Amended Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP)
Linking Agricultural Markets to Producers (LAMP): Pesticide Procurement and Use in the Vegetable Sub-sector

Activity Location:	Bosnia Herzegovina
Activity Title:	Linking Agricultural Markets and Producers (LAMP)
Sub-sector:	Vegetables (green salad, green onion, potato, tomato, peppers, cucumber)
Life of Activity	July 2003-May 2008
Funding (Vegetable sub-sector)	$ 1,500,000 (est.)
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Date Prepared:	September 10, 2005

BACKGROUND:

This PERSUAP evaluates LAMP's proposed assistance in the use of pesticides in the vegetable sub-sector; and addresses pesticide safer use and handling issues. If in the future, LAMP intends to assist the vegetable sub-sector in the use of pesticides other than those requested and approved herein; or to assist in the use or procurement of pesticides for crops other than the target vegetables, LAMP will submit an amendment to this PERSUAP, with a request for the specific pesticides, in accordance with USAID's Pesticide Procedures (22 CFR 216.3).

LAMP previously prepared a PERSUAP covering the project's assistance for the use of pesticides in the berry sector. That PERSUAP was approved by the USAID/E&E Bureau Environmental Officer (BEO) on 3 May 3005. At the time that PERSUAP was conducted, LAMP had yet to identify specific interventions in the vegetable sector, and was not yet prepared to move forward with a request to the USAID/E & E BEO for approval to recommend specific pesticides. Now that LAMP has decided to provide support for interventions to strengthen market links in the vegetable sub-sector, LAMP is submitting this Amended PERSUAP to the BEO.

It is important to note that LAMP is only playing a supporting role for farmer groups and food processors, and is primarily working to strengthen market linkages in the vegetable sector. LAMP's role in production is generally minimal. However, LAMP is aware of many problems associated with pesticide use particularly in Herzegovina where vegetables are grown in greenhouses. Problems include: over-use of pesticides, the use of

inappropriate pesticides for the target crop or pest, ignorance of withholding periods, the lack of an integrated approach to pest control and so forth. For these reasons, LAMP will be providing support to producers to promote safer pesticide use and integrated pest management (IPM), whilst giving specific pest control advice on target crops: green salad, green onion, potato, tomato, peppers, and cucumber. LAMP itself does not intend to fund, distribute or apply pesticides. This Amended PERSUAP covers LAMP's proposed support for promoting safer use of pesticides in the vegetable sector.

The PERSUAP team is comprised of a LAMP environmental compliance specialist, an entomologist and a plant health specialist at the Faculty of Agriculture, University of Sarajevo. The team evaluated 45 pesticides (23 fungicides, 10 insecticides, 7 herbicides and 5 bio-pesticides) typically recommended and used on the target crops in Bosnia and Herzegovina (BiH). These pesticides were compiled from a list obtained by LAMP's technical experts at the Faculty of Agriculture at the University of Sarajevo, through surveys of growers and pesticide suppliers.

LAMP's TARGET CROPS:

LAMP's target crops include: green salad, green onion, potato, tomato, peppers, and cucumber. These crops are grown in commercial quantities mainly in greenhouses in southern Herzegovina although some crops, particularly potatoes, are also grown in other parts of Bosnia and Herzegovina in open fields.

SUMMARY OF FINDINGS:

LAMP is requesting approval to assist in the use of the pesticides shown in Table 1. Only USEPA registered pesticides that are classified as general use pesticides (GUP); and that are WHO and USEPA toxicity classes II and above are being requested. An exception is for copper hydroxide which is relatively non-toxic, but is EPA Toxicity Class 1 based on its potential to cause eye irritation. All pesticides being requested are registered for use by the Ministry of Agriculture (BiH). The selection of pesticides, while the safest regarding human health and the environment, is expected to provide the necessary protection against crop pests and diseases, when used in conjunction with an IPM program, and taking into account the need to vary pesticide families to ensure against pest resistance. While this PERSUAP requests the least toxic pesticides, all pesticides are hazardous to the environment and to human health to some degree, and the PERSUAP recommends measures for mitigating adverse effects.

Based on the analyses contained herein, this Amended PERSUAP requests approval for LAMP to assist in the use of 35 pesticides: 15 are fungicides, 5 are insecticides, 5 are herbicides and 5 are bio-pesticides (Table 1); and presents the rationale for making these recommendations.

Table 1 shows the pesticides for which LAMP is requesting approval from USAID; the pests/diseases for which the pesticide is being requested; and potential problems associated with the pesticide.

Table 1: Pesticides for which LAMP Requests Approval

Active Ingredient/ Chemical)	Crop requested for*	Target pests	Potential problems if any	Comments
FUNGICIDES				
1. Azoxystrobin	C T Po	Late blight(*Pseudoperonospora cubensis)(Phytopthora infestans)*, Early blight (*Alternaria solani)*	**Potential water contaminant**	Aquatic concerns *For terrestrial uses only; should not be applied directly to water or in a way that will contaminate water (e.g. shallow water tables). Application will be limited to areas over 25 meters away from any water bodies.*
2. Copper hydroxide	Po T GO C	Late blight of potatoes and tomatoes, (*Phytophthora infestans*), late blight of onions (*Peronospora destructor*), late blight of cucumbers (*Pseudoperonospora cubensis),* early blight of potatoes and tomatoes (*Alternari solani)*	Some formulations are EPA I **Potential water contaminant** **Severe eye irritation**	Aquatic concerns *For terrestrial uses only; should not be applied directly to water or in a way that will contaminate water (e.g. shallow water table). Application will be limited to areas over 25 meters away from any water bodies.* Mitigation recommended: Use eyewear protection.
3. Copper oxychloride	Po T GO C	General preventative fungicide. Late blight of potatoes and tomatoes, (*Phytophthora infestans*), late blight of onions (*Peronospora destructor*), late blight of cucumbers (*Pseudoperonospora cubensis),* early blight of potatoes and tomatoes (*Alternari solani)*	**Potential water contaminant**	Aquatic concerns *For terrestrial uses only; should not be applied directly to water or in a way that will contaminate water (e.g. shallow water table). Application will be limited to areas over 25 meters away from any water bodies.*
4. Copper sulfate	Po T GO C	Late blight of potatoes and tomatoes, (*Phytophthora infestans*), late blight of onions (*Peronospora destructor*), late blight of cucumbers (*Pseudoperonospora cubensis),* early blight of potatoes and tomatoes (*Alternari solani)*	EPA II WHO not listed **Potential water contaminant**	Aquatic concerns *For terrestrial uses only; should not be applied directly to water or in a way that will contaminate water (e.g. shallow water table). Application will be limited to areas over 25 meters away from any water bodies.*
5. Cyprodinil	GS C T Pe	White mold (*Sclerotinia minor)(Sclerotinia sclerotiorum)*	**Potential water contaminant**	Aquatic concerns *For terrestrial uses only; should not be applied directly to water or in a way that will contaminate water (e.g. shallow water tables). Application will be limited*

Active Ingredient/ Chemical)	Crop requested for*	Target pests	Potential problems if any	Comments
				to areas over 25 meters away from any water bodies.
6. Fenhexamid	T	Gray mold (*Botrytis cinerea*), White mold (*Sclerotinia sclerotiorum)*	**Potential water contaminant**	Aquatic concerns *For terrestrial uses only; should not be applied directly to water or in a way that will contaminate water (e.g. shallow water tables). Application will be limited to areas over 25 meters away from any water bodies.*
7. Mancozeb (dithiocarbamate)	GO T Po	Late blight (*Peronospora destructor) (Phytophthora infestans)* Early blight (*Alternaria solani)*		
8. Metalaxyl	Po T C GO	Late blight	**Some formulations are EPA II** **Potential water contaminant**	Mitigation recommended: Will only be used by trained farmers (see training); safety clothing and equipment mandatory; used as part of IPM program. Aquatic concerns *For terrestrial uses only; should not be applied directly to water or in a way that will contaminate water (e.g. shallow water tables). Application will be limited to areas over 25 meters away from any water bodies.*
9. Metiram (dithiocarbamate)	GO T Po	Late blight (*Peronospora destructor) (Phytophthora infestans)* Early blight (*Alternaria solani)*	**Potential water contaminant**	Aquatic concerns *For terrestrial uses only; should not be applied directly to water or in a way that will contaminate water (e.g. shallow water tables). Application will be limited to areas over 25 meters away from any water bodies.*
10. Myclobutanil	C	Powdery mildew (*Erysphae sp., Sphaerotheca sp.)*	**Some formulations are EPA II**	**Phase out EPA II formulations by 9/30/06**
11. Other copper based compounds : copper hydroxide+copper sulphate ; copper +	Po T GO C	Late blight of potatoes and tomatoes, (*Phytophthora infestans*), late blight of onions (*Peronospora destructor*), late blight of	**Some formulations are EPA I and WHO II**	Mitigation recommended: Will only be used by trained farmers (see training); safety clothing and equipment mandatory; used

Active Ingredient/ Chemical)	Crop requested for*	Target pests	Potential problems if any	Comments
organic fungicide		cucumbers (*Pseudoperonospora cubensis),* early blight of potatoes and tomatoes (*Alternari solani)*		as part of IPM program. EPA I will not be used.
12. Propamocarb-hydrochloride	C Pe Po T	Late blight (*Pseudoperonospora cubensis, Phytophthora capsici, Phytophthora infestans)* , damping of fungus (*Pythium debarianum)* early blight of tomatoes (*Alternaria solani)*		Previcur 607SL (EPA III), Tattoo MC (EPA I): Tattoo will not be recommended
13. Sulfur based compounds (Colloidal sulfur and Dusting sulfur)	Pe C Po	Powdery mildew for peppers (*Leveillula taurica*), powdery mildew for cucumbers (*Erisiphae cichoracearum, Sphaerotheca fuliginea).* General preventative fungicide and miticide, insect repellent.		
14. Triadimefon	C	Powdery mildew (*Erysphae sp., Sphaerotheca sp.)*	**Potential water contaminant**	Aquatic concerns *For terrestrial uses only; should not be applied directly to water or in a way that will contaminate water (e.g. shallow water tables). Application will be limited to areas over 25 meters away from any water bodies.* **Phase out EPA II formulations by 9/30/06**
15. Triadimenol	C	Powdery mildew (*Erysphae sp., Sphaerotheca sp.)*	**Some formulations are EPA II**	Mitigation recommended: Will only be used by trained farmers (see training); safety clothing and equipment mandatory; used as part of IPM program. **Phase out EPA II formulations by 9/30/06**
INSECTICIDES				
1. Acetamiprid	Po, T, Pe, C	Western Flower Trips (*Frankliniella occcidentalis*), Onion trips (*Trips tabaci*), Tobaco whitefly (*Bemisia tabaci*), Colorado beetle, *(Leptinotarsa decemlineata)*		

Active Ingredient/ Chemical)	Crop requested for*	Target pests	Potential problems if any	Comments
		Aphids,		
2. Hexaflumuron	Po	Colorado beetle, *(Leptinotarsa decemlineata)*		
3. Lufenuron	Po, Pe, To, C	Leafminers (*Liriomyza trifolii*, *L. bryoniae* i *Phytomyza horticola*), Colorado beetle, *(Leptinotarsa decemlineata),* Western Flower Trips (*Frankliniella occcidentalis*), Onion trips (*Trips tabaci*), European Corn Borer (*Ostrinia nubilalis*), Tomato fruitworm (*Helicoverpa armigera)*		
4. Pirimicarb	C, T, Pe, Po	Aphids	**All formulations are EPA II and WHO II**	Mitigation recommended: Will only be used by trained farmers (see training); safety clothing and equipment mandatory; used as part of IPM program. **Phase out by 9/30/06**
5. Tiametoksam (Thiamethoxam)	Po, Pe	Colorado beetle, *(Leptinotarsa decemlineata)* Aphids,	**Potential water contaminant**	Aquatic concerns *For terrestrial uses only; should not be applied directly to water or in a way that will contaminate water (e.g. shallow water tables). Application will be limited to areas over 25 meters away from any water bodies.*
HERBICIDES				
1. Flufenacet+ metribuzin	Po	Annual grasses	**Potential water contaminant**	Aquatic concerns *For terrestrial uses only; should not be applied directly to water or in a way that will contaminate water (e.g. shallow water tables). Application will be limited to areas over 25 meters away from any water bodies.*
2. Napropamide	Pe T	Annual grasses and broadleaved weeds.	**Potential water contaminant**	Aquatic concerns *For terrestrial uses only; should not be applied directly to water or in a way that will contaminate water (e.g. shallow water tables). Application will be limited*

Active Ingredient/ Chemical)	Crop requested for*	Target pests	Potential problems if any	Comments
				to areas over 25 meters away from any water bodies.
3. Oxyflourfen	GO	Annual and perennial weeds.		
4. Pendimethalin	Po GO T Pe	Annual grasses and broadleaved weeds.		
5. Propyzamide	GS	Seeding narrow leaved weeds and some broad-leaved weeds and *Cuscuta* sp.	**Potential water contaminant**	Aquatic concerns *For terrestrial uses only; should not be applied directly to water or in a way that will contaminate water (e.g. shallow water tables). Application will be limited to areas over 25 meters away from any water bodies.*
BIOLOGICAL/BOTANICAL PESTICIDES AND REPELLENTS				
1. Abamectin (Avermectim)	C	Leafminers (*Liriomyza trifolii*, *L. bryoniae* and *Phytomyza horticola*), Mites (*Tetranychus urticae*)	**Some formulations are EPA II** **Potential water contaminant**	**Phase out EPA II formulations by 9/30/06** Highly toxic to aquatic ecosystem. *For terrestrial uses only; should not be applied directly to water or in a way that will contaminate water (e.g. shallow water tables). Application will be limited to areas over 25 meters away from any water bodies.*
2. Azadirachtin (Neem oil extract)	Po, T, Pe	Colorado beetle, *(Leptinotarsa decemlineat*), Aphids,		
3. *Bacillus thuringiensis*	Po, T, Pe	Colorado beetle, *(Leptinotarsa decemlineata)*, European Corn Borer (*Ostrinia nubilalis*), Tomato fruitworm (*Helicoverpa armigera)*		
4. Piretrin (Pyrethrins, Synergized)	T, Pe, C	Aphids, Greenhouse whitefly (*Trialeurodes vaporariorum*),		
5. Spinosad	Po, Pe, C, T	Leafminers (*Liriomyza trifolii*, *L. bryoniae* and *Phytomyza horticola*), Western Flower Trips (*Frankliniella occcidentalis*), Colorado		

Active Ingredient/ Chemical)	Crop requested for*	Target pests	Potential problems if any	Comments
		beetle, *(Leptinotarsa decemlineat*),		

*C-Cucumber, GO-Green Onion, GS-Green Salad, Pe – Peppers, Po – Potato, T-Tomato,

Table 1a shows the number of pesticides being requested for each target crop.

Table 1(a) Pesticides/Crop

Crop	Fungicide	Insecticide	Herbicide	Bio-control
Cucumber	12	3	0	3
Green Onion	7	0	2	0
Green Salad	1	0	1	0
Pepper	3	4	2	4
Potato	10	5	2	3
Tomato	11	3	2	4

Table 2, below, lists all pesticides that LAMP's technical experts and extension services found are used on vegetables in BiH, depending on the pest problem. Working with other LAMP technical experts, the PERSUAP Team was able to eliminate 10 of the pesticides because of their restricted use status (RUPs) or because they are not registered by US EPA or by BiH; or because they are EPA and/or WHO Toxicity Class I, and highly toxic. In addition, this PERSUAP recommends that certain EPA and WHO Toxicity Class II pesticide formulations should be phased out, and removed completely by September 30, 2006 unless it can be shown there are no practical alternatives. Table 1 shows the outcome of the PERSUAP's team's screening and assessment process undertaken for this PERSUAP.

This PERSUAP includes recommendations which will mitigate significant adverse impacts of pesticide use on the environment, including the human environment. The following is a summary of the recommendations, which are described in greater detail in Section III.

1. Phase-out more hazardous pesticides (most EPA and WHO Toxicity Class II formulations) from trainings which LAMP may organize beyond September 30, 2006, unless no suitable alternatives exist. If no suitable alternative exists for the more hazardous pesticides (EPA/WHO Toxicity Class II), LAMP will submit a justification for retaining each specific pesticide beyond September 30, 2006. This justification shall be submitted prior to the phase-out date. Annually, LAMP shall review US EPA registration status, and EPA and WHO Toxicity Classes of approved pesticides.

2. LAMP shall only work with farmer groups who agree to use approved pesticides as part of an IPM program.

3. LAMP shall ensure that IPM practices described in the PERSUAP (some examples in Section c) and others developed in collaboration with LAMP technical experts are disseminated and implemented.

4. LAMP, through extension agencies and trainers, shall promote the use of protective clothing and equipment by farmers and shall monitor use.

5. LAMP shall encourage farmers to read and follow labels.

6. LAMP shall train LAMP staff, farmer groups, extension agents, and pesticide suppliers in pesticide safer use and handling, and environmental protection.

7. LAMP shall disseminate information from the PERSUAP broadly.

8. LAMP shall implement a Mitigation and Monitoring Plan.

9. PERSUAP mitigation and monitoring requirements may require LAMP to provide funding to implement the above measures.

Approvals:

_____Date:_____
Mohammad Latif
Bureau Environmental Officer (Acting)

_____Date:_____
Howard Sumka
Mission Director, USAID/BiH

_____Date:_____
Merritt Broady, USAID/MEO

_____Date:_____
Samir Dizdar, Assistant MEO

_____Date:_____
Dina Karic, LAMP CTO

AMENDED PESTICIDE EVALUATION REPORT AND SAFER USE ACTION PLAN: LAMP ASSISTANCE FOR THE USE OR PROCUREMENT OF PESTICIDES IN THE VEGETABLE SUB-SECTOR

I. BACKGROUND TO THE PERSUAP

A. USAID Pesticide Procedures, Amendments, and Updates

The following sections respond to the twelve factors in USAID's Pesticide Procedures (22 CFR 216.3). Prior to approving the use or procurement of pesticides, each pesticide must be evaluated with respect to the economic, social, and environmental risks and benefits of the planned use.

The information in (a) through (l) should be reviewed and modified, as necessary, but at the least, on an annual basis. USEPA regularly revises pesticide data; and therefore, Section III recommends that LAMP shall annually update the information on USEPA registration status, and USEPA and WHO Toxicity Classes and report, in Project Quarterly Reports, to USAID on any changes. In addition, if LAMP intends to support additional crops that require LAMP to assist in the use or procurement of pesticides, the PERSUAP must be amended. This PERSUAP recommends that specific EPA Toxicity Class II and WHO Toxicity Class II pesticides be phased out by September 30, 2006, unless there is no practical alternative. LAMP should report on the status of phase-out, and the PERSUAP should be amended to show any new pesticides necessary to replace those targeted for removal from the LAMP project. Justifications shall be submitted to USAID/BiH and the USAID/E&E BEO if LAMP is unable to identify a suitable alternative for EPA/WHO Toxicity Class II pesticides. This justification will be presented in the form of an Amended PERSUAP.

LAMP will undertake a rigorous training and monitoring program, which will mitigate the risk to human health and the environment that could result from LAMP activities in the vegetable sub-sector. The use of IPM will be a guiding principle for LAMP technical staff. Among other safer practices, discussed in the PERSUAP, LAMP will recommend only "judicious use" of pesticides to help avoid, reduce, and mitigate the risks to human health and the environment.

The degree and consistency with which farmers actually use the safer methods of pesticide application, recommended herein, determines the risk to human health and the environment. The PERSUAP mitigation and monitoring recommendations will be integrated into overall LAMP project monitoring, and monitoring will be conducted on a regular and frequent basis.

LAMP has already had success in promoting IPM and safer use practices in the berry sector through berry production training in the field. LAMP became aware of great disparity between farmers' knowledge of pest control issues. A great number of farmers for example could not differentiate between fungicides and insecticides, were using inappropriate pesticides for the target pests, were unaware of newer pesticides which are

more effective and less toxic, and almost never used protective clothing. On the other hand, some berry growers in Gradacac region, had much higher knowledge of pest management. Through LAMP training in berry production, LAMP has increased awareness of the importance of safety clothing as well as introduced more effective and less toxic pesticides to farmers (pesticides that have been approved in the PERSUAP for berries). Subsequent visits to those farms showed that pest control was more effective, and berries were healthier, as IPM practices are increasingly being used. Protective clothing is being somewhat slowly taken up by farmers so LAMP intends to increase the number of training events on IPM and safe pesticide use through the use of specialist trainers and applying adult learning techniques to change attitudes and behavior.

B. LAMP's Vegetable Sub-Sector:

Agricultural production, especially early vegetables, is a significant contributor to BiH's economy. Vegetables are still largely produced on small parcels of land and production is rarely market-oriented. Much of this production is geared towards subsistence, to meet producers' home needs. Though the region has a long tradition of agricultural production, it lacks new technologies.

The level of production development in this region has also been hurt because many fields and irrigation systems have not been rehabilitated since the war. Another problem is that production is unconnected to the needs of processors or consumers. Therefore, most products are sold on green markets characterized by uncertain spot market sales.

At present, vegetable production and processing are growing very slowly while the level of imports appears to be stagnating. Lately, producers in the region have begun to produce vegetables in poly or plastic greenhouses. These structures help growers capture a better market position, especially outside the main growing seasons. Most of the products sold on the local market are not subject to systematic quality control, although regulatory institutions and laws do exist.

Data on the vegetable industry are scarce. This situation is due to several factors. First is the overwhelming prevalence of illegally imported products: estimates from well-positioned players in the market indicate that 50–70 percent of fresh vegetables enter the country on the gray market. Second, farmers prefer to sell most of their output to friends and neighbors, as well as to buyers at local, open green markets, despite generally low prices. These transactions are unrecorded. Anecdotal evidence from a wide range of reliable sources indicates that most domestic vegetable production is consumed domestically and that fresh vegetables are not being dumped or left unharvested. Observation confirms that domestic production is increasing—although still below prewar levels. This growth is occurring through the cultivation of idle lands, reconstruction of irrigation systems, and the rapid proliferation of greenhouses (including poly tunnels, plastic houses, and glass houses).

Potatoes are one of the most widespread vegetable cultures in BiH, and are recognized nationally and regionally as an important crop. The quality of locally produced potatoes

is very good, and their production is linked to demand in the market and price. This crop is one of the first export crops; over 100 tons were exported to Norway in 2003. The price of potatoes on the domestic market ranges between 0.60–0.80 KM/kg (approx. $US0.40 – 0.50). Packaging for this product has not been standardized, and potatoes are usually packed either in plastic net bags up to 25 kg or in used cardboard cartons. Apart from green market sales, buyers are often large institutions such as the Army, hospitals, and public kitchens. As is often the case with domestically sold vegetables, there is a problem with buyers' not paying.

Tomatoes are planted in greenhouses and in open fields at lower altitudes. This practice allows them to realize a long growing season and sustained market presence. Greenhouse production enables faster, early ripening, whereas open-field production is more suitable to larger quantities. The seasonal price of this product ranges from 0.80 to 1.50 KM/kg (approx. $US0.50-1.00). Tomatoes are usually packed in wooden crates of 10–14 kg or cardboard cartons of 6–10 kg.

Peppers are grown in greenhouses, where production takes less time, and in open fields. Production of peppers in greenhouses is becoming more popular in BiH, since this practice extends the growing season. The seasonal price ranges from 1.50 to 3.00 KM/kg (approx. $US1.00-2.00KM); prices outside the growing area are as much as 4.00 KM/kg (approx. $US2.60KM). Peppers do not have special packaging and are mostly packed in cardboard crates and net bags of 15– 25 kg.

Cucumbers – Production is similar to peppers and tomatoes.

Green onions and lettuce - These vegetables are also second-season crops and can be planted after the early-season crops. They are mainly grown in greenhouses, allowing producers to maximize their use of such facilities and ensuring early ripening. Harvest begins in December and lasts until early spring. This harvest time (mid-winter) ensures attractive prices. In general, these products bring the following prices (in KM/kg): spring onion, 1.00–2.50; lettuce, 1.50– 2.00; and spinach, up to 3.00. The products are normally packed in cardboard cartons. The market is mostly well-secured for these products, and demand is almost always higher than supply.

For the purposes of this PERSUAP, it is important to note that LAMP is only playing a supporting role for farmer groups and food processors, primarily working to strengthen market linkages in the sector. LAMP's role in production is minimal as the sector is generally well supported by agronomists who give advice on site selection, production techniques and pest management. LAMP is focusing on non-production issues such as marketing, branding and packaging. Herzegovina is the geographical focus as this is where much of the commercial vegetable growing occurs, and primarily in greenhouses.

However, LAMP recognizes that there are significant environmental and potentially human health issues associated with pesticide use by vegetable growers particularly in Herzegovina. There is substantial anecdotal evidence that pesticides are used inappropriately:

- Farmers using excessive amounts of pesticides,
- Farmers not abiding by withholding periods, as described on the label, resulting in contaminated products being sold, particularly on the green market,
- Farmers using inappropriate pesticide for the target pest or agricultural crop,
- Farmers using unregistered pesticides,
- Farmers using highly toxic pesticides when other alternatives exist.

To address the above issues, LAMP is intending to undertake training activities and roundtables on Integrated Pest Management and safe pesticide use.

II. PESTICIDE EVALUATION REPORT

The information presented in the Pesticide Evaluation Report corresponds to the factors in 22 CFR 216.3(b)(i) (a) through (l).

(a) The USEPA registration status of the requested pesticides

Table 2 shows USEPA registration status for pesticides (with commercial product name in BiH listed, when available) that the LAMP technical expert and extension services have stated are typically recommended and used for vegetables. The table also shows EPA and WHO Toxicity Classes, and whether EPA has approved the pesticide's use on vegetables. Shaded pesticides did not pass the initial screening, and are not being requested for use in the LAMP vegetable sub-sector. All pesticides listed below are registered for use in BiH.

> USAID's Pesticide Procedures, 22 CFR 216.3, state that when a project includes assistance for the procurement or use, or both, of any pesticide registered for the same or similar uses in the United States but the proposed use is restricted by the USEPA based on user hazard, the Pesticide Procedures in (a) through (l) must be completed, and in addition, an evaluation shall be undertaken regarding user hazards associated with the proposed USEPA restricted uses to ensure recipient government is aware and able to mitigate the risks. If restricted based on other than use hazard, an EA shall be conducted.

Table 2: EPA Registration Status and EPA/WHO Toxicity Classes of Pesticides Typically Used on vegetables in BiH

Ref #	1/Active Ingredient/ Chemical)	2/Crop requested for	3/a)EPA Registra-tion Status;	4/ EPA approved crops	5/Toxicity Class (EPA (2), WHO (3))	6/Commercial Product Name (BiH)
FUNGICIDES						
1	Azoxystrobin	C, T, Po	GUP	Yes	EPA IV WHO U	Quadris KS

Ref #	1/Active Ingredient/ Chemical)	2/Crop requested for	3/a)EPA Registra-tion Status;	4/ EPA approved crops	5/Toxicity Class (EPA (2), WHO (3))	6/Commercial Product Name (BiH)
2	Benalaxyl	Po, T, GO, C	NR		EPA None WHO U	Galben-M, Galben-C, Baldo-M, Baldo-C
3	Bitertanol	C	NR	Yes	EPA None WHO U	Baycor WP
4	Copper hydroxide	Po, T, GO, C	GUP	Yes	EPA I-III (potential eye irritation) WHO III	Champion WP 50, Cuprablau Z, Kocide DF
5	Copper oxychloride	Po, T, GO, C	GUP	Yes	EPA II-III WHO III	Cuprocaffaro 50WP
6	Copper sulfate	Po, T, GO, C	GUP	Yes	EPA II WHO Not listed	Modra galica
7	Cyprodinil	GS, C, T, Pe	GUP	Yes	EPA III-IV WHO not listed	Switch 62,5WG
9	Fenhexamid	To	GUP	Yes	EPA III WHO U	Teldor SC
10	Fosetyl-Al	C, GS	GUP	Yes	EPA I WHO not listed	Alliete Flash WG
11	Iprovalicarb	C, Pe, Po, T	NR	Yes	EPA None WHO U	Melody Duo WP
12	Mancozeb (dithiocarbamate)	GO, T, Po	GUP	Yes	EPA IV WHO U	Dithane-M45
13	Metalaxyl	Po, T, C, GO	GUP	Yes	EPA III WHO III	Ridomil Gold MZ, Metalaxyl, Metador
14	Metiram (dithiocarbamate)	GO, T, Po	GUP	Yes	EPA IV WHO U	Polyram DF, Aviso DF
15	Myclobutanil	C	GUP	Yes	EPA II WHO III	Systane 12E
16	Other copper based compounds : copper hydroxide+copper sulphate ; copper + organic fungicide	Po, T, GO, C	GUP	Yes	EPA I-III, WHO II-III	Bakreni antracol WP-63, Bakreni dithane WP, Bordoška juha caffaro 20WP, Bordoška suspenzija WP-20
17	Procymidone	T, GS, C	NR		EPA None WHO U	Sumilex 50FL
18	Propamocarb-hydrochloride	C, Pe, Po, T	GUP	Yes	EPA I and III WHO U	Previcur 607SL (EPA III), Tattoo MC (EPA I): Tattoo will not be recommended
19	Propineb (dithiocarbamate)	GO, T, Po	NR	Yes	EPA None WHO U	Antracol
20	Sulfur based compounds (Colloidal sulfur and Dusting sulfur)	Pe, C, Po	GUP	Yes	EPA III WHO U	Kossan WG, Kumulus DF, Chromosul 80, Thivit Jet, Sosavet DF, Sumpor Močivi, Sumpor SC-80
21	Tolylfluanid	GS	NR		EPA not listed WHO U	Euparen Multi WP(WG) 50
22	Triadimefon	C	GUP	Yes	EPA III	Bayleton Special

Ref #	1/Active Ingredient/ Chemical)	2/Crop requested for	3/a)EPA Registra-tion Status;	4/ EPA approved crops	5/Toxicity Class (EPA (2), WHO (3))	6/Commercial Product Name (BiH)
					WHO III	
23	Triadimenol	C	GUP	Yes	EPA II and III WHO III	Bayfidan
INSECTICIDES						
24	Acetamiprid	Po, T, Pe, C	GUP	Yes	EPA III WHO not listed	Mospilan SP 20, Volley SP 20, Acelan 20 SP
25	Dichlorvos-DDVP	GS, GO, Po, T, Pe, C, S	GUP	Yes	EPA I WHO 1b	Kofumin EC 50
26	Fipronil	Po	GUP	Yes	EPA II WHO II	Regent WG 80
27	Foksim (Phoxim)	Po, GS, GO, T, Pe, C, S	NR		EPA None WHO II	Volaton G-5
28	Hexaflumuron	Po	GUP	Yes	EPA III WHO U	Sonet 100Ec
29	Imidacloprid	GO, Po, T, C, Pe	GUP	Yes	EPA III WHO II	Confidor SL 200, Magnum SL 20, Boxer 200 SL, Rapid SL
30	Lufenuron	Po, Pe, To, C,	GUP	Yes	EPA III WHO not listed	Mach Ec 50
31	Pirimicarb	C, T, Pe, Po	GUP	Yes	EPA II WHO II	Pirimor WG 50
32	Thiacloprid	Po, Pe, C, T,	GUP	Yes	EPA II WHO II	Calypso Sc 480
33	Tiametoksam (Thiamethoxam)	Po, Pe	GUP	Yes	EPA III WHO not listed	Actara 25 WG, Acrra 25 WG, Tara WG 25
HERBICIDES						
34	Flufenacet+metribuzin	Po	GUP	Yes	EPA III WHO II-III	Plateen WG 41,5
35	Napropamide	Pe, T	GUP	Yes	EPA III WHO U	Devrinol SC 45, Razza KS
36	Oxyflourfen	GO	GUP	Yes	EPA III WHO U	Goal EC, Verton EC
37	Pendimethalin	Po, GO, T, Pe	GUP	Yes	EPA III WHO III	Stomp 330E, Ston EC
38	Propaquizafop	T, Pe	NR		EPA None WHO U	Agil 100EC
39	Propyzamide	GS	GUP	Yes	EPA III WHO U	Kerb 50W
40	Quizalofop-p-tefuryl	Po	NR		EPA None WHO II	Targa Super EC
BIOLOGICAL/BOTANICAL Pesticides and Repellents (all vital for IPM Programs)						
41	Abamectin (Avermectim)	C	GUP	Yes	EPA II and III WHO not listed	Vertimec Ec 018
42	Azadirachtin (Neem oil extract)	Po, T, Pe	GUP	Yes	EPA-No consensus	NeemAzal TS

Ref #	1/Active Ingredient/ Chemical)	2/Crop requested for	3/a)EPA Registra-tion Status;	4/ EPA approved crops	5/Toxicity Class (EPA (2), WHO (3))	6/Commercial Product Name (BiH)
					WHO-Not listed	
43	*Bacillus thuringiensis*	Po, T, Pe	GUP	Yes	EPA III WHO U	Novodor Sc 3
44	Piretrin (Pyrethrins Synergized)	T, Pe, C	GUP	Yes	EPA III WHO not listed	Keniatox verde EC 41
45	Spinosad	Po, Pe, C, T	GUP	Yes	EPA III WHO U	Laser Ks 24

References for columns:
1/, 2/ and 6/from LAMP technical experts and Zaštita povrća od štetočinja (2004)
3/ and 4/ from www.pesticideinfo.org, www.epa.gov/
5/ from www.who.int.pcs, www.pesticideinfo.org, www.extonet.orst.edu
Notes:
(1) NR: not registered
(2) EPA Toxicity classification: 1, Highly toxic; 2, Moderately toxic; 3, Slightly toxic; 4 Not acutely toxic
(3) WHO classification: 1a, extremely hazardous; 1b, highly hazardous; II, moderately hazardous; III, slightly hazardous; U, unlikely to present acute hazard in normal use. The LD 50 used for acute toxicity is either oral (O) or dermal (D).
[In some cases, references for registration status and toxicity conflict; the PERSUAP Team considered the most up-to-date information, and in consultation with LAMP technical experts, selected the most efficacious and least toxic, according to the information available]

(b) The basis for selection of the requested pesticides

General: The PERSUAP team screened the list of pesticides typically recommended in BiH for use on vegetables. The Team made selections based on the pesticide's USEPA registration status—they are GUPs; they are listed by USEPA as being registered for use on the specific crop and pest/disease or for a similar use; they are registered in BiH by the Ministry of Agriculture, the pesticide regulatory entity; they have relatively lower human toxicity or health risks; and relatively lower environmental risks (the last two criteria are based on the EPA and WHO Toxicity Classes and on the information in Table 5); most are recommended for use in IPM programs; and they treat most pests or diseases in the project locations. All recommendations contained herein have been formulated in consultation with project technical staff. Pesticides that passed the screening process are presented in Table 3 showing the basis for selection. LAMP's selection takes into account the need to use a variety of pesticide families so that pathogens and pests do not develop resistance.

The PERSUAP team, comprised of LAMP technical experts, identified a minimum number of pesticides, selecting from the least toxic *and* most effective alternatives. The pesticides selected will allow farmers to achieve adequate control, within an overall IPM program (Sections (c) and (i)), while conforming to the high quality requirements of the buyers.

Pesticides chosen are applied during different periods of the year, some before the start of plant growth, others during plant growth, and still others after harvest.

Table 3: Basis for selection of the requested pesticides

Pesticide (1)	**Crop** **GS=Green salad** **GO=Green Onion** **Po=Potato** **T=Tomato** **Pe = Pepper** **C=Cucumber**	**Pest/disease (2)**	**Basis for selection (3)**
FUNGICIDES			
Copper hydroxide	Po T GO C	Late blight of potatoes and tomatoes, (*Phytophthora infestans*), late blight of onions (*Peronospora destructor*), late blight of cucumbers (*Pseudoperonospora cubensis),* early blight of potatoes and tomatoes (*Alternari solani)*	Relatively inexpensive and available pesticides. Applied preventatively. Work well against mentioned pests. Have been used in this region for some time. These pesticides can be used within an IPM program with warning that the withholding period is respected which varies according to crops grown e.g. 14 days for potatoes, 28 days for onions, and until flowering for cucumbers. Efficiency depends on the time and method of application, which varies according to crops grown e.g. 14 days for potatoes, 28 days for onions, and until flowering for cucumbers.
Copper oxychloride	Po T GO C		
Copper sulphate	Po T GO C		
Other copper based compounds : copper hydroxide+copper sulphate ; copper + organic fungicide	Po T GO C		
Azoxystrobin	C T Po	Late blight(*Pseudoperonospora cubensis)(Phytopthora infestans)*, Early blight (*Alternaria solani)*	Can be used as a preventative fungicide. Systemic control.
Cyprodinil	GS C T Pe	White mold (*Sclerotinia minor)(Sclerotinia sclerotiorum)*	The only pesticide which is registered for use on these vegetables for the control of this pathogen and by which use there is also control of *Botryotinia sp.* on cucumber and peppers.
Fenhexamid	To	Gray mold (*Botrytis cinerea*), White mold (*Sclerotinia sclerotiorum)*	Has a short withholding period. Can be combined with other botriticides as there is no multiple resistance.
Mancozeb (dithiocarbamate)	GO T Po	Late blight (*Peronospora destructor) (Phytophthora infestans)* Early blight (*Alternaria solani)*	Indispensable protectant fungicide for Late Blight, used in rotation with systemic fungicide; inexpensive; available; effective; recommended for use in IPM Programs. GO – in combination with metalaxyl.

Pesticide (1)	**Crop** **GS=Green salad** **GO=Green Onion** **Po=Potato** **T=Tomato** **Pe = Pepper** **C=Cucumber**	**Pest/disease (2)**	**Basis for selection (3)**
Metalaxyl	Po T C GO	Late blight	Unique preventative fungicide combined with copper based compounds for potatoes, tomatoes, cucumber and onions. Combined with mancozeb for potatoes and tomatoes. Effective.
Metiram (dithiocarbamate)	GO T Po	Late blight (*Peronospora destructor) (Phytophthora infestans)* Early blight (*Alternaria solani)*	Low toxicity; an alternate formulation of Maneb; protectant fungicide used as potato seed treatment.
Myclobutanil	C	Powdery mildew (*Erysphae sp., Sphaerotheca sp.)*	Effective in the control of powdery mildew though systemic action. Fits into IPM as fewer applications are required, low rate of active ingredient, and its safety to beneficial insects.
Propamocarb-hydrochloride	C Pe Po T	Late blight (*Pseudoperonospora cubensis, Phytophthora capsici,Phytophthora infestans)* , damping of fungus (*Pythium debarianum)* early blight of tomatoes (*Alternaria solani)*	Systemic insecticide which improves the management of diseases if alternated with other fungicides having a different mode of action.
Sulfur based compounds (Colloidal sulfur and Dusting sulfur)	Pe C Po	Powdery mildew for peppers (*Leveillula taurica*), powdery mildew for cucumbers (*Erisiphae cichoracearum, Sphaerotheca fuliginea).* General preventative fungicide and miticide, insect repellent.	Sulfur-based chemicals are used for controlling powdery mildew but it can also have an effect on mites. Low toxicity. Need to keep in mind that under high temperatures it can cause leaf burns. Used in IPM.
Triadimefon	C	Powdery mildew (*Erysphae sp., Sphaerotheca sp.)*	Effective at controlling powdery mildew. Short withholding period.
Triadimenol	C	Powdery mildew (*Erysphae sp., Sphaerotheca sp.)*	Effective at controlling powdery mildew. Short withholding period.
INSECTICIDES			
Acetamiprid	Po, T, Pe, C,	Western Flower Trips (*Frankliniella occcidentalis*), Onion trips (*Trips tabaci*), Tobaco whitefly (*Bemisia tabaci*), Colorado beetle, *(Leptinotarsa decemlineata)* Aphids,	Highly systemic in action. Useful in IPM. Effective and less toxic than other alternatives.
Hexaflumuron	Po	Colorado beetle, *(Leptinotarsa decemlineata)*	Growth regulator (does not kill insects but it affects their digestive system and therefore

Pesticide (1)	**Crop** **GS=Green salad** **GO=Green Onion** **Po=Potato** **T=Tomato** **Pe = Pepper** **C=Cucumber**	**Pest/disease (2)**	**Basis for selection (3)**
			development). Useful in IPM.
Lufenuron	Po, Pe, To, C,	Leafminers (*Liriomyza trifolii*, *L. bryoniae* i *Phytomyza horticola*), Colorado beetle, *(Leptinotarsa decemlineata),* Western Flower Trips (*Frankliniella occcidentalis*), Onion trips (*Trips tabaci*), European Corn Borer (*Ostrinia nubilalis*), Tomato fruitworm (*Helicoverpa armigera)*	Growth regulator. Useful in IPM.
Pirimicarb	C, T, Pe, Po	Aphids	Highly systemic in action. Useful in IPM.
Tiametoksam (Thiamethoxam)	Po, Pe	Colorado beetle, *(Leptinotarsa decemlineata),* Aphids,	Highly systemic in action. Useful in IPM.
HERBICIDES			
Flufenacet+metribuzin	Po	Annual grasses.	Cost, Availability, Efficacy.
Napropamide	Pe T	Annual grasses and broadleaved weeds.	Cost, Availability, Efficacy.
Oxyflourfen	GO	Annual and perennial weeds.	Labor Saving, Cost, Availability, Efficacy.
Pendimethalin	Po GO T Pe	Annual grasses and broadleaved weeds.	Cost, Availability, Efficacy.
Propyzamide	GS	Seeding narrow leaved weeds and some broad-leaved weeds and *Cuscuta* sp.	Cost, Availability, Efficacy.
BIOLOGICAL/BOTANICAL PETICIDES/REPELLENTS			
Abamectin (Avermectim)	C	Leafminers (*Liriomyza trifolii*, *L. bryoniae* and *Phytomyza horticola*), Mites (*Tetranychus urticae*)	Very effective at controlling resistant strains.
Azadirachtin (Neem oil extract)	Po, T, Pe	Colorado beetle, *(Leptinotarsa decemlineat*), Aphids,	Plant-based insecticide. Effective control of a wide range of pests.
Bacillus thuringiensis	Po, T, Pe	Colorado beetle, *(Leptinotarsa decemlineata),* European Corn Borer (*Ostrinia nubilalis*), Tomato fruitworm (*Helicoverpa armigera)*	Bioinsecticide. Ecologically acceptable
Piretrin (Pyrethrin)	T, Pe, C	Aphids, Greenhouse whitefly (*Trialeurodes vaporariorum*),	Plant-based insecticide.
Spinosad	Po, Pe, C, T	Leafminers (*Liriomyza trifolii*, *L. bryoniae* and *Phytomyza horticola*), Western Flower Trips (*Frankliniella*	Ecologically acceptable.

Pesticide (1)	Crop GS=Green salad GO=Green Onion Po=Potato T=Tomato Pe = Pepper C=Cucumber	Pest/disease (2)	Basis for selection (3)
		occcidentalis), Colorado beetle, *(Leptinotarsa decemlineat*),	

References for Table 3:
(1) Only pesticides from Table 2 that are GUP and EPA and WHO Toxicity Classes II and above are included in this list
(2) and (3) LAMP technical experts

(c) The extent to which the proposed pesticide use is part of an IPM program
[See Section (i) for specific crop, pest, and pest management option including IPM for specific pests/diseases.]

An integrated disease-management program for controlling vegetable diseases and pests combines the use of all available control methods into one program. For example, the use of fungicides for control of several important diseases can be a major part of the overall disease-management program, but the use of various cultural practices is perhaps even more important in obtaining effective disease control. In integrated disease management, pesticides are the control measure of last resort.

IPM principles started to be introduced into BiH, in a systematic way, only about three years ago. IPM is still not widely used. However, traditional approaches to farming include IPM principles, and because of limited funds—not always by choice—farmers do use IPM.

Since IPM is still not widely practiced or understood, LAMP will be training farmers in safer use of pesticides and IPM, and will assist individual farmers, and also work through the cooperative and association structure, to implement IPM. In addition, since they are in contact with farmers on a regular basis, LAMP technical staff must have the most recent IPM information on hand. Monitoring will take place to ensure that farmers are practicing IPM and that the IPM approach is effective.

LAMP's approach to and experience with IPM for berries will help strengthen the project's assistance in IPM for vegetables. LAMP has been revisiting berry growers, and has taken note of the efforts that are successfully moving farmers towards safer pesticide use, and IPM training areas that need to be strengthened. For berries, there is greater, although still inadequate, pest monitoring; some farmers are now using meteorological monitoring to determine optimal time for spraying; and farmers are employing preventative measures a lot more: using healthier seedlings and not planting on waterlogged sites thus avoiding attacks by *Phytophthora* fungus.

In the vegetable sector, it is expected that through LAMP interventions, farmers will be much more careful with pesticide use on market crops. LAMP training in safe pesticide use and IPM is expected to have a positive impact beyond project target crops.

In the vegetable sector, IPM practices to be introduced by LAMP technical staff will include the following recommendations:

- Select disease resistant varieties and high quality (certified virus-free), healthy stock;
- Trickle irrigation (as opposed to overhead sprinkler irrigation) greatly reduces the wetting of foliage and fruit and the risk of splash dispersal of several important fungal pathogens;
- Keep plantings free from weeds and plant debris;
- Manually control pests and diseases when infestations are low;
- Remove infected plant material from the field;
- Use bait traps/plants for insect pests;
- Apply insecticides as a measured response to monitored pest populations, rather than on a fixed schedule;
- Properly select application methods, using farmer operated hand-pumped backpack sprayers at early stages of plant growth;
- Alternate protectant and systemic fungicides from different chemical families to reduce the use of more toxic pesticides and to avoid developing resistant pathogen strains.

Section (l) contains information on monitoring pesticide use and implementation of IPM measures.

(d) The proposed method or methods of application, including availability of appropriate application and safety equipment

Table 4 shows protective clothing that is recommended for a few of the LAMP-requested pesticides. Rather than list all protective clothing for each pesticide, which varies by formulation, LAMP will be training and encouraging farmer groups to apply pesticides using appropriate safety clothing and equipment, as described on pesticide labels, and will encourage chemical dealers to ensure that safety clothing and equipment are available. Except for the summer months, the area is relatively cool, and there should be less objection to using protective clothing and equipment than in hotter regions.

Farmers apply pesticides in their own fields, and do not use trained applicators. The majority of mentioned pesticides are applied by spraying; an exception is thiamethoxam, which is applied through the irrigation system. Type of sprayers depends on the size of the area under planting. Back sprayers (10-20l) are mostly used in closed areas and tractors with 330l sprayers are most frequently used in the open space. Protective clothing which may be used includes long-sleeved shirts and trousers, gloves, boots, face protection gear.

Safe and appropriate application methods are a requirement of some EU buyers under EUREPGAP and are verified by field audits. LAMP will promote the safe application of pesticides and IPM, gradually introducing EUREPGAP standards to make local producers aware of EU standards should they wish to export these products in the future and to gradually prepare BiH for the eventual accession into the EU. The introduction to EUREPGAP standards will first be undertaken through the MASHAV trainers (plant protection specialists from Israel) and then continually reinforced through BiH technical specialists in the field.

LAMP will implement a monitoring program, through farmer groups or local agronomists as appropriate, to ensure that the clothing and equipment are being used, used correctly, and are maintained. Some improvements in this respect have been noticed in the berry sector, however, LAMP intends to provide further training in safer use practices (in the berry and vegetable sector), and improve application methods so that they are safer for farmers and less potentially harmful to the environment. This training will be provided by two technical specialists from the Agriculture Faculty of Sarajevo University, both of whom have specialized training and experience in IPM and safety aspects of pesticide use (furthermore, one of the specialists is one of the leading experts in BiH on pesticide residues and EU standards).

Table 4: Example of Protective Clothing Required for Some LAMP-requested Pesticides

Pesticide	Protective Clothing (1)
FUNGICIDES	
Azoxystrobin	Long-sleeved shirt, long pants, chemical resistant gloves, shoes and socks
Copper hydroxide	Dust mask and eye protection
Mancozeb	Safety glasses, chemical resistant gloves and apron or other impervious clothing

(1) This is a sample of the protective clothing and equipment required; protective equipment varies by formulation, and a proper label should specify the requirements for that particular product.

(e) Any acute and long-term toxicological hazards, either human or environmental associated with the proposed use and measures available to minimize such hazards

Table 5 shows the hazards associated with the pesticides being requested by LAMP.

Table 5: User and Environmental Hazards Associated with LAMP Requested Pesticides

	Pesticide	Acute/Chronic Toxicity (human hazards)	Eco-toxicity	Groundwater (GW) Contamination Potential
FUNGICIDES				
1	Azoxystrobin	Acute oral, dermal, inhalation-RNT-ST. Harmful if absorbed through the skin. Not a likely carcinogen.	ST to HT to fish.	Potential water contaminant; *For terrestrial uses only; should not be applied directly to water or in a way that will contaminate water (e.g. Shallow water tables).*
2	Copper hydroxide	Severe eye irritation. Skin and respiratory tract irritation. Carcinogenicity unknown.	HT to molluscs. RNT to crustaceans.	Not known.
3	Copper oxychloride	Acute effects: RNT Chronic toxicity includes hepatic cirrhosis & brain damage	HT to earthworms; MT to fish, aquatic inverts; RNT to birds, beneficial arthropods	No evidence of contamination potential, unlikely to enter GW
4	Copper sulfate	Moderate acute toxicity. No evidence of chronic effects in humans	ST to fish.	Insufficient data.
5	Cyprodinil	Causes moderate eye irritation. Harmful if absorbed though the skin. Carcinogenicity unclassifiable.	T to fish and aquatic invertebrates.	Potential water contaminant; *For terrestrial uses only; should not be applied directly to water or in a way that will contaminate water (e.g. Shallow water tables).*
6	Fenhexamid	Acute oral, dermal, inhalation-RNT. Not a likely carcinogen.	ST to MT to fish.	Potential water contaminant; *For terrestrial uses only; should not be applied directly to water or in a way that will contaminate water (e.g. Shallow water tables).*
7	Mancozeb (dithiocarbamate)	Acute oral, dermal, inhalation-RNT. Probably carcinogen; endocrine disruptor (on 4 of 4 lists), development or reproductive toxin.	HT to fish, aquatic inverts, MT to bees, aquatic plants; RNT to birds	Does not accumulate in soil; moderate potential to contaminate GW
8	Metalaxyl	Causes eye irritation; harmful if inhaled or absorbed through skin. Carcinogenicity unknown. No other effects on humans.	Practically non-toxic to birds, bees, & fish	Potential water contaminant; *For terrestrial uses only; should not be applied directly to water or in a way that will contaminate*

	Pesticide	Acute/Chronic Toxicity (human hazards)	Eco-toxicity	Groundwater (GW) Contamination Potential
				water.
9	Metiram (dithiocarbamate)	Not acutely toxic Suspected endocrine disruptor; not a cholinesterase disruptor; probable carcinogen	ST to fish; MT to other aquatic organisms; T to birds and other wildlife	Potential water contaminant; *For terrestrial uses only; should not be applied directly to water or in a way that will contaminate water (e.g. Shallow water tables).*
10	Myclobutanil	Slight acute toxicity. Not likely carcinogen. Likely developmental or reproductive toxin.	MT to fish.	Insufficient data.
11	Other copper based compounds : copper hydroxide+copper sulphate ; copper + organic fungicide	Similar to other copper based compounds.	Similar to other copper based compounds.	Similar to other copper based compounds.
12	Propamocarb-hydrochloride	Causes moderate eye irritation. Not likely carcinogen.		Insufficient data. Do not apply directly to water.
13	Sulfur based compounds (Colloidal sulfur and Dusting sulfur)	Acute-RNT Chronic-RNT	Minimal threat to non-target species; ST to fish; RNT to birds, aquatic inverts, bees, beneficial arthropods	Not expected to have negative impact. Elemental sulfur leaches in soil as sulfate, at a slow rate.
14	Triadimefon	Moderate acute toxicity. Suspected endocrine disruptor. Possible carcinogen. Developmental or reproductive toxin.	ST to fish. RNT-ST to birds. NT to bees.	Potential water contaminant; *For terrestrial uses only; should not be applied directly to water or in a way that will contaminate water.*
15	Triadimenol	Moderate acute toxicity. Possible carcinogen. Suspected endocrine disruptor.	ST to fish. RNT-ST to birds. NT to bees.	Insufficient data.
INSECTIDES				
1	Acetamiprid	Low dermal and inhalation toxicity. May irritate eyes and the skin and may absorb through the skin. Unlikely human carcinogen.	ST to MT to bees. NT to MT to birds. NT to fish.	Not known.
2	Hexaflumuron	Slight acute toxicity. Moderate eye irritation. Harmful if absorbed through the skin.	HT to fish. Slight acute toxicity.	Insufficient data.
3	Lufenuron	Causes moderate eye irritation. Harmful if absorbed through the		Insufficient data. Do not apply directly to water.

	Pesticide	Acute/Chronic Toxicity (human hazards)	Eco-toxicity	Groundwater (GW) Contamination Potential
		skin.		
4	Pirimicarb	Limited information.	ST-HT birds. MT to mammals. NT to bees.	Low risk. Moderately persistent and mobile.
5	Tiametoksam (Thiamethoxam)	Moderate eye irritation. A likely human carcinogen.	HT aquatic invertebrates. HT to bees.	Potential water contaminant; *For terrestrial uses only; should not be applied directly to water or in a way that will contaminate water.*
HERBICIDES				
1	Flufenacet+metribuzin	Slight acute toxicity. Not likely carcinogen.	MT to fish. ST to birds. ST to mammals. Practically not toxic to bees. HT to terrestrial and aquatic plants.	Potential water contaminant; *For terrestrial uses only; should not be applied directly to water or in a way that will contaminate water.*
2	Napropamide	Slight acute toxicity. Unlikely carcinogen.	ST to fish and crustaceans. Practically non toxic to birds.	Potential water contaminant; *For terrestrial uses only; should not be applied directly to water or in a way that will contaminate water.*
3	Oxyflourfen	Slight acute toxicity Possible carcinogen; not a cholinesterase inhibitor; insufficient data on endocrine disruption; reproductive toxin	HT to fish and other aquatic organisms; MT to other wildlife.	Insufficient data on GW contamination
4	Pendimethalin	Slight acute toxicity. Possible carcinogen. Suspected endocrine disruptor. Suspected gastrointestinal or liver toxicant.	MT-HT to fish and aquatic invertebrates. ST to birds. Non toxic to bees. Moderate risk to non-target terrestrial and semi-aquatic plants.	Potential for water contamination is low as the chemical has high affinity to bind with soil and sediment particles.
5	Propyzamide	Slight acute toxicity. Likely/recognized carcinogen. Suspected endocrine toxicant.	RNT to fish. ST to amphibians. Practically non toxic to birds. NT to bees.	Potential water contaminant; *For terrestrial uses only; should not be applied directly to water or in a way that will contaminate water.*
BIOLOGICAL/BOTANICAL PESTICIDES				
1	Abamectin	High acute toxicity. Slight to moderate eye irritation and mild skin irritation.	ST-HT to fish. Extremely toxic to aquatic invertebrates. Non-toxic to birds. HT to insects. HT to	Immobile and unlikely to leach in soils and therefore unlikely to contaminate water.

	Pesticide	Acute/Chronic Toxicity (human hazards)	Eco-toxicity	Groundwater (GW) Contamination Potential
		Developmental or reproductive toxin. Unlikely carcinogen.	bees.	
2	Azadirachtin (Neem oil extract)	Acute oral: RNT; No chronic toxicity noted	HT to fish; MT to aquatic invertebrates; RNT to bees, beneficial arthropods	Insufficient data on groundwater contamination potential, but unlikely to cause problems.
3	*Bacillus thuringiensis*	Non toxic. Unlikely carcinogen.	Not toxic to birds and fish. Shrimp and mussels may be affected adversely. Not toxic to most beneficial insects.	Unlikely to cause problems because of rapid biological breakdown.
4	Piretrin (Synergized Pyrethrins)	Slight acute toxicity. Causes adverse effects if inhaled. Possible carcinogen.	HT to fish. ST to birds. Toxic to bees.	Unlikely contaminant.
5	Spinosad	Slight acute toxicity. Unlikely carcinogen.	RNT-ST to birds. ST to fish. HT to bees.	Immobile and unlikely to leach in soils and therefore unlikely to contaminate water.

Information in this table is primarily from www.pesticideinfo.org, www.epa.gov/pesticides, www.extoxnet.orst.edu
HT=highly toxic
MT=moderately toxic
T=Toxic
ST=slightly toxic
RNT=relatively non-toxic

(f) The effectiveness of the requested pesticides for proposed uses

To determine the most effective pesticides for the proposed uses, the PERSUAP team discussed with LAMP and other technical experts, and consulted web sites and the Crop Protection Reference 2004. The requested pesticides will likely be the most effective in controlling the specific pests. They will be used in conjunction with IPM measures, which will prove more effective than the pesticide alone, and be less hazardous to human health and the environment.

(g) Compatibility of the proposed pesticides with target and non-target ecosystems

Table 5, "User and Environmental Hazards," discusses the main risks the requested pesticides pose to non-target organisms and the environment. While this Amended PERSUAP requests approval for the least toxic pesticides typically used for vegetables in BiH, many of the requested pesticides pose some risk to non-target ecosystems. The Amended PERSUAP proposes training and monitoring to minimize environmental threats.

Some of the requested pesticides pose a threat to ground or surface water, and also to aquatic organisms. Training will also take these threats into account, and trainers will ensure that farmers understand the importance of protecting the aquatic environment, and that they have the tools necessary to implement precautionary measures. In the case of the berry sector, this issue was not a particular problem as berry plantations are on hillsides away from waterlogged sites and streams. LAMP will ensure that the effect of pesticides on water sources and the aquatic ecosystem is addressed in the vegetable sector where it is applicable. Since many of the crops are grown under greenhouses, mitigation to minimize effects on aquatic resources will be fairly simple to undertake.

In all cases, proper application, storage, and disposal to minimize threats to non-target ecosystems and species will be an integral part of training. Pesticide use, storage and disposal will be monitored to prevent misuse or drift and run-off from application site, and to protect non-target species and surface and groundwater.

Where honey bees and other pollinators are present, precautions must be taken to prevent poisoning. If the vegetable crop is the only attractive plant within flight range, bee colonies from several miles away may be affected. Thiamethoxam spinosad, and abamectin are highly toxic to honey bees. Precautions include not applying these pesticides during the blooming period; using the lowest effective rate; using the pesticide least hazardous to bees; use the pesticide with the shortest residual effect; using sprays or granules instead of dusts; applying pesticides in late afternoon or at night when bees are not working blooms; avoiding drift of pesticides onto plants that are attractive to bees; and notifying beekeepers several days before applying pesticides.

These precautions should be incorporated into IPM and safer use training, where honey bees and other pollinators are present. Already LAMP has been raising this issue with berry growers and noticed that most farming communities are quite organized in this respect. Before spraying, berry growers put signs up and notify neighboring apiculturalists when spraying will take place. Similar can be applied with vegetable growers. Furthermore, as many vegetables are increasingly grown in greenhouses, the adverse impact on bees and other non target organisms will be further reduced.

(h) The conditions under which the pesticides are to be used, including climate, flora, fauna, geography, hydrology, and soils

Summarized mostly from NEAP (2003).

Varied agro-climatic conditions and the potential for low-cost irrigation allow production of a wide range of crops. The inland mountain areas experience a continental climate, with harsh winters of 3-4 months at higher altitudes. Rainfall in these areas averages 800-1,000 mm per year with the majority of precipitation falling in the winter months, although much of the winter precipitation is snow. Temperatures range from 22 ^{o}C in July to 0 ^{o}C in January. Moving towards the coast, in Herzegovina, the climate becomes more Mediterranean with wet winters, dry summers and higher temperatures. Mostar has an annual average rainfall of 1,500 mm (of which less than 200 mm falls from June-

September), summer temperatures of 25-30 ^{o}C, and winter temperatures of 5 ^{o}C. These agro-climatic conditions allow most forms of crop and livestock production.

Vegetable growing is concentrated in Herzegovina, in the lowland areas close to urban markets and/or processors, and increasingly so in greenhouses. Crops such as beans, cabbage, onions, tomatoes, green pepper, salads and green onions are most prominent. Potatoes are generally grown in the hilly-mountainous areas throughout Bosnia-Herzegovina.

Bosnia and Herzegovina is contained within the Black Sea catchment (75.7 percent) and the Adriatic Sea catchment (24.3 percent). In spite of the relative abundance of water resources, there is spatial and time variation resulting in some areas experiencing heavy flooding in winter months and drought in the summer. Water resources are under threat due to inadequate catchment protection, insufficient wastewater treatment plants, poor maintenance of sewage systems, intense exploitation of forests and uncontrolled use of pesticides. Only about 2% of arable land is irrigated.

Soils in BiH are very heterogeneous. Automorphous soils make up 86% of the total, while the remaining 14% are hydromorphous soils. The content of humus in agricultural soils is approximately 50% lower than in soils covered with forest vegetation and is showing a tendency to decline. Hydromorphic soils with good conditions for agricultural production dominate the northern part of BiH on flat and moderately undulating terrain in the valleys of the Sava River and its tributaries. The central part of BiH is mainly hilly and mountainous region with steep and sloping terrain. This area is covered mainly by dystric cambisol, humus that overlies limes and dolomites and lessivated soil as well as diluvial soils that are mainly covered by forests and pastures. Southern part of BiH, the Herzegovina region, is dominated by shallow layers of soil on lime/dolomite substrata and with sparse covering of vegetation and rock outcrops. Mainly the narrow strips of land located along the Neretva and Trebisnjica Rivers are used for agriculture such as vegetables, fruits, vineyards and tobacco.

(i) The availability and effectiveness of other pesticides or non-chemical control methods

The use of pesticides can be reduced through the application of IPM principles specified in Table 6. Various measures also exist that may reduce the reliance on specific pesticides generally used in BiH, for example:

Fungicides

- **Copper-based compounds** – the reliance on copper-based compounds could be reduced by using preventative measures though the selection of healthy seeds and seedlings and selecting varieties with higher pathogen resistance. It is important to destroy disease infected areas from the previous season (which is often as issue in monoculture particularly in potatoes).

- **Sulfur-based compounds** – Planting more resistant hybrids. Avoid the use of sulfur-based compounds when entomophage controlling pesticides are used. Pathogens are more frequent in protected than on open terrain (where they occur at the end of vegetative period).
- **Fenhexamid –** Substrate sterilization is a very important measure in closed area. In open areas for *Sclerotinia sp.* it is necessary to plough deeply so that *Sclerotinia* is pushed deeply underground. The fungicide is used during flowering.
- **Cyprodinil** – Crop rotation, soil sterilization. Treating the plant at the zone of collar stem will reduce attacks.
- **Fosetyl-Al** – Preventative measures: resistant cultivars, appropriate timing for seeding, wider planting, ensuring good aeration of the area. (not being requested)
- **Fenarimol** – The use of resistant cultivars particularly in closed areas. (not being requested)
- **Carbamates (propamocarb-hydrochloride) –** Healthy seed, disinfection, selecting well-drained soils.

Insecticides

- **Dichlorvos-DDVP –** This is a highly toxic pesticide used in BiH and LAMP will work to encourage farmers to use less toxic pesticides such as bioinsecticides (NeemAzal) and by planting disease free seedlings, using mechanical control such as nets, natural enemies (parasites and predators), and implementing crop rotation.
- **Thiamethoxam, Acetamiprid –** Alternatives to these insecticides, some of them relatively toxic, include growth regulators such as hexaflumuron, bioinsecticides (Azadirachtin, *B. thuringiensis*), parasites and predators.

Herbicides

The use of herbicides can be reduced or avoided by using mechanical removal methods.

Table 6: Pest control methods available:

Crop	Main Pest/Disease Problems	Integrated Pest Management
Green salad	Late blight (*Bremia lactucae*)	Choose more resistant cultivars, crop rotation, not too dense plantings, ensure good soil drainage, destroy diseased plants. One-two chemical treatments during seedling raising and up to 1 after transplanting.
	White mold/ (*Sclerotinia minor*)	Use of resistant cultivars, soil sterilization (solarization), ensure that water ponding is not occurring during watering, removal of diseased plants. Maximum 2 chemical treatments at the start of vegetative period.
	Salad bacteriosis (*Pseudomonas* sp. *Erwinia* sp.)	Crop rotation (4 year is the best), balanced feed with nitrogen and potassium. Removing and destroying diseased plants.
	Viroses (CMV, LeMV)	The use of certified seedlings and seeds (free of viruses), control of weeds which can be hosts to viruses and control of vectors (aphids), ensure optimal application of nitrogen (do not over-apply as plants become sensitive), remove and destroy diseased plants.
	Wireworms (Elateridae)	Substrate disinfection.

Crop	Main Pest/Disease Problems	Integrated Pest Management
	Aphids	Covering with nets, the use of parasites, predators and bioinsecticides.
	Leafminers (*Liriomyza trifolii*, *L. bryoniae* and *Phytomyza horticola*),	Covering with nets, the use of parasites, predators and bioinsecticides.
Green onion	Late blight (*Peronospora destructor*)	Preventative measures: crop rotation and healthy seedlings. Pathogens on bulbs can be destroyed with thermotherapy. Drip system of watering is better than a sprinkle system which tends to increase the chance of infection. As this pathogen frequently occurs, it is necessary to combine systemic fungicides based on metalaxyl with contact fungicides.
	Grey mold (*Botrytis spp.*)	Selection of tolerant cultivars, crop rotation and use balanced nitrogen fertilizers.
	Rust (*Puccinia allii*)	Pathogen over-winters on diseased remains so all infected plants from previous years need to be destroyed. Fungicides which control late blight also control rust.
	White mold (*Sclerotiu cepivorum*)	Since infections originate from soil where sclerotia survives, the best measure is crop rotation (at least 3 years, preferably 5-6). Aim for soil pH of 4.8 as this does not suit the pathogen. Moderate application of nitrogen fertilizers.
	Viroses (AV1)	Healthy seedlings.
	Onion fly (*Delia antiqua*)	Covering with nest. Mixed sowing/planting of onions and carrots.
Potato	Late blight (*Phytophthora infestans*)	Healthy certified seed potatoes and resistant cultivars. Crop rotation is essential. Mounding is essential to ensure that water runs-off in canals between rows. Avoid heavy soils. Timely management of infected areas. Since the pathogen is common in this region it needs to be treated preventatively when the potato plants are 20cm tall or during flowering using contact fungicides in nearby areas where pathogen is observed. Use systemic fungicides on infected potato plants. Wide spectrum of pesticides can be used in combination, as needed, to reduce plant resistance. The disease can be predicted if instruments exist for monitoring temperature, air humidity, precipitation and spores. Timing of treatment can be predicted on the basis of obtained information although this is not a usual practice here due to the lack of equipment.
	Early blight (*Alternaria solani*)	Healthy seed potatoes, resistant cultivars and crop rotation. Disease can be predicted if leaf moisture is monitored as well as minimum and maximum temperatures which help determine the timing of disease control.
	Black scurf (*Rhizoctonia solani*)	Healthy seed potatoes and buds placed not too deep, crop rotation, optimal planting period.
	Bacteriosis and viroses	Healthy seed potatoes and disease-free soil. Crop rotation.
	Colorado beetle *(Leptinotarsa decemlineat*)	Tolerant varieties, bioinsecticides and growth regulators.
	Aphids	Parasites, predators and bioinsecticides.
Tomato	Late blight (*phytophthora infestans*)	Crop rotation that does not include potatoes. Planting of more resistant hybrids. There is a wide choice of fungicides but needs to bear in mind the withholding period.

Crop	Main Pest/Disease Problems	Integrated Pest Management
	Early blight (*Alternaria solani*)	Healthy seedlings. Soil sterilization. Chemical treatment during seedling production.
	White mold (*Sclerotinia sclerotiorum*)	Crop rotation; destroy diseased plant remains, soil sterilization (water vapor). Deep ploughing. Spraying of plants around the root neck will reduce attacks.
	Gray mold (*Botrytis cinerea*)	Maintaining optimal moisture (especially in covered areas), maintaining hygiene in greenhouses, removing the plant material collected after the removal of side shoots. Start applying fungicides at times of flowerings and removal of side shoots.
	Verticilosis and fusariosis (*Verticillium sp., Fusarium sp.)*	Soil sterilization, healthy seedlings, crop rotation and phytohygiene measures.
	Bacteriosis and viroses	Healthy seedlings, substrate sterilization, crop rotation, removal of diseased plant remains, phytohygiene and control of weeds and vectors.
	Leafminers (*Liriomyza trifolii*, *L. bryoniae* and *Phytomyza horticola*)	Tolerant hybrids, parasites, predators and bioinsecticides.
	Greenhouse whitefly (*Trialeurodes vaporariorum*)	Tolerant hybrids, parasites, predators and bioinsecticides.
Peppers	Damping off (*Pythium* sp., *Fusarium* sp., *Rhizoctonia* sp., *Alternaria* sp.)	Sterilization of substrates (water vapour), seeding of healthy seeds, phytohygiene measures, airing of hotbeds/greenhouses. Use of fungicides after planting.
	Collar rots and stem rots (*Phytophthora capsici*)	Soil disinfection.
	Powdery mildew (*Leveillula taurica*)	Choosing resistant cultivars. Sulfur-based compounds can be used for preventative purposes.
	Bacteriosis and viruses of peppers	Healthy seedlings, phytohygiene measures.
	Aphids	Crop rotation, tolerant hybrids, parasites, predators, bioinsecticdes.
	Thrips	Crop rotation, tolerant hybrids, parasites, predators, bioinsecticdes.
Cucumbers	Late blight (*Pseudoperonosora cubensis*)	Crop rotation (without *Cucurbitaceae* the previous year), spraying of fungicides on the reverse side of the leaf where the disease occurs.
	Black stem rot and white stem rot (*Didymella brioniae*, *Sclerotinia sclerotiorum*)	Planting of healthy seeds and seedlings, crop rotation, destroying diseased plants before sclerosis is formed, soil sterilizing (water vapor).
	Bacteriosis and viroses	Healthy seedlings, phytohygiene measures, crop rotation.
	Leafminers (*Liriomyza trifolii*, *L. bryoniae* and *Phytomyza horticola*),	Tolerant hybrids, parasites, predators and bioinsecticides.
	Greenhouse whitefly (*Trialeurodes vaporariorum*	Crop rotation, tolerant hybrids, parasites, predators, bioinsecticides.
	Mites	Crop rotation, tolerant hybrids, parasites, predators,

Crop	Main Pest/Disease Problems	Integrated Pest Management
		bioinsecticides.
Spinach (Green Salad)	Late blight (*Peronospora farinosa f.sp. spinacea*)	Healthy seed and resistant cultivars. Use crop rotation if there were infections in the past; sol sterilization (solarization), destroy diseased plants. Apply mancozeb and metalaxyl in instances where the environmental conditions are right for the pathogen to expand.
	Anthracnose (*Colletotrichum dematium f.sp. spinaciae*)	Healthy and treated seeds, resistant cultivars, crop rotation.
	Viruses (CMV, BMV, BYV)	Healthy seeds.
	Aphids	Use net covering, tolerant hybrids, parasites, predators, bioinsecticides.
	Leafminers (*Liriomyza trifolii*, *L. bryoniae* and *Phytomyza horticola*),	Use net covering, tolerant hybrids, parasites, predators, bioinsecticides.

Note: Information in this table provided by LAMP technical staff and Zaštita povrća od štetočinja (2004).

(j) The requesting country's ability to regulate or control the distribution, storage, use, and disposal of the requested pesticide

BiH inherited in 1992 the phytosanitary legislation from the former Yugoslavia. Since then, the two responsible entity Ministries of Agriculture have worked largely independently on the improvement of the legislation. Because not all areas of the phytosanitary legislation have been modified and the laws and regulations are not harmonized between the entities, the legal framework is rather weak and not in line with EU standards.

In the absence of appropriate state level institutions the responsibility for the implementation of any phytosanitary measure is in the jurisdiction of the Federal Ministry of Agriculture (FBiH MoA), the Republika Srpska Ministry of Agriculture (RS MoA) and the Agricultural Department of the District Brcko (AgDep DB). Because of a lack of coordinating mechanisms, this creates practical problems in the implementation at the borders as well as inland.

Based on recommendations of the EU Road Map and the EU Feasibility Study the BiH Ministry of Foreign Trade and Economic Relations (MoFTER) initiated in early 2003 the establishment of a Phytosanitary Commission. The commission had a temporary character for six months only, and was designed to develop the legal framework for all plant health related matters. The commission was comprised of representatives of the entity Ministries of Agriculture, the District Brcko and scientific agricultural institutions (faculties and institutes). MoFTER only chaired the commission and served as a secretariat. Due to some financial constraints the work of the commission lasted twelve months. The Commission received some technical assistance from Slovenian experts to assure EU compliance. Because of the complicated administrative structure of BiH, the EU directives could not be just copied. Although the Slovenian administration is different than BiH's, the Slovenians had historically the same legal background and

underwent the introduction of EU compliant laws and regulations recently. Therefore, their expertise was highly appreciated.

The commission finished drafts of several phytosanitary laws and regulations and handed them over to MoFTER. Amongst these laws is the Law on Plant Protection Products in BiH published on November 2, 2004 in the Official Gazette (OG 02/2005). This law is harmonized with EU standards; however the law only sets the framework for the development of secondary legislation.

Law on Plant Protection Products in BiH

The Law on Plant Protection Products basically sets the framework for the use and marketing of all plant protection products. It regulates the licensing of those products according to their active substances which need to be included in a positive list (approved substances). BiH acknowledges the EU list of active substances which is based on scientific evaluations. Once a substance is included in the positive list, the authorities may authorize the use of products containing them. This is a very pragmatic approach taking into consideration both the high EU safety standards and BiH's economic situation as well. The law stipulates conditions for individuals and legal entities trading with plant protection products, the register of traders and users as well as the technical requirements regarding the application. Furthermore, the role of the public service in the control and application, and the responsibilities of the different authorities on state and entity level are prescribed. Unfortunately this law is not yet implemented. The reason for this is the lack of secondary legislation as well as the absence of a government body to implement the law.

Future

In order to meet international standards and to fulfill international obligations, BiH needs to have a competent authority on state level as a focal point for all plant health related matters. BiH is a signatory of the International Plant Protection Convention (published in OG 8, 10/2003-International Agreements). Consequently, this means that BiH accepted the obligation to establish a national organization for plant health (i.e. BiH Administration for Plant Health). The BiH Administration for Plant Health has been established in the middle of 2005 but it currently has only one, albeit very competent, staff member. The Administration is expected to expand to needed capacity in the next few months.

The activities in the field of regulating the use and trade of plant protection products should be as follows:

- Preparation and adoption of by-laws/regulations
- Harmonisation, review, updating and expansion of the BiH list of plant protection products (active substances)

Implementation

The BiH Administration for Plant Health needs to establish mechanisms on how to cooperate with the competent entity bodies and the District Brcko. Given the complicated administrative system in BiH, success or failure in the implementation of the laws depends strongly on the establishment of functioning mechanisms. Implementation rules are currently being drafted and this is being supported by the EU. LAMP will also provide technical support to address organizational issues. This will help BiH to implement the law according to EU standards.

Currently BiH imports all of the pesticides as no pesticides are produced in the country. The procedure for importing pesticides is as follows:

1. Companies (as legal entities) must be registered with the relevant Ministry of Agriculture (RS, FBiH or the District of Brcko as relevant)
2. Must have appropriate storage for pesticides
3. Must have an adequately trained employee (i.e. an agronomist)
4. For every pesticide a company wishes to import, a copy of registration for use in the country of origin must be submitted, as supplied by the relevant authority of that country
5. For every pesticide a company wishes to import, an approval for its use needs to be obtained from the Ministry of Health. Then a request for registration for use in BiH must be submitted to the Ministry of Agriculture. Following this, permission for import needs to be obtained from the Ministry of Foreign Trade and Economic Relations.

The above-mentioned administrative procedures have been put in place in absence of an adequate laboratory in the FBiH for the testing of pesticides. In the RS, there is a laboratory for testing pesticides at the Agriculture Institute in Banja Luka. Therefore, in the RS, pesticides need to be tested at the laboratory before they can be registered for use by the Ministry of Agriculture. Then a license for permission for import can be obtained from the Ministry of Foreign Trade and Economic Relations.

(k) The provisions made for training users and applicators

LAMP training will target LAMP staff and project beneficiaries. LAMP will also include agricultural service providers (Government extension workers and pesticide dealers, if possible). In general, the training will cover IPM/safer use of pesticides, including safety clothing and equipment, storage, application, and disposal of unused pesticides and used containers, pest resistance, and environmental considerations, including protection of aquatic resources, birds, and other wildlife, honeybees, and domestic animals. LAMP will make a special effort to target all family members who may work in the fields or come in contact with pesticides.

For pesticides highly toxic to aquatic organisms, and/or that could contaminate groundwater, trainers/technicians should give specific instructions about protecting aquatic habitats and groundwater. For pesticides highly toxic to birds, bees, and other

wildlife, trainers/technicians should give specific instructions about protecting habitat, including preventing drift.

The summary of the LAMP PERSUAP for the vegetable sub-sector will be translated and made available to LAMP partners in the sub-sector, and it will be used as a basis for training.

Proposed Training Methods:

- LAMP shall provide training in IPM to farmer groups and agricultural advisors. This will be incorporated within farmer training on vegetable production as well as more intensive IPM training focusing particularly on agricultural advisors (extension agencies, agronomists at food processors, LAMP agronomists and other pesticide advisors). The initial 2-day training in IPM and safe pesticide use will be provided through the Israeli MASHAV program and continued on by two BiH technical specialists (who will also take part in the training but already are leading experts in BiH in IPM and safe pesticide use).
- Any LAMP supported training to farmer groups on pesticide application in vegetables shall incorporate IPM and training in safe pesticide use. This will be undertaken by BiH technical specialists.

LAMP's training in IPM and pesticide safer use practices for berry growers has already shown results, and farmers are using pesticides more safely, as described above (section c).

(l) The provisions made for monitoring the use and effectiveness of the pesticides
Currently farmers use field observation to monitor the need for pesticides and the effectiveness of pesticides. LAMP will strengthen farmer capacity to use field observation within an overall IPM program.

LAMP will encourage farmer groups, directly and/or through agronomists and local extension agencies, as relevant, to monitor pests, efficacy of pesticides and safe application of pesticides. In the case of the berry sector, LAMP has taken every opportunity to promote IPM and safe application of pesticides. Pest monitoring is being undertaken to a greater extent than before but there are still improvements to be made. Some farmers are particularly advanced having obtained meteorological stations which can provide them with better information on optimal periods for spraying. Better control of pests is being achieved though the implementation of IPM measures but continued training in this respect is needed. Continued efforts in awareness raising of safe pesticide application practices are also necessary.

Besides monitoring at the farmer/field level, LAMP will undertake further monitoring associated with pesticide use and the provisions of this PERSUAP, which may include the following:

- Registration status (change in status of requested pesticides)
- Phase out of select pesticides (Table 7) by 9/30/06

- Training implemented and safer use practices applied (farmers and agriculture service providers aware of and using the information)
- Chemicals being used by farmers; minimum reliance on chemicals
- Efficacy of IPM measures
- Pesticides being sold to farmers with intact labels
- Safety clothing and equipment available and maintained, spare parts available
- Proper storage of pesticides
- Proper disposal of unused pesticides and empty containers

Monitoring pesticide use and implementation of safer practices will be incorporated into LAMP's overall monitoring plan.

III. RECOMMENDATIONS: SAFER USE ACTION PLAN

LAMP shall report to USAID on mitigation measures required herein, including training courses, in project quarterly reports.

1. Remove and phase-out more hazardous pesticides from trainings which LAMP may organize beyond September 30, 2006, unless no suitable alternatives exist. LAMP shall only recommend or assist with the use of pesticides approved herein, and with formulations that are USEPA registered as GUPs; that are registered for use on vegetables; that are registered for use in BiH; and that are above USEPA *and* WHO Toxicity Class I. By September 30, 2006, except for those with no practical alternative, LAMP shall replace pesticides in USEPA Toxicity Class II or WHO Toxicity Class II. Table 7 shows EPA/WHO Toxicity Class I or II pesticides that LAMP is requesting, and that will be phased out by September 30, 2006. Copper hydroxide (eye irritant) and Metlaxyl (some formulations are EPA II) will not be phased out, and the justification for this is given below. If no suitable alternative exists for the more hazardous pesticides (EPA/WHO Toxicity Class II), LAMP will submit a justification for retaining each specific pesticide beyond September 30, 2006. This justification shall be submitted prior to the phase-out date, and shall be in the format of an Amended PERSUAP.

a) On an annual basis, LAMP shall review US EPA registration status, and EPA and WHO Toxicity Classes of approved pesticides, and shall report, in the Quarterly Report, to USAID on any significant revisions.

Table 7 Phase out of select pesticides and justification for not phasing out

Pesticide/Issue	Justification	Mitigation
Copper hydroxide: EPA warns on potential for severe eye irritation.	This can be mitigated, and LAMP requests to retain this pesticide, and not phase it out.	Will ensure applicators use protective eye wear. Safer use training will include this precaution.
Other copper based compounds, including copper hydroxide, copper oxychloride and copper sulfate: Some formulations are EPA I and EPA II. EPA I formulations will not be used.	Copper based compounds are general preventative fungicides recommended in IPM programs, and widely used in BiH.	Will only be used by trained farmers (see training); safety clothing and equipment mandatory; used as part of IPM program.
Metalaxyl: Some formulations	This pesticide was approved in	Will only be used by trained

Pesticide/Issue	Justification	Mitigation
are EPAII	the LAMP berry PERSUAP. LAMP requests to retain this pesticide, and not phase it out as no effective systemic alternative exists.	farmers (see training); safety clothing and equipment mandatory; used as part of IPM program.
Myclobutanil: Some formulations are EPA II	Effective in the control of powdery mildew though systemic action. Fits into IPM as fewer applications are required, low rate of active ingredient, and its safety to beneficial insects. Useful in rotation with triadimenol and triadimefon,	Phase out EPA II formulations by 9/30/06
Triadimenol: Some formulations are EPA II	Has a short withholding period and useful in rotation with triamidefon and myclobutanil.	Phase out EPA II formulations by 9/30/06
Pirimicarb: Formulations are EPA II, WHO II	Highly systemic in action and useful in IPM. Needed in rotation with acetamiprid. Prior to phase-out will only be recommended if acetamiprid fails to control aphids.	Phase out by 9/30/06
Abamectin (Avermectim): Some formulations are EPA II	Useful in rotation with lufenuron. Phase out EPA II formulations by 9/30/06.	Phase out EPA II formulations by 9/30/06

2. LAMP shall only work with farmer groups who agree to use approved pesticides as part of an IPM program.

3. LAMP shall ensure that IPM practices described in the PERSUAP (some examples in Section c) and others developed in collaboration with LAMP technical experts are disseminated and will encourage implementation of these practices, for example:

a) Rotation of chemical families of pesticides to minimize the chance of resistance

b) Rather than using insecticides on a prophylactic basis or at the mere appearance of pests, chemical application should be undertaken upon reaching established action thresholds.

c) Pesticides shall be the last resort control; the first level of control is cultural practices; chemicals shall be used minimally.

d) Better on-farm water management practices to avoid contamination of ground and surface water with pesticide residues.

e) Only clean, disease free seed should be used by growers.

4. LAMP, through extension agencies and trainers, shall promote the use of protective clothing and equipment by farmers and shall monitor use:

a) LAMP shall encourage chemical suppliers to store appropriate protective clothing and equipment;

b) LAMP shall show examples of safety clothing to farmers during training and ask them to request these items when purchasing the relevant pesticides from chemical suppliers;

c) LAMP shall inform farmers how the safety clothing should be used; and

d) LAMP shall monitor, through farmer groups or agronomists as appropriate, to ensure that the protective clothing and equipment is well-maintained and spare parts are available.

5. LAMP shall encourage farmers to read and follow labels.

a) LAMP shall work with farmers groups, farmer organizations, and pesticide suppliers to ensure pesticide packaging remains intact and that instructions are provided in appropriate languages, at appropriate levels.

b) LAMP shall assist farmers to understand and abide by the information provided on the pesticide label.

6. LAMP shall train LAMP staff, farmer groups, extension agents, and pesticide suppliers in pesticide safer use and handling, and environmental protection: LAMP shall provide training, as appropriate (described in Section k), to target groups, in safer use of pesticides, including use of protective clothing and equipment, pesticide storage and disposal, restricted entry intervals, pre-harvest intervals, IPM, rotating chemical families to minimize pesticide resistance, and environmental protection, especially regarding protection of aquatic habitats and terrestrial wildlife, including birds (Section (k).

a) To some degree, many of the proposed pesticides could adversely affect bees and other beneficial insects, fish and other aquatic organisms, birds, and other wildlife (those in Table 7 are the most serious offenders). Training for LAMP, farmer groups and service providers shall include information on proper use and disposal so as to minimize any danger to aquatic and terrestrial non-target species, surface and groundwater.

b) Encourage all family members, who may come in contact with pesticides, to participate in training.

7. LAMP shall disseminate information from the PERSUAP broadly:
a) Information should be translated and disseminated to farmer groups, agricultural service providers, project staff, consultant trainers, and others involved in the vegetable sub-sector. For farmers, an IPM or safe pesticide use pamphlet may be more appropriate for dissemination rather than the full report.

8. LAMP shall implement a Mitigation and Monitoring Plan: LAMP shall implement the mitigation and monitoring described herein, and report in Project Quarterly Reports on the implementation of mitigation measures and successes and failures. Where monitoring indicates that mitigations/safer use practices are not being implemented, or where they are not adequately addressing impacts, LAMP shall report to USAID and develop means to respond to the problem.

9. PERSUAP mitigation and monitoring requirements may require LAMP to provide funding to implement the above measures; LAMP project budget will be adjusted accordingly.

REFERENCES

EPA: www.epa.gov/pesticides

Extoxnet: www.ace.ace.orst.edu/info/extoxnet

National Environmental Action Plan BiH 2003.

PAN: www.pesticideinfo.org

USAID Safer Use Practices/IPM: http://www.encapafrica.org/SmallScaleGuidelines.htm

WHO: www.who.int/pcs

Zaštita povrća od štetočinja (2004) 'Zrinski Čakovec' Hrvatska. (Pest management in vegetables)