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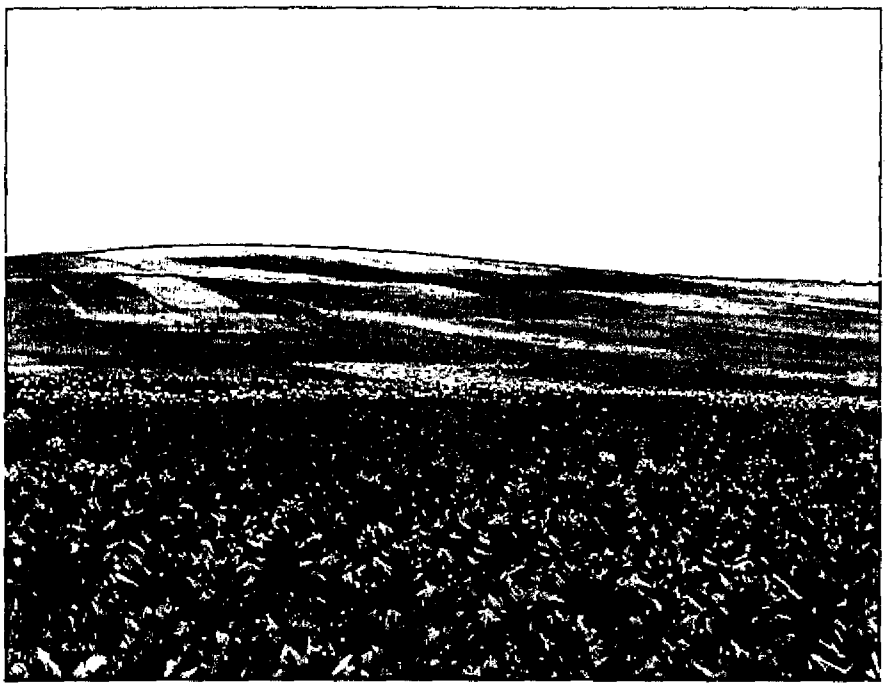
UNIVERSITY St. CYRIL AND METHODIUS
FACULTY OF AGRICULTURE - SKOPJE

FINAL REPORT
on Training Activities to Phase Out Methyl Bromide in the Republic of Macedonia



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Executive summary

In the project proposal for Phasing Out of Methyl Bromide in the Republic of Macedonia it was foreseen that by implementing techniques that could be easily adopted by the average farmer, with the least possible economical losses for the farmers and the community, and which include labour utilization, maintaining environmental quality, including sustainable land use, Macedonia would freeze the consumption of methyl bromide on December 31, 2001, phase out 70% on December 31, 2005, and phase out the entire 100% on December 31, 2007.

By the expertise and the training know-how provided by the Faculty of Agricultural Sciences, Skopje, during the project period, the above mentioned goals were reached much earlier, i.e. the use of methyl bromide in the country is 100% phased out by the year 2004.

The training was organized for the technicians from the kombinats and the extension services for the floating system and for the other alternatives to be used during the projects. Trough the extended network of the Agency for agricultural Development, using the system "training of trainers", about 12,500 farmers, located in the different regions, have been trained in all aspects related to the selected alternatives to the use of methyl bromide.

Due to the limited lot size (around 0.4 ha), the medium, size kombinats and cooperatives have enabled growers to access larger markets. Cooperatives provide a variety of services to their members. The centralized seedling production with a Floating Tray System in these companies supported with the sawing machines provided by the implementation project, the individual growers from the region have been supplied with unified and healthy planting material.

In average, there is one technician on each 200 growers, advising the cultivation from treating with MeBr till determining the raw leaf quality. Based on the above mentioned, there is a very good possibility for centralized seedling production with a Floating Tray System in these companies, so that the individual growers from the region may be supplied with unified and healthy planting material.

The target group for the training in the field of small micro-tunnels installation was the technicians from the tobacco companies that are already providing extension services to the farmers. The total number of the trained technicians in the Republic was 180. To provide better training quality the total number of trainees was divided into six groups, with approximately 30 persons each.

The vegetable production in the greenhouses throughout the Republic is endangered by the soilborn diseases, due to the intensive production of limited number of crops. Growers also complain on weeds that can be hardly controlled by the herbicides that are currently present on the local markets.

Based on the findings from the Demonstration project: "Three Alternatives to the Use of Methyl Bromide" it was concluded that beside the successful control of soil born diseases, the soil structure is enriched and a sufficient amount of nutrients is supplied for the main crop. As a result, the average fruit mass per plant, both for cucumbers and tomatoes, showed better results compared to the control, i.e. methyl bromide treatment.

Tobacco production in the Republic of Macedonia makes a decreasing trend in the last few years, as a result to the privatization of the large kombinats and other discouraging conditions for development of the tobacco industry. Starting from year 2003, when the total planted surface with tobacco was reduced from 19,158 ha on 17,716 ha in the year 2004.

During the season, the practical part of the training took place in several kombinats and the villages in their vicinity. It is general conclusion that the growers are very interested for the new technology . With exception of few mistakes, most of the growers have very well understood the principle of soil-less cultivation and are ready to abandon the use of Methyl Bromide.

Floating tray system for production of the tobacco seedlings production in Republic of Macedonia as a new method that substitutes traditional production during last years, presented best results. Therefore, in the preparation of the sowing season, several steps was carried out towards practical implementation and its wide application in the tobacco production in general. For that purpose, several thousands of containers with 589 alveoli trays were delivered to the tobacco production enterprises for producing oriental types of tobacco and with 280 alveoli trays for producing Virginia type of tobacco.

Following the changes on the tobacco production and marketing in the Republic of Macedonia and the uncertain economical circumstances at the larger combinats, the project team made a decision to include in the training activities, along with the technicians, the extension officers from the Agency for Agricultural Development.

The main reason for this decision was the reduction in number of contracted growers, reported by the Ministry of Agriculture, Forestry and Water Economy. Intending to cover larger number of growers, the Faculty of Agriculture trained the extension officers in additional 16 regions of the Republic, along with model growers from each region, that in future would be able to transfer their knowledge to the rest of the growers in the respective region.

Preparatory meetings

Representatives of the Kombinats and the Ministry of Agriculture, as well as the Agency for Agricultural Development were invited on a meeting at the Faculty of Agriculture. They were informed about the commencing of the Phase-out project and the activities that will be carried out in the following period. The participant of the meeting expressed willingness and readiness to accept their commitments, regarding the successful and efficient replacement of methyl bromide application. Special emphasis has been made on the allocation of personnel of each Kombinat that will be trained in the first year of the Project to be able to advice the growers on the usage of the floating trays system.

Theoretical part of the training

Training activities for non-chemical alternatives to the use of Methyl Bromide in tobacco and horticulture commenced by the end of year 2001. In the period January - March, the first group successfully accomplished the training, both in theoretical and practical part of the sessions by presentation of the obtained results of the Demonstration and the Implementation projects in the Republic and abroad. The training sessions and the materials were prepared and organized by Prof. Simeon Karajankov and Ass. Prof. Zlatko Arsov. Both tobacco experts were continuously engaged in the Demonstration project. For the preparation of the training material the results and experiences of the local and foreign trials have been used adapted to our productive conditions.

During the three days sessions the following topics were covered:

- Choice and preparation of suitable cite for pool construction

- Construction of the pool
- Erection of micro-tunnels
- Monitoring the micro-tunnel environment (EC, pH, temperature, etc)
- IPM principles and recommended plant protection
- Cleaning, disinfecting and safe storing of the trays

The attending trainees were supplied with comprehensive material that would help them to construct the micro-tunnels on their own. The handbook contains step by step explanation and scheme of the micro-tunnel.

Practical part of the training

The practical part was carried out in the growers' fields. For that purpose the growers in more than 30 locations have been engaged. In each site there were regional technicians present from the corresponding tobacco kombinat, so that they would be able to train other growers in the region in the following period. Taking into consideration that some training session were performed out of season, it was a good opportunity to show the trainees that the FTS could be installed on any flat surface and in that way to make use of the inactive parts of their lots.

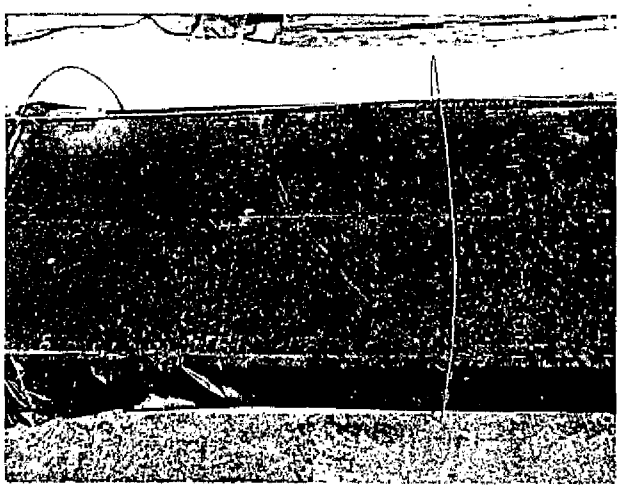
The observations during the reporting period were crucial for determining the bottlenecks that were expected during the wider application of the Floating Trays System and projecting appropriate solutions for them.

Tobacco Training

Practical training on Floating Tray System

Following the theoretical part of the training at the beginning of the year, the delivery of the trays and sowing machines was used as a good opportunity for practical training. The growers and the technicians that were attending the training sessions held at the Faculty of Agriculture, had chance to carry out in practice what they have learned on the their own fields or the kombinats seedling departments, respectively. In the meantime, due to the increased interest for this kind of seedling production, several more regions were included on the training list.
Companies that have organized seedling production on Floating Tray System were as follows: Kochani-Tabak from Kochani, Dajmond-Gorica from Vinica, Dalija-Tabak from Delchevo, Jaka-Tabak from Radovish, Veles-Tabak from Veles, Jugotutun from Sveti Nikole, Negotino-Tabak from Negotino, Tobacco Kombinat from Prilep, Niko Doaga from Krushevo and the Tobacco Institute from Prilep.
The Faculty of Agriculture prepared a study with comparative analysis of seedling production with Methyl Bromide application in traditional seedbeds and the Floating Tray System for each manager team. Productive characteristics evaluation from the Demonstration project was included, in order to illustrate the advantages this technology.
Kochani -Tabak from Kochani, the company had changes in the management team that resulted in relatively low production of seedlings in FTS. On that account the direct production in the regional growers was enlarged.

Person in charge: Dipl. ing. agr. Aleksov Blagoja
Sowing date: 08.04.2003
Type of trays: 589
Variety: Jaka-125
Seedbeds: 400 m^2
Transplanted surface: 50,000 m^2



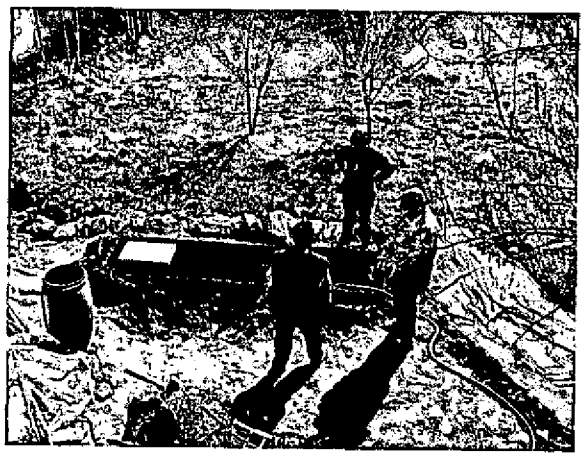
Dajmond Gorica from Vinica and Kavadarci - During 2003 these two companies have merged and are owned by Mr. Nino Hadzi Georgiu. The owner was acquainted with the project and shows willingness to support the growers in the vicinity to replace the use of Methyl Bromide.

Person in charge: Dipl. ing. agr. Petkov Dragi
Sowing date: 15.04.2002
Type of trays: 589
Variety: Jaka-125
Localities: Kombinat seedling department
Seedbeds: 400 m^2
Transplanted surface: 50,000 m^2

Person in charge: Dipl. ing. agr. Mancev Gjoko
Sowing date: *10.04.2003 till 20.04.2003*
Type of trays: 589

Variety: Prilep NS-72
Localities: Kombinat seedling department
Seedbeds: 200 m^2
Transplanted surface: 24,000 m^2

Variety: Prilep NS-72
Localities: Several villages (individual growers)
Seedbeds: 300 m^2
Transplanted surface: 36,000 m^2



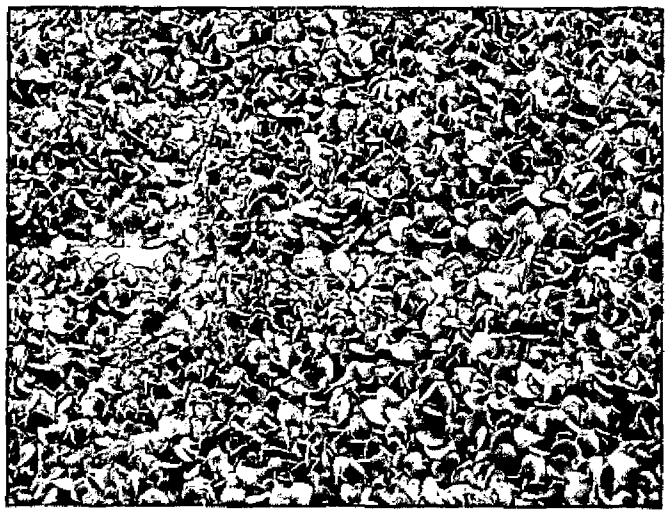
The seedbeds in the Kombinat seedling department – Veles

Dalija-Tabak from Delchevo - very well maintained production of seedlings. They have been delivered to the growers in due time and also seedling production has been organized in the growers fields.

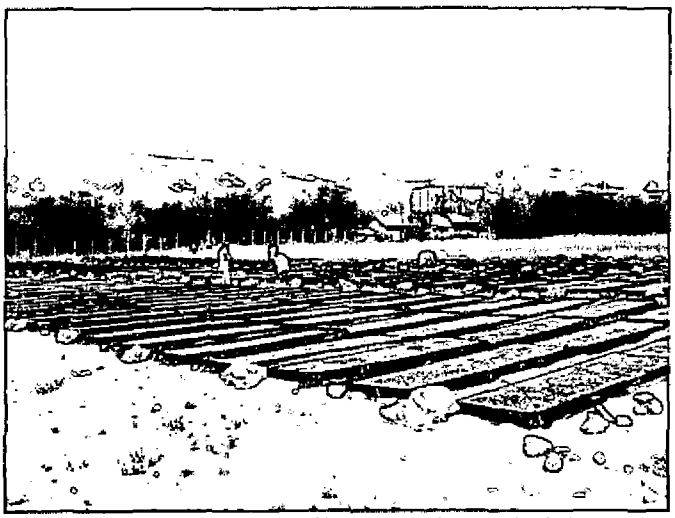
Jaka-Tabak from Radovish – being one of the largest producers of tobacco in the Republic, this company participated in the project from the very beginning. The technicians are well trained and capable to transfer their knowledge to the wide range of growers that use the input support of the kombinat.. The seedling production that is organized in the Seedling Department of the kombinat is well maintained and productive.

Person in charge: Dipl. ing. agr. Donev Blagoj

Sowing date: 30.03.2003
Type of trays: 589
Variety: Jaka-125
Localities: several villages in the region
Seedbeds: 1000 m^2
Transplanted surface: 120,000 m^2



Veles-Tabak from Veles – The Company faced some problems with supplies of raw materials for the substrate and was supported by the Faculty of Agriculture, both with materials and technical support. For that reason the sawing was delayed. Regardless the weather conditions, the seedlings were with excellent quality and they were delivered to the growers, just in time for transplanting.



Person in charge: Dipl. ing. agr. Stojanoski Orce
Sowing date: 15-20.04.2003
Type of trays: 589
Variety: Jebel M-38
Localities: Kombinat seedling department
Seedbeds: 300 m^2
Transplanted surface: 50,000 m^2

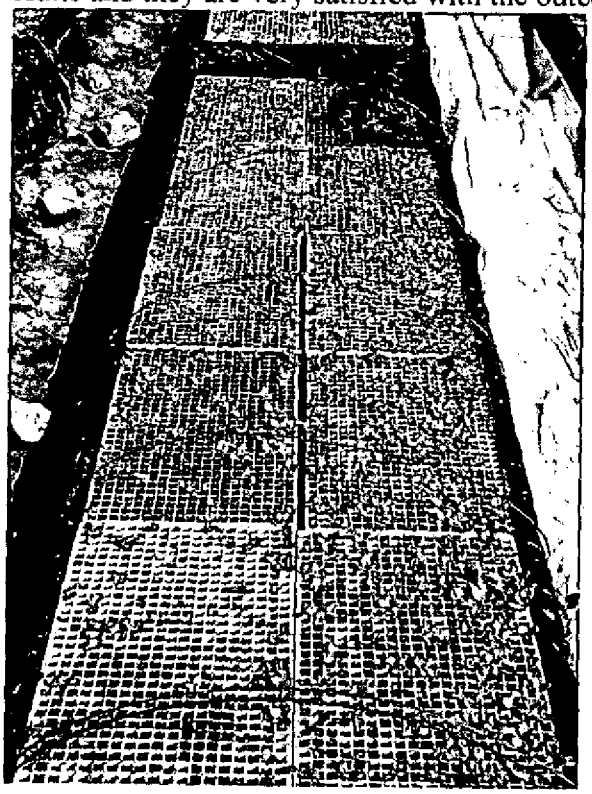
Jugotutun from Sveti Nikole – The technicians from the kombinat have tried to replace the inorganic component of the substrate with styrofoam instead of perlite. The styrophoam particles being with larger granulation that necessary created conditions for higher humidity in the substrate causing poor germination.

Fortunately, the production in the kombinat was established on limited area of only 17 seedbeds and have not created serous damage. The production carried out in the fields of individual growers has given much better results and they are very satisfied with the outcome.

Person in charge: Dipl. ing. agr. Gigov Stojance
Sowing date: 12.04.2003
Type of trays: 589
Variety: Prilep NS-72
Localities: Village Lozovo
Seedbeds: 60 m^2
Transplanted surface: 10,000 m^2

Variety: Prilep NS-72, Jebel M-38
Localities: Village Karatmanovo (individual growers)
Seedbeds: 80 m^2
Transplanted surface: 14,000 m^2

Variety: Prilep NS-72,
Localities: Village Milino (individual grower Mr. Stojcevski)
Seedbeds: 40 m^2
Transplanted surface: 6,000 m^2

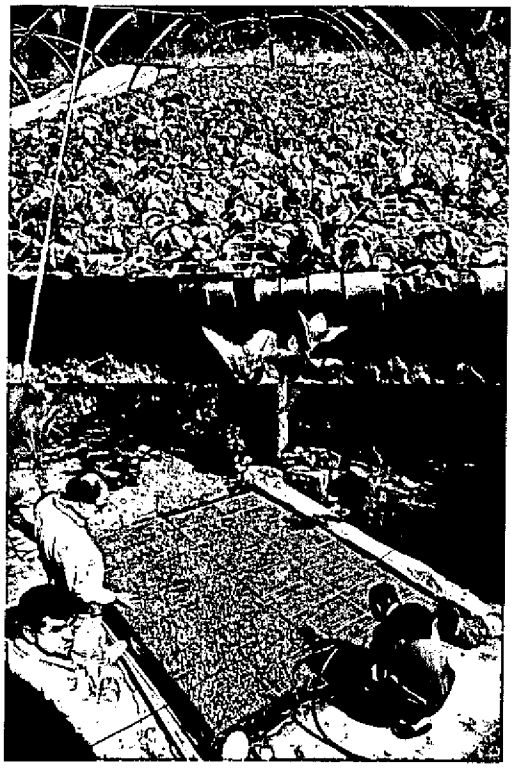


Negotino- Tabak from Negotino - the production of seedlings in FTS is totally replacing the traditional production in seedbeds on soil. The procedures and the organization of the production was observed to be under control and gave very satisfactory results. From the previous season there were some raw materials left for preparation of the substrate and they were properly used in the following one. It was recommended that there should be national center for preparation of substrates for tobacco seedlings production with standard quality.

Person in charge: Dipl. ing. agr. Cockov Zivko and Leov Dusko
Sowing date: 01.04.2002 till 20.04.2002
Type of trays: 589
Variety: Prilep NS-72
Localities: Kombinat seedling department
Seedbeds: 1000 m^2
Transplanted surface: 120,000 m^2

FTS seedbeds in Negotino tabak

Tobacco Kombinat from Prilep – large number of individual growers have applied the FTS technology using the manual machines provided by the demonstration project. The Virginia type seedlings were produced in the Kombinats seedling production department using the new semi-automatic machine for sowing palletized seeds. It can be concluded that technicians that have followed the trainings provided by the Faculty of Agriculture have good commend of the sowing procedures and maintenance of the seedling production afterwards.



Person in charge: Dipl. ing. agr. Staleski Dime and dipl. ing. agr. Joveski Blagoja
Sowing date: 01.04.2003 till 07.04.2003

Type of trays: 589
Variety: Prilep NS-72
Localities: Several villages in the region (individual growers)
Seedbeds: 1400 m^2
Transplanted surface: 180,000 m^2

Type of trays: 280
Variety: Virginia
Localities: Kombinat seedling department
Seedbeds: 240 m^2
Transplanted surface: 140,000 m^2

Niko Doaga from Krushevo - is a cooperative that only organizes the buy-out of tobacco, but is largely involved in overseeing the production of seedlings and in open field. They have also been involved in the demonstration project and their technicians have followed the trainings. Several good standing, example growers have also followed the trainings and applied their knowledge in the production of their own FTS seedbeds.

Person in charge: Dipl. ing. agr. Stevanoski Sasho and dipl. ing. agr. Bojcinovski Koco

Sowing date: 02.04.2003
Type of trays: 589
Variety: Prilep NS-72
Localities: village Godivje (individual growers)
Seedbeds: 120 m^2
Transplanted surface: 20,000 m^2

Localities: village Krivogashtani (individual growers)
Seedbeds: 120 m^2
Transplanted surface: 20,000 m^2

In different regions the demand for seeds varied, based on the climatic conditions and market demand. For that reason, in the regions where Prilep NS-72 is not traditionally grown, naked seeds were used, sown with the machines for that purpose.

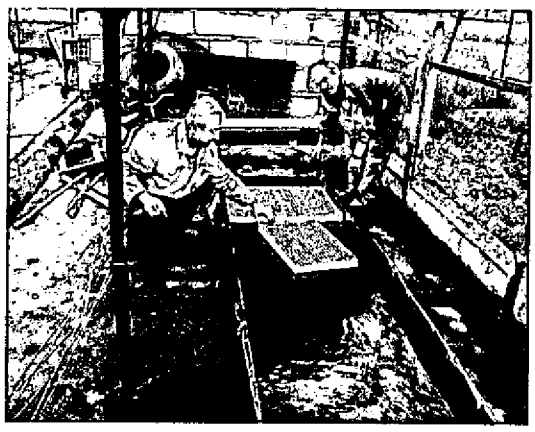
During the project period the extension officers from the Agency for Agricultural Development were actively included in the practical training. The detailed list with names and contacts of the growers and their instructors from the Agency is as follows:

Location	***Extension officer/Farmer/Village***
1. KUMANOVO	Extension officer Milan Janevski, kont.tel. 031 421-092 farmer Menduj Fetai – v.Lopate..... 1 ha
2. SV.NIKOLE	Extension officer Vanco Dimitriev, kont.tel. 032 443-756 farmerAngel Manev – Sv.Nikole..... 0,5 ha
3. KRATOVO	Extension officer Pance Ivanov, kont.tel. 031 488-220 farmer Chedomir Dimitrievski – v.Shopsko..... 0,15 ha
4. KR.PALANKA	Extension officer Stefan Dimitrievski, kont.tel. 031 377-320 farmer Mitko Simonovski – v.Odreno..... 0,1 ha

Location	***Extension officer/Farmer/Village***
5. BITOLA	Extension officer Janche Cilev, kont.tel. 047 223-150 farmer Zlatko Dukovski – v.Logova..... 2 ha
6. PRILEP	Extension officer Kiril Jankulovski, kont.tel. 048 419-213 farmer Mirko Nasteski – v.Mazucishte,..... 1 ha

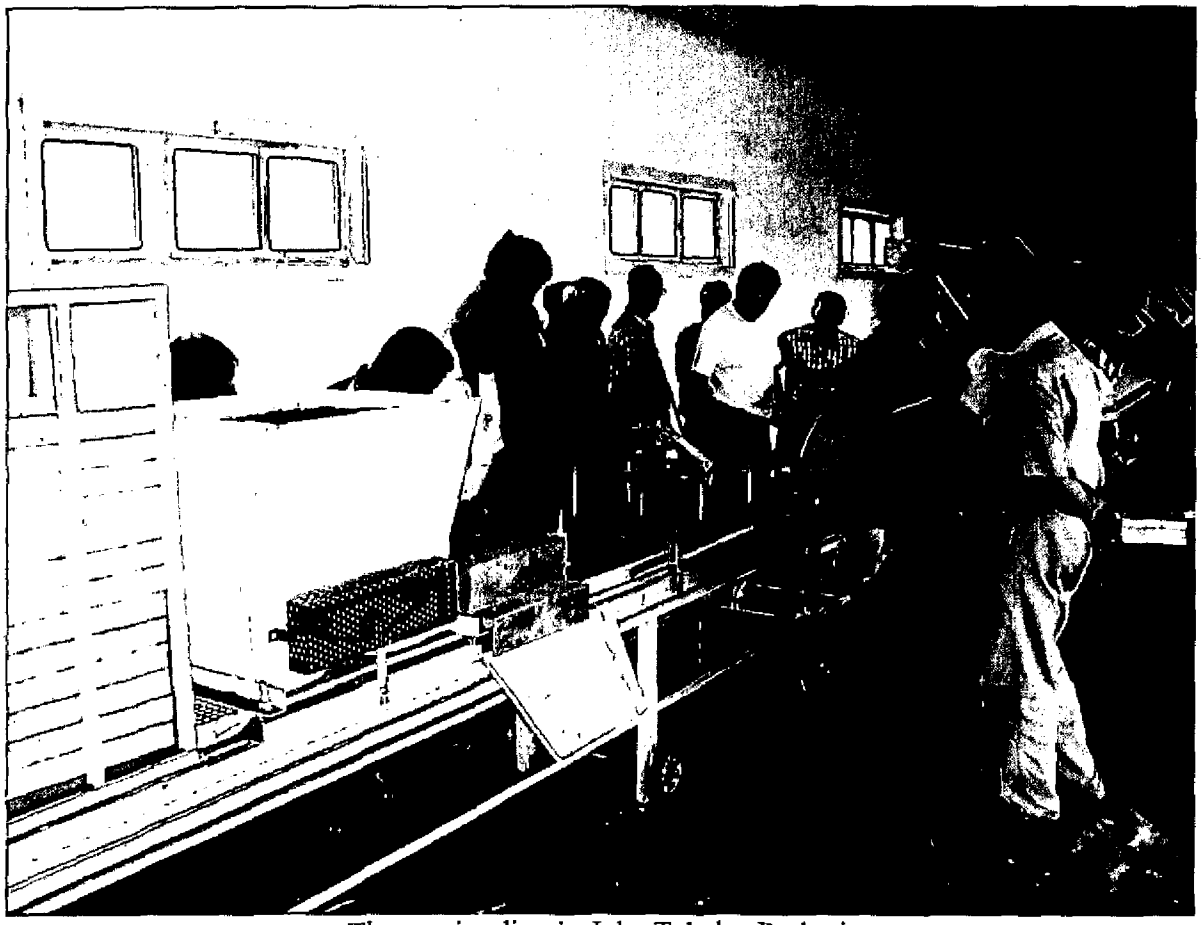
7.D.HISAR	Extension officer Metodija Shutevski,

	kont.tel. 047 276-122 farmer Peco Stankovski – v.Edinakovci..... 0,5 ha
8. OHRID	Extension officer Biljana Gjorchevska, kont.tel. 046 261-908, farmer Mile Joseski – Ohrid ..... 1 ha
9. STRUMICA	Extension officer Zorica Ilkova, kont.tel. 034 346-291, farmer Kiro Kirov – v.Ilovica..... 1,5 ha
10. VALANDOVO	Extension officer Ilija Andonov, kont.tel. 034 382-237, farmer Gjorgji Janev – v.Balinci.....1,5 ha
11. GEVGELIJA	Extension officer Savka Markudova, kont.tel. 034 212-131, farmer Vasil Angelov – v.Nikolich..... 0,5 ha
12. RADOVISH	Extension officer Stanoje Stojchev, kont.tel. 032 630-340, farmer Kostadin Kocev – v.Konche..... 1,5 ha
13. SKOPJE	Extension officer Elisaveta Tasheva, kont.tel. 02 3122-412, farmer Dragoslav Trpkovski - v.Bardovci..... 0,1 ha
14. VELES	Extension officer Rade Ristevski, kont.tel. 043 212-774, farmer Siljan Jovevski - nav."Prevalec"..... 1 ha
15. KAVADARCI	Extension officer Bozanka Kuzmanovska, kont.tel. 043 400-125, farmer Roza Ilieva - v.Marena pr..... 0,5 ha
16. VINICA	Extension officer Vancho Zahariev, kont.tel. 033 362-306, farmer Marko Sokolov - v.Leski..... 0,2 ha



For the purpose of the training and promotion of the FTS as an alternative to the use of Methyl Bromide, during the project implementation 130,000 trays have been distributed in the above-mentioned locations.

In order to accomplish the training sessions for FTS cultivation of tobacco and vegetable crops in the last project year, the Faculty for Agricultural Sciences and Food along with the Agency for Agricultural Development established additional17 training cites with model growers throughout the country. The Faculty of Agricultural Sciences and Food supplied the materials for the demonstration and training trials, from the Project budget.



The sowing line in Jaka Tabak - Radovis

Large-scale production of young plants was carried out in two companies, for 40 ha of transplanted area. For both companies only palletized seed was provided by the Project. Half kilogram of the varieties Prilep 80 and Jaka 48 were palletized in Austria (SAREEin Geschafzweig von Kwizda Agro, A-1010, Wien, Dr. Karl Lueger-Ring 6). Information about the training sessions with model growers in the growing season 2005.

	Municipality	Grower/trainee	Village	Variety	Surface for transplanting [ha]	Number of low tunnels (10 trays)	Date of sowing
1	Prilep	Mirko Nastoski	Mazuciste	Prilep	0.2	4	25.03.2005
2	Demir Hisar	Pece Stankoski	Edinakovci	Prilep	0.5	10	25.03.2005
3	Bitola	Zlatko Dukovski	Logovardi	Prilep	2.0	40	26.03.2005
4	Bitola	Blagoja Taleski	Dobrusevo	Prilep	0.1	2	26.03.2005
5	Kavadarci	Roza Ilieva	Marena	Prilep	0.5	10	26.03.2005
6	Veles	Milan Nedelkov	Stari grad	Prilep	0.1	2	28.03.2005
7	Radovis	Kostadin Kocev	Konce	Jaka	0.1	2	30.03.2005
8	Strumica	Kiro Kirkov	Ilovica	Jaka	0.1	2	31.03.2005
9	Valandovo	Gjorgji Janev	Balinci	Jaka	0.5	10	31.03.2005
10	Sveti Nikole	Angel Manev	Sveti Nikole	Prilep	0.1	2	02.04.2005
11	Kumanovo	Menduj Fetai	Lopate	Prilep	0.2	4	02.04.2005
12	Gevgelija	Vasil Angelov	Nikolis	Jaka	0.1	2	06.04.2005
13	Vinica	Marko Sokolov	Leski	Piper	0.1	2	07.04.2005
14	Vinica	Ilija Mitev	Jakimovo	Jaka	0.1	2	07.04.2005
15	Kratovo	Cedomir Dimitrievski	Shopsko Rudare	Jaka	0.1	2	13.04.2005
16	Kriva Palanka	Mitko Simonoski	Odreno	Prilep	0.1	2	13.04.2005
17	Ohrid	Milan Soseski	Ohrid	Prilep	0.5	10	16.04.2005
	Total				5.4	108	

Quantity of trays delivered by kobinat/company

Combinats	Number of trays delivered for the Virginia variety	Number of trays delivered for the Oriental variety
PRILEP	6,000	96,220
KAVADARCI		14,580
DELCEVO		7,240
VINICA		19,600
OHRID	4,000	2,000
DEMIR HISAR		8,000
RADOVIS		82,000
STIP		7,500
PEHCEVO		4,000
M. BROD	2,000	5,800
VALANDOVO		8,200
KOCANI	3,000	6,800
TETOVO	5,000	9,500
RESEN	4,500	5,000
GEVGELIJA		8,500
BITOLA		30,000
NEGOTINO		7,800
STRUMICA	1,500	108,000
VELES		12,800
KRUSEVO		46,500
KUMANOVO		10,500
SV. NIKOLE		11,600
SKOPJE		27,000
Total	26,000	539,140

Five to ten technicians of each of the kombinat have attended the training and participated in the delivery of the trays, seeds and the training package to the out growers for the kombinats. Kombinats that have been provided with corresponding semi automatic machines were supplying growers with young plants.

Intending to cover larger number of growers, starting from 2003 the Faculty of Agricultural Sciences and Food included in the training activities the extension officers from the regional offices, along with model growers from each region, to transfer their knowledge to the rest of the growers in the respective region. The Agency for Agricultural Development took the responsibility to be included in the direct distribution of the trays to the growers associations and individual growers.

Extension offices of the Agency for Agricultural Development

Extension office of the Agency for Agricultural Development	Extension Officer in Charge for Distribution of the Trays	Contact	Number of trays in storage
1.KUMANOVO	MILAN JANEVSKI	Tel.031 421-092	10,000
2. SVETI NIKOLE	VANCO DIMITRIEV	Tel.032 443-756	10,000
3. KRATOVO	PANCE IVANOV	Tel.031 488-220	5,000
4. KRIVA PALANKA	STEFAN DIMITRIEVSKI	Tel.031 377-320	5,000
5. BITOLA	JANCE CILEV	Tel.047 223-150	10,000
6. PRILEP	KIRIL JANKULOVSKI	Tel.048 419-213	10,000
7. DEMIR HISAR	METODIJA SUTEVSKI	Tel.047 276-122	10,000
8. OHRID	BILJANA GJORCEVSKA	Tel.046 261-908	5,000
9. STRUMICA	ZORICA ILKOVA	Tel.034 346-291	10,000
10. VALANDOVO	ILIJA ANDONOV	Tel.034 382-237	10,000
11. GEVGELIJA	SAVKA MARKUDOVA	Tel.034 212-131	5,000
12. RADOVIS	STANOJE STOJCEV	Tel.032 630-340	5,000
13. SKOPJE	ELISAVETA TASEVA	Tel.02 3122-412	10,000
14. VELES	RADE RISTEVSKI	Tel.043 212-774	10,000
15. KAVADARCI	BOZANKA KUZMANOVSKA	Tel.043 400-125	10,000
16. VINICA	VANCO ZAHARIEV	Tel.033 362-306	5,000
Total			130,000

Remaining quantity of the trays (15,708) were delivered directly to nearly 800 individual farmers that intend to start with FTS technique in 12 municipalities. The total foreseen transplanted surface is approximately 75 ha. The complete list of the municipalities and the farmers is given as annex to this report.

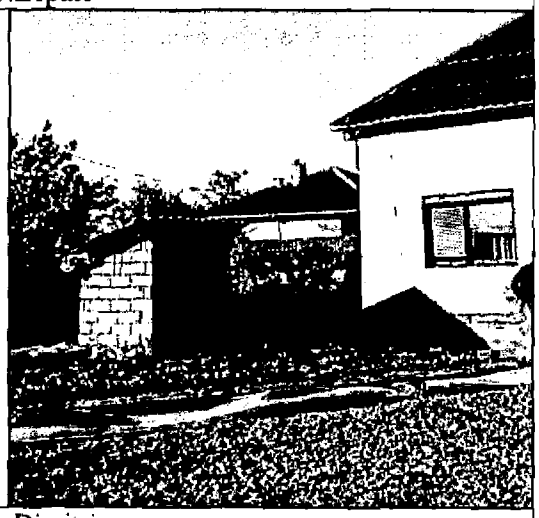
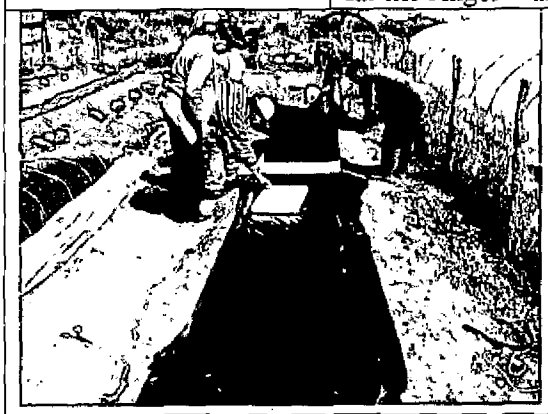
Delivered trays and trainings by the Agency during the season of 2005

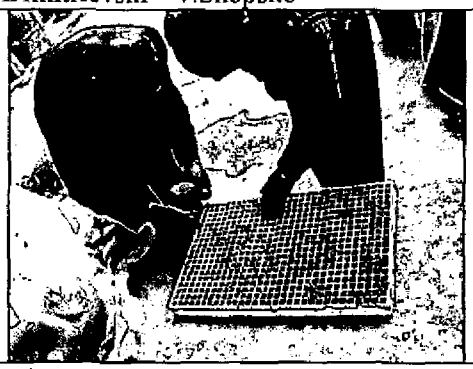
	Extension office location	Number of delivered trays	Number of growers
1	Kumanovo	890	66
2	Sv. Nikole	902	32
3	Kratovo	334	22
4	Bitola	546	38
5	Prilep	814	23
6	Demir Hisar	598	37
7	Ohrid	38	6
8	Valandovo	4,877	272
9	Gevgelija	887	71
10	Radovis	3,066	52
11	Kavadarci	2,291	103
12	Vinica	465	30
	Total	15,708	752

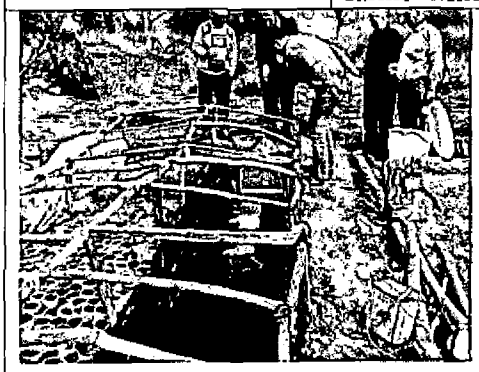
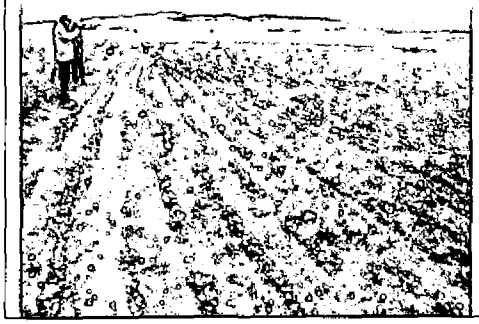
Companies and regions that have organized seedling production on Floating Tray System in the year 2004 were as follows:

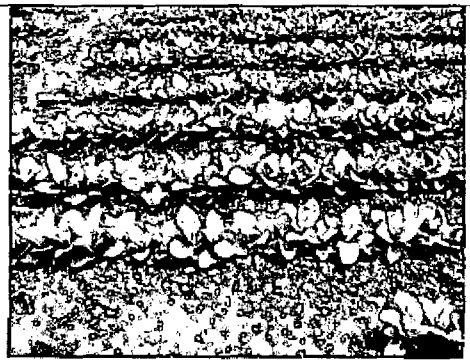
Veles-Tabak from Veles – The Company faced some problems with supplies of raw materials for the substrate and was supported by the Faculty of Agriculture, both with materials and technical support. For that reason the sawing was carried out later, in the beginning of April.

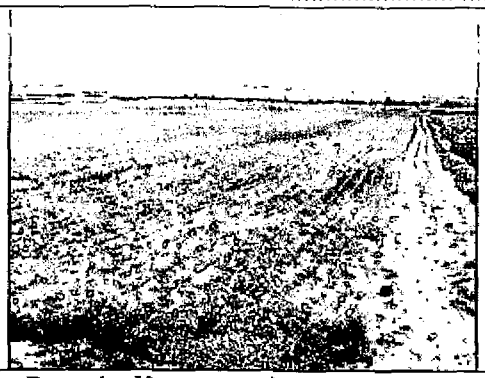
Regardless the weather conditions, the seedlings were with excellent quality and they were delivered to the growers, just in time for transplanting.
A large number of individual growers have applied the FTS technology using the manual machines provided by the demonstration project. The Virginia type seedlings were produced in the Kombinats seedling production department using the new semi-automatic machine for sowing palletized seeds. It can be concluded that technicians that have followed the trainings provided by the Faculty of Agriculture have good commend of the sowing procedures and maintenance of the seedling production afterwards.
In different regions the demand for seeds varied, based on the climatic conditions and market demand. For that reason, in the regions where Prilep NS-72 is not traditionally grown, naked seeds were used, sown with the machines for that purpose.

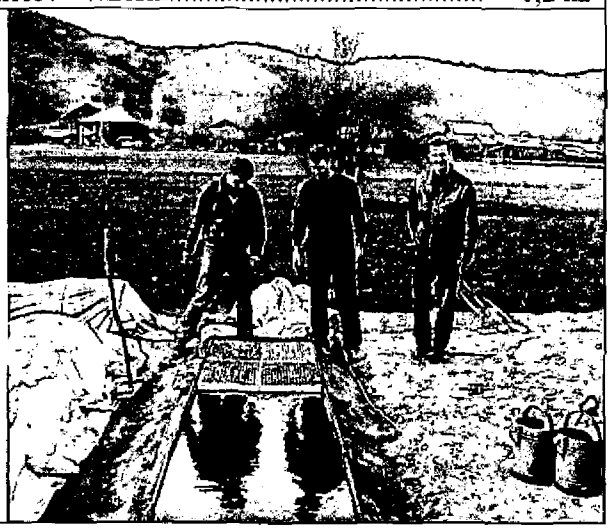
KUMANOVO	Extension officer Milan Janevski, kont.tel. 031 421-092 farmer Menduj Fetai – v.Lopate
Sowing date: 15.04.2004 Type of trays: 589 Variety: Jaka-125 Localities: near the family hous Seedbeds: 65 m^2 Transplanted surface: 10,000 m^2 Remarks: Seedbeds regularly ventilated and additional 10 seedbeds sown by the end of April for the neighbors. Grower decided to transfer completely from traditional to FTS from the next season.	
SV.NIKOLE	Extension officer Vanco Dimitriev, kont.tel. 032 443-756 farmer Angel Manev – Sv.Nikole
	Sowing date: 03.04.2004 Type of trays: 589 Variety: Jaka-125 Localities: Near the family house Seedbeds: 30 m^2 Transplanted surface: 5,000 m^2 Remarks: First time trying the FTS. Used Basamide previous years for disinfections of the seedbeds in concentration of 100g/ m^2 and finds it too expensive.

KRATOVO	Extension officer Pance Ivanov, kont.tel. 031 488-220 farmer Chedomir Dimitrievski – v.Shopsko
Sowing date: 10.04.2004 Type of trays: 589 Variety: Jaka-125 Localities: Near the family house Seedbeds: 10 m^2 Transplanted surface: 1,500 m^2 Remarks: First time trying the FTS. Used herbicide previous years for "disinfection" of the seedbeds m^2 and finds it ineffective.	
SKOPJE	Extension officer Elisaveta Tasheva, kont.tel. 02 3122-412, farmer Dragoslav Trpkovski - v.Bardovci
	Sowing date: 30.03.2004 Type of trays: 589 Variety: Jaka-125 Localities: out of the village Seedbeds: 65 m^2 Transplanted surface: 10,000 m^2 Remarks: Appearance of leakage in some of the pools. Double polyethylene sheet, or a layer of sand was recommended to prevent this damage, as well as the problem with levelling.
BITOLA	Extension officer Janche Cilev, kont.tel. 047 223-150 farmer Zlatko Dukovski – v.Logova..... 2 ha
Sowing date: 20.04.2004 Type of trays: 589 Variety: Prilep NS Localities: Private seedling Seedbeds: 150 m^2 Transplanted surface: 20,000 m^2 Remarks: Model grower. One of the training sessions for the region of Bitola was held on his premises. Firs time trying the FTS.	

PRILEP	Extension officer Kiril Jankulovski, kont.tel. 048 419-213 farmer Mirko Nasteski – v.Mazucishte
	Sowing date: 25.04.2004 Type of trays: 589 Variety: Prilep NS Localities: Private seedling Seedbeds: 65 m^2 Transplanted surface: 10,000 m^2 Remarks: Produces tobacco and vegetables. The trays were used for both crops. Had a problem with the herbicides in the last years. Will transfer completely to FTS for both crops.
D.HISAR	Extension officer Metodija Shutevski, kont.tel. 047 276-122 farmer Peco Stankovski – v.Edinakovci
Sowing date: 25.04.2004 Type of trays: 589 Variety: Prilep NS Localities: Private seedling Seedbeds: 30 m^2 Transplanted surface: 5,000 m^2 Remarks: The water level was not maintained regularly that caused bad conditions for ventilation. As a result 10% of the seedlings were lost.	
STRUMICA	Extension officer Zorica Ilkova, kont.tel. 034 346-291, farmer Kiro Kirov – v.Ilovica
	Sowing date: 25.04.2004 Type of trays: 589 Variety: Prilep NS Localities: Private seedling Seedbeds: 90 m^2 Transplanted surface: 15,000 m^2 Remarks: Very heavy soil for transplantation. (had to be made by hand) and the acceptance percentage was bellow 90%. Recommended to add manure for the next season.

VALANDOVO	Extension officer Ilija Andonov, kont.tel. 034 382-237, farmer Gjorgji Janev – v.Balinci
Sowing date: 15.04.2004 Type of trays: 589 Variety: Prilep NS Localities: Private seedling Seedbeds: 90 m^2 Transplanted surface: 15,000 m^2 Remarks: Expecting to have some percentage of non accepted plants in the field after transplanting the farmer has made too dense transplanting.	
GEVGELIJA	Extension officer Savka Markudova, kont.tel. 034 212-131, farmer Vasil Angelov – v.Nikolich
	Sowing date: 10.04.2004 Type of trays: 589 Variety: Prilep NS Localities: Private seedling Seedbeds: 30 m^2 Transplanted surface: 5,000 m^2 Remarks: The farmer made a comparison between the traditional and FTS system. The plants grown from FTS seedlings matured earlier and more uniform.
RADOVISH	Extension officer Stanoje Stojchev, kont.tel. 032 630-340, farmer Kostadin Kocev – v.Konche
Sowing date: 25.04.2004 Type of trays: 589 Variety: Prilep NS Localities: Private seedling Seedbeds: 90 m^2 Transplanted surface: 15,000 m^2 Remarks: All recommended operations during the training sessions applied regularly. Compared to the rest of the farmers in the village maturing stated 10 days earlier	

KR.PALANKA	Extension officer Stefan Dimitrievski, kont.tel. 031 377-320 farmer Mitko Simonovski – v.Odreno
	Sowing date: 15.04.2004 Type of trays: 589 Variety: Jaka-125 Localities: near the family house Seedbeds: 65 m^2 Transplanted surface: 10,000 m^2 Remarks: Model grower. One of the training sessions for the village Ordeno was held on his premises. Firs time trying the FTS.
VELES	Extension officer Rade Ristevski, kont.tel. 043 212-774, farmer Siljan Jovevski - v."Prevalec"..... 1 ha
Sowing date: 25.04.2004 Type of trays: 589 Variety: Prilep NS Localities: Private seedling Seedbeds: 65 m^2 Transplanted surface: 10,000 m^2 Remarks: Had a problem with the herbicides in the last years. Will transfer completely to FTS for both crops.	
KAVADARCI	Extension officer Bozanka Kuzmanovska, kont.tel. 043 400-125, farmer Roza Ilieva - v.Marena pr..... 0,5 ha
	Sowing date: 25.04.2004 Type of trays: 589 Variety: Prilep NS Localities: Private seedling Seedbeds: 30 m^2 Transplanted surface: 5,000 m^2 Remarks: Produces Virginia and oriental tobacco. The trays were used for the oriental type. Had a problem with the herbicides in the last years. Will transfer completely to FTS for both types of tobacco.

VINICA	Extension officer Vancho Zahariev, kont.tel. 033 362-306, farmer Marko Sokolov - v.Leski..... 0,2 ha
Sowing date: 10.04.2004 Type of trays: 589 Variety: Prilep NS Localities: Private seedling Seedbeds: 15 m^2 Transplanted surface: 2,000 m^2 Remarks: As a model grower, one of the training sessions for the region of Vinica was held on the premises of Mr. Sokolov. Firs time trying the FTS on a limited surface and is very satisfied with the results.	

During the season 2005, there was great interest to continue with floating tray system production of seedlings, especially in the region of Veles, Sveti Nikole, Vinica and Radovis.

In the region of Veles the FTS production was applied on the field of Veles Tabak-Veles. The necessary materials (peat, perlite, black polyethylene, agril, soluble artificial fertilizer and potassium permanganate) were obtained / supplied / provided from the enterprise. The filling up the containers with substrate was made by Spanish line "Agrotex" and the sowing was finished by the Italian automatic sowing mashine "Germa". Naked seeds –Jaka basma MK-1 (only the larger fractions) have been used for this purpose. The company has been facing some problems in supplying palletized seed. Consequently, the whole process of sowing was delayed (the machine for naked seeds has smaller productivity). After finishing the sowing process, the containers were placed in bays previously prepared with water solution. The total amount was 90 bays. Sowing period was from 27.04.2005 to 30.04.2005. The bays were regulary covered and uncovered and fulfilling with water.

The follow-up of the general situation with trainees around the country indicated that the growers have been very enthusiastic to find an applicable end efficient alternative to the use of Methyl Bromide. The possibility to make use of practically any flat surface for growing tobacco young plants was excessively exploited by the growers.

Training biofumigation and Solarization in Horticultural Production

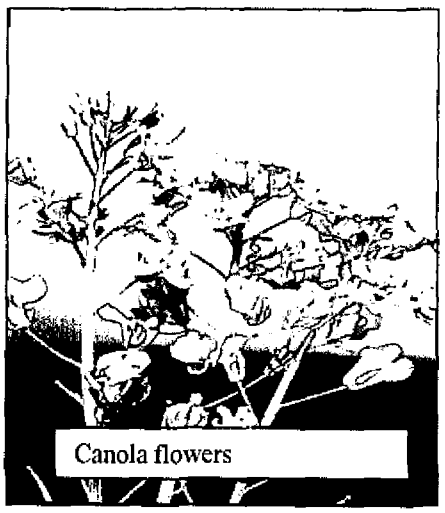
Biofumigation as use of brassicas that produce toxic isothiocyanate compounds, similar to the methyl isothiocyanate toxin from metham sodium soil fumigant, or fresh cow manure combined with solarization give very good results for suppressing pests and diseases in soil. It seeks to offer a biological alternative for producing fumigant-like chemicals in the soil, providing an option for suppressing soil-borne pests and diseases, and helping promote soil health. These were the basis used for the theoretical part of the training in the horticultural sector, which in the last season was accomplished with young plants produced in FTS.

Ass. Prof. Jovanka Katarzyna Petrevska was engaged to prepare a training material that would explain the basic principles of the biofumigation treatment accompanied with solarization. The material was organized based on the findings of the Demonstration project carried out in the greenhouses of "Anska reka", as well as the results of similar projects. In order larger impact to be obtained by the training, it was carried out in several plastic houses in Strumica, owned by distinguished vegetable growers in the region.
The training and presentation material covers the following topics:

- Choice of organic material for biofumigation
- Time and quantity of application
- IPM monitoring and recommended plant protection

The practical part of the horticultural training was carried out in eight plastic houses owned by the growers from Strumica and Gevgelia in total acreage of approximately 10,000 m^2.

The purpose of the training was to see the results of having canola crop (*Brasica napa*) prior to tomatoes, as second crop. The sowing was carried out at the beginning of March and the plants were harvested at beginning of July. The leftovers were irrigated and covered with polyethylene sheets. In this period the temperatures were extremely high, around 40 centigrade. The tomatoes were transplanted by the end of June.


Canola flowers

Although laboratory tests for nematodes were not made, the growers report healthy development compared to the rest of the plastic houses. Besides the toxic effect on the nematodes, caused by glycosinolates that are released by the canola leftovers and the effect of solarization, it can be assumed that the canopy of this crop is dense enough to prevent development of any weeds.
The effects on the nematodes can be evaluated by the end of the cropping season according the Bridge and Page rating chart..

Besides the toxic effect on the nematodes, caused by glycosinolates decomposition that are released by the canola leftovers and the effect of solarization, it can be assumed that the canopy of this crop is dense enough to prevent development of any weeds.
In the previous training sessions with vegetable growers it was concluded that there is need for more excessive work on young plants production. Vegetable growers start preparing the young plants in January and transplant in February or March depending on the climatic conditions.
This period was used to organize several trainings to disseminate the results obtained from the pervious growing season with solarization and biofumigation and to add some new topics for application of soil-less techniques in vegetable production.
In designing the training package, special attention was broth to choice of seed materials, choice of containers, preparation of the substrate mixture with elaboration of the following characteristics that correspond to the role of the substrate:
-physical, which refer to the granulometry, density, fibrocity, water holding capacity;
-chemical, stands for pH, cation exchange capacity, C/N ratio
-biological, receptiveness to favorable microorganisms.

The trainings covered the North-West part of Macedonia, close to the Albanian and Kosovo border. That is a resourceful, but still extensive region in agricultural production. For the growers it was very important to encircle the whole production from seed to harvest and to avoid the possibility or necessity of illegal use of methyl bromide.
During 2003, the practical part of the horticultural training was carried out in eight plastic houses owned by the growers from the region of Prilep, Bitola, Negotino and Kavadarci. These regions are evaluated as perspective ones for vegetable production under protected crops. The purpose of the training was to see the results of having cabbage crop prior to tomatoes, as a second crop. The sowing was carried out at the beginning of March and the plants were harvested at beginning of July.
Production of nursery plants in FTS has been made on the following way:

- Preparation of substrate mixture
- Sowing
- Putting containers in bays previously prepared with water solution.
- Transplant care and protection to their delivery to the growers.
- Delivery of transplant to the growers with instructions on transplantation, irrigation and advises on the first development phase, by giving special accent to temperature oscillation and humidity.

Substrate contains 60% peat, 30% perlite and 10% of garden soil. Garden soil is added for keeping humidity in the root system during the transportation.
A direct sowing was made in the containers, previously filled with substrate mixture, by putting, one seed in each hole of the container.
Planted seeds containers are placed to float in small basins with water solution, having a surface of 1,5 square meter, coated inside with black foil and filled with 150 liters of water solution made of 130 gr. N: P: K 20: 20:20 with microelements and a very small quantity of hyper manganese. Water solution was always levelled to 10 cm. The transplant completely sprouted within the period from 01.08.2003 to 05.08.2003.

The transplant was cultivated in a protective space – green house with a surface of 500 square meters. After sprouting when the transplant appeared with the first leaves, the first protective treatment was made by 0,03% Konfidor (3 ml:10 l. water) and 0,4% Cibak (40 gr.: 10 l. water) according to the recommendation of the control made by Dr. Mrs. Gordana

Popsimonova and Dr. Mr. Slobodan Bandjo. During the second control on the transplant was recommended a protection by Previcur and Konfidor.

When the transplant was leafy, foliar fertilization by SAL – 12 was applied. The transplant was completely protected against diseases and harmful insects attacking the vegetative part of the plants. It was not necessary to protect the plants from soil harmful insects, since they could not exist in water. The transplant had more developed root system than the vegetative part, being a prerequisite for successful growth of the plant.

Delivery of transplant to the growers was made in three phases, i.e. on 29 October 2003 was delivered to: Marena, Manastirec, Desovo, Golemo Konjarevo, Pasino Ruvce, Budikovo, Mogila and Ribarci, on 03 November 2003 transplant was delivered to: Bistrenci, Ljubanci and Pobozevo, and on 15 November 2003, transplant was delivered to: Zelino, Brvenica, Vrapciste and Tumceviste.

Twelve hours prior to transportation, the transplant was taken out of the water solution. Each container was packed in carton box separately and transported by a truck covered with tarpaulin. When delivery of transplant was being made, the growers were practically informed about the way of taking out the transplant from the containers and the way of transplanting the tomatoes and paprika. The growers were given instructions about the installation of drip irrigation system, and water quantity to be used in the first phase and a special attention was paid to temperature and humidity control, as very important condition for healthy plant root system. It was emphasized that the first fifteen days of the transplantation were the most important phase for successful growth of the plants.

It was found out that some of the growers were not following the instructions regarding the quantity of manure and maturity. However, some of the growers were interested in the instructions and in the whole cultivation process such as the growers from Negotino, Golemo Konjarevo, Zelino and Vrapciste.

Finally , it was concluded that by following and observing the expert's instructions and taking some relevant training of the growers for more than one season in learning in details the way of applying biofumigation and solarization, would result successful cultivating process.

Practical Horticultural training

The vegetable growers, specially in the regions where vegetable growing is mixed with tobacco, were very interesting in applying FTS in cultivation of vegetable young plants. In order to complete the cycle of sustainable production under plastic houses, the bioufimigation and solarization trainees in 16 regions of Macedonia were also trained to produce the young plants in FTS. The young plants for that purpose were produced in one place and distributed to the growers that have previously treated their plastic houses with raw cow manure, covered with transparent plastic for five-six weeks.

The practical part of the horticultural training was carried out in eight plastic houses owned by the growers from the region of Prilep, Bitola, Negotino and Kavadarci. (Marena, Manastirec, Desovo, Golemo Konjarevo, Pasino Ruvce, Budikovo, Mogila and Ribarci, Bistrenci, Ljubanci and Pobozevo, Zelino, Brvenica, Vrapciste and Tumceviste). These regions are evaluated as perspective ones for vegetable production under protected crops. The purpose of the training was to see the results of having cabbage crop prior to tomatoes, as a second crop.

The Republic of Macedonia is in implementation phase of the Strategy for Harmonization with CAP initiated by the Ministry of Agriculture forestry and Water Management. The principles of Good Agriculture Practice, including environmentally friendly sterilization of the soil has to be incorporated in all technical recommendations for the vegetable growers. Solarization with biofumigation, as a justified method for soil sterilization is proposed to be a recommended method for soil-born pest management in the productive conditions of Macedonia.

Workshops & Seminars

At the end of November, 2001 a seminar was held in Negorci -Gevegelija, as one of the most important vegetable regions in Macedonia. Around 50 vegetable growers and representatives of grower's associations attended the seminar that was entitled "Non-chemical treatments in the vegetable production". In the framework of that seminar the growers were acquainted with the principles of the biofumigation and solarization method along with the different organic components that are present and usable in the region as potential biofumigants. The presentation initiated large interest and many growers expressed intention to implement this technique in their plastic houses.

The workshop that was organized from 24.04.2002 to 27.04.2002,in Ohrid, by the Faculty of Agriculture, Ozone Unit – Ministry of Environment and Physical Planning and UNIDO, gathered researchers and technicians from several countries that work on the alternatives to the use of Methyl Bromide. The technicians from Macedonian tobacco combinats and individual growers were also participating. For them it was a good occasion to share the experiences they have been obtaining in the last three years with their colleagues from around the world. The opening speech was held by the Minister of Environment and Physical Planning, followed by representatives from the Ministry of Agriculture, the Agency of Agricultural Development, the Ozone Unit, the Faculty of Agriculture and UNIDO. After the presentations from Spain, Croatia, Zimbabwe, Georgia, Turkey, Bosnia-Herzegovina had the host country Macedonia, the participants of the Workshop had chance to see the see several individual growers in the vicinity of Prilep and Negotino. In the Tobacco combinat of Prilep, the delegation of the workshop participants was welcomed by the management team.

In the period between July 26-28, 2003 the project Mr. El Arini, Chief Officer of the Montreal Protocol, visited the project sites. He was informed by the National coordinator Dr Gjorji Martinovski, about the latest development of the project and the phasing out of Methyl bromide in the agricultural sector. Mr. El Arini had the chance to visit the fields that were transplanted with FTS seedlings and to discuss the acceptance of this technology with the growers.

The basic principles on young plants production by FTS a training material (booklet) was produced in order to support the vegetable and flower growers that would decide to use this system as an alternative to the use of Methyl bromide in the seedling production. The promotion of the booklet was held in Sv. Nikole, by the end of April, 2004 in organization of the NGO Women Initiative.

The results from the demonstration project for viable alternatives to the use of Methyl Bromide in the Vegetable sector were presented on the FAO Working Group for Greenhouse production in September 2004. Vegetable growers have also shown large interest for implementation of the FTS technique in the young plant production.

The mutual project with Republic of Bulgaria was initiated. The promotion of this method as a part of the Integrated Crop Management for the vegetable growers started in Gevgelija and Strumica on 14 and 16 of April 2005.

Agricultural aspects of FTS as Methyl Bromide alternative

Production of high and stabile income and tobacco with good quality depends on the seedling quality. It means that in the following period the production of tobacco in Macedonia should be definitely oriented on floating tray system production of seedlings.
Production of healthy seedling with definite size and rigidity is the first condition for production of the tobacco with good quality. The traditional way of seedlings step by step will be replaced with the new one.
The ideal seedling is not infected, rigid, with developed root system and stem, capable of overcoming the shock after transplantation and to continue normally its vegetation at open field.
The tobacco production will increase and we will get higher quality tobacco classes . With achieving the better quality we will succeed to satisfy our customers needs and the demands of the trade and processing of cigarettes in Europe and all over the World.
There are several kombinats from different areas in Macedonia that are interested in massive FTS production of seedling:

- Jaka Tabak – Radovis; Dajmond Gorica – Vinica; Veles Tabak – Veles; tobacco sector
- Jugotutun - Sveti Nikole; vegetable sector

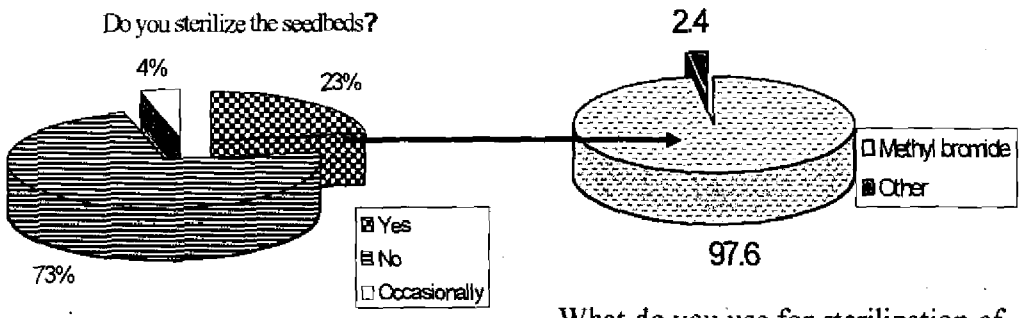
They intending to sow over 50 ha tobacco seedlings in each of above mentioned regions; so the individual growers from the region will be supplied with unified and healthy planting material.
Very interesting is that whole villages are starting with the new FTS production, not only because it is alternative to the use of methyl bromide, but also because of the fact that making easier entire process of production is very important for the farmers an their families.

These are the most frequent mistakes that were noticed and will require additional attention in the future:

- The levelling of the bays bottom was not done properly. Some growers use to level the sides of pool, instead of levelling the bottom.
- There was appearance of leakage in some of the locations. Double polyethylene sheet, or a layer of sand could prevent this damage, as well as the problem with levelling.
- Water level was not sufficiently high to enable good ventilation of the seedlings.
- Ventilation was not carried out properly. In same cases the tunnels were not being opened in time and on the contrary, in other cases they were left opened for too long period.
- Although it was mentioned that *Confidore*, or similar systemic insecticide should be added into the nutrient solution, in the locations that were endangered with virus vectors, this instruction was not being followed. As a result, there were some TMV symptoms observed.

Phase out of Methyl Bromide
(Survey on the Methyl Bromide Consumption in the Republic of Macedonia)

Methyl bromide is used for sterilization of the seedbeds. The average number of seedbeds per grower is 7.7. The number of seedbeds depends on the lot size and the type of tobacco that is cultivated. In the region of Valandovo, where the average lot size is 0.15 ha the number of seedbeds was lowest -3.1, whereas in the region of Kochani the recorded number of seedbeds per grower, due to the fact that the percentage of Virginia grown in that region is higher compared to the rest of the tobacco centers and partly because the lot size is high -0.8 ha.
To estimate the actual consumption of methyl bromide an extensive survey was carried by the Faculty of Agriculture in year 2000.
The main conclusion of that survey was that only 22.7 % or of the tobacco growers sterilize the seedbeds 12,400 and 97.6% out of them, or 12,100 use methyl bromide for sterilization, it can be concluded that the actual consumption of methyl bromide in the Republic of Macedonia is approximately 41,9 t.

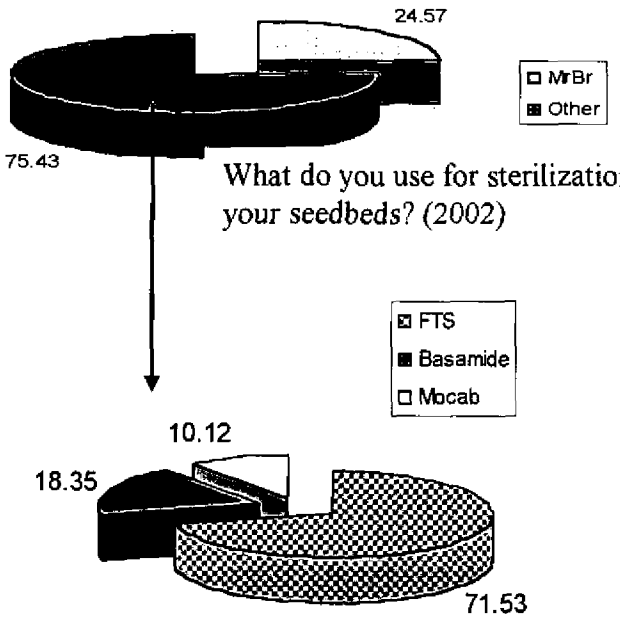


What do you use for sterilization of your seedbeds? (1999)

Survey 2002

The survey was undertaken in the period November and December, 2002. The findings from the previous survey, made in year 2000, were taken as directives for this restricted questionnaire distributed among 300 growers in representative regions. The only two questions were weather growers use Methyl bromide for sterilization or not, and if not what do they use instead.

The sample size was calculated based on the conclusion that only 22.7 % of the growers in the Republic, or 12,400 sterilize the seedbeds regularly, 4.0% occasionally, mainly depending on the financial capabilities and 73.2% do not sterilize the seedbeds or use herbicides for that purpose.
It can be noticed that growers are abandoning the use of Methyl bromide due to the better alternative offered in the previous three years. From the defined group of growers that sterilize the tobacco seedbeds, 75.43% decided not to use Methyl Bromide for that purpose, and 71.53 has pointed FTS as suitable alternative for sterilization of the seedbeds.



Structure of non-MeBr treatment of seedbeds

Extrapolating the results of the survey on national level it can be concluded that 8869 kg of Methyl Bromide were still used during the growing season of 2002 in the Republic of Macedonia, either from old stocks or from illegal import. The growers that are cooperants to the largest companies, the stake-holders of the demonstration project and further on to the Implementation project do not use MeBr. The lowest reduction (33.27%) has been recorded in the Southeast part of Macedonia, near the Bulgarian border and in the vicinity of the private tobacco company in Strumica. Out of the interviewed vegetable growers there were no records of methyl bromide use in horticultural production.

During the years 2003 and 2004, as a result of the practical trainings and demonstration cites, the majority of the tobacco growers abandoned the use of methyl bromide and alternative pesticides and switched to FTS.

The phase out of Methyl Bromide consumption has been reported to the Ozone office at the Ministry of Environment and physical planning at the end of December 2004.