	**2077**	**2077**	**2077**	**2077**	**2077**	**2077**	**2077**	**2077**	**2077**	**2077**	**20771**
Indirect and administrative costs											
Depreciation	820	820	820	820	820	820	820	820	820	820	**8200**
Maintenance	40	40	40	40	40	40	40	40	40	40	**400**
Administrative costs	0	0	0	0	0	0	0	0	0	0	**0**
Non planned costs	104	104	104	104	104	104	104	104	104	104	**1039**
Total of indirect costs	**964**	**964**	**964**	**964**	**964**	**964**	**964**	**964**	**964**	**964**	**9639**
Incomes without interests and taxes	**-111**	**-111**	**-111**	**-111**	**-111**	**-111**	**-111**	**-111**	**-111**	**-111**	**-1115**
Bank interests costs	0	0	0	0	0	0	0	0	0	0	**0**
Taxes	0	0	0	0	0	0	0	0	0	0	**0**
Credit loans	0	0	0	0	0	0	0	0	0	0	**0**
Total expenditures	3041	3041	3041	3041	3041	3041	3041	3041	3041	3041	**30410**
Net incomes	-111	-111	-111	-111	-111	-111	-111	-111	-111	-111	**-1115**

Annex 4.1 SUMMARY OF FINANCIAL CALCULATIONS

medium level (tomato+cucumber)

Assumptions	First crop	Second crop	Total		
Planted area	Tomato	Cucumber	1000	m2	
					Two plants per year (tomato & cucumber)
Incomes					
Plants	2.5	2.5		per m2	
Total plants	2500	2500	5000.0	plant	
Sales per plant	4.7	2.3		kg/plant	
Sales per sq.meter	12	6	17.3	kg	
Total sales	11625	5625	17250.0	kg	
Average sale price	0.35	0.44	0.39	Euro/kg	
Incomes/sq. meter	4.03	2.48	6.5	Euro	
Incomes from sales	**4031**	**2475**	**6506.3**	Euro	
Expenditures					
Direct costs					
Machinery costs	0.14	0.1		Euro/plant	Based on respective crop budget
Labour	0.38	0.2		Euro/plant	Based on respective crop budget
Seedlings	0.15	0.2		Euro/plant	Based on respective crop budget
Fertilizers	0.13	0.1		Euro/plant	Based on respective crop budget
Pesticides	0.02	0.01		Euro/plant	Based on respective crop budget
Fuel	0.03	0.0		Euro/plant	Based on respective crop budget
Electric power	0.00	0.0		Euro/plant	Based on respective crop budget
Other materials	0.16	0.1		Euro/plant	Based on respective crop budget
Total of direct costs	**1.00**	**0.72**		Euro/plant	
Total costs per sq.meter	**2.51**	**1.81**	**4.32**	**Euro/m2**	
Indirect and administrative costs					
Depreciation			1.93	Euro/m2/ year	Based on investment table
Maintenance			0.20	Euro/m2/ year	1 % of the total of investments
Administrative costs			0	Euro/year	
Non planned costs			0.22	Euro/m2/ year	5% of the direct costs
Kosto e investimit					

Summary		
Incomes	6.51	euro/sq.m
Expenditures	6.66	euro/sq.m
Direct	4.32	euro/sq.m
Interest	2.34	euro/sq.m
Bank interests	0.00	euro/sq.m
Critical point	16.94	kg/m2
Critical point	0.39	Euro/kg
Production cost	22	euro/kv
Farmers income	5	euro/day

Greenhouse	15500	Euro	Based on the investment table
Other investments	4500	Euro	Based on the investment table
Total of investments	20000	Euro	
Investiment/m2	20	Euro/m2	The price of land is not included
Investor contribution	100.00	%	
Donor contribution	0.00	%	

Annex 4.2 CASH FLOW TABLE (Euro)

Planted area 1000 m2 medium level (tomato+cucumber)

		-6 Month	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
A	**Annual costs**												
	Sells (incomes)	0	6506	6506	6506	6506	6506	6506	6506	6506	6506	6506	65063
	Expenditures	0	4739	4739	4739	5539	4739	4739	4739	5539	4739	4739	4985
	Gross incomes	**0**	**1767**	**1767**	**1767**	**967**	**1767**	**1767**	**1767**	**967**	**1767**	**1767**	**60077**
B	**Investments**												
	Greenhouse	15500	0	0	0	6	0	0	6	0	0	6	15519
	Other facilities	4500	0	0	0	0	0	0	0	0	0	0	4500
	Total of investments	**20000**	**0**	**0**	**0**	**6**	**0**	**0**	**6**	**0**	**0**	**6**	**20019**
C	**Credits and debits**												
	Credits	20000	0	0	0	0	0	0	0	0	0	0	20000
	Donor credits	0	0	0	0	0	0	0	0	0	0	0	0
	Investor credits	20000	0	0	0	0	0	0	0	0	0	0	20000
	Debits	0	0	0	0	0	0	0	0	0	0	0	0
	Bank loans	0	0	0	0	0	0	0	0	0	0	0	0
	Net financed	**20000**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**20000**
	Total A+B+C	**0**	**1767**	**1767**	**1767**	**961**	**1767**	**1767**	**1761**	**967**	**1767**	**1761**	**16055**
	Cash flow	**0**	**1767**	**3535**	**5302**	**6263**	**8031**	**9798**	**11559**	**12526**	**14294**	**16055**	

Annex 4.3 SUMMARY OF CROP EXPENDITURES AND INCOMES

medium level (tomato+cucumber)

Incomes											
Planted area	1000	m2									
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Totali
Sells											
Tomato & cucumber	6506	6506	6506	6506	6506.25	6506.25	6506.25	6506.25	6506.25	6506.25	65063
Total sells	**6506**	**6506**	**6506**	**6506**	**6506**	**6506**	**6506**	**6506**	**6506**	**6506**	65063
Direct costs											
Machinery costs	575	575	575	575	575	575	575	575	575	575	5750
Labour	1566	1566	1566	1566	1566	1566	1566	1566	1566	1566	15657
Seedlings	875	875	875	875	875	875	875	875	875	875	8750
Fertilizers	511	511	511	511	511	511	511	511	511	511	5110
Pesticide	84	84	84	84	84	84	84	84	84	84	840
Fuel	112	112	112	112	112	112	112	112	112	112	1120
Electric power	0	0	0	0	0	0	0	0	0	0	0
Other materials	600	600	600	600	600	600	600	600	600	600	6000
Total of direct costs	**4323**	**4323**	**4323**	**4323**	**4323**	**4323**	**4323**	**4323**	**4323**	**4323**	**43227**
Indirect and administrative costs											
Depreciation	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	19250
Maintenance	200	200	200	1000	200	200	200	1000	200	200	3600
Administrative costs	0	0	0	0	0	0	0	0	0	0	0
Non planned costs	216	216	216	216	216	216	216	216	216	216	2161
Total of indirect costs	**2341**	**2341**	**2341**	**3141**	**2341**	**2341**	**2341**	**3141**	**2341**	**2341**	**25011**
Incomes without interests and taxes	**-158**	**-158**	**-158**	**-958**	**-158**	**-158**	**-158**	**-958**	**-158**	**-158**	**-3176**
Bank interests costs	0	0	0	0	0	0	0	0	0	0	0
Taxes	0	0	0	0	0	0	0	0	0	0	0
Credit loans	0	0	0	0	0	0	0	0	0	0	0
Total expenditures	6664	6664	6664	7464	6664	6664	6664	7464	6664	6664	**68239**
Net incomes	-158	-158	-158	-958	-158	-158	-158	-958	-158	-158	**-3176**

Annex 5.1 SUMMARY OF FINANCIAL CALCULATIONS

Assumptions	First crop	Second crop	Total		
Planted area	Tomato	Cucumber	1000	m2	
Incomes					
Plants	2.5	2.5		per m2	
Total plants	2500	2500	5000.0	plant	
Sales per plant	4.7	2.3		kg/plant	
Sales per sq.meter	12	6	17.3	kg	
Total sales	11625	5625	17250.0	kg	
Average sale price	0.35	0.44	0.39	Euro/kg	
Incomes/sq. meter	4.03	2.48	6.5	Euro	
Incomes from sales	**4031**	**2475**	**6506.3**	Euro	
Expenditures					
Direct costs					
Machinery costs	0.14	0.1		Euro/plant	Based on respective crop budget
Labour	0.38	0.2		Euro/plant	Based on respective crop budget
Seedlings	0.15	0.2		Euro/plant	Based on respective crop budget
Fertilizers	0.13	0.1		Euro/plant	Based on respective crop budget
Pesticides	0.02	0.01		Euro/plant	Based on respective crop budget
Fuel	0.03	0.0		Euro/plant	Based on respective crop budget
Electric power	0.00	0.0		Euro/plant	Based on respective crop budget
Other materials	0.16	0.1		Euro/plant	Based on respective crop budget
Total of direct costs	**1.00**	**0.72**		Euro/plant	
Total costs per sq.meter	**2.51**	**1.81**	**4.32**	**Euro/m2**	
Indirect and administrative costs					
Depreciation			1.51	Euro/m2/ year	Based on investment table
Maintenance			0.15	Euro/m2/ year	1 % of investments
Administrative costs			0	Euro/year	
Non planned costs			0.22	Euro/m2/ year	5% of the direct costs

medium level (tomato+cucumber) 2

Two plants per year (tomato & cucumber)

Summary

Incomes	6.51	euro/sq.m
Expenditures	6.20	euro/sq.m
Direct	4.32	euro/sq.m
Interest	1.87	euro/sq.m
Bank interests	0.00	euro/sq.m
Critical point	15.75	kg/m2
Critical point	0.36	Euro/kg
Production cost	22	euro/kv
Farmers income	10	euro/day

Kosto e investimit

Greenhouse	11500	Euro	Based on the investment table
Other investments	3500	Euro	Based on the investment table
Total of investments	15000	Euro	
Investiment/m2	15	Euro/m2	The price of land is not included
Investor contribution	100.00	%	
Donor contribution	0.00	%	

Annex 5.2 CASH FLOW TABLE (Euro)

Planted area 1000 m2 medium level (tomato+cucumber) 2

		-6 Mon	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
A	**Annual costs**												
	Sells (incomes)	0	6506	6506	6506	6506	6506	6506	6506	6506	6506	6506	65063
	Expenditures	0	4689	4689	4689	5489	4689	4689	4689	5489	4689	4689	9652
	Gross incomes	**0**	**1817**	**1817**	**1817**	**1017**	**1817**	**1817**	**1817**	**1017**	**1817**	**1817**	**55411**
B	**Investments**												
	Greenhouse	11500	0	0	0	6	0	0	6	0	0	6	11519
	Other facilities	3500	0	0	0	0	0	0	0	0	0	0	3500
	Total of investments	**15000**	**0**	**0**	**0**	**6**	**0**	**0**	**6**	**0**	**0**	**6**	**15019**
C	**Credits and debits**												
	Credits	15000	0	0	0	0	0	0	0	0	0	0	15000
	Donor credits	0	0	0	0	0	0	0	0	0	0	0	0
	Investor credits	15000	0	0	0	0	0	0	0	0	0	0	15000
	Debits	0	0	0	0	0	0	0	0	0	0	0	0
	Bank loans	0	0	0	0	0	0	0	0	0	0	0	0
	Net financed	**15000**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**15000**
	Total A+B+C	**0**	**1817**	**1817**	**1817**	**1011**	**1817**	**1817**	**1811**	**1017**	**1817**	**1811**	**16555**
	Cash flow	**0**	**1817**	**3635**	**5452**	**6463**	**8281**	**10098**	**11909**	**12926**	**14744**	**16555**	

Annex 5.3 SUMMARY OF CROP EXPENDITURES AND INCOMES

medium level (tomato+cucumber) 2

Incomes											
Planted area	1000	m2									
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Totali
Sells											
Tomato & cucumber	6506	6506	6506	6506	6506.25	6506.25	6506.25	6506.25	6506.25	6506.25	65063
Total sells	**6506**	**6506**	**6506**	**6506**	**6506**	**6506**	**6506**	**6506**	**6506**	**6506**	65063
Direct costs											
Machinery costs	575	575	575	575	575	575	575	575	575	575	5750
Labour	1566	1566	1566	1566	1566	1566	1566	1566	1566	1566	15657
Seedlings	875	875	875	875	875	875	875	875	875	875	8750
Fertilizers	511	511	511	511	511	511	511	511	511	511	5110
Pesticide	84	84	84	84	84	84	84	84	84	84	840
Fuel	112	112	112	112	112	112	112	112	112	112	1120
Electric power	0	0	0	0	0	0	0	0	0	0	0
Other materials	600	600	600	600	600	600	600	600	600	600	6000
Total of direct costs	**4323**	**4323**	**4323**	**4323**	**4323**	**4323**	**4323**	**4323**	**4323**	**4323**	**43227**
Indirect and administrative costs											
Depreciation	1508	1508	1508	1508	1508	1508	1508	1508	1508	1508	15083
Maintenance	150	150	150	950	150	150	150	950	150	150	3100
Administrative costs	0	0	0	0	0	0	0	0	0	0	0
Non planned costs	216	216	216	216	216	216	216	216	216	216	2161
Total of indirect costs	**1874**	**1874**	**1874**	**2674**	**1874**	**1874**	**1874**	**2674**	**1874**	**1874**	**20345**
Incomes without interests and taxes	**309**	**309**	**309**	**-491**	**309**	**309**	**309**	**-491**	**309**	**309**	**1491**
Bank interests costs	0	0	0	0	0	0	0	0	0	0	0
Taxes	0	0	0	0	0	0	0	0	0	0	0
Credit loans	0	0	0	0	0	0	0	0	0	0	0
Total expenditures	6197	6197	6197	6997	6197	6197	6197	6997	6197	6197	**63572**
Net incomes	309	309	309	-491	309	309	309	-491	309	309	**1491**

Annex 6.1 SUMMARY OF FINANCIAL CALCULATIONS

medium level (pepper+lettuce)

Assumptions	First crop	Second crop	Total		
Planted area	Pepper	Lettuce	1000	m2	
					Two plants per year (pepper and lettuce)
Incomes					
Plants	2.5	16.0		per m2	
Total plants	2500	16000	18500.0	plant	
Sales per plant	3.2	0.2		kg/plant	
Sales per sq.meter	8	3	11.2	kg	
Total sales	8000	3200	11200.0	kg	
Average sale price	0.56	0.40	0.48	Euro/kg	
Average inc./sq. meter	4.48	1.28	5.8	Euro	
Incomes from sales	**4475**	**1280**	**5755.0**	Euro	
Expenditures					
Direct costs					
Machinery costs	0.14	0.01		Euro/plant	Based on respective crop budget
Labour	0.42	0.02		Euro/plant	Based on respective crop budget
Seedlings	0.20	0.02		Euro/plant	Based on respective crop budget
Fertilizers	0.19	0.00		Euro/plant	Based on respective crop budget
Pesticides	0.01	0.00		Euro/plant	Based on respective crop budget
Fuel	0.06	0.00		Euro/plant	Based on respective crop budget
Electric power	0.00	0.00		Euro/plant	Based on respective crop budget
Other materials	0.08	0.00		Euro/plant	Based on respective crop budget
Total of direct costs	**1.10**	**0.05**		Euro/plant	
Total costs per sq.meter	**2.76**	**0.87**	**3.63**	**Euro/m2**	
Indirect and administrative costs					
Depreciation			1.62	Euro/m2/ year	Based on investment table
Maintenance			0.20	Euro/m2/ year	1 % of investments
Administrative costs			0	Euro/year	
Non planned costs			0.18	Euro/m2/ year	5% of the direct costs
Kosto e investimit					
Greenhouse			15500	Euro	Based on the investment table

Summary		
Incomes	5.76	
Expenditures	5.63	
Direct	3.63	
Interest	2.00	
Bank interests	0.00	
Critical point	11.73	kg/m2
Critical point	0.50	Euro/kg
Production cost	35	euro/kv
Farmers income	11	euro/day

Other investments	4500	Euro	Based on the investment table
Total of investments	20000	Euro	
Investiment/m2	20	Euro/m2	The price of land is not included
Investor contribution	100.00	%	
Donor contribution	0.00	%	

Annex 6.2 CASH FLOW TABLE (Euro)

Planted area 1000 m2 medium level (pepper+lettuce)

		-6 Mon.	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
A	**Annual costs**												
	Sells (incomes)	0	5755	5755	5755	5755	5755	5755	5755	5755	5755	5755	57550
	Expenditures	0	4010	4010	4010	4810	4010	4010	4010	4810	4010	4010	4000
	Gross incomes	**0**	**1745**	**1745**	**1745**	**945**	**1745**	**1745**	**1745**	**945**	**1745**	**1745**	**53550**
B	**Investments**												
	Greenhouse	15500	0	0	0	6	0	0	6	0	0	6	15519
	Other facilities	4500	0	0	0	0	0	0	0	0	0	0	4500
	Total of investments	**20000**	**0**	**0**	**0**	**6**	**0**	**0**	**6**	**0**	**0**	**6**	**20019**
C	**Credits and debits**												
	Credits	20000	0	0	0	0	0	0	0	0	0	0	20000
	Donor credits	0	0	0	0	0	0	0	0	0	0	0	0
	Investor credits	20000	0	0	0	0	0	0	0	0	0	0	20000
	Debits	0	0	0	0	0	0	0	0	0	0	0	0
	Bank loans	0	0	0	0	0	0	0	0	0	0	0	0
	Net financed	**20000**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**20000**
	Total A+B+C	**0**	**1745**	**1745**	**1745**	**939**	**1745**	**1745**	**1739**	**945**	**1745**	**1739**	**15833**
	Cash flow	**0**	**1745**	**3490**	**5236**	**6175**	**7920**	**9665**	**11404**	**12349**	**14094**	**15833**	

Annex 6.3 SUMMARY OF CROP EXPENDITURES AND INCOMES

Incomes											medium level (pepper+lettuce)
Planted area	1000	m2									
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
Sells											
Pepper & lettuce	5755	5755	5755	5755	5755	5755	5755	5755	5755	5755	57550
Total sells	**5755**	**5755**	**5755**	**5755**	**5755**	**5755**	**5755**	**5755**	**5755**	**5755**	57550
Direct costs											
Machinery costs	475	475	475	475	475	475	475	475	475	475	4750
Labour	1360	1360	1360	1360	1360	1360	1360	1360	1360	1360	13597
Seedlings	820	820	820	820	820	820	820	820	820	820	8200
Fertilizers	543	543	543	543	543	543	543	543	543	543	5430
Pesticide	34	34	34	34	34	34	34	34	34	34	336
Fuel	147	147	147	147	147	147	147	147	147	147	1470
Electric power	0	0	0	0	0	0	0	0	0	0	0
Other materials	250	250	250	250	250	250	250	250	250	250	2500
Total of direct costs	**3628**	**3628**	**3628**	**3628**	**3628**	**3628**	**3628**	**3628**	**3628**	**3628**	**36283**
Indirect and administrative costs											
Depreciation	1617	1617	1617	1617	1617	1617	1617	1617	1617	1617	16167
Maintenance	200	200	200	1000	200	200	200	1000	200	200	3600
Administrative costs	0	0	0	0	0	0	0	0	0	0	0
Non planned costs	181	181	181	181	181	181	181	181	181	181	1814
Total of indirect costs	**1998**	**1998**	**1998**	**2798**	**1998**	**1998**	**1998**	**2798**	**1998**	**1998**	**21581**
Incomes without interests and taxes	**129**	**129**	**129**	**-671**	**129**	**129**	**129**	**-671**	**129**	**129**	**-314**
Bank interests costs	0	0	0	0	0	0	0	0	0	0	0
Taxes	0	0	0	0	0	0	0	0	0	0	0
Credit loans	0	0	0	0	0	0	0	0	0	0	0
Total expenditures	5626	5626	5626	6426	5626	5626	5626	6426	5626	5626	**57864**
Net incomes	129	129	129	-671	129	129	129	-671	129	129	**-314**

Annex 7.1 SUMMARY OF FINANCIAL CALCULATIONS

medium level (pepper+lettuce) 2

	First crop	Second crop	Total		
Assumptions					
Planted area	Pepper	Lettuce	1000	m2	
Incomes					
Plants	2.5	16.0		per m2	
Total plants	2500	16000	18500.0	plant	
Sales per plant	3.2	0.2		kg/plant	
Sales per sq.meter	8	3	11.2	kg	
Total sales	8000	3200	11200.0	kg	
Average sale price	0.56	0.40	0.48	Euro/kg	
Average inc./sq. meter	4.48	1.28	5.8	Euro	
Incomes from sales	**4475**	**1280**	**5755.0**	Euro	
Expenditures					
Direct costs					
Machinery costs	0.14	0.01		Euro/plant	Based on respective crop budget
Labour	0.42	0.02		Euro/plant	Based on respective crop budget
Seedlings	0.20	0.02		Euro/plant	Based on respective crop budget
Fertilizers	0.19	0.00		Euro/plant	Based on respective crop budget
Pesticides	0.01	0.00		Euro/plant	Based on respective crop budget
Fuel	0.06	0.00		Euro/plant	Based on respective crop budget
Electric power	0.00	0.00		Euro/plant	Based on respective crop budget
Other materials	0.08	0.00		Euro/plant	Based on respective crop budget
Total of direct costs	**1.10**	**0.05**		Euro/plant	
Total costs per sq.meter	**2.76**	**0.87**	**3.63**	**Euro/m2**	
Indirect and administrative costs					
Depreciation			1.28	Euro/m2/ year	Based on investment table
Maintenance			0.15	E/m2/ year	1 % per year of the total of investments
Administrative costs			0	Euro/year	
Non planned costs			0.18	Euro/m2/	5% of the direct costs

Two plants per year (pepper and lettuce)

Summary

Incomes	5.76	
Expenditures	5.24	
Direct	3.63	
Interest	1.61	
Bank interests	0.00	
Critical point	10.93	kg/m2
Critical point	0.47	Euro/kg
Production cost	35	euro/kv
Farmers income	14	euro/day

	year		
Kosto e investimit			
Greenhouse	11500	Euro	Based on the investment table
Other investments	3500	Euro	Based on the investment table
Total of investments	15000	Euro	
Investiment/m2	15	Euro/m2	The price of land is not included
Investor contribution	100.00	%	
Donor contribution	0.00	%	

Annex 7.2 CASH FLOW TABLE (Euro)

Planted area 1000 m2 medium level (pepper+lettuce) 2

		-6 Month	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
A	**Annual costs**												
	Sells (incomes)	0	5755	5755	5755	5755	5755	5755	5755	5755	5755	5755	57550
	Expenditures	0	3960	3960	3960	4760	3960	3960	3960	4760	3960	3960	7833
	Gross incomes	**0**	**1795**	**1795**	**1795**	**995**	**1795**	**1795**	**1795**	**995**	**1795**	**1795**	**49717**
B	**Investments**												
	Greenhouse	11500	0	0	0	6	0	0	6	0	0	6	11519
	Other facilities	3500	0	0	0	0	0	0	0	0	0	0	3500
	Total of investments	**15000**	**0**	**0**	**0**	**6**	**0**	**0**	**6**	**0**	**0**	**6**	**15019**
C	**Credits and debits**												
	Credits	15000	0	0	0	0	0	0	0	0	0	0	15000
	Donor credits	0	0	0	0	0	0	0	0	0	0	0	0
	Investor credits	15000	0	0	0	0	0	0	0	0	0	0	15000
	Debits	0	0	0	0	0	0	0	0	0	0	0	0
	Bank loans	0	0	0	0	0	0	0	0	0	0	0	0
	Net financed	**15000**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**15000**
	Total A+B+C	**0**	**1795**	**1795**	**1795**	**989**	**1795**	**1795**	**1789**	**995**	**1795**	**1789**	**16333**
	Cash flow	**0**	**1795**	**3590**	**5386**	**6375**	**8170**	**9965**	**11754**	**12749**	**14544**	**16333**	

Annex 7.3 SUMMARY OF CROP EXPENDITURES AND INCOMES

Incomes											medium level (pepper+lettuce) 2
Planted area	1000	m2									
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Total
Sells											
Pepper & lettuce	5755	5755	5755	5755	5755	5755	5755	5755	5755	5755	57550
Total sells	**5755**	**5755**	**5755**	**5755**	**5755**	**5755**	**5755**	**5755**	**5755**	**5755**	57550
Direct costs											
Machinery costs	475	475	475	475	475	475	475	475	475	475	4750
Labour	1360	1360	1360	1360	1360	1360	1360	1360	1360	1360	13597
Seedlings	820	820	820	820	820	820	820	820	820	820	8200
Fertilizers	543	543	543	543	543	543	543	543	543	543	5430
Pesticide	34	34	34	34	34	34	34	34	34	34	336
Fuel	147	147	147	147	147	147	147	147	147	147	1470
Electric power	0	0	0	0	0	0	0	0	0	0	0
Other materials	250	250	250	250	250	250	250	250	250	250	2500
Total of direct costs	**3628**	**3628**	**3628**	**3628**	**3628**	**3628**	**3628**	**3628**	**3628**	**3628**	**36283**
Indirect and administrative costs											
Depreciation	1283	1283	1283	1283	1283	1283	1283	1283	1283	1283	12833
Maintenance	150	150	150	950	150	150	150	950	150	150	3100
Administrative costs	0	0	0	0	0	0	0	0	0	0	0
Non planned costs	181	181	181	181	181	181	181	181	181	181	1814
Total of indirect costs	**1615**	**1615**	**1615**	**2415**	**1615**	**1615**	**1615**	**2415**	**1615**	**1615**	**17748**
Incomes without interests and taxes	**512**	**512**	**512**	**-288**	**512**	**512**	**512**	**-288**	**512**	**512**	**3519**
Bank interests costs	0	0	0	0	0	0	0	0	0	0	0
Taxes	0	0	0	0	0	0	0	0	0	0	0
Credit loans	0	0	0	0	0	0	0	0	0	0	0
Total expenditures	5243	5243	5243	6043	5243	5243	5243	6043	5243	5243	**54031**
Net incomes	512	512	512	-288	512	512	512	-288	512	512	**3519**

Terms of reference

Horticultural Promotion in Kosovo

Terms of Reference

Subject: **Study on the potential of a greenhouse industry in Kosovo**

Purpose: The overall objective of the study is to:

- Assess the potential of a large expansion in the greenhouse industry in Kosovo with the aim of generating nationally-significant income and employment – especially in rural areas, and
- Advise on a range of options that could be taken to achieve the identified potential.

Month: August 2008

Duration: 12 days

Introduction

Vegetable production in Kosovo represents one of the most important sub-sectors of agriculture while, in some areas of Dukagjini, its constitutes the main economic activity.

Vegetable production in Kosovo is characterised by its seasonality – supplying the local market for only a short period of time. Most indoor production is carried out in simple tunnels covered plastic and without heating. The area under greenhouses has expanded considerably in the last four years – being currently estimated at a little under 500 ha. This is made up of traditional farms 320 ha, semi-comercial farms 100 ha and comercial farms 50 ha according to information provided by MAFRD).

This increase in area has not been matched with significant improvements in technology – so much so that the large majority of greenhouses are poorly constructed and are utilised without improved technology.

Scope of work

- Description of the current situation of the greenhouse industry in Kosovo (including areas),
- Importance of Greenhouse industry for the Kosovo economy and rural development,
- Current difficulties of the industry,
- Types of greenhouse and growing technology,
  - Low – level of greenhouse,
  - Mid – level of greenhouse,
- Suitability of diferent areas for developing the greenhouse industry (using scientific metods and meterological data for identification the suitable areas),

- Comparative economic advantages between the two types of greenhouse production (including the production cost & gross margine analysis),
- Situation and prospects for post-harvest activities,
- Situation and prospects for processing,
- Market analysis (import - export and marketing channels).
- Farmers organisation within the sector,
- Perspective and trend of developing the greenhouse industry in Kosovo
- Conclusions
- Recommendations

Methodology

Two consultants will be engaged – one regional, the other local. They will:

- Work under the direction of Ismet Babaj (IB) – Project Officer of HPK,
- Familiarize themselves with the written material on the subject made available by the Project and from other sources,
- consult the existing data from MAFRD and another sources about the area of greenhouses, yields, technologies used,
- Interview key informants using interview schedules,
- visit the operations of a sample of producers representing the various types of production at their production sites,
- Clearly distinguish data, information, conclusions and recommendations for the potential of a greenhouse industry in Kosovo.

Expected outputs

- A final report in English is to be sent electronically within 10 days of the departure from Kosovo.
- A debriefing is to be held at the end of the mission

Estimated time frame

2 days preparation outside Kosovo
1 day travelling
6 days working in Kosovo
3 days report writing