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23718

FINAL REPORT

**FOR THE IMPLEMENTATION OF THE
NATIONAL PHASE-OUT OF METHYL BROMIDE-CHINA
Phase II-V**

REPORTING PERIOD: Oct. 2008 - Oct. 2009

Project No.: TF/CPR/08/006

UNIDO's Contract No.: 16001705

**Beijing, China
16th November 2009**

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I Technical report filed monitoring Strawberry sector Sep 2009 (by the UNIDO's project manager)

II Progress of greenhouse construction Stage II for tobacco sector

Acronyms:

ExCom: Executive Committee

FECO: Foreign Economic Cooperation Office

MB: Methyl Bromide

MEP: Ministry of Environmental Protection

MLF: Multilateral Funds

ODP: Ozone Depleting Potential

SAG: State Administration of Grain

STMA: State Tobacco Monopoly Administration

TA: Technical Assistance

UNEP: United Nations Environment Programme

UNIDO: United Nations Industrial Development Organization

1. Abstract

At the 44th Meeting, an additional 10,702,742 US\$ were approved for Methyl Bromide Consumption Sector - Phase II, which includes 4 million USD from the Italian contribution, to achieve the complete phase-out of methyl bromide, corresponding to additional 698 ODP tones which includes 164 ODP tonnes of Methyl Bromide used in the tobacco seedling sector and 534 ODP tonnes of Methyl Bromide in the agriculture sector.

The Draft final report for the implementation of the national phase-out of methyl bromide-China phase II-V summarizes the activities implemented from October 2008 to 20th July 2009 for the tobacco sector and agriculture sector in line with what is required in the contract No.16001705 of Phase II-V.

2. Methyl bromide phase-out target achieved

In 2008 according to the agreement signed between China and ExCom, of the MLF, 180.6 ODP tones MB have been phased out, to meet the maximum eligible consumption of 390 tones. The total consumption of methyl bromide in China, in 2008, is 378.8 ODP tonnes, which is 11.2 tones lower than the eligible consumption limit agree with the ExCom, of the MLF.

Table No.1: Methyl bromide consumption in 2003-2008

Year		2003	2004	2005	2006	2007	2008
Max. allowable consumption approved by Excom (ODP tones)	Commodity	126	126	46	25.2	0	0
	Tobacco	427.8	427.8	300	164.6	124.6	0
	Agriculture	534	534	534	534	446	390
	Total	1087.8	1087.8	880	723.8	570.6	390
Actual consumption (ODP tones)	Commodity	126	52.2	32.1	6.96	0	0
	Tobacco	427.8	227.8	54	21	32.4	0
	Agriculture	534	534	534	282.08	351.72	378.8
	Total	1087.8	814	620.1	310.04	384.12	378.8
Phase-out achieved (ODP tones)	Commodity	0	73.8	20.1	25.14	6.96	0
	Tobacco	0	200	173.8	33	-11.4	32.4
	Agriculture	0	0	0	251.92	-69.64	-28.28
	Total	0	273.8	193.9	310.06	-74.08	4.12

3. Progress in tobacco seedling sector

Since 2008, methyl bromide is no longer used in the tobacco seedling sector in China. The activities under this contract include the completion of the verification of the remaining four nurseries and a series of technical assistance programmes.

3.1 Alternative technology

Tobacco floating tray technology has been selected as the main alternative technology to substitute methyl bromide by generally avoiding sterilization after implementation of the sector plan. Due to the special geographical and climatic features, in north of China, such as in Inner Mongolia and Jilin, suspended nursing technology was used and substrate was sterilized by heating.

Through the comparison between the alternative and methyl bromide, it shows that alternatives can satisfy the basic requirement of seedling, and reduce the disease incidence. The economic benefit of alternative is better than before, and the market acceptance is good.

3.2 Progress

The construction and installation of all 17 nurseries in Stage II have been completed, with a total area of 261,550 m², according to the terms of the contract. (See contract information and the installation progress of the stage II, at Annex I).

15 nurseries, specifically Chifeng, Nanping, Qujing, Baicheng, Sanming, Bijie, Tongren, Baoji, Luoyang, Yichang, Shiyan, Rizhao, Weifang, Chenzhou and Yongzhou had been verified by MEP and UNIDO. The tobacco seedlings are of high quality, and low lost percent after transplanting. The disease incidence on seedlings has been reduced greatly. In all, the greenhouse operation results can meet the requirement of tobacco seedling.

The remaining 2 nurseries including Liangshan and Luzhou will be inspected in December, 2009.

3.3 Technical Assistance activities

3.3.1 Technical Assistance projects

To consolidate the achievement of tobacco sector, and improve the seedling quality, four TA projects have been established under this contract

- a) Selection and application of integrated pest management technologies in tobacco seedling greenhouses in China;
- b) Improvement of floating tray seedling and suspended seedling technologies in tobacco sector;
- c) MB alternative technologies compilation in tobacco sector;
- d) Environment-friendly substrate and renewable resource utilization technology research.

Till now all the TORs of these TA projects have been finalized and approved by UNIDO. The bidding of these TA projects are ongoing.

3.4 Conclusion

- a) The floating seedling alternative technology is effective.
- b) Chinese government, especially STMA, attached great attention to this project and invested additional fund for greenhouse construction.
- c) An effective working mechanism was established, including the joint working group, the regular meetings between MEP and STMA and the close association with local tobacco bureaus/ companies.

4. Progress in Agriculture Sector

A total of US\$6.7 million is allocated in agriculture sector, of which, are used for procuring equipment and alternative, and technical assistance activities.

In January 2008, the 2008's work plan was finalized and approved by FECO/MEP, MOA, UNIDO and the Italian Ministry of Environment. The target sectors and regions are: for the cucumber sector, Shandong province; for the strawberry sector, Hebei province; for the ginger sector, Shandong province. The targets achieved in 2008 are shown in the Table No.

2

Table No. 2: target achieved in 2008

Sector	Region	Model farms No.	Total Ha to be treated	No. of Farmers	Timing for soil treatment
Strawberry	Hebei, Liaoning	47	671	10,851	From the end of June to the beginning of August
Cucumber	Shandong	5	50	120	From August to October
Ginger	Shandong	10	85	50	March and August
TOTAL		62	806	11,021	

4.1 Alternative technology

4.1.1 Alternative technology for Strawberry

The major soil-borne diseases for strawberry are plant death caused by combined infection of fusarium, verticilium, phytophthora and rhizoctonia pathogens. The diseased plants showed poorly developed root system, fewer new roots, slow growth, and weak vigor.

Chloropicrin is mainly used in greenhouses on strawberry, with a little in plant bedding. In greenhouses, fumigation starts after harvest, which is during late June until early August. Because it is the raining season in summer, the actual fumigation lasts less than a month.

Chloropicrin and dazomet were used as MB alternatives for strawberry in Liaoning province. The dosage of dazomet is 15-30g/m². The application method is to splash Dazomet equally on the soil, then use Rotary tiller to mix it with soil and cover with plastic film.

4.1.2 Alternative technology for Cucumber

The main soil-borne disease in cucumber is root-knot nematode (*Meloidogyne incognita* Chitwood), other diseases that affect cucumbers are: Fusarium wilt (*Fusarium oxysporum* f. sp. *cucurbitum*), cucumber damping-off (*Pythium aphanidermatum*), Phytophthora (*Phytophthora melonis*), Gummy stem blight (*Mycosphaerella melonis*), Sclerotinia rot (*Sclerotinia sclerotiorum*), Anthracnose (*Colletotrichum lagenarium*), Block rot (*Alternaria cucurbitina*), Bacteria wilt (*Pseudomonas lachrymans*), Viruses such as TMV, CMV and MMV.

In cucumber sector, grafting is the main MB alternative techniques, Calcium cyanamide and fosthiazate were also used in the model farm.

4.1.3 Alternative technology for Ginger

Main pest and disease attack ginger is the root-knot nematodes born in soil and the ginger bacterial wilt caused by *Ralstonia solanacearum*, as well as joint attack by the two.

In case of ginger bacterial wilt attack, Chloropicrin is selected as an alternatives ; in case of joint attack by ginger bacterial wilt and root-knot nematodes, the alternatives should be

Chloropicrin+1,3-D; in case of root-knot nematodes attack, 1,3-D or Calcium Cyanamide should be the alternative. Chloropicrin, 1,3-D and Chloropicrin +1,3-D should be applied by small injection machine. According to the disease-resistant of crop varieties and years of continuous planting, the dosage of Chloropicrin was 30-50g/m², dosage of 1,3-D is 15 g/m², dosage of Chloropicrin +1,3-D is 45g/m². A plastic film should be laid after the application; the dosage of Calcium Cyanamide is 120g/m², which should be mixed with soil for application.

It should be noted that high dosage of Calcium Cyanamide can effectively prevent ginger from being attacked by root-knot nematodes. Therefore, this has been adopted by some field this year.

4.2 Progress

4.2.1 The activities have been carried out according to the 2008 work plan in the period from April 2008 to Dec 2008. Some of the equipments were not provided; details can be seen in the table No. 3 below. The necessity of procuring such equipment will be evaluated while formulating the work plan 2010.

a) Area treated with methyl bromide alternative:

- i. Strawberry: total 671 Ha were treated in Hebei and Liaoning, of which, 644.4 hectares were treated with chloropicrin, 26.6 hectares with dazomet.
- ii. Cucumber: total 50 Ha in Shandong, the alternative is grafting, plus combination with chloropicrin in some pilot farms.
- iii. Ginger: total 85.5 hectares were treated in Shandong, of which 48.5 Ha were treated with chloropicrin or 1,3D, and 37 Ha were treated with calcium cyanamide.

b) Equipment procurement, delivering, installation and inspection in 2008: the Tables from No. 3 to No. 6 below show the updates status of equipment procurement against the 2008's work:

Table No.3 Equipment for the strawberry sector in 2008

Ref No	Equipment and material	Unit	Amount	Unit price (USD\$)	Total Budget (USD\$)	Status
1	No. 1 Soft Capsule machine (Big) and No. 1 soft Capsule Machine (Small)	Set	2	50,000	100,000	completed
2	Training, installation and service for No.2 soft capsule machine	Set	1	20,000	20,000	on-going
3	Injection machine (metham sodium), including 30 HP tractor and pump for refilling the fumigant tank	Set	2	50,000	100,000	not procured
4	Small mechanical injection machines-petrol type 1	Set	90	2,000	180,000	completed
	Small mechanical injection machines-diesel type 1	Set				completed
	Small mechanical injection machines-petrol type 2	Set				completed
	Small mechanical injection machines-diesel type 2	Set				completed
5	Small mechanical injection machine including mulching film layer	Set	1	20,000	20,000	not procured

6	Manual chloropicrin injection machines	Set	10	80	800	Completed
7	Safety kits, each set is composed by No. 1 pair of gloves, No. 1 mask (including No. 3 spare canisters)	Set	600	50	30,000	Completed
8	Chloropicrin 94%	Ton	50	2,400	120,000	Completed
9	High density polyethylene plastic film for mulching	Ton	30	2,200	66,000	Completed
10	Dripping line and venture injection system for drip irrigation	Set	10	700	7,000	Completed
	TOTAL				643,800	

Table No.4 Equipment for the cucumber sector in 2008

Ref No	Equipment and material	Unit	Amount	Unit price (USD\$)	Total Budget (USD\$)	Status
1	Grafting kits for 40 Ha	Set	600	50	30,000	completed
2	Dripping line and venture injection system for drip irrigation	Set	35	760	26,600	completed
3	Injection pump system for drip irrigation	Set	4	2,000	8,000	completed
4	Small mechanical injection machines diesel type 1	Set	5	2,000	10,000	completed
5	1.3D	Ton	0.5	N.A.	7,500	completed
	BCA	Ton	0.5	N.A.		completed
	Chloropicrin 94%	Ton	2	N.A.		completed
	Metham sodium 35%	Ton	2	N.A.		completed
6	High density polyethylene plastic film for mulching	Ton	5	2,200	11,000	completed
7	Safety kits, each set is composed by No. 1 pair of gloves, No. 1 mask (including No. 3 spare canisters)	Set	150	50	7,500	completed
	TOTAL				100,600	

Table No. 5 Equipment for the ginger sector in 2008

Ref No	Equipment and material	Unit	Amount	Unit price (USD\$)	Total (USD\$)	Status
1	Injection machine (metham sodium) with rotary-tiller/spading, including tractor for 60 HP and pump to refill the fumigant tank	set	1	90,000	90,000	not procured
2	Small mechanical injection machines-petrol type 1	set	10	2,000	20,000	completed
3	Manual chloropicrin injection machines	set	5	80	400	completed
4	Safety kits, each set is composed	set	100	50	5,000	completed

	by No. 1 pair of gloves, No. 1 mask (including No. 3 canisters)					
5	Chloropicrin 94%	ton	15	2,400	36,000	completed
6	Metham sodium 35%	ton	1	2,000	2,000	completed
7	1.3D	ton	1	2,000	2,000	completed
8	High density polyethylene plastic film for mulching	ton	20	2,200	44,000	completed
	TOTAL				199,400	

Table No. 6 Training and TA in 2008

Ref No	Items	Cost (USD\$)	Status
1	Inception meeting	9,260	completed
2	Training	199,440	completed
3	Training equipment and consumable material	101,360	on-going
4	Assessment equipment	88,800	on-going
5	Dissemination	76,000	not carried out in 2008, rescheduled for 2009 e
6	Formulation of equipment technical specification (Study tour to Japan and expert meeting)	29,840	completed
7	Assessment on project progress and alternative comparison	87,820	completed
8	Monitoring and Assessment (field visiting and expert meeting)	30,000	completed
9	Technical Assistance (International consultants Fee)	120,000	completed
	Total	742,520	

c) Technical assistance, monitoring and evaluation programmes:

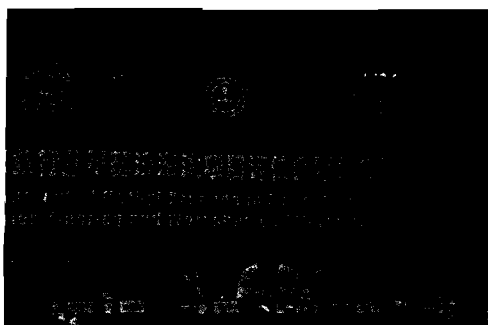
- i. IPP-CAAS was appointed as Technical Assistance unit. The technical assistance framework has been set up and is operating.
- ii. 62 model farms were established, 47 model farms in Hebei and Liangning for strawberry, 5 model farms in Shandong for cucumber and 10 model farms in Shandong for ginger sector.
- iii. Technical Assistance unit had selected the alternative technologies for each sector and area based on efficacy and cost-effective analysis.
- iv. Production and distribution of training material and protocols for trainers, fumigation companies' technical staffs and farmers, in the strawberry, cucumber and ginger sector.
- v. A total of 317 trainers trained to provide training and continuous technical assistance to about 11,000 farmers. Fumigation companies' staffs were also trained on the safe and effective use of toxic fumigants, mainly chloropicrin and metham sodium. Note that as for the Chinese law, chloropicrin can only be applied by certified applicators.
- vi. Study tour to Japan: to inspect innovative equipment for the application of chloropicrin or mixtures of chloropicrin and 1,3-Dichloropropene, from 10th to 15th March 2008.

vii. The monitoring and evaluation had been developed and is currently implemented:

- 1) IPP-CAAS is responsible for the daily monitoring, to process data and finalize the evaluation. Trainers are entrusted to collect data in the field, in model farms as well in individual farms.

2) PMO, together with concerned parties from MOA, MEP and UNIDO as well as an expert panel from IPP-CAAS have been visited the pilot areas in Hebei and Shandong province to check the project implementation progress in February and March.

- d) The Methyl Bromide phase-out in Agricultural Sector 2008 Project Review Meeting and Workshop on Alternative Technology was held on May 27, 2009. Participants include representatives from MOA, UNIDO Beijing Office, FECO/MEP, TA units; local AEPS and fumigation companies. Seven national experts evaluated the 2008 project progress report and identified technical specifications for the equipment to be procured.



4.2.2 The activities have been carried out according to the 2009 work plan of agriculture sector (which was formulated and approved in March 2009) during the period from January 2009 to October 2009:

a) MB phasing-out Progress in 2009

i. MB phasing-out Progress in Ginger Sector

Shandong AEPS is responsible for the MB phase-out in ginger sector according to the 2009's work plan. The MB phasing out activities was mainly carried out in Anqiu area, Shandong province, in March 2009.

The IPP-CAAS (Technology Assistance agency) trained the technical staff recommended by Shandong Banmufangtang Agro-technical Co. Ltd. And the trained technical staff formed a team to carry out chloropicrin fumigation through mechanical injection in different ginger farms. In the fumigation season, 23.57 tons of chloropicrin were applied on 60 ha ginger farms and 452 households were involved.

ii. MB Phase-out in strawberry sector

Hebei AEPS is responsible for the MB phase-out in strawberry sector and the phase-out activities were carried out in Mancheng, Shunping, Xushui and Qingyuan County from June to August 2009.

Mancheng Xingnong Agro-technical service Co. Ltd has been selected for soil fumigation in Baoding district in 2009 by the provincial AEPS.

The Institute of Plant Protection trained the agricultural technicians recommended by Mancheng Xingnong Agro-technical Service Company. A team of professional workers of the company carried out the chloropicrin fumigation for farmers with injection machines.

iii. MB Phase-out in cucumber sector

The Shandong AEPS is responsible for the MB phase-out in cucumber sector in Qingzhou and Shouguang City. The main alternative is grafting, A small amount of household use calcium carbimide as the alternative. A detailed number of households and the phase-out areas will be provided after the verification by the monitoring staff.

iv. MB Phase-out in tomato sector

The Shandong AEPS is responsible for the MB phase-out in tomato sector in Linzi and Shouguang City. The first round of grafting has been finished in September and the second round is scheduled to begin in early October. A detailed number of households and the phase-out areas will be provided after the verification by the monitoring staff.

b) Equipment and Chemicals Procurement according to 2009 work plan

In 2009, CNIITC is selected as the procurement agency responsible for the procurement of all the equipment and chemicals. Details are as follows:

i. Chemical Procurement:

30 tons of calcium cyanamide have been purchased through bidding, 31 tons of chloropicrin and 16 tons of metham sodium have been purchased through requesting quotations.

The inquiry of Avermectins, Sulfur fluoride and 1,3-D has been finished. Now the Contracts are going to sign.

ii. Equipment Procurement:

41 sets of small mechanical injection machines have been purchased through bidding and transported to Hebei and Shandong provinces. The procurement for other equipments and chemicals is pending and will be evaluated while formulating the work plan 2010.

c) TA activities:

i. CNIITC was selected as the procurement agency by bidding process in 2009. The technical specifications of the equipment to be procured in 2009 have been finalized in May 2009.

ii. MOA has signed subcontracts with the five TA projects (the publicity sub-contract, the technical assistant sub-contract, the graft technical assistant sub-contract, the subcontract of monitoring & evaluation of MB phase-out in strawberry sector in Hebei Province and the sub-contract of monitoring & evaluation of MB phase-out in cucumber, ginger and tomato sector in Shandong Province) bid-winners and the procurement agency. The first payments of these contracts have been disbursed.

iii. Training

a) By June 2009, 9 model farms on ginger were established in Anqiu, Laizhou and Longkou of Shandong province, of which 6 are in Anqiu, 1 in Laizhou, and 2 in Longkou.

From July to September, 2009, 6 model farms on strawberry have been selected in Hebei province, of which 3 are in Mancheng, 3 in Shunping; 2 model

farms on cucumber and 4 model farms on tomato have been selected in Shouguang of Shandong province.

b) Monitoring staff training

The training courses for monitoring staff have been conducted by IPP-CAAS on July 20th in Baoding, Hebei Province and on August 10th in Tai'an Shandong Province. 80 people have been trained, of which 33 are from Hebei Agriculture University and 47 from Shandong Agriculture University.

c) Technical staffs training

10 sessions of Technical staffs training on MB alternative technologies have been launched by IPP-CAAS in Anqiu, Qingzhou, Shouguang, Laiwu and Longkou of Shandong Province and in Mancheng and Shunping of Hebei Province.

Table7: Training Programme 2009

Crop	Date	District	Number of Technical staffs
Strawberry	June 6 th	Mancheng County	78
	June 7 th	Shunping County	107
Cucumber	March 13 th	Qingzhou City	181
Tomato	March 20 th	Shouguang City	916
Ginger	Feb 22 nd	Anqiu City	251
	August 11 th	Laiwu City	160
	August 12 th	Anqiu City	64
	Sep 24 th	Longkou City	313

iv. Promotion

10,000 T-shirts have been produced and distributed to Hebei and Shandong Province by PMO.

Beijing Baixin Company has finished shooting of the MB phase-out process in strawberry, cucumber, tomato and ginger sector. And the camera crew is taking a photograph of the effect of the alternative technology.

v. Monitoring & Assessment

Tripartite Monitoring: Staffs concerned from PMO, MEP and UNIDO as well as the MB expert have visited the strawberry site in Mancheng County, Hebei Province for the soil fumigation process on 7th and 8th in July.

Local Monitoring: In 2009, the Hebei Agricultural University is responsible for the monitoring of MB phase-out in strawberry sector in Hebei Province and the Shandong Agricultural University is responsible for the monitoring of MB phase-out in cucumber, ginger and tomato sectors in Shandong Province.

In compliance with the project requirements, the monitoring subcontractors have worked out a proper plan for monitoring and assessment activities and hired monitoring staffs who are now doing their job in the field after being trained by the Institute of Plant Protection, Chinese Academy of Agricultural Sciences.

4.3 Conclusion

4.3.1 Experience

- a) The establishment of a working group comprising FECO/MEP, MoA, IPP-CAAS, UNIDO, and representative of the Italian Ministry of Environment has proven very effective for designing the management mechanisms.
- b) Alternatives have been applied at large commercial scale throughout different regions and various crops and shown positive results.

4.3.2 Problems encountered:

- a) The monitoring and assessment system have been formulated but it is still weak in implementation, the lack of structured farm associations and the magnitude of the task cause logistic problems.
- b) External factors interfered with the progress, i.e., during the 2008's Olympic Games, the transportation of dangerous chemical, such as chloropicrin and 1,3-D, were restricted.
- c) Some alternatives are very effective but still not registered, such as 1,3D in ginger and strawberry.
- d) The range of alternative is very narrow and consequently reduces the possibility of choice by farmers.
- e) Chloropicrin is a highly toxic chemical and therefore can be applied only by certified fumigation companies. Since the process of certification is rather time-consuming and complex, the number of certified companies is very limited and so the competition for price and quality of services.
- f) In China, 70% population are farmers who live on small pieces of farmland, the lacking of farmers association makes it difficult to manage the programme at a centralized level. Therefore, the programme has to be carried out piece by piece land, which increases the difficulties of agriculture project comparing to the commodity and tobacco sector.

4.3.3 Suggestion and proposal

- a) A wide range of alternatives should be made available to farmers by:
- b) Registering multiple alternatives for the same crop (i.e. 1,3D).
- c) Certifying more fumigation companies.
- d) Promoting the Integrated Pest Management so to reduce the dependence on chemical alternatives.
- e) The monitoring and evaluation system must be strengthened by enlarging the number of technical staff in the field. Local AEPS have to play a more responsible and effective role in the monitoring process.
- f) According to the characteristic of agriculture sector, a more effective long-term programme strategy should be set up to strengthen the implementation and consolidation the phase-out achievement.

5. Policies

For the management of methyl bromide production, consumption and trade in China, the following policies have been issued:

- a) Circular on the establishment, expansion or innovation of 1,1,1-Trichloroethane and Methyl Bromide production equipment (Huanfa No. 60 [2003]), July 1st, 2003.
- b) Public Notice on Implementing Methyl Bromide Production Licensing and Quota Management (Huanfa No. 155 [2004]), 21st May 2007.

- c) Control for the methyl bromide import and export (including QPS): the Licensing Management for import and export of Methyl Bromide (including QPS) became effective since 1st January 2004.
- d) Catalogue of Controlled ODS in China's Import & Export (Third batch) (Huanfa No. 25 [2004]), 6th February 2004.
- e) Ban of Methyl Bromide in the commodities sector by SGA and MEP (No. 4 [2006]), 26th September 2006.
- f) Ban of Methyl Bromide in the Tobacco Seeding Sector by STMA and MEP (No. 1[2008]), 19th November 2008.

(The end)

Annex I

TECHNICAL REPORT

1. **NAME:** Alessandro Amadio - UNIDO's office Beijing
2. **PLACES VISITED:** Shouguang - Shandong Province
3. **DATES OF MISSION:** from 12th and 13th October 2009
4. **SUBJECT:** methyl bromide phase-out in Shouguang County, Shandong Province.
5. **FINDINGS:**

Preamble:

The following are the information made available in the course of the mission by various individuals, belonging to local institution, PMO and private enterprises. As for the nature of the information sources, collection method and the context, this report does not allege full comprehensiveness and correctness. Further information and/o clarifications may need to be provided by institutional bodies if and as required.

Background:

- a) The programme focuses in the tomato and cucumber sectors.
- b) As for the local regulations, methyl bromide is not allowed to use.
- c) Farmers and nurseries, as overall, show high professionalism and technical competence.
- d) The model farms look very well managed and are testing a wide range of alternatives at commercial scale as for the work plan 2009.
- e) Other farms, outside the programme, looked very good, no evident pathology, good uniformity, and good sanitation.
- f) The typical greenhouse is the solar type. No heating available.

Alternative:

- g) The primary soil borne disease is nematodes.
- h) The main chemical alternatives to methyl bromide, beside the model farms, are: metham sodium/dazomet. Other specific nematicides, such as 1.3D and DMDS, despite that they are not registered, seem to be used at some extend.
- i) Grafting is used and available rootstocks show various levels of resistance/tolerance to nematodes therefore, grafting is for the most combined with various nematicides.
- j) Farmers recognized a grater tolerance of grafted cucumber to low temperature, translated into higher productivity during the cold season.
- k) Beside tests in model farms, Chloropicrin was not applied at commercial scale in the current crop season.

- l) Farmers' expressed the concern that, as well known, chloropicrin is not effective controlling nematodes.
- m) Metham sodium and dazomet, as well known, are not as effective against nematodes as methyl bromide or 1.3D or DMDS. Still they are used in low infected soils.
- n) Calcium-cinamide use is very limited. Solarization is not employed. Previous tests showed no efficacy to control soil borne diseases.
- o) Integrated Pest Management (IPM) is not employed.
- p) In one case, the farmer uses ozone as methyl bromide alternative. The generator sits in the greenhouse entrance and the application, through irrigation water, is done pre-planting as well as post-planting. As for the specific condition of his greenhouse and crop management it seems to be effective against nematodes.

Grafting:

- q) We have visited two specialized nurseries, both looked very well managed and equipped. The structures are based, in one case on glass greenhouse and in the other in plastic greenhouses, tunnel type. In the county there are about 20 specialized nurseries.
- r) Both have a yearly production of about 6 million regular seedlings and 1 million grafted seedlings.
- s) The main crops grafted are, by far, cucumber and eggplant, and, at much smaller extend, tomato and pepper. The rootstocks are pumpkin for cucumber and *Solanum torvum* for eggplant. Resistant tomato and pepper varieties are used as tomato and pepper rootstock.
- t) Cucumber, and is seems also watermelon, are largely grafted by farmers themselves, while eggplant, tomato and pepper are exclusively produced by specialized nurseries.
- u) The cost, for specialized nurseries, range between 0.7 and 1 RMB/seedling.
- v) Grafted seedlings are both produced by farmers themselves or purchased from specialized nurseries.

Monitoring:

- w) For model farms, there is in place a mechanism for monitoring disease incidence and productivity. Despite it is managed from staff based in Beijing, it seems to be sufficiently effective.
- x) It is not clear if other farmers are monitored and with which methodology.

Equipment and goods:

- y) Beside the model farms, no equipment, fumigants and other goods and equipment were provided; as described in the work plan 2009; i.e. mulching film, dripping lines, injection machine, rotor-tillers, monitoring equipment, etc.

Training:

- z) The training programme is ongoing and is reaching the planned number of farmers. No information available with regard to its effectiveness. No assessment available.

6. REMARKS

- a) Methyl bromide phase-out seems to be effective, and most like sustainable, for the following reasons:
 - i. Methyl bromide nearly disappeared from the market.
 - ii. Methyl bromide has become very expensive, much more than alternatives.
 - iii. Various alternatives, including not registered chemicals, are available in the market.
 - iv. Farmers are capable, technically prepared, motivated by the favourable market conditions and therefore able to handle the disappearance of methyl bromide from the market.
- b) The model farm format proved to be an effective tool to disseminate methyl bromide alternatives. The testing role is limited since the technologies are mature and well know. The only exception may be the capsule technology, which has first been proposed by China and indeed need further development.
- c) 1.3-D and DMDS are well-known and effective nematicides. Their registration or the strict implementation of present regulations is needed to avoid improper uses and harm.
- d) The large-scale implementation of methyl bromide alternatives, through the provision of equipment and goods to farmers or fumigation companies, as descried in the work plan 2009, it appears not implemented.
- e) The visit at the ginger pilot area, despite very close to Shouguang, was not scheduled in this filed visit. Note that the middle of October, until 24th October, is the last week for harvesting ginger in the area and therefore, the most appropriated time to monitor and assess the effectiveness of methyl bromide alternatives. We note with regret that our request to visit the pilot area was not answered, neither explanation was provided. Furthermore during two year of implementation of activities in the ginger sector no monitoring has been performed.
- f) We recommend starting the preparation of the work plan 2010 as soon as possible and adjusting the implementation strategy based on the assessment of the last two years implementation.

7. DATE OF THE REPORT: 23rd October 2009

9. SIGNATURE:

A. Amadio, Project manager, UNIDO's Regional Office China

10. Distribution list: Mr Yang Lirong; Ms Tang Yandong; Ms Li Xiongya; Ms Sun Funjian

Annex I: Progress of greenhouse construction Stage II for tobacco sector

No.	Beneficiary	Contract No.	Grant Amount (\$)	Area (m ²)	Date of bidding	Construction started on	Completion date
1	Baicheng, Jilin	F/III/S/07/380	180,000	12,850	Sep.2007	Oct.2007	Completed in Apr-08
2	Baoji, Shanxi	F/III/S/07/384	180,000	12,850	Sep.2007	Jan.2008	Completed in Aug-08
3	Bijie, Guizhou	F/III/S/07/374	230,000	16,400	Oct.2007	Nov.2008	Completed in Jul-08
4	Chenzhou, Hunan	F/III/S/07/378	230,000	16,400	Sep.2007	Oct.2007	Completed in Jan-08
5	Chifeng, Inner Mongolia	F/III/S/07/381	240,000	17,100	Sep.2006	Oct.2006	Completed in Dec-06
6	Liangshan, Sichuan	F/III/S/07/388	230,000	16,400	Nov.2007	Dec.2007	Completed in Jan-08
7	Luoyang, Henan	F/III/S/07/376	220,000	15,650	Sep.2007	Nov.2007	Completed in Jul-08
8	Luzhou, Sichuan	F/III/S/07/385	200,000	14,300	Dec.2007	Jan.2008	Completed in May-08
9	Nanping, Fujian	F/III/S/07/372	260,000	18,600	Oct.2006	Oct.2006	Completed in Dec-06
10	Qujin, Yunnan	F/III/S/07/386	230,000	16,400	Oct.2007	Dec.2007	Completed in Mar-08
11	Rizhao, Shandong	F/III/S/07/382	125,000	9,000	Sep.2007	Nov.2007	Completed in Apr-08
12	Sanming, Fujian	F/III/S/07/373	230,000	16,400	Sep.2007	Nov.2007	Completed in Mar-08
13	Shiyan, Hubei	F/III/S/07/377	190,000	13,650	Sep.2007	Nov.2007	Completed in Apr-08
14	Tongren, Guizhou	F/III/S/07/375	230,000	16,400	Sep.2007	Dec.2007	Completed in Apr-08
15	Weifang, Shandong	F/III/S/07/383	230,000	16,400	Sep.2007	Nov.2007	Completed in Sep-08

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No.	Beneficiary	Contract No.	Grant Amount (\$)	Area (m²)	Date of bidding	Construction started on	Completion date
16	Yichang, Hubei	F/III/S/07/387	180,000	12,850	Sep.2007	Nov.2007	Completed in May-08
17	Yongzhou, Hunan	F/III/S/07/379	280,000	19,900	Sep.2007	Oct.2007	Completed in Aug-08
	Total		366,5000	261,550			