

**Report on the Farmer Training Project Assessment on the
Safe & Responsible Use of Pesticides in Guanghan City,
Sichuan Province, PRC.**

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1. Background

With the rising of living standards, the consumer starts to care more about the "quality" rather than the "quantity" of agricultural products. Thus the use of highly toxic pesticides is now strictly prohibited on crops. The majority of Chinese farmers lack necessary knowledge on the correct use of pesticides due to their low educational level, this can lead to high pesticide residue levels in agricultural products and environmental pollution, which can become major obstacles in entering both domestic and international markets. The correct handling and storing of pesticides is another key issue that is neglected by many farmers, these are the main reasons for many occupational, accidental and intentional poisoning incidents. Meanwhile, environmental pollution due to the inappropriate disposal of empty containers and packaging is the hidden threat for the rural environment. The effective and safe use of pesticides is very important, as they are vital products for agricultural production in China in defending crops against diseases, pests and weeds. The agricultural authorities and pesticide industry have the responsibility to improve pesticide use safety and help farmers use pesticides in a more safe and effective way.

The Ministry of Agriculture (MOA) has released action plans on non-hazardous food production and highly toxic pesticides elimination, which aims at human, food and environmental safety. To help comply with these action plans and reduce pesticide residues and environmental pollution, CropLife China working in partnership with NATESC and Sichuan PPS carried out a training project in Guanghan City, Sichuan Province. This project focuses on the safe and effective use of pesticides. Sichuan Agricultural University acted as the third-party auditor to conduct a survey to assess impact of this training program.

2. Project Overview

2.1 Timing

March 28th, launch meeting in Guanghan, Sichuan
Completed investigators' training before April 18th
April 20th, conducted pre training survey
May 9th, Train the trainers program
June 12-22nd, farmers training in Guanghan
July 10th, conducted post training survey
September, provided the drafted report of the survey
October 10th, completed the survey report

2.2 Training

2.2.1 Trainings on the safe and effective use of pesticides

52 training sessions were held in 24 towns around Guanghan City, 2800 farmers, grass root extension workers and retailers participated. Trainers were from the member companies of CropLife China and the training concentrated on the safe and effective use of pesticides and pest management under the non-hazardous rules.

2.2.2 The extension of knowledge and the techniques for the safe use of pesticides.

10,000 posters, 400 training manuals, 2,000 technical manuals and 52,000 pieces of technical materials were distributed to participants. These materials were also posted in township level government buildings, retailer' shops, hospitals and schools. Other media, e.g. TV programs, radio and newspapers were also used to help spread the knowledge to a wide audience.

2.2.3 Donating PPE and good quality manual sprayers.

Presented to personnel who attended each training: 3,000 PPE kits, 3,000 face protection masks, 110 sprayers named " the bodyguard", 70 flap type insect destroying lights, and secure wooden boxes for storing agrochemicals. Students were awarded

sprayers, gloves, eye protectors and facemasks as prizes for competitions during the training events. After the training, ponchos, face shields, sprayers, insect lights and storage boxes with locks were given to local farmers for free to help them use pesticides more safely and effectively.

2.2.4 Doctors training on pesticide poisoning treatments

Two training events for 200 rural doctors from hospitals in Guanghan City. These gave doctors advise on appropriate treatments when encountering pesticide poisoning cases. Prof. You Quancheng from Sichuan University was the trainer.

2.3 Survey

The survey focused on the knowledge and the behavior of farmer relating to the safe and responsible use of pesticide. It included the following 4 aspects: buying pesticides (label reading, pesticide selection), handling pesticides (measuring & mixing, application, PPE, application timings, PHI, package disposal, sprayer maintenance (cleaning & repairing), pesticide storage and other aspects (first aid, pesticide residues and cost).

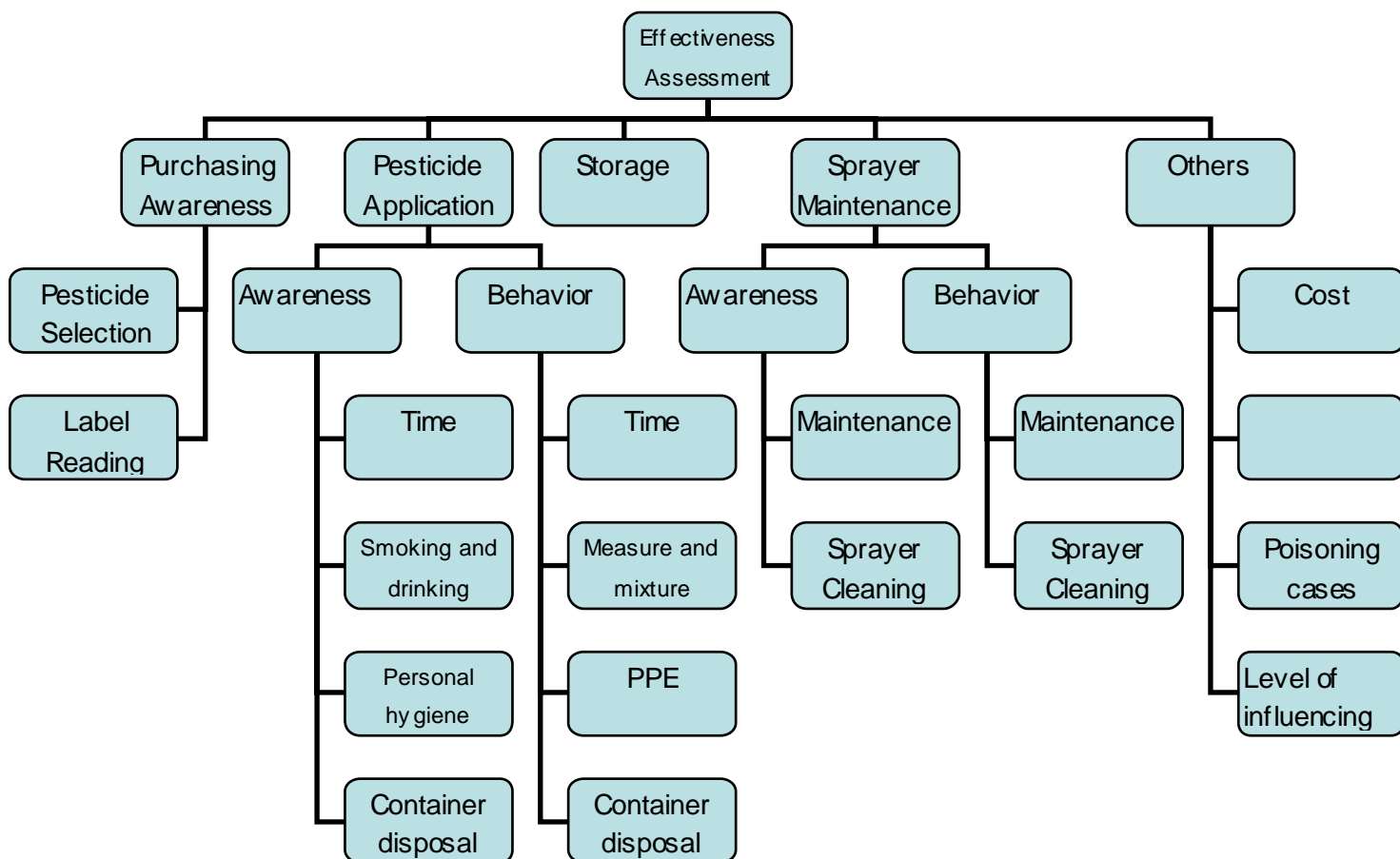


Fig.1 Survey content

2.4 Data collection

Two methods were used in the survey, random sampling and surveys in key areas. The survey aimed at obtaining realistic, reliable and scientific data.

2.4.1 Related data on farmer’s safe use knowledge pre and post training

The trainers conducted surveys pre and post training. The farmer completed the questionnaires before the training started and then after the training was completed. 1917 and 1867 questionnaires were collected pre and post training respectively. The data analysis is listed in the following sections.

2.4.2 Related data on farmer's safe use behavior pre and post training

15-20% of participants (including key farmers, retailers and extension workers, covering all the towns) were randomly surveyed along with some influenced farmers from the same areas. About 6% were surveyed pre and post training, the survey was conducted on the same 30 people. The 90 influenced farmers were selected and surveyed randomly. Photographs and questionnaires were collected during the process. The number of the questionnaire was 491 and 557 pre and post training respectively. The data analysis is listed in the following sections.

2.4.3 Other data

The Agriculture Bureau of Guanghan City provided data on pesticide residues. The data on pesticide poisonings was obtained from 14 hospitals under the control of the Health Bureau of Guanghan City.

2.4.4 Survey routes

Table 1. Allocation of work

Route	Group	Townships
1	6	Xiwai、Nanxing、Sanxing
2	1	Dongnan、Beiwai、vegetable agency
	2	
3	3	Nanfeng、Xinglong、Jinlun
4	4	Xinping、Xigao、Gaopin
5	5	Jinyu、Lianshan、Shuangquan、Songlin
	7	
6	8	Guangxing、Xiangyang

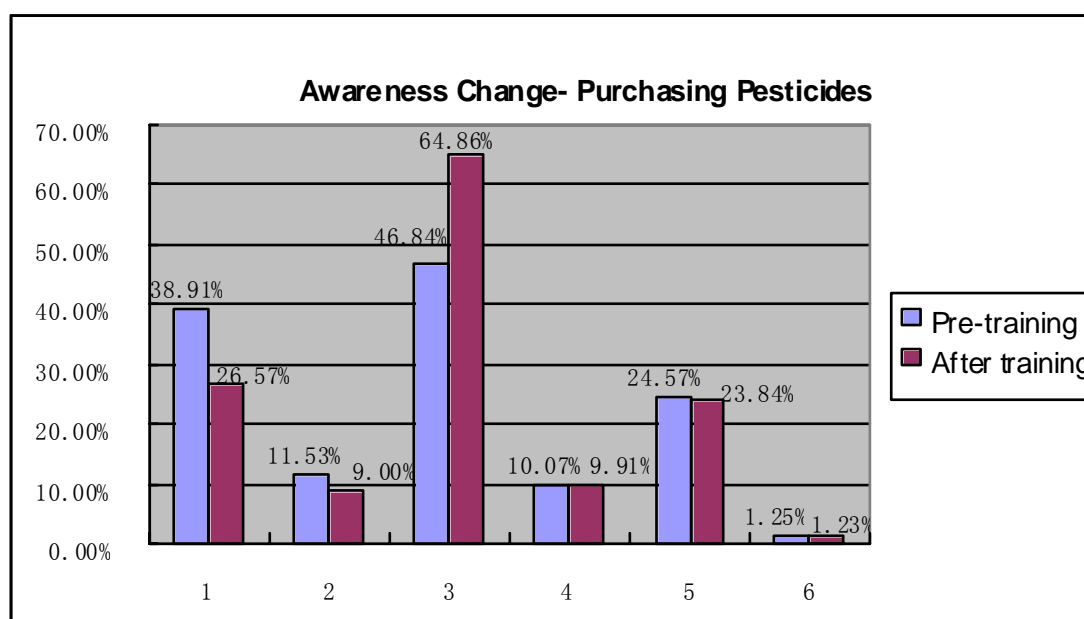
3. Assessment of the effects of the training

3.1 Buying pesticides

3.1.1 Choosing a pesticide

The information that influences the farmer's choice mainly came from 6 areas: suggestion from a retailer, suggestion from a neighbor and other farmers, suggestion from an extension worker, advertisement or own choice. The survey showed that the rate that farmers buy under the advice of the retailer decreased from 38.91% (pre training) to 26.57% (post training) whilst buying under the advice of an extension worker increased from 46.84% to 64.86%, an increase of 18.02%. The data shows that the extension department has more influence on farmer's choice following the training. The extension department then played an important role in leading farmers to select the correct, good quality products.

Chart 1

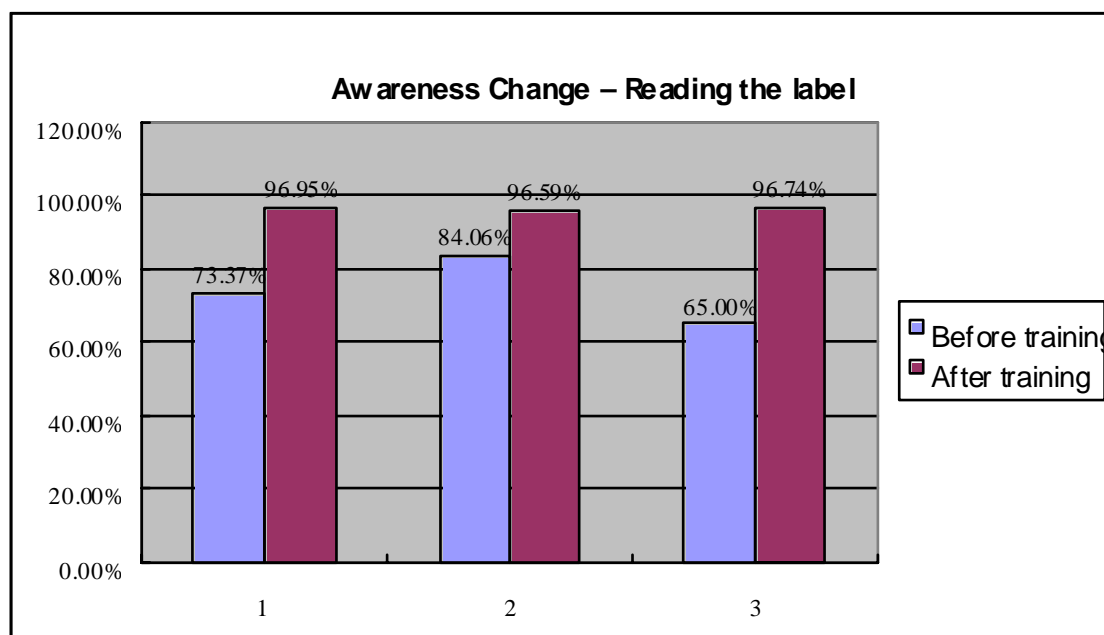


- Legend:
- 1 Recommended by retailer
 - 2 Recommended by other farmers
 - 3 Recommended by extension agent
 - 4 Advertisements
 - 5 Own decisions
 - 6 Others

3.1.2 Reading the label

By training farmers to read the label before use, understanding the words and the meaning of pictograms improves safety. 96.59% of the trained farmers read the label before applying the products and followed the safety instructions, which was 12.54% more than before the training. The farmers got information on toxicity, target crops, pest spectrum, use rate, application timing from the label. 96.95% knew about PHI post training, 23.58% higher than pre-training. 96.74% of trained farmers knew about the meaning of the three certificates for pesticide products, 31.73% higher than pre-training. Better timing of applications helped farmers use pesticide more effectively and decreased pesticide residue levels in agricultural products.

Chart 2



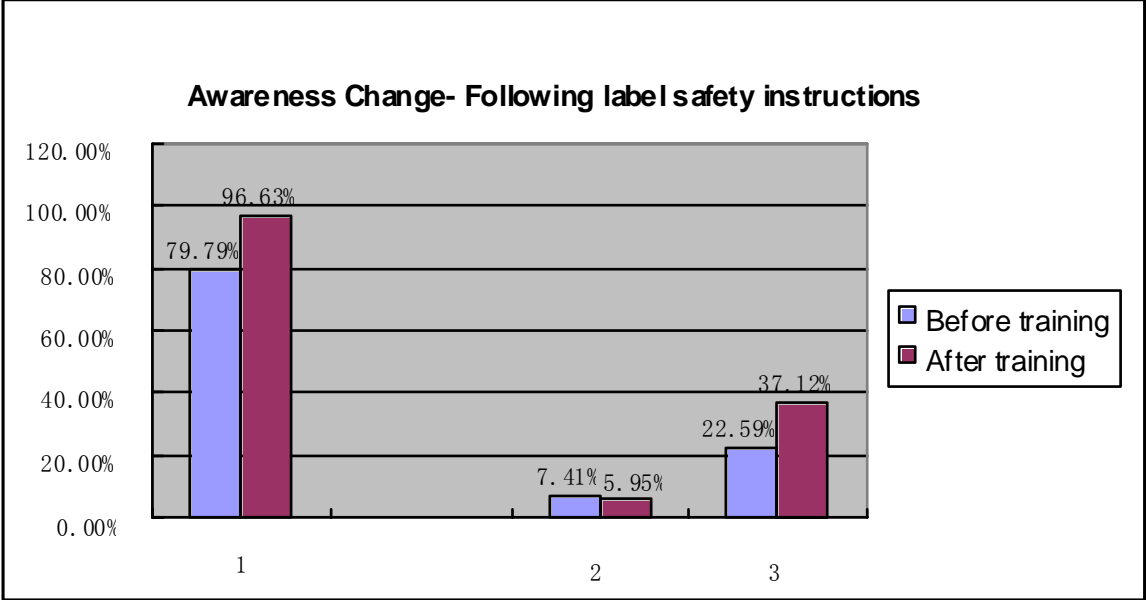
Legend: 1 Understanding PHI

2 Read label before application

3 Understanding the 3 certificates numbers of pesticide

96.63% of trained farmers understood the safety requirements and followed the instructions on the label, an increase of 16.84%. The use of PPE to cover key body parts increased by 14.53% following the training.

Chart 3

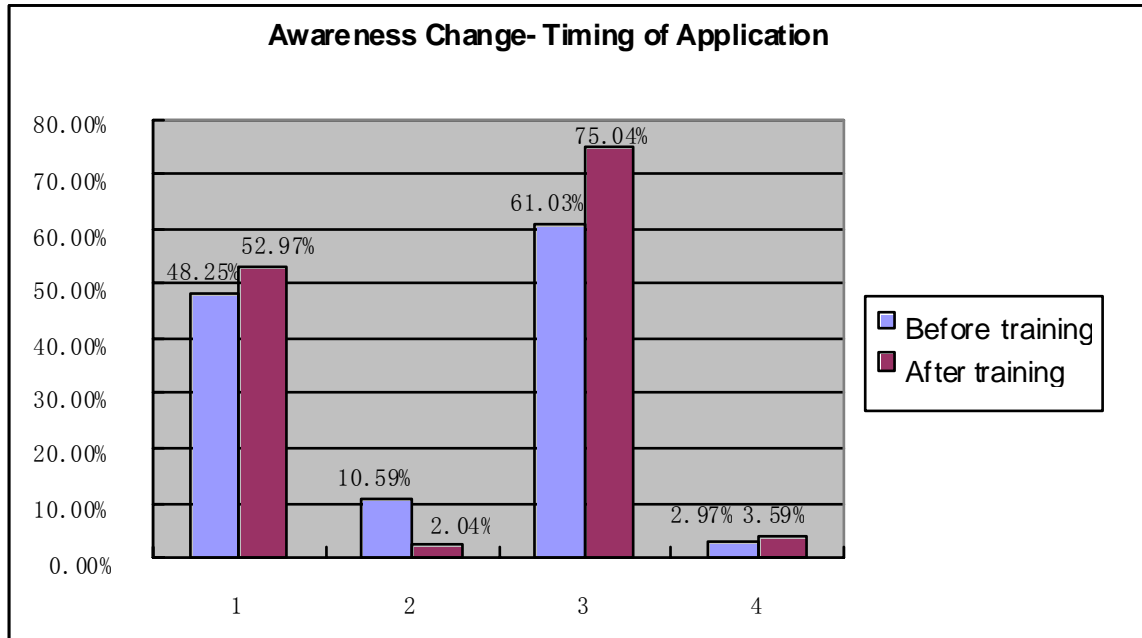


- Legend:
- 1. Yes, understand the label
 - 2. Do not understand the label
 - 3. Use PPE on key parts of the body

3.2 Application of products

3.2.1 Timing of application

Chart 4



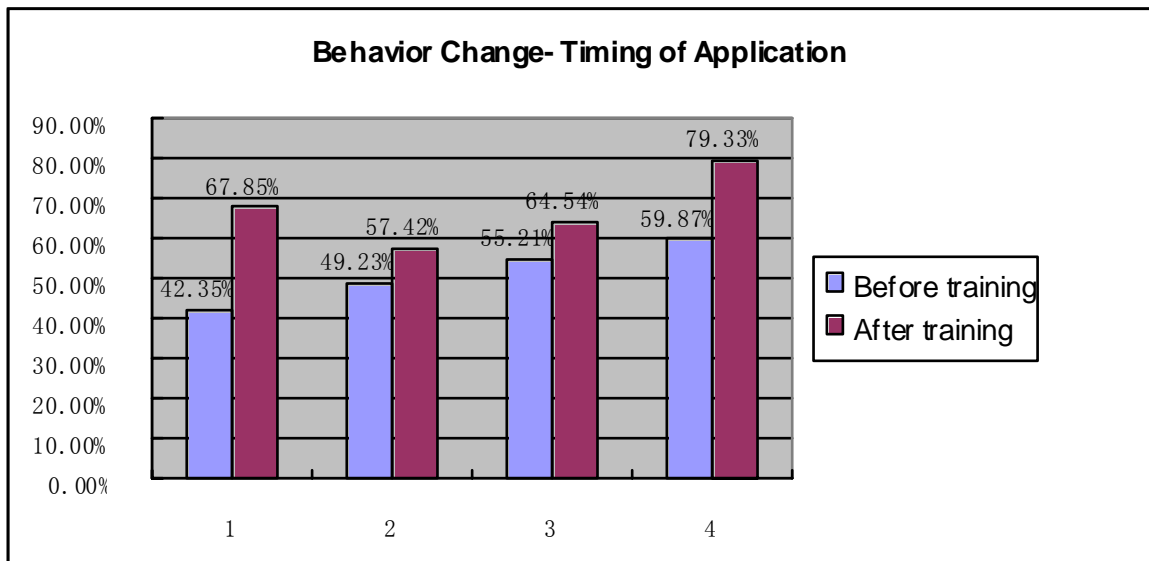
Legend: 1 8:00-10:00 a.m.

2 No fixed time

3 After 4:00 p.m.

4 Other time

Chart 5



Legend: 1 6:00-8:00 a.m. 2 8:00-10:00 a.m. 3 4:00 -6:00p.m. 4 6:00 -8:00p.m.

By analysis of the awareness change, more farmers elected to apply products between 8am – 10am and after 4pm after the training.

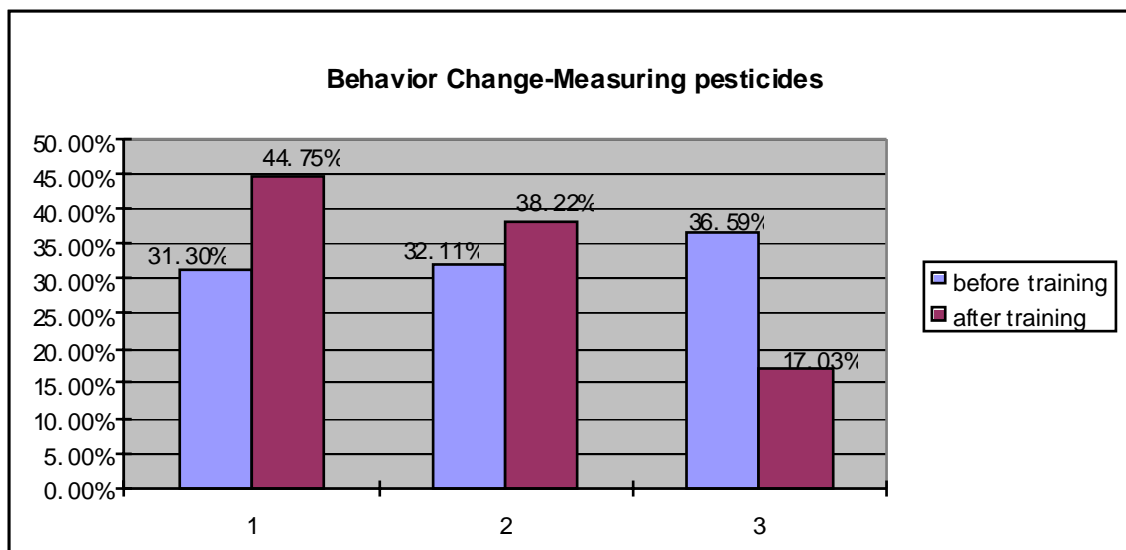
By analysis of the behavior change, the trained farmers sprayed mainly before 10am and after 4pm, which was consistent with the awareness change. 67.85% of farmers sprayed between 6am and 8am, an increase of 25.5% over pre-training. 57.72% of farmers sprayed between 8am and 10am, an increased of 8.19% over pre-training. 64.54% of farmers sprayed between 4pm – 6pm, an increase of 9.33%. 79.33% of farmers sprayed between 6pm-8pm, an increase of 19.46%

The correct timing of application during the day helps avoid occupational poisoning by inhalation and skin contamination especially in hot conditions.

3.2.2 Measuring Pesticide

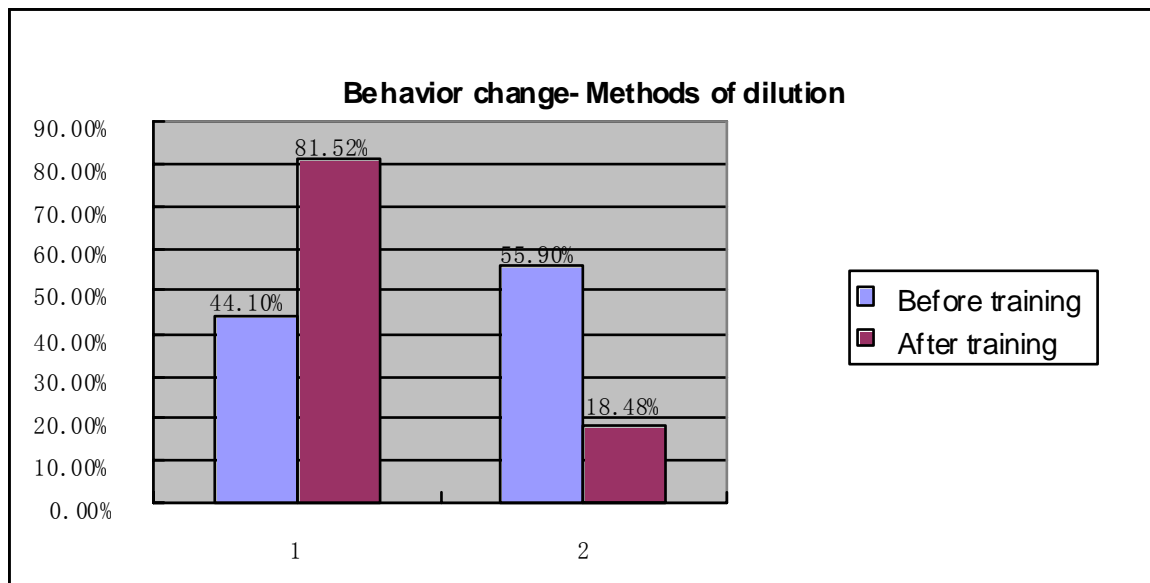
The number of farmers using measuring cylinders and bottle caps increased 13.45% and 6.11% respectively after the training, reaching 44.75% and 38.22%. 81.52% of the farmers use two-step dilution to dilute solid pesticide after the training, 37.42% more than pre-training. The training helped farmers use pesticides more precisely, avoided waste, decreased costs and increased the efficacy of the pesticide.

Chart 6



Legend: 1. With measuring cylinder 2. With bottle cap 3. Poured directly

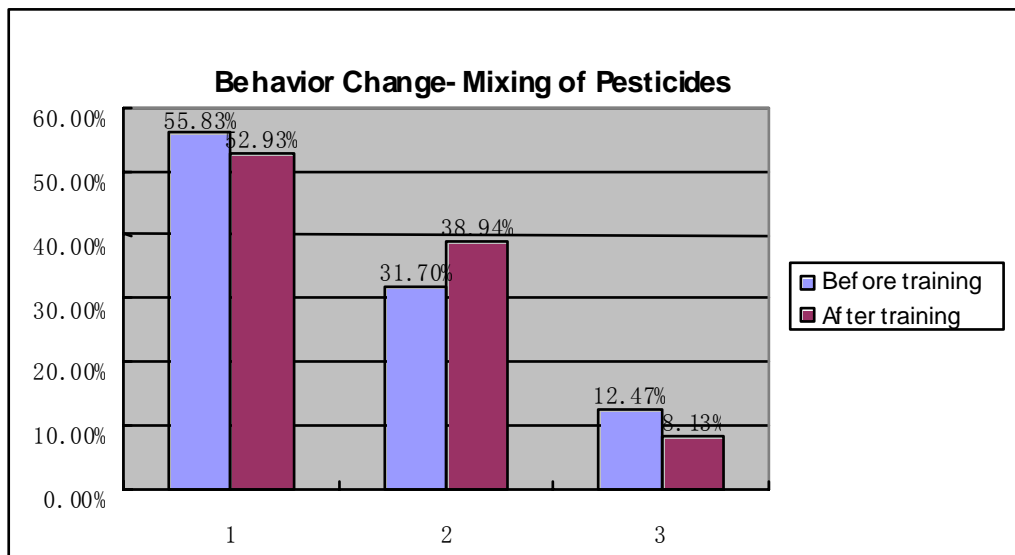
Chart 7



Legend: 1.Two step dilution 2.Direct dilution

91.78% of farmers used 2-3 different pesticides in tank mixes after training, an increase of 4.34% over pre-training. Meanwhile, fewer farmers used more than 3 pesticides in a tank mix. A responsible tank mix of different pesticides helps farmers control pests, weeds and diseases in one application, increasing efficacy and save labor costs and time.

Chart 8



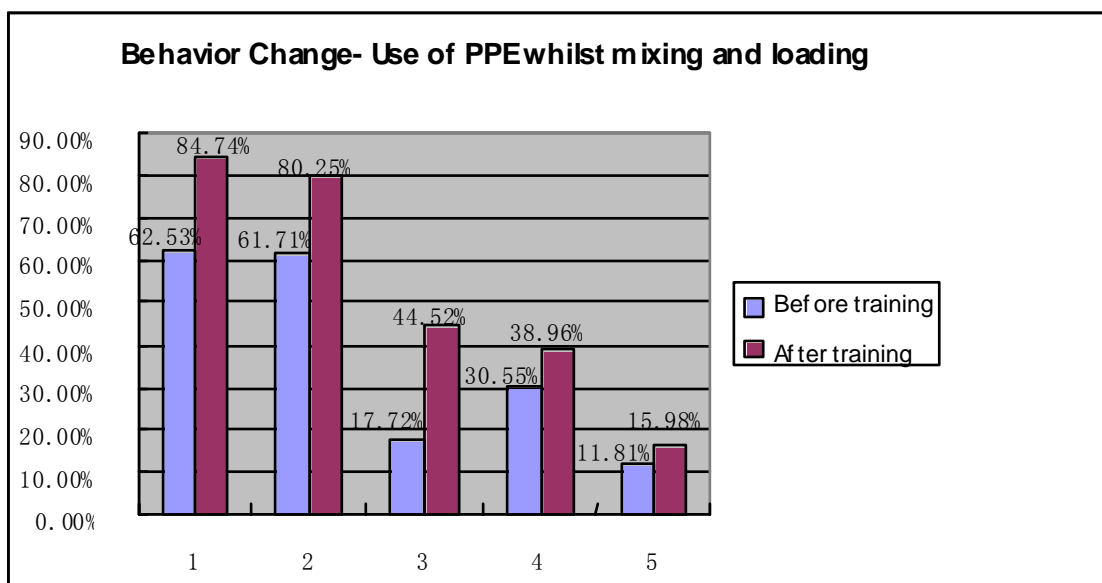
Legend: 1. 2 products 2. 3 products 3. More than 3 products

3.2.3 PPE

Wearing Personal Protective equipment whilst mixing and loading.

Skin contamination is the most general cause of occupational illness. The number of farmers taking correct personal protection measures whilst mixing and loading rose dramatically after training in comparison with pre-training numbers (16.14%). The use of gloves, long-sleeve shirts and trousers reached 44.52%, 84.74% and 80.25% respectively, increases of 26.81%, 22.21% and 18.54% respectively. The influenced farmers also used a raincoat as protective equipment when spraying.

Chart 9



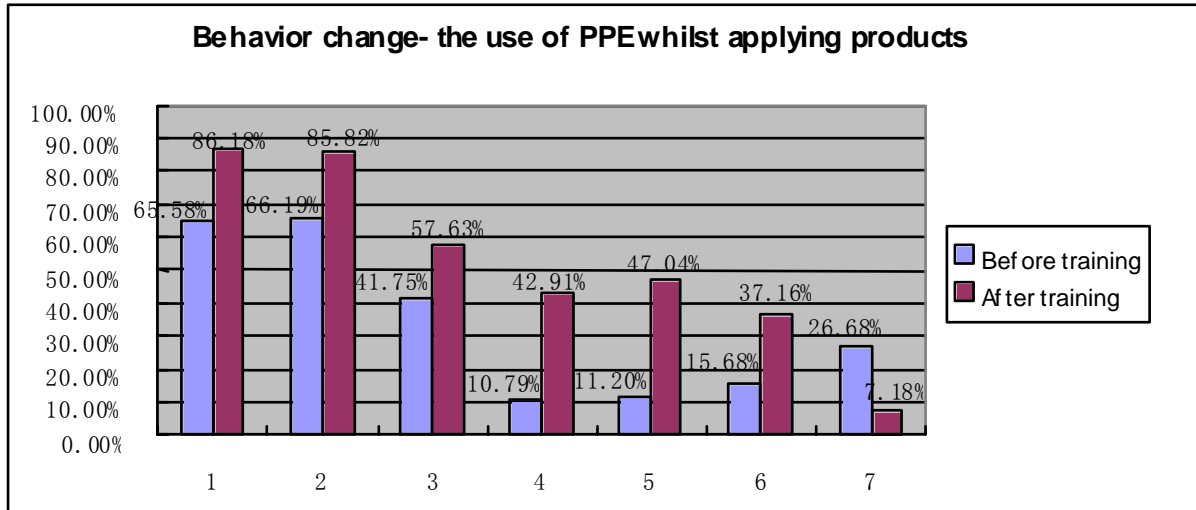
- Legend:
- 1. Long sleeve shirt
 - 2. Long trousers
 - 3. Glove
 - 4. Boots or shoes.
 - 5. Others (e.g. ponchos)

Personal protection whilst spraying

The number of farmers using PPE when spraying increased after the training. The use of face shields, gloves, ponchos, long sleeve shirts, trousers and boots increased by 35.84%, 32.11%, 21.48%, 20.60%, 19.63% and 15.88% respectively, an average increase of 20.79%. Fewer farmers did not care about PPE; the ratio decreased

19.50%, to 7.18%. The awareness of using personal protective equipment increased after the training.

Chart 10

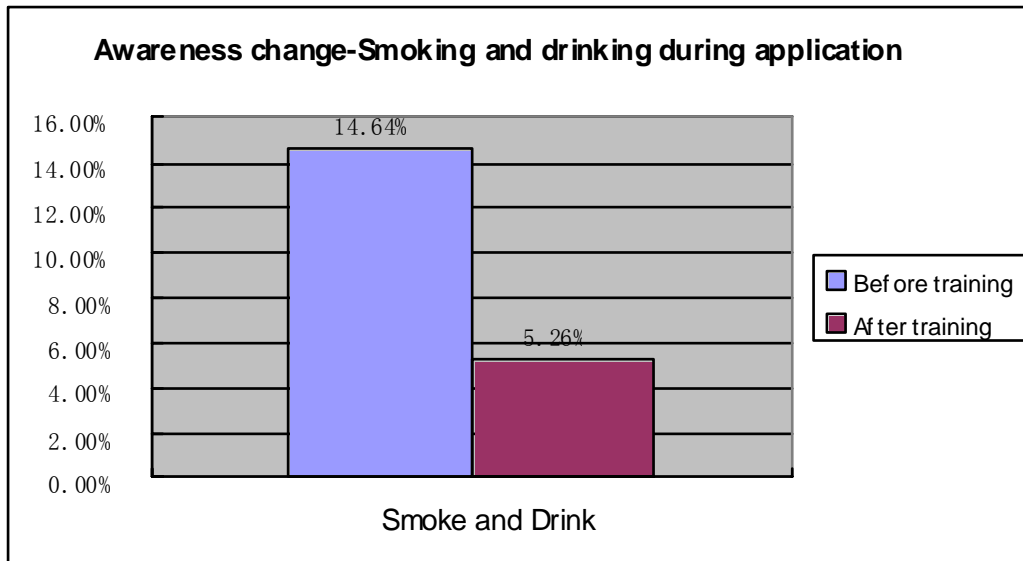


- Legend:
- 1. Long sleeve shirts
 - 2. Long trousers
 - 3. Boots or shoes
 - 4. Gloves
 - 5. Face shield
 - 6. Ponchos or apron
 - 7. Pays no attention, dresses as usual

Smoking or drinking whilst spraying

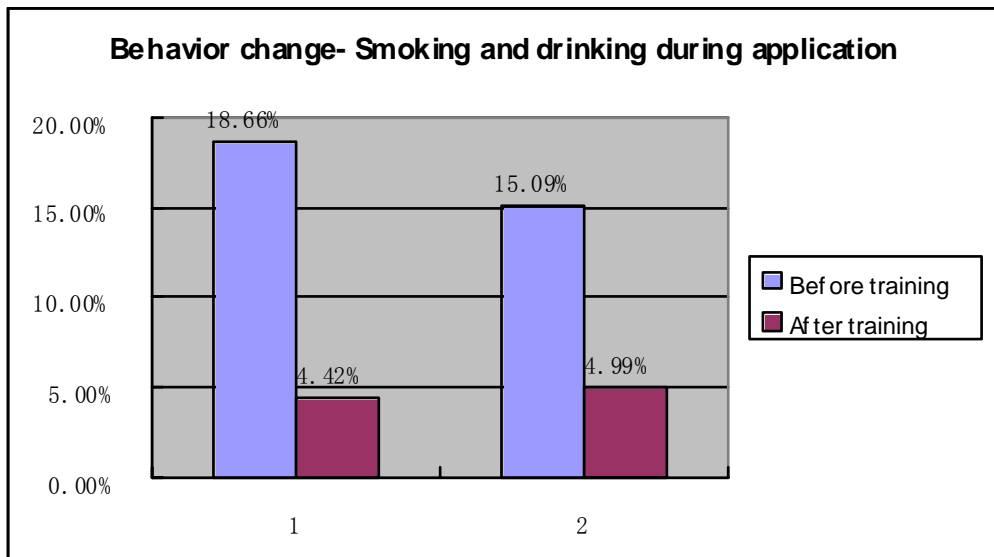
Fewer farmers believe it is appropriate to smoke and drink while spraying, the percentage decreased 9.38% & 5.26% respectively after training. 94.74% of trained farmers realized the hazards of smoking and drinking during spraying.

Chart 11



By analysis of behavior change, 4.42% of farmers smoke while spraying, this is 14.24% less than before training and 4.99% of farmers drink while spraying, 10.10% less than before training.

Chart 12



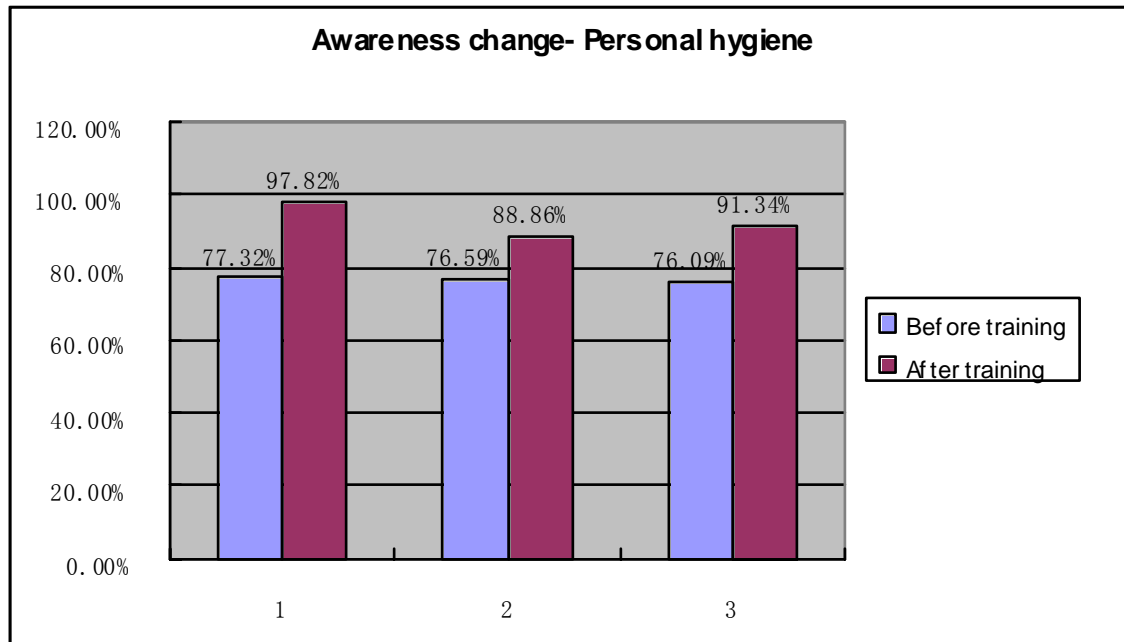
Legend: 1.Smoking 2.Drinking

After training, the farmers knew the hazard of drinking and spraying while spraying and changed their behavior. This helps decrease occupational poisonings via inhalation and accidental ingestion.

Personal hygiene

97.82% of trained farmers believe it is necessary to wash hands after spraying, an increase of 20.50%. 88.86% of trained farmers believe it is necessary to bath after spraying and 91.34% of farmers believe it is sensible to change clothes after spraying.

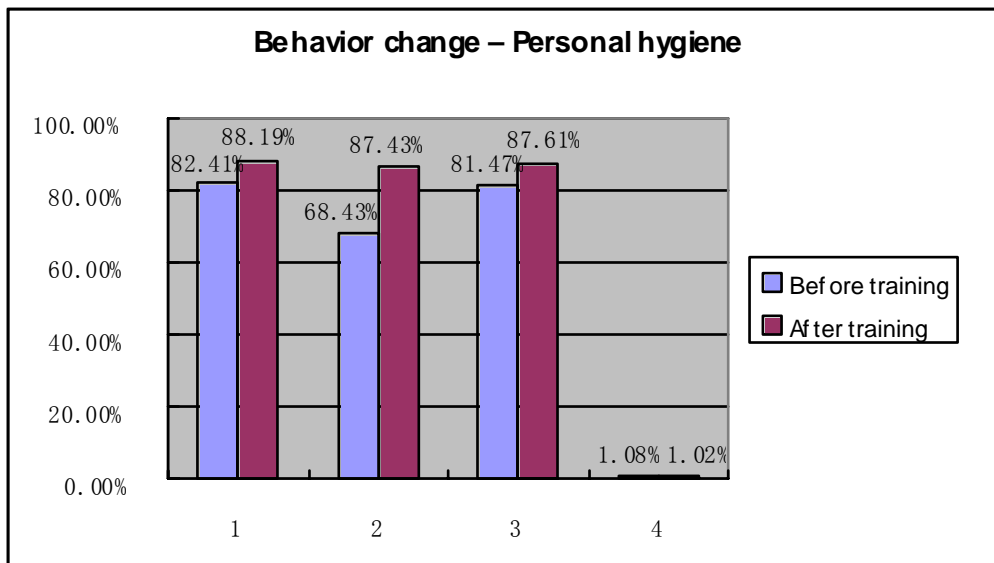
Chart 13



Legend: 1.Wash hands 2.Shower 3.Change clothes

By analysis of the behavior change, 88.19% farmers wash hands with soap and water, an increase of 5.78% over the pre-training number. 87.43% of farmers bath after spraying and 87.61% change clothes after spraying. Only 1.02% take zero personal hygiene measures at all.

Chart 14



Legend: 1.Wash with soap and water 2.Shower 3.Change clothes 4.No personal hygiene

The awareness of good personal hygiene in turn changes farmers' behavior. The ratio of farmers taking personal hygiene measures increased after training, the option of taking a bath after spraying had the most increase (Table 2). Correct personal hygiene measures can avoid the residue of pesticides on the skin and clothes, thus decreasing the possibility of dermal and oral poisoning.

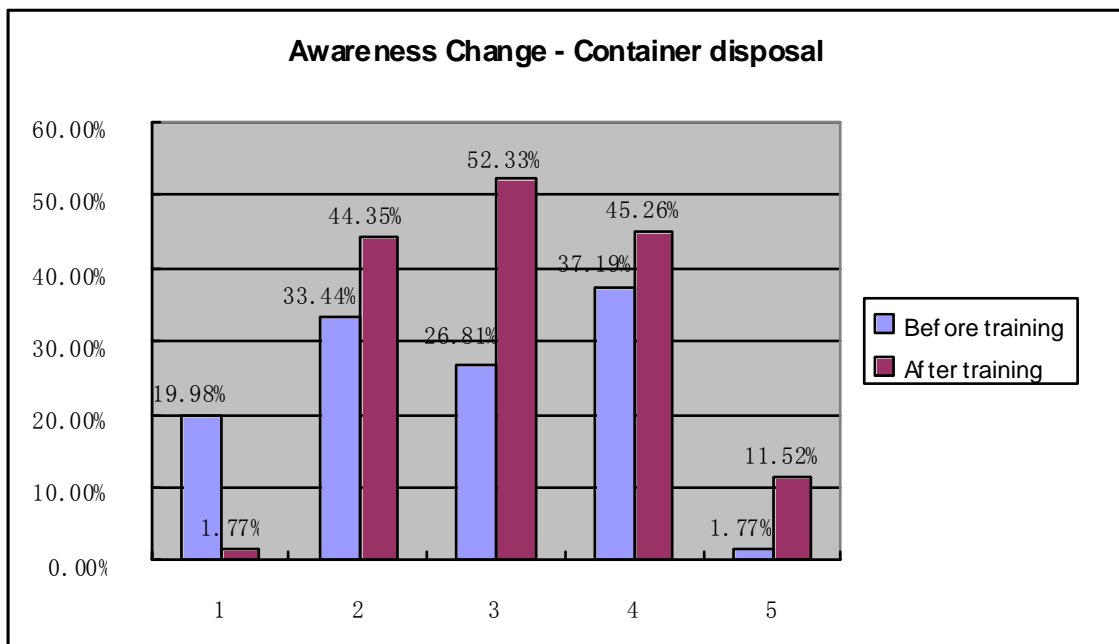
Table 2. The comparison of personal hygiene pre and post training Unit: %

Item		Wash hands	Shower	Wash clothes
Awareness	% after training	97.82	88.86	91.34
	Improvement by training (%)	20.5	12.27	15.24
Behavior (Observation and interview)	% after training	88.19	87.43	87.61
	Improvement by training (%)	5.78	19	6.15

3.2.4 Container Disposal

Farmers changed their behavior on container disposal after training. Only 1.77% of farmers think it is appropriate to dispose the container “at will” after training, while the figure was 19.98% before the training. Burning, burying and taking away from the field for appropriate disposal were the choices of most farmers, 52.33%, 45.26% and 44.35% respectively.

Chart 15

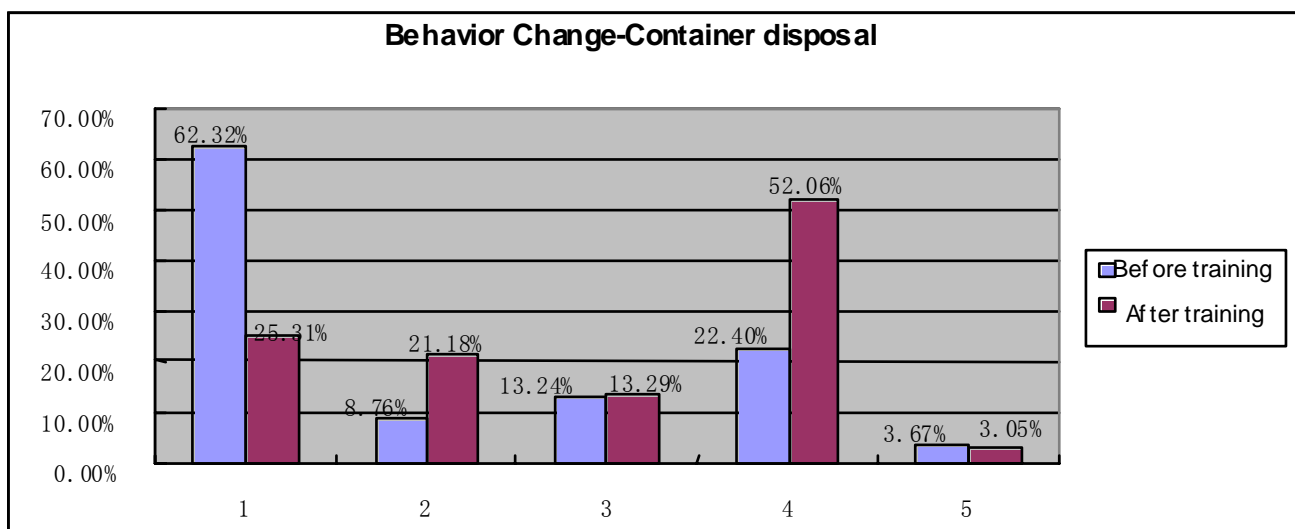


Legend: 1.Throw away in the field 2.Bury 3.Burn

4.Put into plastics bags and take away from field for disposal 5.Other methods

The behavior of disposing of containers “at will” decreased dramatically after the training, from 19.98% down to 1.77% after the training. 52.06% of farmers gathered the empty containers in plastic bags and took them away from fields for correct disposal. 21.28% of farmers bury container after use. The ratio of these two behaviors increased 29.66 and 12.43% compared to pre-training.

Chart 16



Legend: 1.Throw away in the field 2.Bury 3.Burn
 4.Put into plastics bags and take away from field for disposal 5.Other methods

More farmers followed the correct measures for container disposal after training and less farmers disposed the containers “at will”. Meanwhile, 25.31% farmers still thrown empty packages in the field and 52.33% farmers think it is correct to burn the packaging, this behavior may lead to environmental contamination.

Table3 The comparison of package disposal after training Unit: %

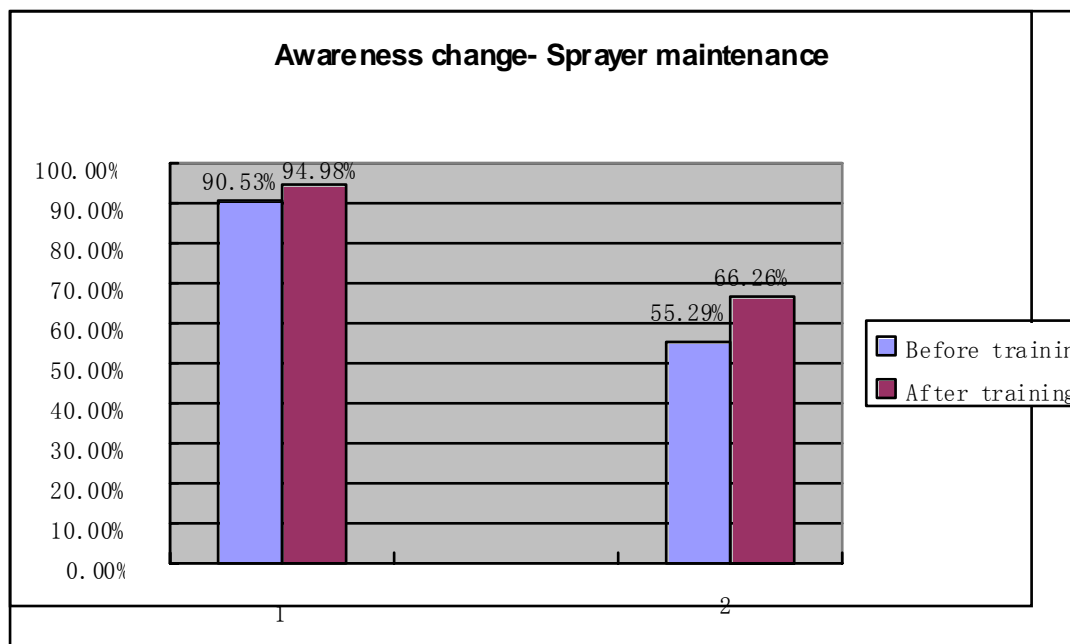
Item		Throw in the field	Bury	Burn	Put into plastics bags and take away from field for disposal	Others
Awareness	% after training	1.77	44.35	52.33	45.26	11.52
	Improvement by training (%)	-18.21	10.91	25.52	8.07	9.75
Behavior	% after training	25.31	21.18	13.29	52.06	3.05
	Improvement by training (%)	-37.01	12.43	0.05	29.66	-0.52

3.3 Sprayers

3.3.1 Sprayer maintenance

About 90% of farmers check the sprayer before spraying to avoid leakage, but many did not fix it immediately. 66.26% of farmers understand the necessity of timely fixing after training, an increase of 10.96%.

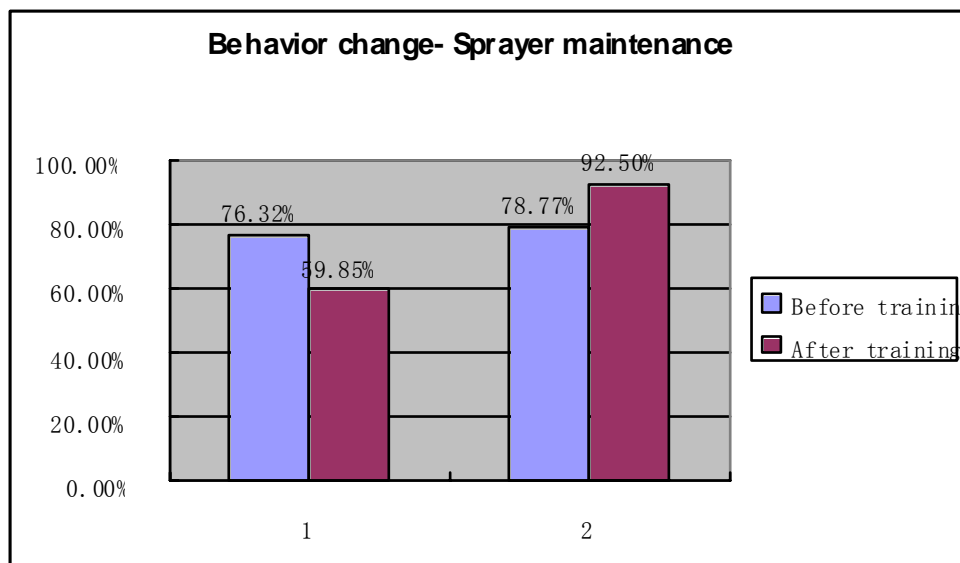
Chart 17



Legend: 1.Check 2.Timely maintenance

92.50% of farmers checked and timely maintained the sprayer after training, an increase of 13.73%. The number of leaking sprayers decreased to 59.85%, down 16.47%.

Chart 18



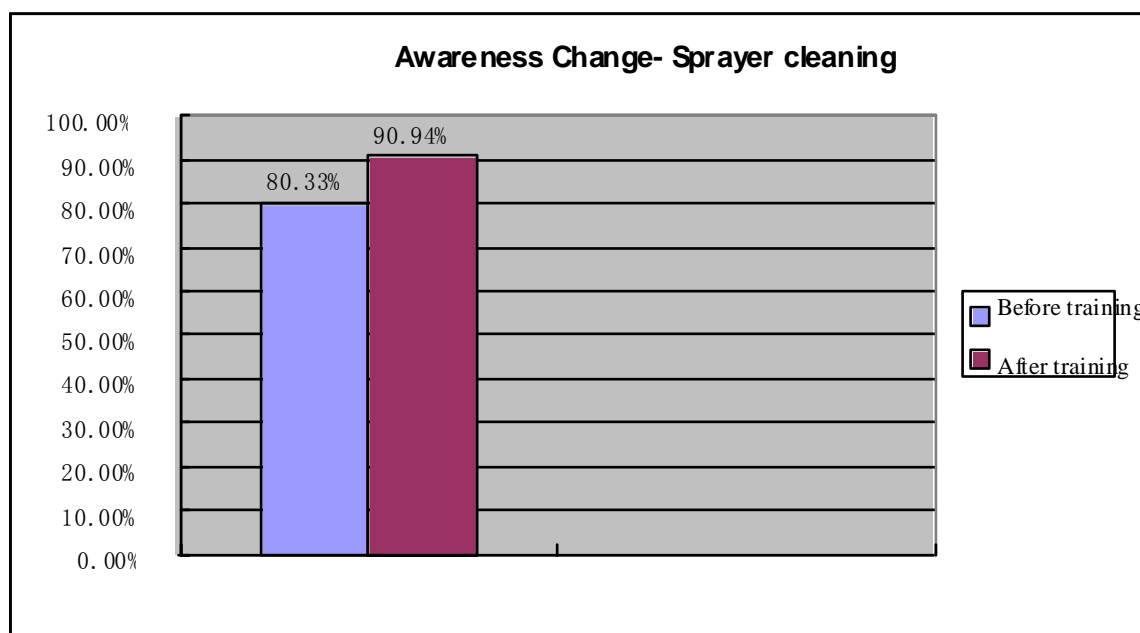
Legend: 1. Leakage during spray 2. Checked and maintained on time

The training helped farmers understand the importance of sprayer maintenance; more farmers checked their sprayers more often to avoid leakages. However, the leakage of sprayers can still be found in the survey and the ratio was high.

3.3.2 Cleaning sprayers

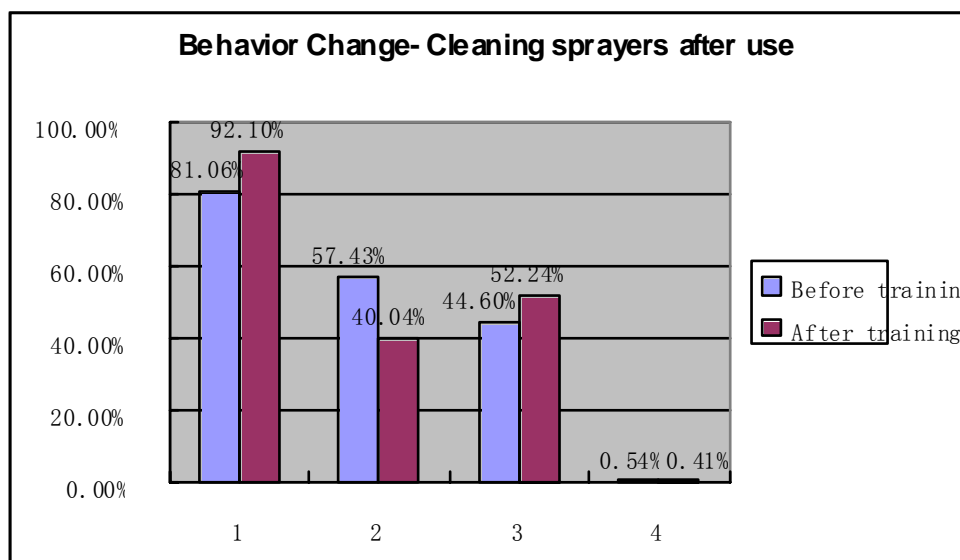
The awareness of cleaning sprayers after use rose to 90.94%.

Chart 19



After training, 92.10% of farmers cleaned their sprayers after use, an increase of 11.04%. Farmers that pour rinsings into watercourses decreased by 17.4% whilst 7.64% more farmers pour them onto fields. The behavior of pouring rinsing away water near wells decreased by 0.13%.

Chart 20

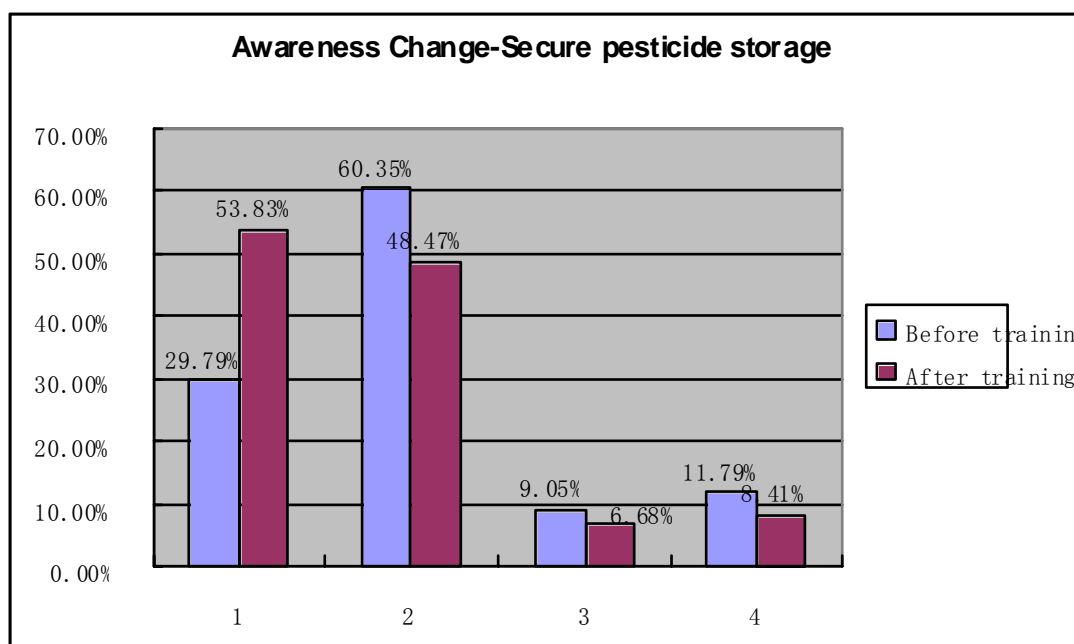


Legend: 1. Cleaned sprayer 2. Rinsed water flushed into drainage system
 3. Rinsed water flushed into field 4. Rinsed water flushed adjacent to well

3.4 Pesticide Storage

The training of distributors and farmers on the use of storage boxes decreases the risks of an accident occurring. 53.83% of trained farmers now lock pesticides in the box at home, an increase of 24.04% compared to before the pre-training.

Chart 21



Legend: 1. Stored and locked 2. Kept in hidden area at home
 3. Kept anywhere at home 4. Stored in shed at field

3.5 The assessment of training influence

3.5.1 The influence of trained farmers

Table 4 The assessment training influence ¹ Unit: person, %

Trained Targets	Number	Influenced farmers (each)	Influenced farmers (total)	The population of surveyed town	% Of the influenced farmers
Key farmers	35	36	1,281	121,941	10.51
Retailers	75	199	14,925	172,712	86.41
Extension Workers	83	262	21,815	102,588	21.27

Data source: Guanghai survey, July, 2006

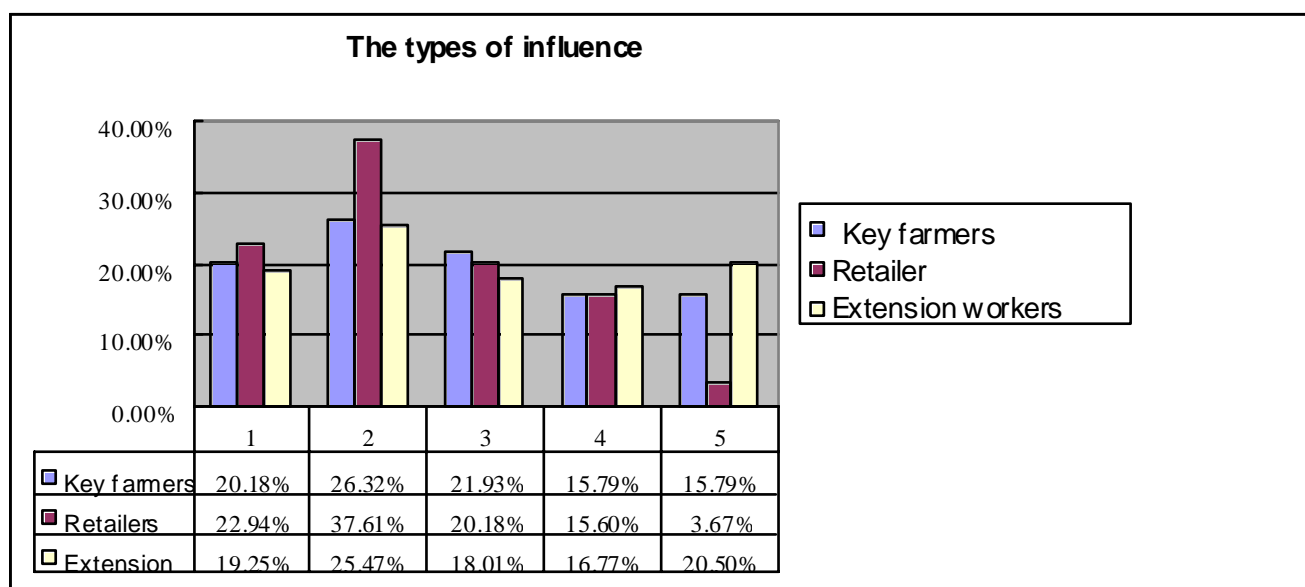
¹"The influence contents of different means" in the form means the safety behavior when using agrochemical, including:

- a: Pesticide purchase (label reading, selecting pesticides)
- b: Pesticide application (measuring, application, PPE, PHI, container disposal)
- c: Sprayer maintenance (cleaning, maintenance etc)
- d: Pesticide storage (transport, lock away)
- e: others (first aid measures and keeping away from sprayed field)

Trained key farmers, retailers and local extension workers have different levels of influence on other farmers. The retailer has a high influence level on the farmers as they have shops and can spread the knowledge of safe use when farmers come to them to purchase products. According to the survey, the retailer can influence 199 farmers in his or her near vicinity. The extension workers, however, have the higher influence factor in comparison with retailers because they are responsible for extension work with a wide range of retailers, and they are more reliable to farmers. On average, each extension worker can influence 262 farmers. Guanghai city now has an effective network of key farmers, retailers and extension workers in safe use knowledge.

3.5.2 Types of Influence

Chart 22



Legend : 1.Agrochemical purchases 2.Agrochemical usage 3.Agrochemical apparatus maintenance 4.Transport of agrochemical 5.Others

The key farmers, retailers and extension workers have more influence over farmers on application technology and safety as opposed to other aspects i.e. purchasing, sprayer maintenance and storage.

3.5.3 Influencing methods

The trained participants have different ways to influence farmers, key farmers mainly by demonstration, retailers by advertisement and posters and extension workers by conducting farmers training. The extension workers have more influence on farmers than the other two groups

Chart 23

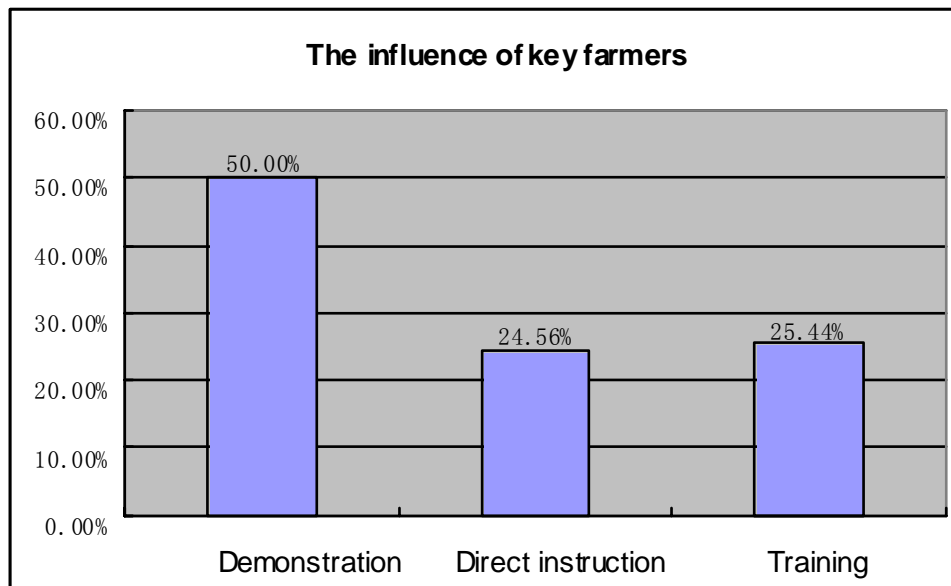
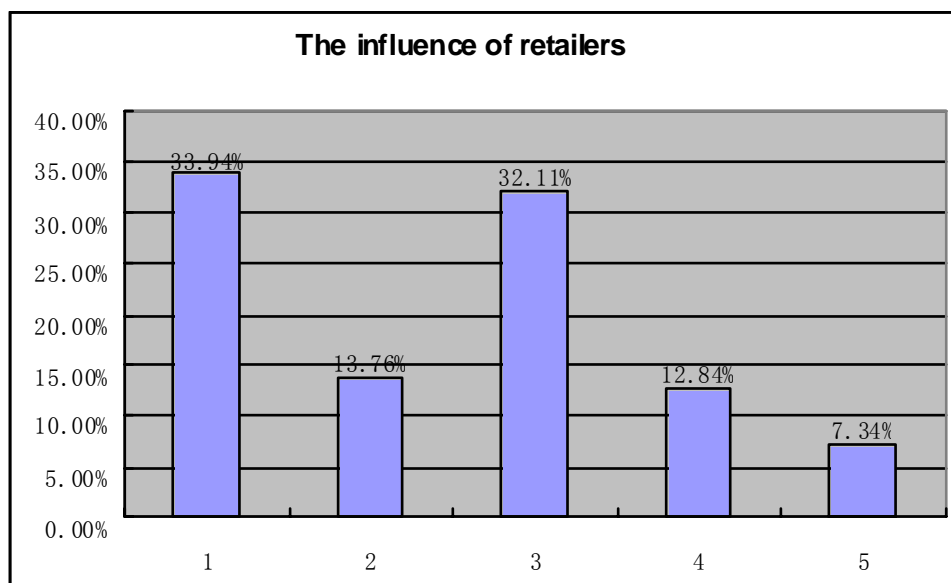
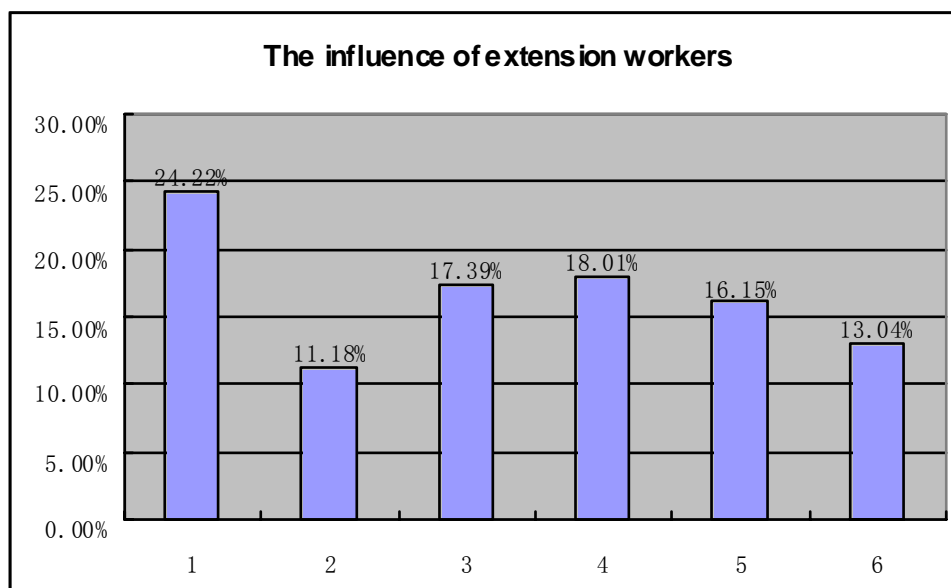


Chart 24



Legend: 1.Propaganda 2.Distributing materials 3.Posters 4.Demonstrations 5.Training

Chart 25



Legend: 1.Training 2. Radio and television 3.Propaganda 4.Demonstrations 5、 Posters
6. Blackboard

3.5.4 Costs, pesticide residues and poisoning cases (including suicides)

The training and the support materials on the safe and effective use of pesticides helps farmers use products more safely, save costs, decrease pesticide residues in produce and decreases poisoning cases by intentional ingestion. The farmers can make more effective use of pesticide while ensuring safety to humans, animals and the environment.

Through training, more farmers read product labels before they buy and use low-toxic and more effective products. The maintenance of sprayers avoids leakage and saves farmers money. According to the survey of 71 farmers in 17 towns, 60.56% of the farmers reduced their costs of pesticides after the training.

Cost changes 2006 vs. 2005

Category Crop	Farmers	Yr	Pesticide	Cost per Crop (RMB)	Cost change (RMB)	Decrease (%)
Tomato	Zou Qingyan	05	Carbendazim Topsin M Decis	239	Decrease ¥28	11.72
		06	Sandofan Topsin M KungFu	211		
Tomato	Ma Wanrong	05	imidacloprid Decis Topsin M	208	Decrease ¥31	14.90
		06	imidacloprid Dacotech Ridomil Gold	167		
Tomato	Zhuang Zhaoyou	05	Decis imidacloprid carbendazim	202	Decrease ¥48	23.76
		06	Decis imidacloprid Topsin M	154		
Tomato	Zeng Suhua	05	imidacloprid Quanshabi(Quin alphos+ fenvalerate) carbendazim	195	Decrease ¥41	21.03
		06	imidacloprid Decis chlorothalonil	154		
Tomato	Zhang Youmo	05	imidacloprid Decis metalaxyl	198	Decrease ¥56	28.28
		06	imidacloprid KungFu Dacotech	142		
Tomato	Gu Jiqing	05	Quanshabi(Quin alphos+ fenvalerate) carbendazim Topsin	221	Decrease ¥43	19.46
		06	Quanshabi(Quin alphos+ fenvalerate) Sandofan Topsin M	178		
Chili	Yang Congming	05	imidacloprid 病毒 A Topsin 481	97	Decrease ¥16	16.49
		06	imidacloprid Score Ridomil Gold 481	81		

Chili	Wu Daibi	05	imidacloprid 病毒 A Ridomil Gold Topsin M	178	Decrease ¥52	29.21
		06	Actara Ridomil Gold Sodium nitriphenolate	126		
Cucumber	Zhou Lianying	05	imidacloprid 乙 锰 Topsin	212	Decrease ¥44	20.75
		06	imidacloprid Ridomil Gold Topsin	168		
Cucumber	Chen Daoqun	05	imidacloprid 乙 锰 Topsin	223	Decrease ¥46	20.63
		06	KungFu Ridomil Gold Topsin	177		
Lettuce	Chen Xiaoqi	05	乙 锰 Topsin M Sumilex	57	Decrease ¥12	21.05
		06	Ridomil Gold Sumilex	45		
Lettuce	Jiang Peifu	05	乙 锰 Topsin M Sumilex	51	Decrease ¥2	3.92
		06	Ridomil Gold Dimetachlone	49		
Lettuce	Wu Entao	05	乙 锰 Topsin M imidacloprid	45	Decrease ¥7	15.56
		06	乙 锰 Dimetachlone imidacloprid	38		
Celery	Lin Mingsu	05	imidacloprid dimethoate carbendazim	42	Decrease ¥4	9.52
		06	Quanshabi(Quin alphos+ fenvalerate) zineb Metalaxyl	38		
Celery	Wu Enjun	05	imidacloprid dimethoate carbendazim	40	Decrease ¥5	12.5
		06	Aoya carbendazim Kehui	35		
Cowpea	Xie Fengchang	05	Propiconazole triadimefon Dursban	77	Decrease ¥9	11.69

		06	Propiconazole triadimefon Dursban	68		
Eggplant	Cui Yongxue	05	Kuaishaling Huimeisukeling Sumilex	150	Decrease ¥ 30	20.00
		06	Celest KungFu Comite	120		
Cucumber	Xie Zhiliang	05	dimethomorph mancozeb Yashijing	180	Decrease ¥ 20	11.11
		06	Curzate Acrobat Gongke	160		
Eggplant	Zhao Changgui	05	chlorothalonil Acrobat acetamiprid Manjisi	110	Decrease ¥ 20	18.18
		06	chlorothalonil Acrobat imidacloprid Manjisi	90		

According to the residue analysis work conducted by the local agricultural bureau, levels of pesticide residues in locally grown crops were low.

Percentage of low pesticide residue vegetable (%)

	Jan	Mar	May	Jul	Sep	Nov
2005	100	98. 95	99. 46	99. 14	96. 77	99. 08
2006	98. 77	99. 63	98. 31	99. 31	96. 00	98. 99

According to the survey of 14 hospitals in Guanghan, 92.17% of pesticides poisoning cases were caused by intentional ingestion in 2005. In 2006, the data shows a decline by 89.86%. The safe and secure storage of pesticides results in a decrease reported poisoning cases.