



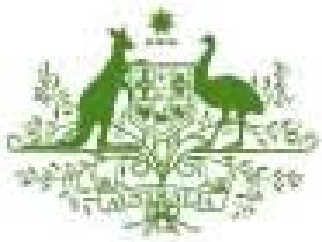
REPORT ON

STUDY TO IMPROVE TEMPERATE FRUIT TO BETTER LINK WITH MARKETS IN NORTH WEST HIGHLAND OF VIETNAM

Project:

“Improved market engagement for sustainable upland production systems in the North West Highlands of Vietnam– AGB/2008/002”





Australian Government

Australian Centre for
International Agricultural Research



THE UNIVERSITY
OF QUEENSLAND
AUSTRALIA

Manager: Associate Professor, Dr. Pham Thi Vuong

Implementing timeframe: 6/2009 – 5/2013

Le Duc Khanh, Nguyen Van Chi, Nguyen Thi Thuy, Nguyen
Nam Hai, Do Xuan Dat, Pham Van Ben



General information

North West Highland provinces are among the poor provinces in Vietnam with the poor rate is at 28% (national average is 10%)

- Lack of market integration
- Inappropriate and unsustainable land management
- Limited awareness and capacity of poor

To increase smallholder engagement in competitive and more profitable for small holder producers value chains associated with two farming systems based on maize and temperate fruits

OBJECTIVES



Upgrading some existing Tam Hoa plum orchards to have higher yield and better quality *Pieng Sang – Phieng Luong, Moc Chau, Son La*

Establishing newly planted temperate fruit orchards in 3 districts Sin Ho, Tam Duong (Lai Chau), & Moc Chau (Son La)

Research methodology & activities

Research activities

- Activity 1: Carry out diagnostic study to select suitable project sites (completed in 2009)
- Activity2: Upgrade existing Tam Hoa plum orchards in Pieng Sang, Phieng Luong, Moc Chau, Son La (2010-2013)
- Activities 3: Plant new temperate fruit orchards in Son La (La Nga, Muong Sang, Moc Chau) and in Lai Chau (Giang Ma, Tam Duong, Lung Su Phin, Sin Ho) ; also intercrop these orchards with other plants to provide living mulch and increase farmers' income (2010-2013)
- Activities 4: build capacity for project's officers(2010-2013)

Upgrading existing plum orchard activities

✓ Experiment design

Are implementing in Pieng Sang (2010 – 2013)

| Treatment | Treatment 1 (CT1) | Treatment 2 (CT2) | Treatment 3 (CT3) | Treatment 4 (CT4/control) |
|------------------------|---|---|-----------------------|---------------------------|
| Technical intervention | -Pruning -Applying fertilizer 1 -Mulching | -Pruning -Applying fertilizer 2 -Mulching | -Pruning -Mulching | -No intervention |
| Time frame | 2010 – 2012 | 2012 - 2013 | 2010 - 2013 | 2010 - 2013 |

Applying fertilizer 1

| # | Type | Total (g/tree/year) | After harvest (g/tree) | Early Autumn (g/tree) | End of winter (g/tree) |
|---|--------------------|---------------------|------------------------|-----------------------|------------------------|
| 1 | Urea (46 %) | 450 | 100 | 100 | 250 |
| 2 | Phosphorous (16 %) | 340 | 100 | 100 | 140 |
| 3 | Posstassium (60%) | 540 | 150 | 150 | 240 |

Applying fertiliser 2

| # | Type | Total (g/tree/year) | After harvest (g/tree) | End of winter(g/tree) |
|---|--------------------|---------------------|------------------------|-----------------------|
| 1 | Urea(46 %) | 350 | 100 | 250 |
| 2 | Phosphorous (16 %) | 250 | 100 | 150 |
| 3 | Posstassium (60%) | 350 | 150 | 200 |

Project's activities on exisiting orchards and project's adjustments

| Impacts | Completed (2010 – 2012) | Adjustments (2012 - 2013) |
|-------------------------------------|---|--|
| Pruning | 2 times/year (after harvest & end of winter) | 1 time/ year (after harvest) |
| Applying fertilizer | - 3 times/year (after harvest, early Autumn, and end of winter) | - 2 times/year (after harvest, end of winter) - Add secondary elements and micro element, micro element Ca,Bo when fruits are established |
| Mulching | Weeds, maize's stems, cana's stem... to mulch 30 cm away, around tree's trunk. The thickness of mulching layer 20cm. | As in 2012. |
| Pest and disease control activities | -Monitor some main pests' and diseases' occurrence - Control Fruit flies using methyl eugenol and protein baits when fruit flies' polulation reached 4 – 5 flies/bait. | - Monitor some main pests' and diseases' occurrence - Use methyl eugenol to monitor fruit's fly population and spray Protein bait from 1 – 1,5 month before harvesting. |

Planting new orchards activities

Implemented activities

| Plan | Completed activities (2011 – 2012) | Adjustment (2012 – 2013) |
|-----------------------------|--|---|
| Digging holes | Hole standard: 80x80x80cm | - |
| Planting trees | Prepare seedlings, fertilizer to plant Take care of the new orchards | - |
| Pruning, training | -Train branches to make open- vase canopy -2 times/year (June& December) | -maintain the open-vase shape -1 time/year |
| Applying fertilizer | 3 times/ year(following procedure) | As in2011 – 2012 |
| Mulching | Dead mulching materials: dead weeds, hay..... to preserve the soil's moisture | As in 2011 – 2012 |
| Intercropping | With peanut and soybean | As in 2011 – 2012 |
| Plant protection activities | Monitor main pests and diseases to address suitable solution | As in 2011 – 2012 |

Amount of fertilizer used in newly planted orchards

| # | Type of fertilizer | After Harvest (g/tree) | Early Autumn (g/tree) | End of winter (g/tree) |
|---|--------------------|------------------------|-----------------------|------------------------|
| 1 | Urea (46 %) | 75 | 75 | 150 |
| 2 | Phosphorous (16 %) | 35 | 35 | 70 |
| 3 | Posstassium (60%) | 60 | 60 | 120 |

Capacity building activities

- ✓ Organized training and workshop to improve technical knowledge
- ✓ Study tour to Australia

Results and discussion

1. Diagnostic study

Suitable locations for project's activities

| Son la province | | Lai Chau province | |
|---|--|---|---|
| Moc Chau district | | Tam Duong district | Sin Ho district |
| La Nga village | Phieng Sang village | Giang Ma village | Lung Su Phin village |
| Planting new orchards using early ripen peach variety | Upgrade existing Tam Hoa plum orchards | Planting new orchards using early ripen peach variety, persimmon variety and plum variety | Planting new orchards using early ripen peach variety, persimmon variety and plum variety |

2. Upgrading existing orchards

Table 1.List of participating farmers in upgrading existing plum orchard activities in Pieng Sang, Phieng Luong, Moc Chau, Son La

| TT | Farmers | Plum variety | Trees' age(year) | Number of trees in 1 orchard |
|----|----------------|--------------|------------------|------------------------------|
| 1 | Ly Duc Duong | Tam Hoa | 7 | 70 |
| 2 | Tang Van Dan | Tam Hoa | 9 | 60 |
| 3 | Dang Van Chien | Tam Hoa | 7 | 91 |
| 4 | Dang Thanh Tam | Tam Hoa | 7 | 315 |
| 5 | Trieu Van Son | Tam Hoa | 7 | 35 |



✓ **Pest and disease control activities**
 Table 2. The damage rate causing by fruit flies for plum in Pieng Sang

| Orchard | Damage rate (%) | |
|--------------------|-----------------|-------|
| | 2012 | 2013 |
| Project's orchards | 7 | 9.69 |
| Other orchards | 7 | 20.94 |

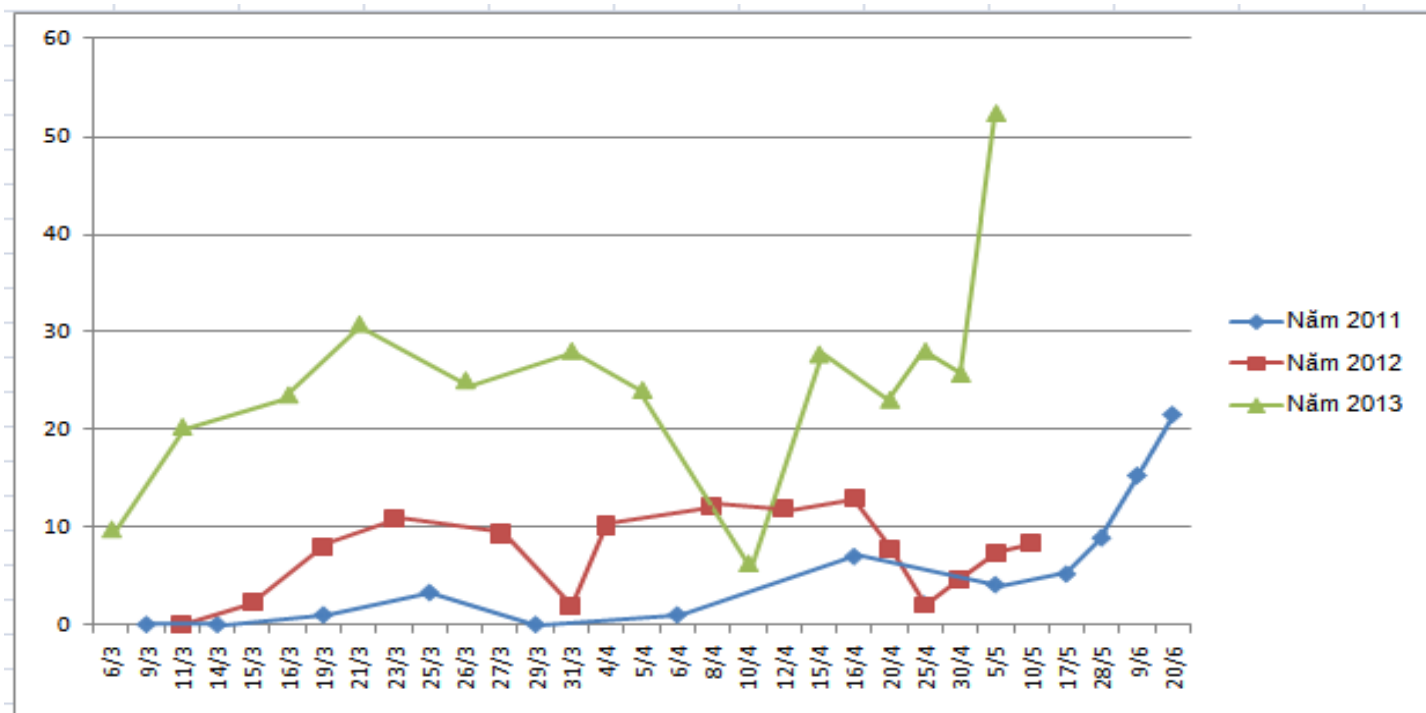


| | |
|--|---|
| | Tên khoa học: <i>Grapholia molesta</i> (Busck) |
| | Họ Tortricidae |
| | Bộ Lepidoptera |
| | |
| | |





- ✓ Results from fruit fly controlling activities
 - Monitor fruit fly's population using Methyl eugenol baits



Graph 1: Fruit fly's polulation in attractant baits inPieng Sang,
2011,2012



The effectiveness of controlling fruit flies using Protein & attractant traps

Table 3. the damage rate causing by fruit flies at harvesting period (Pieng Sang 2010 - 2013)

| Location | The rate of damaged fruit (%) | | | |
|-----------------------|-------------------------------|------|------|------|
| | 2010 | 2011 | 2012 | 2013 |
| Experiential orchards | 56,33 | 11,0 | 0 | 3.55 |
| Control | 52 | 32,0 | 0 | 7.85 |



- The development of plum in Pieng Sang



Table 4. Some indicators of plum from different treatments in Pieng Sang 2011, 2012

| TT | Treatment | Length of shoots (cm) | Leaf falling period | End of leaf falling period |
|---------|------------------------------------|-----------------------|---------------------|----------------------------|
| In 2011 | | | | |
| 1 | Fertilization, pruning, mulching | 47,29 ± 5,61 | 20 – 27/10 | 20 – 25/11 |
| 2 | Pruning, mulching | 39,52 ± 4,82 | 15 – 22/10 | 10 – 15/11 |
| 3 | Control | 29,6 ± 2,5 | 1 – 7/10 | 25 – 30/10 |
| In 2012 | | | | |
| 1 | Fertilization 1, pruning, mulching | 43,17 ± 4,41 | 1 – 5/11 | 17 – 25/11 |
| 2 | Fertilization 2, pruning, mulching | 40,52 ± 4,82 | 27/10 – 5/11 | 15 – 25/11 |
| 3 | Pruning, mulching | 33,65 ± 3,52 | 20 – 30/10 | 10 – 20/11 |
| 4 | Control | 23,76 ± 4,21 | 30/9 – 5/10 | 25/10 – 7/11 |



- Plum's yield and quality from different treatments

Table 5. The rate of cracked fruits amongst treatments (Pieng Sang, 2011).

| Monitoring date | The rate of cracked fruit(%) | | |
|-----------------|------------------------------|---------|---------|
| | Pruning+ fertilization | Pruning | Control |
| 6/6 | 13.16 | 0.91 | 0.00 |
| 17/6 | 4.79 | 2.03 | 0.51 |
| 22/6 | 6.54 | 0.46 | 0.00 |

Table 6. Plum's yield among different treatments from 2010 – 2013 in Pieng Sang

| Year | Yield (kg/tree) | | | |
|------|-----------------|-------|-------|-------------------|
| | CT 1 | CT 2 | CT 3 | CT 4 (Control) |
| 2010 | 11,9a | - | 8,1a | 2,1b |
| 2011 | 16,5a | - | 9,1b | 5,6c |
| 2012 | 12,3a | 11,9a | 10,9a | 9,3b |
| 2013 | | 58.5 | 35.7 | 16.8 |

Table 7. Plum's hardness and sugar content among different treatments (Pieng Sang, Moc Chau – 2010, 2011 & 2012).

| Treatment | Sugar content (Sweetness) % | | | | Hardness (kg/cm ²) | | | |
|-----------|-----------------------------|---------------|---------------|------|--------------------------------|-------|------|------|
| | 2010 | 2011 | 2012 | 2013 | 2010 | 2011 | 2012 | 2013 |
| CT1 | 11,24b | 12.0 b | 9.71b | - | 7,64b | 5.3 a | - | - |
| CT2 | - | - | 10.08ab | 10.9 | - | - | - | 7.3 |
| CT3 | 11,13b | 11.7 b | 10.45a | 11.0 | 7,6b | 5.8 a | - | 9.5 |
| Control | 12,09a | 12.6 a | 10.35a | 11.1 | 9,48a | 6.2 a | - | 9.0 |

Note: (*) different letter in the same column meant errors within 95% confidence level, - Tukey's standard

CT1: Pruning + fertilization 1 + mulching

CT2: Pruning + fertilization 2 + mulching

CT3: Pruning + mulching

CT4: control

Table 8. Plum's size among different treatment over years (Pieng Sang, Moc Chau).

| Monitoring year | Plum's diameter (cm) | | | |
|-----------------|----------------------|-------|--------|---------------|
| | CT1 | CT2 | CT3 | CT4 (control) |
| 2010 | 3,98a | - | 3,76b | 3,62b |
| 2011 | 4,04a | - | 3,87ab | 3,64b |
| 2012 | 2,96a | 2,96a | 2,9a | 2,63b |
| 2103 | | 3.31 | 3.12 | 3.20 |

Table 9. Economic analysis for Pieng Sang plum in 2011 (when farmers sold ripe plum)

| TT | Items | Unit | Price ('000 vnd | Treatments | | | Total ('000 VND) | | |
|------|-----------------------------|--------|--------------------|------------|------|------|------------------|------|------|
| | | | | CT1 | CT2 | Đ/C | CT1 | CT2 | Đ/C |
| I | Cost for every 200 trees | | | | | | | | |
| 1 | Cost of labour | | | 64 | 58 | 17 | | | |
| | Dressing fertilizer | Day | | 6 | - | - | | | |
| | Pruning | Day | | 30 | 30 | - | | | |
| | Clearing weeds+ mulching | Day | | 8 | 8 | - | | | |
| | Spraying pesticide | Day | | 10 | 10 | - | | | |
| | Spraying protein baits | Day | | 3 | 3 | 3 | | | |
| | Harvesting | Day | | 7 | 7 | 14 | | | |
| 2 | Cost of input | | | | | | 4792,6 | 2668 | 1200 |
| - | Fertilizer | | | | | | | | |
| | + Phu My Urea | Kg | 10,8 | 75 | - | - | 810 | - | - |
| | + Lam thao phosphorous | Kg | 4,2 | 48 | - | - | 201,6 | - | - |
| | + Belarus posstassium | Kg | 13,5 | 78 | - | - | 1053 | - | - |
| | + Lime | Kg | 0,6 | 100 | - | - | 60 | - | - |
| - | Pesticide | | | | | | | | |
| | + Sherpa 25EC | Bottle | 25 | 10 | 10 | - | 250 | 250 | - |
| | + Ridomil 68WP | Bag | 30 | 29 | 29 | - | 870 | 870 | - |
| | + Sancozerb 80WP | Bag | 12 | 29 | 29 | - | 348 | 348 | - |
| - | Protein baits | Bottle | 100 | 12 | 12 | 12 | 1200 | 1200 | 1200 |
| II. | Gross income from 200 trees | | | | | | 5264 | 2912 | 1792 |
| | Estimated yield | Ton | 1600 | 3,29 | 1,82 | 1,12 | 5264 | 2912 | 1792 |
| III. | Benefit | | | | | | 471,4 | 244 | 592 |

Table 10. Economic analysis for Pieng Sang plum in 2012 (when farmers sold green plum)

| # | Items | Unit | Price (‘000VN D) | Treatments | | | | Value (‘000VND) | | | |
|------|-----------------------------|--------|------------------------|------------|------|------|------|-----------------|------|------|------|
| | | | | CT1 | CT2 | CT3 | ĐC | CT1 | CT2 | CT3 | ĐC |
| I | Over 200 trees | | | | | | | | | | |
| 1 | Cost of labour | | | 58 | 55 | 49 | 8 | | | | |
| | Fertilization dressing | Day | | 9 | 6 | - | - | | | | |
| | Pruning | Day | | 30 | 30 | 30 | - | | | | |
| | Clearing weeds+ mulching | Day | | 8 | 8 | 8 | - | | | | |
| | Spraying pesticide | Day | | 5 | 5 | 5 | - | | | | |
| | Spraying protein baits | Day | | 1 | 1 | 1 | 1 | | | | |
| | Harvesting | Day | | 5 | 5 | 5 | 7 | | | | |
| 2 | Input cost | | | | | | | 3185.6 | 2381 | 410 | 290 |
| - | Fertilizer | | | | | | | | | | |
| | + Phu My Urea | Kg | 10.8 | 90 | 70 | - | - | 972 | 756 | - | - |
| | + Lam Thao phosphorous | Kg | 4.2 | 68 | 50 | - | - | 285.6 | 210 | - | - |
| | + Belarus Posstassium | Kg | 13.5 | 108 | 70 | - | - | 1458 | 945 | - | - |
| | + lime | Kg | 0.6 | 100 | 100 | - | - | 60 | 60 | - | - |
| - | Pesticide | | | | | | | | | | |
| | + Anvil 5SC | Bottle | 120 | 1 | 1 | 1 | - | 120 | 120 | 120 | - |
| | Fuit fly traps | Bait | 9 | 10 | 10 | 10 | 10 | 90 | 90 | 90 | 90 |
| - | Protein baits | Bottle | 100 | 2 | 2 | 2 | 2 | 200 | 200 | 200 | 200 |
| II. | Gross income over 200 trees | | | | | | | 8610 | 8330 | 7630 | 6510 |
| | Estimated yield | Ton | 3500 | 2.46 | 2.38 | 2.18 | 1.86 | 8610 | 8330 | 7630 | 6510 |
| III. | Net benefit | | | | | | | 5424.4 | 5949 | 7220 | 6220 |

Bảng 11. Economic analysis for Pieng Sang plum in 2013 (when farmers sold ripe plum)

| # | Items | Unit | Price('000 VND) | Treatment | | | Value (.000VND) | | | |
|------|-----------------------------|--------|-----------------|-----------|------|------|-----------------|-------|-------|-------|
| | | | | CT1 | CT2 | ĐC | CT1 | CT2 | ĐC | |
| I | Over 200 trees | | | | | | | | | |
| 1 | Cost of labour | | | 45 | 34 | 8 | | | | |
| | Dressing fertilization | Day | | 6 | - | - | | | | |
| | Pruning | Day | | 15 | 15 | - | | | | |
| | Clearing weeds + mulching | Day | | 8 | 8 | - | | | | |
| | Spraying pesticide | Day | | 5 | 5 | - | | | | |
| | Spraying foliage fertilizer | Day | | 5 | | | | | | |
| | Spraying protein baits | Day | | 1 | 1 | 1 | | | | |
| | Harvesting | Day | | 5 | 5 | 7 | | | | |
| 2 | Input cost | | | | | | 2196 | 225 | 190 | |
| - | Fertilizer | | | | | | | | | |
| | + Phu My Urea | Kg | 10.8 | 70 | - | - | 756 | - | - | |
| | + Lam Thao phosphorous | Kg | 4.2 | 50 | - | - | 210 | - | - | |
| | + Belarus posstassium | Kg | 13.5 | 70 | - | - | 945 | - | - | |
| | + lime | Kg | 0.6 | 100 | - | - | 60 | - | - | |
| | Cabo | Bag | 5 | 40 | - | - | | | | |
| - | Pesticide | | | | | | | | | |
| | + Sherpa 25EC | Bottle | 35 | 1 | 1 | - | 35 | 35 | - | |
| | Fruit fly | Trap | 9 | 10 | 10 | 10 | 90 | 90 | 90 | |
| - | Protein baits | Bottle | 100 | 1 | 1 | 1 | 100 | 100 | 100 | |
| II. | Gross income over 200 trees | | | | | | | 36270 | 22134 | 10416 |
| | Estimated yield | Ton | 3100 | 11.7 | 7.14 | 3.36 | 36270 | 22134 | 10416 | |
| III. | Net benefit | | | | | | | 34074 | 21909 | 10226 |



3. Plating new orchards in Son La & Lai Chau

Table 12. List of participating farmers in Son La & Lai Chau.

| TT | Farmer | Location |
|----|-----------------|---|
| 1 | Giang Pao Giang | Ban Giang Ma, Giang Ma, Tam Duong, Lai Chau |
| 2 | Giang A Vang | Ban Giang Ma, Giang Ma, Tam Duong, Lai Chau |
| 3 | Giang A Vang | Ban Giang Ma, Giang Ma, Tam Duong, Lai Chau |
| 4 | Ma Khoa Giang | Ban Giang Ma, Giang Ma, Tam Duong, Lai Chau |
| 5 | Giang A Giao | Ban Giang Ma, Giang Ma, Tam Duong, Lai Chau |
| 6 | Tan A Tai | Ban Giang Ma, Giang Ma, Tam Duong, Lai Chau |
| 7 | Thao A Dao | Ban Lung Su Phin, Ta Ngao, Sin Ho, Lai Chau |
| 8 | Giang Chu Sinh | Ban Lung Su Phin, Ta Ngao, Sin Ho, Lai Chau |
| 9 | Mua A Cha | Ban Lung Su Phin, Ta Ngao, Sin Ho, Lai Chau |
| 10 | Lo Van En | Ban La Nga, Muong Sang, Moc Chau, Son La |
| 11 | Đinh Cong Sun | Ban La Nga, Muong Sang, Moc Chau, Son La |
| 12 | Nguyen Van Tuan | Ban La Nga, Muong Sang, Moc Chau, Son La |
| 13 | Lo Van E | Ban La Nga, Muong Sang, Moc Chau, Son La |
| 14 | Vu Van Khang | Ban La Nga, Muong Sang, Moc Chau, Son La |

Table 13. Different temperate fruit varieties planted in Muong Sang – Moc Chau – Son La, Giang Ma – Tam Duong & Ta Ngao – Sin Ho - Lai Chau.

| Project sites | Total trees | Peach variety ĐCS1 | Sunwright | Plum Rubenal | Tropic beauty | Persimmon Fuyu, Jiro |
|--------------------------------|-------------|--------------------|-----------|--------------|---------------|----------------------|
| Giang Ma, Tam Duong, Lai Chau | 253 | 213 | 20 | | 10 | 10 |
| Lung Su Phin, Sin Ho, Lai Chau | 188 | 128 | 30 | 10 | 10 | 10 |
| La Nga, Moc Chau, | 246 | 154 | | | 92 | |
| Total | 687 | 495 | 50 | 10 | 112 | 20 |



■ Outcomes

Table 14. Yield of peach variety DCS1 at project's sites (4/2013)

| Farmers | Sites | Yield (kg/tree) |
|-----------------|---------------------|-----------------|
| Tan A Tai | Tam Duong – La Chau | 31.3 |
| Giang A Giao | | 22.9 |
| Mạ Khoa Giang | | 10.2 |
| Giang Pao Giang | | 6.1 |
| Giang A Vang | | 11.3 |
| Average | | 16.36 |
| Giang Chu Sinh | Sin Ho - Lai Chau | 2.7 |
| Thao A Giao | | 1.8 |
| Thao A Long | | 0.6 |
| Average | | 1.7 |
| Luong Van Binh | Moc Chau – Son La | 26.5 |
| Lo Van Hanh | | 8.6 |
| Vu Van Khang | | 5.7 |
| Average | | 13.6 |

Table 15. Income from peach for each farmer researcher

| Farmers | Site | Kg of sold peach | Price (.000đ) | Income from peach(.000đ) |
|-----------------|-----------|---------------------|------------------|-----------------------------|
| Lo Van En | Moc Chau | 150 | 10 | 1.500 |
| LO VanHanh | Moc Chau | 300 | 9 - 10 | 2.850 |
| Luong Van Binh | Moc Chau | 200 | 7 – 8 | 1.250 |
| Vu Van Khang | Moc Chau | 35 | 8 – 10 | 300 |
| Giang Pao Giang | Tam Duong | 125 | 28 – 30 | 3.500 |
| Tan A Tai | Tam Duong | 280 | 22 – 26 | 6.000 |
| Giang A Giao | Tam Duong | 320 | 25 – 30 | 8.000 |
| Giang A Vang | Tam Duong | 140 | 25 – 30 | 4000 |
| Ma Khoa Giang | Tam Duong | 230 | 25 – 28 | 5.800 |

(nguồn: nông dân)

Table 16. Several indicators measured in peach variety DCS1 in Giang Ma, Tam Duong in 2013 .

| Farmers | Perimeter (cm) | Height (cm) | Brix (%) | Hardness (kg/cm ²) |
|--------------------|----------------|-------------|----------|--------------------------------|
| 1/ Giang A Giao | 14.89 | 5.17 | 9.60 | 6.93 |
| 2/ Giang Pao Giang | 11.92 | 4.21 | 9.41 | 8.12 |
| 3/ Giang A Vang | 12.03 | 4.29 | 9.54 | 7.37 |
| 4/ Ma Khoa Giang | 11.90 | 4.36 | 9.29 | 8.60 |
| 5/ Tan A Tai | 12.21 | 4.31 | 9.60 | 5.91 |

Table 17. Several indicators measured in Muong Sang, Moc Chau, 2013.

| Farmers | Tropic beauty | | | | DCS1 | | | |
|---------|---------------|--------|------|----------|-----------|--------|------|----------|
| | Perimeter | Height | Brix | Hardness | Perimeter | Height | Brix | Hardness |
| Hạnh | 11.3 | 3.9 | 11.3 | 7.8 | 12.3 | 4.2 | 9.2 | 6.5 |
| Binh | 11.3 | 3.7 | 10.3 | 7.7 | 12.5 | 4.4 | 9.2 | 6.3 |
| Khang | 12.2 | 3.9 | 9.8 | 7.3 | 13.0 | 4.5 | 10.3 | 7.3 |

Table 18. Several development indicators measured in plums and persimmon in Lung Su Phin, Sin Ho, Lai Chau, March- 2013

| N# | Variety | Ø trunk (cm) | Height (cm) |
|----|-------------------------|--------------|-------------|
| 1. | Rubenal plum | 3,61 | 135.5 |
| 2. | Fuyu &Jiro persimmon | 1,76 | 76.67 |

4. Capacity building activities

- ✓ **Training**
- PPRI conducted a training to share knowledge with 17 extension officers in Son La, Lai Chau on how to identify different pests and diseases; how they develop at different stages; what are the potential damages; and methods to control pests and diseases
- Trainees' evaluation on the training:

| # | Training topics | Evaluation results | | |
|---|--|--------------------|------|----------|
| | | Very good | Good | Not good |
| 1 | <i>Control pests & diseases in soya bean</i> | 70% | 30% | - |
| 2 | <i>Control pests & diseases in maize</i> | 75% | 25% | - |
| 3 | <i>Control pests & diseases in peanuts</i> | 72% | 28% | - |

- ✓ **Training and study tour**
- Two research officers were sent to Australia to share experiences and learn more about pest and disease biological controlling methods
 - Discuss with Australian experts on fruit fly controlling methods
 - Visit some labs to understand more the impact of climate change to plants and diseases
 - To have a general view on current apple, peach, plum, cherry orchards in Australia
 - Visit The University of Queensland and BugsforBugs Centre
 - The study tour was very successful and Vietnamese researchers learnt many effective methods in producing fruits and controlling pests and diseases.

5. Results from transferring techniques to farmers in reality

✓ Upgrading existing plum orchards

| # | Farmers | Numbers of rejuvenating trees | Note |
|---|---------------|-------------------------------|-----------------------|
| 1 | Đang Van Tam | 41 | Commune deputy leader |
| 2 | Trieu Van Tan | 23 | Farmer |
| 3 | LyThi Xuan | 76 | Farmer |
| | Total | 140 | |

- Procedures of pruning, training canopy and applying fertilizer was based on treatment 2



✓ Newly planted orchards

- Was highly evaluated by Lai Chau provincial People Committee; therefore, Tam Duong was chosen as a focused production area according to the provincial master plan. Technical procedure recommended by PPRI will be applied here.
 - PPRI has scaled up 2 ha of Peach variety DCS1 in Tam Duong, Lai Chau (experimental production)
 - Giang Ma farmers dugged 700 holes themselves to motivate the government's support on providing seedlings
 - In 2013, PPRI cooperated with the Agricultural Department, Tam Duong extension Station, and Giang Ma people committee to transfer techniques for farmers who have been involving in the provincial's fruit development program.
- Results from training farmers:
- Farmers' leader was trained on pest and diseases controlling methods such as on temperate fruit trees, maize, peanut, soya bean, pumpkin,...
 - Most of farmers know how to apply good techniques → no damage was recorded from either the temperate trees or intercropping plants.

5. Implementing approach

- ✓ Applying Participatory Evaluation and Monitoring :
 - ✓ Son La: PPSD, Moc Chau Extension station.;
 - ✓ Lai Chau: DARD , Lai Chau PPSD, Sin Ho Extension Station,
 - ✓ Extension officers from all levels
 - ✓ Farmer researchers

Conclusions and recommendations

1. Conclusion

■ *Upgrading existing orchards*

- Pruning and applying fertilizer have proved to help TF trees develop well; plum's size was improved at a more consistent size → yield recorded was higher than control treatment
- Fertilizer affected the sugar content and hardness of plums
- Damages caused by fruit flies and other pests were lower in our treatments than that of control's
- Higher economic benefit was achieved

■ *Newly planted temperate fruit orchards*

- Successfully established 3 models of newly planted orchards with 687 trees in total from peach, plum and persimmon varieties.
- DCS1 peach variety was proved to be a suitable variety which can develop very well with the natural conditions in research areas. Farmers can earn good incomes from selling peaches after 3 years. Therefore, Lai Chau people committee highly evaluated and is planning to scale up this peach variety.

- *Capacity building activities*

- A training on pest & disease controlling methods was carried out in Son La for 17 extension officers from Son La and Lai Chau
- 02 project officers were sent to Australia on a study tour to enrich knowledge on controlling pests and diseases applying biological methods

- *Outcomes from transferring techniques*

- Scale out our upgrading existing orchard techniques in 3 voluntary households in Pieng Sang (total 140 trees)
- Lai Chau province will develop 300ha for temperate fruit production in Tam Duong district, applying our recommend techniques. In 2012, Giang Ma farmers dugged 700 holes, following the project's standards to engage the government's support.
- In 2013, PPRI has transferred good techniques on growing and taking care of temperate trees to farmers in Tam Duong. This activity belongs to the provincial's development programs.

- *Implementing process*

- Applying PM&E

2. Recommendations

- More in-depth reseachs on suitable level of fertilisation as well as pruning techniques for Pieng Sang plum should be carried out
- Study more about fruit fly *Grapholia molesta* to recommend suitable controlling procedure.
- More study on green plum markets and potential markets for early-ripen peach

Thank you very much!!!

