Developing Training Supplements to the FAO Guidance on Empty Pesticide Containers:

A Project of TPSA's International Committee

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When organized pesticide container stewardship programs first appeared in developed nations more than 25 years ago, pesticide handler training became a necessary companion for improved environmental health and safety. Training materials evolved, usually fitting the resources available to the target audience: their language and their level of sophistication. In relatively rare instances, training was supported by quantities of visual aids, yet the predominant media was textural. Worldwide or even within nations, the instructions were sometimes slightly different or inconsistent. Training based on custom and tradition was as likely as *best practice* education based on verifiable scientific research.

The FAO saw the need to develop more uniform guidance on pesticide container stewardship, correctly recognizing that regularized Code of Conduct would not only serve to protect human and environmental health, but would also create an improved model or direction for pesticide container stewardship programs around the globe. The output from an international panel of experts was published May, 2008 as *Guidelines on Management Options for Empty Pesticide Containers.*[1] This Code of Conduct normalizes the FAO ideals for empty pesticide container management and provides instructions for emptying and handling smaller containers that can be held in hands, larger containers too heavy to be held in hands (drums), pressure rinsing of smaller containers and larger drums. This document is published in the 6 accepted FAO languages.

Implementing this Code of Conduct is now a task before the world community. In some instances, this is not difficult; in other regions of the world it is perhaps not as easy. Literacy, or inability of anyone handling pesticides to read, not only the FAO Code of Conduct, but also the product label and any textural training materials remains a challenge in all pesticide stewardship and safety efforts. Political debates vary any literacy statistics, but there are approximately 195 recognized nations on the planet.[2] There is, however, less debate on the nations or regions with the highest levels of illiteracy: Afghanistan and some nations in Equatorial, West and Central Africa comprise the states with the lowest levels of *literacy*. [2]

The ability to read and understand any written language is not the only impediment to pesticide safety and container stewardship. In fact, ability to read one or more languages worldwide is quite high. In ordinal ranking, one has to look below the 150 out of 195 listing of nations (lower 23%) to reach the less than 2/3rds level (66.6%) literacy.[2] Statistically then, the larger impediment to effective communication is often more the *choice* of language, as opposed to the *inability to read* and understand *any* language. The international organization, *Ethnologue*, estimates that there are 6,809 living world languages.[3] The challenge for disseminating textural knowledge, including any pesticide management knowledge, sometimes comes down to finding a way to communicate directly to the target audience in way that they can first acquire, then retain as memory. The 6 FAO languages are a good start, but only a start. And yet, no one would suggest that the FAO or any central organization print training materials into thousands of languages.

Additionally, there is the limitation of words themselves. Arguably, all of us learn in slightly different ways, depending on our culture and experience. Yet, there are only a handful of types of learning and some categories of mental processing predominate. In the world of agricultural and environmental safety training, information transfer, and presumably the transfer of the FAO Code of Conduct, is most frequently attempted through verbal and written instructions. Malcolm Caldwell, author of *Blink: The Power of Thinking without Thinking*; said, "We learn by example and by direct experience because there are real limits to the adequacy of verbal instructions." [4] This may be true, especially the assertion that verbal instructions are inadequate, but it also impractical, and possibly dangerous, to learn pesticide safety from experience alone. Visualization, demonstration by a competent expert, and finally, hands-on, adequately supervised practice are shortcuts to "try and fail" life experience and are possibly the most effective pesticide education tools. To achieve this end, the first step toward increased memory cognition, or desirable conduct for handlers of pesticides containers, could be visual images to better imprint any best management practices. According to a recent article in Memory and Cognition: "The picture superiority effect has been well documented in tests of item recognition and recall."[5] Images, better than text, or in addition to text, give our minds a mental experience that is far more indelible.

In 2008, The Pesticide Stewardship Alliance recognized the contribution of the FAO Code of Conduct for pesticide container stewardship and sought solutions to 1) better implement the Code and 2) address, if possible, situations where even the most basic resources for pesticide management and communications were stressed or lacking, and yet dramatically improve the acquisition and retention of fundamental pesticide stewardship principles. A core group of TPSA active participants have developed pesticide training programs throughout the US and Canada, a relatively well resourced agricultural community. But certain TPSA International Committee members: Don Mullins, Pat Hipkins, are also experienced in more stressed environments, specifically in West Africa. Using our combined backgrounds; The Pesticide Stewardship Alliance International Committee has chose to simultaneously explore ways to better deliver the pesticide stewardship message. The first project, presented here, aims to strengthen the delivery of the FAO Code of Conduct content through visual media that illustrate and make memorable specific residue removal instructions.

Visual Supplements to "Guidelines on Management Options for Empty Pesticide Containers"

The FAO Code of Conduct is an improvement on most regional, public and private training efforts around the globe. Therefore, this project is not attempting to change the message of this document in any way, but strives to provide a *visual* supplement to a few small, but important sections on residue removal and important points regarding final container disposition. Specifically, the project targets Section 1.5.5 Triple Rinsing for containers small enough to shake *and* for containers that are too large to shake; Section 1.5.6 Pressure Rinsing and select, important messages from following sections on rendering containers unusable and a brief messages regarding final disposition.

The Pesticide Stewardship Alliance's - International Committee has several ideals or goals in mind as they complete this task: 1) the emphasis of the image is on the process, not the artwork or any other aspect of the image, 2) the image should ideally

convey and make memorable each step of the process, 3) the setting of the images are





universal and convey no geographical context, 4) in so far as possible, any representation of figures are without prejudice or identification to any religion, race or other ethnic identifications, 5) images work in either color or black-white formats in any media including grouped in a logical sequence on a poster. A train-the-trainer manual will demonstrate how these images may be used in classroom or field training applications.

The inspiration for this sequence owes a debt of gratitude to many prior efforts, especially a number of CropLife efforts around the globe, [6, 7] the ACRC training programs in the US [8, 9] that were also incorporated into the ASABE Container Rinsing Standards [10] and a number of University training programs, [11, 12] especially the illustrations accompanying the Purdue University training on Pesticide Container Management[13]. The design, preparation and critique of this sequence was presented to an audience of experts at this Albuquerque, NM Conference; 2009-02-24 and changes were suggested for almost every image[14]. The storyboard and comments from this conference are summarized as follows:

Series A. : 3 Rinse-C	ontainer Small Enough	to Shake- FAO Container Guidelines Poster Images
Scene (Italics =Exact FAO language)	Image Needed +Notes	Image/Description of Image
 Using no additional equipment, rinsing instructions for containers that can be held in hands. Emphasis is on rinsing immediately after using last quantity of pesticide. 	Image of container being held. Person should be tan skinned or just a blank ? Top of head not shown so no hat needed like here. Simple V or round neck shirt no western style collar. Long sleeves a must! Comments from participants at TPSA workshops: (2009-02- 24) Figure okay, but one or two comments that person seems to be holding container too close to body, arms more extended. Second comment, should not be "F-Style" container, not common in other parts of world. No comment on whether person skin	<image/>

Storyboard with Comments from Conference Participants:

	should be white or shaded.	
2. Empty the remaining contents into application equipment or a mix tank and	Contents being poured into tank of some kind Ignore the 3 x, but something like this. Make the effluent yellow in color. Comments: Image generated significant comments, re glugging position of container and fact that hollow handle would catch pesticide. BUT if we change container as in above comments, these comments may be nullified. Consensus Suggestion: Show two drawings instead of one. 1) coloured liquid coming out of newly drawn container indicating pouring pure pesticide, and container held in position that will not	
3drain for at least 30 seconds after the flow begins to drip;	The stopwatch is good idea, but don't like the floating container in Purdue slides. Needs two rubber gloved hands with person wearing long sleeved shirt. Drips on this image should be yellow in colourall others in 8 and 14 should be clear. Comments, continued from A1 and A2 earlier	

	and above, and 2) newly drawn container tilted to maximize effective dripping. Drips are coloured yellow and going into tank as here. Stopwatch is okay.	
4. Fill the container ¼ full with clean water;	Show this same F Style container sitting on surface and as if it is transparent and gray water line indicated at 25% of full. Comments, continued from above: change container per comments above. No consensus on whether marks/arrows should indicate 25% or ¼ full.	
5. Securely re-close the cap;	Show person's hand tightening the cap Or Something like this, maybe a corkscrew arrow going down above the cap. Comments: Consensus, this is okay, except for shape of container as listed above.	

6. Shake, rotate, and invert the container so that the water reaches all the inside surfaces;	Image of up and down shaking. Same caveats about the image of the man (and yes it is sexist but probably should be a man) Comments: Except for shape of container, the action marks are good. Container should be held further away from body.	
	Show shaking at either 90 degree angle to above image or upside down. Either okay Comments: Same as above.	

te to the lication pment or the tank; or store r later use or osal.	again, same image as 2. Comments: Same as image 2, EXCEPT steady stream of liquid is now clear or blue indicating rinsate.	
container to drain for 30 seconds after the flow begins to drip;	Comment, Same as image 3 EXCEPT drips are now clear or blue.	

 9. The procedure should be repeated at least two more times until the container appears clean. Fill Container ¼ full with clean water 	Same image as 4. Comments: Same -4	
10.Securely re-close the cap;	Same image as 5. Comments: Same-5	
11.Shake, rotate, and invert the container so that the water reaches all the inside surfaces;	Same 2 images as 6. Comments: Same as changes for two images for 6.	
12.Either add the rinsate to the application equipment or the mix tank; or store it for later use or disposal.	Same image as 2.and 7. Comments: Same as images 7	
13.Allow the container to drain for 30 seconds after the flow begins to drip;	Same image as 3. and 8. Comments: Same as images 8.	
14.The procedure	Repeat 4.5.6.7. and	

should be repeated at least two more times until the container appears clean. Fill Container ¼ full with clean water	8.(as revised)	Same image as 4.
15. Securely re-close		
<i>the cop,</i>		
16.Shake, rotate, and invert the container so that the water reaches all the inside surfaces	Same 2 images as 6.	

17.Either add the rinsate to the application equipment or the mix tank; or store it for later use or disposal.		
18.Allow the container to drain for 30 seconds after the flow begins to drip		Same image as 3. and 8.
<i>19</i> . Puncture Container, make it unusable	Comments: Considerable discussion on what to use here. Consensus was not to use anything that looked like a pocket or other knife that can be used for some other purpose. Suggestion of sharpened spike but no clear consensus and needs more discussion. Comments made that either container does NOT have label at this point or separate drawing shows label being removed. No consensus.	

20. Dispose of in trash or recycle ¹	Comment: Considerable discussion, but not clear guidance. Recycling is preferred alternative. Perhaps drawing with or without the cap being recycled depending on local situation.	
	have labels on at this point.	

Series B. : 3 Rinse-Container <u>Too Large</u> to Shake- FAO Container Guidelines Poster Images		
Scene (Italics =Exact FAO language)	Notes	Image/Description of Image

¹ NOTE: This document is not intended to stand alone but is to serve only as a training aid and refresher for the user. Critical information on hierarchy for final disposition is absent from this brief visual cue.

1) Rinsing instructions for Drums or Containers Too Large to Adequately Shake	Image of Drum or Drums: Recommend Plastic Drum. Color should be white. Good to indicate somehow that there is a top and a bottom. Suggest putting either an upward pointing arrow or some differently colored panel suggesting a label (no particular language) on top third. Reason apparent below	
	Comments: This series generated considerable comment. Some questioned whether manual drum rinsing was even needed. Consensus was that 1) manual rinsing is in the FAO guidance and 2) drums are rarely but occasionally used for backpack sprayers on plantations, other small spray operations. Series is needed.	Comments: Okay as far as image is concerned

2) Empty remaining Contents into application equipment or a mix tank;	dripping into measuring cup. Drum is essentially horizontal with drum tap in one of the two drum openings (other is for ventilation). Liquid is colored; suggest yellow and color inside measuring cup is also yellow.	
	Advisors advocate the measuring cup or beaker should be used but the drawing should have some indication of gradations/measureme nts and be partially filled with colored liquid.	Comment: Debate was on what the drum should be draining "into?" Measuring device or tank or backpack sprayer. No real consensus. May need steady stream going into "whatever" and then show drum tilted to drip last amounts prior to rinsing. This is a must comment and another drawing is needed to show drum tilted. Some debate, too, on what the drum should be resting on. Options were cradle of wood or metal, hand tilted or like here as undefined. No clear consensus.
3) Fill the container ¼ full with water;	Surface of this "liquid" could be stylized water surface. Option: Show rubber gloved hand filling drum with what looks like ordinary flexible hose. Hose is not inserted into the opening just slightly above it and clear liquid (water) is flowing heavily into the drum	Image is of a medium sized white drum that for this image appears to be semi-transparent. The bottom 25% of the drum is gray/blue colored with a stylized surface that is classic graphic for water / liquid surface. A double ended arrow or a label on one end outside of the drum indicates that the drum is upright, or vertical and has "¼" in the middle of it indicating that the drum is filled with liquid 25%. Comments: Some suggestion that the surface of the water could more closely follow the 3 dimensional curve of the container and that the height be indicated as 1/4 th of 25%

4) Replace and Tighten Closures;	Option? show drum closures hovering above with corkscrew arrow indicating closure and tightening	Show top of drum with two openings. One has a rubber gloved hand, long sleeve shirted person with cap (will not be able to see it very well) over top of one of the openings. Clockwise arrow would show rotation better Comments: Most thought this fairly good. No one suggested drawing in the hand. Question as to whether the clockwise arrows should be elevated off the top or not. No consensus.

5) Tip container on its side and roll it back and forth, ensuring at least one complete revolution, for 30 seconds;		Our mixer loader applicator caricature, as described in earlier frames (Series 1), is bent over pushing a cylindrical container (white drum) on the ground. We see the end of the container and arrows indicate that the person is rotating the drum to and fro, back and forth.
		Hovering above is the half coloured in stopwatch indicating 30 seconds.
		Comments: Our reviewers thought this image fairly self explanatory. One person questioned as to whether the arrow should be double-ended perhaps indicating back and forth motions of rolling.
6) Stand the	Here is where it is	The drum is now upright; clearly the top side is UP. But
container on its	important to have some	the drum is slightly off its 90 degree upright axis. Our
and forth several	drum/large container	agitating the rinse water inside We know this because
times;	has a top and a bottom.	there are arrows showing back and forth motion and
	This can be an arrow or	we can see the water inside which is on a horizontal
	a suggestion of a label	plane
	at one end. The thick	FAO suidelines de actorestica 20 consuls base de bi
	ring/band at the top of	FAU guidelines do not mention 30 seconds here, should

	the plactic drupp cap	the the same?
	the plastic urum can	It be the same?
	also be a clue.	Comment: Fairly good consensus that this showed the rocking motion and the drum upright. On question of the 30 seconds, no consensus. One comment: "we are not here to re-write the FAO guidance."
7) Turn the container over onto its other end and tip it back and forth several times;	This is the same drawing EXCEPT the indications of top and bottom of the drum/large container are reversed.	The drum is now reversed; clearly the top side is DOWN. But the drum is slightly off its 90 degree upright axis. Our caricature person is tipping the drum back and forth agitating the rinse water inside. We know this because there are arrows showing back and forth motion and we can see the water inside which is on a horizontal plane
		it be the same? Comments: Similar to above. Fairly satisfied with result. Drum is obviously upside down.



	until future use, it	
	"E Stulo" containor Not	
	r Style container. Not	
	what liquid should be	
	going into Tank or	
	backpack spravor woro	
	two most common	
	choices	
	choices.	
	This image should be	
	followed by drum tilted	
	and dripping going into	
	whatever tank is	
	selected for this image.	
	Difference between	
	image 2 (when	
	modified) is that this	
	will show clear or blue	
	liquid coming out,	
	indicating rinsate.	
9) Repeat this	Same images as 3, 4, 5,	
procedure one	6, 7, 8	
more time.		
10)Repeat this	Same images as 3, 4, 5,	
procedure at least	6, 7, 8	
one more time		
annears clean		
uppeurs cieun.		

11 Drill or puncture		
both ends of		
container	Not exactly at this spot	
container	But on the sides near	
	the ends so neither end	
	can be used as a vessel	
	of any kind	
	Comment: Discussion	
	did agree that drill	
	should be pointed at	
	the seams. Comment	
	suggested another set	
	of arrows should	
	indicate that the holes	
	he also on the other	
	side At least two holes	
	per end of the drum	
	per end or the druin.	
	Comment: Label should	
	be removed at about	
	this point for recycling	
12. Dispose of in trash	Any better suggestions?	
or recycle. ²		
	Comments: Consensus	
	was that the best choice	
	is recycling and even	
	though some solid	
	waste disposal will be	
	necessary, the image	Recycling Symbol on side Green truck
	should only show the	
	preferred option which	OR
	is recycling. Consensus	
	was the best image	
	would be a green	
	coloured cab with	
	recycling emblem on an	
	open truck/lorry and	
	drums lined up on the	
	open platform bed.	
	Drums do not have	
	labels on at this point.	
	Townships of the s	
	Forget the other	
	arawings.	

² NOTE: This document is not intended to stand alone but is to serve only as a training aid and refresher for the user. Critical information on hierarchy for final disposition is absent from this brief visual cue.



Series C. : Pressure Rinsing- FAO Container Guidelines Poster Images

Scene	Notes	Image/Description of Image
(Italics =Exact FAO language)		
I. Pressure rinsing	How to show the	
equipment uses	concept of 3	
water pressure	atmosphere's of	
(typically 3 bar) in	pressure? When there	
the form of a static	is no positive pressure	
or rotating spray	capable of moving	
jet ana vaive.	"one" bar.	30m 3
	Comment: The basic concept of Illustrating 3 bars of pressure was presented at the TPSA 2 nd work session. This concept received positive comments. The remainder of this programme was not discussed beyond this point.	
И.	But when water is unleashed from a height of approximately 30 meters (top of the water column to outlet height) ³ , water pressure is sufficient to dislodge most residues with pressure rinse equipment.	
	Of course, not everyone	OR
	pumps can accomplish	

³ Precise deliver of 3 bar depends on elevation above sea level and other small variables, inc. atmospheric pressure, but 30 m is good approximation for delivery of 3 bar. Water tower is not only way to achieve 30 m of head pressure.

		the equivalent pressure	
<i>III.</i>	The jets of water hit the internal surfaces of the container removing and dissolving the pesticide residue	The FAO Guidelines use this photo from North Dakota training materials. Question is: should this image be used or drawing substituted illustrating the same fan type spray pattern? My preference: Drawing with rubber gloves even though pesticides are apparently not present	
IV.	Some pressure rinsing equipment includes a sharp device that penetrates the container walls for rinsing purposes, thereby offering the additional advantage of making the container unusable for storage. These devices should be used in accordance with the manufactures' instructions to avoid injury to the operator. Examples of pressure rinsing devices are	Recommendation: Use these drawing as depicted in the FAO Guidance.	

	shown		
		The procedure for rin	sing small containers is:
V.	Put on the personal protective equipment listed on the products label.	Comments: Probably the same comments apply as Series A-1.	
VI.	Install pressure- rinse nozzle on hose connected to a water supply capable of delivering 3 Bar of water pressure		



-		-	
VIII.	Firmly press the pressure-rinse nozzle tip into the side or bottom of the pesticide container until the probe is inserted and seated, then turn on and rinse the container for at least 30 seconds with it draining into the sprayer's tank	Earlier comments suggested different container, and if agreed, then this image would need to be redrawn. Opening to spray tank would likely be bigger. There are ways of holding the container that would distance the mixer- loader from the spray mix.	
		There are a large number of photos and even a few existing drawings of pressure- rinsing.	
IX.	During the rinsing, rock and rotate the nozzle so that the water jets reach all internal surfaces of the container. Make sure hollow handles are properly rinsed.	Comment: From my experience, there are several things about this drawing that appears in the FAO guidance that could be done better. What it does do correctly is indicate the rocking motion of both	

		the container and the pressure-rinse nozzle. This positive must be maintained! What could be done better? If done well we don't need words on the image. The nozzle doesn't look like any currently available. US EPA research indicates that best point for inserting nozzle, when there is a hollow handle is on the short side, nearest to handle, about 1/3 from bottom to the top. NOT THE BOTTOM.	NOTE: Use "rocking", twisting or "wobbling" motion to make sure spray hits bottom of container; or pierce side of container instead of bottom. Container Rinser Water Line Replaceable Tips 1-5 Gallon Pesticide Container Sprayer Tank
X. Allov to dr least	w the container rip drain for at : 30 seconds.	Repeat image with all previous comments.	

XI.	Rinse the caps by placing in a bucket of water for 3 minutes. Screw the rinsed caps back onto the container and add the water to the spray tank.	Comment: To my knowledge no one has ever pictured this cap in a bucket process. Routine in US is to hold cap under the outflow of the pressure-rinsed container, over the receiving spray tank, and clean caps simultaneously. This avoids cross contaminating a bucket that may be used for other purposes. <i>Almost certainly is not my place to editorialize</i> and drawing should be made to illustrate this point of cap cleaning. Disposal or recycling information missing from this section and may need to show that?? Remove label prior to that point?	Image: caps soaking in bucket of water. Image: (below) Screw the rinsed caps back onto the container. Image: Container Image: Add bucket water to spray tank. Image???: Remove label Image???: Recycle
The F	Procedure for Rinsing	Large Containers Is	

For larger containers that are too heavy to lift above the spray tank for example		
200 litre drums		
a suction rinse probe can be used with the container standing upright. A diagram of a probe is shown	Comment: This could be improved with artwork. I think the probe on a different axis than the drum would illustrate better than words that the probe is not secured to the drum and can rotate and rock for better cleaning geometries. Distance to bottom should be in metrics. As gross calculation suggest: 1 to 3 mm as closest practical measure. Alt: 1.5 to 3 mm.	Rinsate to the Mix Tank Water Inlet DO NOT SEAL PROBE TO THE CONTAINER! O O O O O O O THE CONTAINER! O O O O O O O O THE CONTAINER! THE CONTAINER! O O O O O O O O O THE CONTAINER! THE CONTAINER!
Suck the contents		Image: Drum with probe out top flowing through hose
into the spray tank.		to spray tank and yellow liquid flowing into tank.
Tilt the drum slightly so the remaining contents gather in a corner at the bottom and suck these into		Image: Tilted "transparent drum" with small quantity of pesticide in corner being sucked by probe into hose and then spray tank or just close-up of probe inside tilted drum
	tank, for example 200 litre drums a suction rinse probe can be used with the container standing upright. A diagram of a probe is shown Suck the contents into the spray tank. Tilt the drum slightly so the remaining contents gather in a corner at the bottom and suck these into spray tank	tank, for example 200 litre drumsComment: This could be improved with artwork. I think the probe can be used with the container standing upright. A diagram of a probe is shownComment: This could be improved with artwork. I think the probe on a different axis than the drum would illustrate better than words that the probe is not secured to the drum and can rotate and rock for better cleaning geometries.Suck the contents into the spray tank.Distance to bottom should be in metrics. As gross calculation suggest: 1 to 3 mm as closest practical measure. Alt: 1.5 to 3 mm.

XVI.	Turn on rinsing nozzles while sucking the rinsate into the mixing tank. Rinse for 3 to 5 minutes		Image: Inside view of rinse water filling drum and circulating (as witnessed by arrows). Some rinsate flowing through hose to tank. Rows of 3 and 5 stopwatches, all coloured red are hanging over scene.
XVII.	Turn the rinsing nozzles off and continue to suck the rinsate into the spray tank. The drum can be tilted to enable all the rinsate to be sucked into the spray tank.	Comment: a little confusing when reference in one instruction to mix tank and another as spray tank, but presume it can be/is the same.	Image: Tilted drum draining the last bit of blue coloured water from corner of drum into spray tank.
		I. Comment: Any image of recycling or label removal?	

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