

CROP PROTECTION PROGRAMME

**Project Title: Promoting Potato Seed-Tuber Management For
Increased Ware Yields in Kapchorwa District, Eastern Uganda.**

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FINAL TECHNICAL REPORT

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**Promoting Potato Seed-Tuber Management For Increased Ware Yields in
Kapchorwa District, Eastern Uganda**

Acronyms

BW	Bacterial wilt
CABI	CAB International
CIP	International Potato Centre
COMESA	Common Market for Eastern and Southern Africa
CPP	Crop Protection Programme [DFID]
DFID	Department for International Development [UK]
DLS	Diffused Light Store
EAC	East African Community
ELISA	Enzyme Linked Immunosorbant Assay
FAAB	Farming As A Business
FPRA	Farmer Participatory Research Assistant
KASPPA	Kapchorwa Seed Potato Producers Association [Uganda]
JAGED	Jigegeme Agricultural and General Development Self-help Group [Kenya]
MoA	Ministry of Agriculture
MAAIF	Ministry Agriculture, Animal Industry and Fisheries [Uganda]
MU	Makerere University [Uganda]
NAADS	National Agricultural Advisory Development Services [Uganda]
NARO	National Agricultural Research Organisation [Uganda]
NC-ELISA	Nitrocellulose Membrane ELISA
NGO	Non-governmental Organisation
PCs	Production Committees
PDCs	Parish Development Committees
PIS	Projected Income Statement
RSA	Republic of South Africa
SPS	Seed Plot System
UNSPPA	Uganda National Seed Potato Producers Association [Uganda]
USh	Uganda shillings
US\$	US dollars

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Kapchorwa District, Eastern Uganda**

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1. EXECUTIVE SUMMARY

The Farmer Led Seed Potato Multiplication For Eastern Uganda is a 3 year project implemented by AT Uganda Ltd funded by DFID Crop Protection Programme and managed by Natural Resources International (NRI) Ltd.

Many poor households could not access healthy seed to grow potatoes in the highlands of Eastern Uganda resulting in poor yields. The project aimed to establish a sustainable system of farmer led seed potato production for improved varieties in Kapchorwa district, in four subcounties of Kaserem, Kaptanya, Kapraron and Bukwa. Emphasis was on establishing a limited number of viable commercial seed producers as well as training farmers to maintain their own healthy seed from season to season. The seed for multipliers is then passed over to the poor farm households who further multiply the seed using small seed plot system.

The project established 20 commercial Seed Potato Multipliers in Kapchorwa and provided them with training in seed potato production, disease monitoring and management. The multipliers formed Kapchorwa Seed Potato Producers Association (KASPPA).

To support production by the primary potato multipliers, the project developed management tools for crop management that aim to provide a best practice, quality assured, identity-preserved pathway of potato multiplication. The main management tools centers on the Crop History Sheet which provides a written record of management practices and pest status at the potato stand level. In addition, recognizing the destructiveness of bacterial wilt in potato an on-farm post harvest incubation test for the interception of infected seed that can be implemented by farmers has been tested with promising results. The KASPPA members have managed to keep BW levels below 1.0%.

About 1,410 small- scale group farmers received seed for further multiplication using the small seed plot system. These include all the project group members plus additional partner groups.

The distribution of seed to the small-scale farmer has been implemented through the of the Parish Development Committee to ensure effective targeting of the poorest of the poor. The project has achieved good recognition at the community level.

The impact survey was carried out in September, 2004, and the finding indicate that, the project has made an impact among the multipliers and direct beneficiaries in terms of changing production practices, eating patterns, and income sources. As expected, impact of the project has diffused to the neighbouring non-beneficiaries to a greater extend than to non-beneficiaries who are more distant from the project.

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2. BACKGROUND

The Farmer Led Seed Potato Multiplication For Eastern Uganda is a 3 year project implemented by AT Uganda Ltd funded by DFID Crop Protection Programme and managed by Natural Resources International (NRI) Ltd.

Earlier project (LIFE Project) implemented in Kapchorwa district, identified the need to address the high risk of potato crop failure due to diseases of bacterial wilt and blight during the needs assessment,. Availability of healthy seed potato and knowledge on potato production were identified as the major constraints to potato production in the highlands of Eastern Uganda, resulting to poor yields and product quality, though potato production is very profitable in the Eastern mountains. To address this situation, this project promotes farmer led seed potato production, which focuses on the implementation of locally driven and monitored quality-assured production methods that allow for the traceability of the tubers as they move through cycles of multiplication until delivery to the small-scale farmer. This will increase potato production and ensures poor people access to quality improved varieties.

The project started on 1st February 2002 and is implemented in 4 sub counties of Kaserem, Kaptanya, Kapraron and Bukwa. During the course of the three years, seed of improved varieties has been multiplied using the improved seed production system developed by CABI with CPP funding under project R7858, "Promoting potato seed-tuber management for increased ware yields in Kenya, Uganda and Republic of South Africa".

3. PROJECT PURPOSE

Potato is becoming an important crop in Uganda due to the growing market for chips and crisps. In Uganda, potato production is centered in the highlands and is dominated by smallholder farms. Their major constraint is low yields attributed to the high incidence of bacterial wilt and a shortage of disease-free seed. Current efforts in potato seed development and diffuse of new varieties has shown the potential of on-farm seed delivery. In view of that situation, there was need to engage farmers as multipliers of seed, maintain seed quality, and establish a marketing and distribution structure that promotes seed production.

A small number of farmers are involved as commercial seed multipliers. The multipliers, extension staff and field assistants were trained in potato production, disease management, storage and seed multiplication. They in turn conducted training for Production Committees and Parish Development committees. The Basic seed for new varieties is obtained from Kalengyere Research station for multiplication by the primary multipliers. The multipliers are obliged to handover seed tubers as agreed in the contract as repayment and the remaining seed is bought by the project for the first two seasons. This seed is supplied to the groups of poor farm households. The group members receive one bag each for planting into multiplication plots using small seed plot system to raise their own seed for subsequent ware potato production. Of the ware potato produced, some is reserved for home consumption and the rest used for sale to raise money for purchase of new seed from the multipliers. The objective is to increase seed production and ensure that poor farmers have access to healthy and improved seed potato.

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4. OUTPUTS OF RESEARCH ACTIVITIES

The project goals were to achieved through four outputs.

1. Training
2. Multiplication
3. Distribution
4. Commercial Sustainability

4.1 Output 1: Training of Extension Staff, Local Authorities and Farmers on Potato Production, Multiplication and Storage.

4.1.1 Trainings

The project provided training to farmers in potato production through a ‘training of trainers’ approach. Training initially focused on building capacity of the primary multipliers, extension staff, field assistants and the production committee members. These, in turn, have been responsible for training small- scale farmer group members at the time of delivery of seed. The trainings have been done through attendance of a series of workshops, field days at the established demonstration sites, and exchange visits.

Twenty primary farmers and eight extension staff/field assistants were trained in potato crop best management practices i.e. seed potato production, disease monitoring /management, storage and marketing (see the Best Practices developed for KASPPA in Appendix 12: KASPPA Concepts). During every seasonal planning, multipliers have refresher training. As a way of building confidence of multipliers in facilitation, for this last year of the project, the multipliers have been the lead facilitators with AT Uganda and CABI staff only giving technical back stopping.

Local leaders at parish and village level in seven parishes from all four sub-counties and one hundred twenty thousand production committee members in the participating groups were trained in seed production i.e. small seed plot techniques and disease control (see Appendix 13, on Introduction to Potato Seed Plot System and Pest Symptom Class sheets). Each of the farmers received a copy of the Farmers’ Guide to Potato Production.

Training of 1,200 of farmer group members (beneficiaries) on small seed plot techniques was conducted at various levels by the extension staff, Parish Development Committees (PDCs) and Production committees (PCs). Refresher trainings were conducted for all beneficiaries by FPRAs and PCs in this last year of the project.

End of season evaluations were conducted. Results highlighted the importance of disease management and timely production practices in determining yields and maintaining quality seed standards.

Trainings focused on the Best Practices developed by CABI and AT Uganda together with KASPPA members (see Appendix 12) i.e. Agronomic Practices, pest and disease identification and control, harvesting and post harvest handling. Three hundred copies of Farmers’ Guide on Potato Production were prepared and distributed to all potato farmers. The main features advocated best practices as outlined below (See Appendix 13: Farmers' Guide on Potato Production for details and illustrations).

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a) Summary of the recommended Agronomic practices for seed and ware potato production.

Table 1. Summary of the recommended Agronomic practices for seed and ware potato production

Agronomic Practices	Recommendations
Good site selection	1. Field free from tree shades 2. Field with no history of solanaceous crops
Land Preparation	3. A smooth weed free field with broken clods
Seed source and selection	4. From reliable source and tubers of egg sized.
Planting time	5. Plant at onset of rain
Seed rate	6. 44.500 tubers/ha (18,000tubers/acre). OR 18 bags of 1000 tubers per acre.
Fertilizer and application	7. NPK 17:17:17 or DAP fertilizers can be used at planting at rate of 50kg/acre depending on soil type, and can top dress with Urea i.e. Kaproron sub county.
Weeding/Earthing up	8. A good ridge at planting and during growth encourages more tuber formation.. 9. Earthing up at 2 to 3 weeks after emergence

There are two methods of planting: Ridge furrow and Small Plot System (SPS) see Appendix 12, plates 1a and 1b)

(a) Seed Plot System (SPS)

- Prepare a nursery bed the deep seedbed less than 2m wide but of any length.
- Spacing 20 x 20cm or 30 x 30 cm at 15cm depth.

Advantage of SPS: Makes good use of limited land size and gives better yield from small tubers (less than 30mm).

b). Ridge furrow.

- Dig 10 cm deep furrow 75cm apart.
- Place the seed 30 cm apart along the furrow.
- Cover up with soil to form a ridge.

b) Pests and Disease Management

Diseases:

The major diseases are Late blight, Bacterial wilt, Fusarium Wilts and virus. The symptoms and control of each of these are included in the Pest symptom class sheet developed for KASPPA (Appendix 13) and Farmers' Guide to Potato Production –page 6)

The major Insects are cut worms, Potato tuber moths and Ants (details in the Farmers' Guide to Potato Production).

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c) Pre-Harvesting of Seed and Table potatoes.

Dehauling: is the cutting of stem at 4-6," at least 2 weeks before harvesting. Dehauling helps the skin to harden so as to reduce damage at harvest.

For Seed, dehauling is done at flower drop and for Table it is done at full maturity, when the plants are naturally turning yellow.

d) Harvesting:

For seed potato, harvesting is done in such away that potato crop neighboring the pegs (marked places where green wilted crops were removed) are harvested earlier and used for table (home consumption), and the rest of the crop harvested for seed (Farmers' Guide for Potato Production in appendix 13)

However, medium and large potato tubers are preferred for seed. Small tubers can be used in the seed plot system and the very large ones for table.

e) Storage:

Storage for Seed and table potatoes require different conditions. For seed, the conditions required are for sprouting whereas for table, the tubers are kept for long without sprouting (Farmers' Guide on Potato Production, section on storage)

Other trainings offered to the seed multipliers include Farming As A Business, Savings and Credit and Collective Marketing.

4.1.1.1 Farming As A Business (FAAB)

Seed Potato Multipliers were introduced to Farming as a Business, in order to learn to operate their seed multiplication as a business. The three main goals and objectives of Farming As A Business:

- i) Reducing costs
- ii) Increasing profit
- iii) Minimize risks

To break out of the subsistence poverty cycle, farmers should change their attitude towards farming and start taking farming as a business.

During the training, the participants were divided into groups. Each group was to discuss the differences. and similarities between business and farming (see Appendix 2). It was found that both farming and business require inputs, operational and marketing activities, but farmers do not take or handle farming as they handle their business. The differences are actually with the risks involved. In farming risks are much more while some can be minimized, others are beyond the farmers' control.

The Projected Income Statement (PIS) was introduced to the participants. It's a planning tool and an evaluation tool. The production cost per bag was also calculated which helps the farmers to decide on the selling price. A number of projected income statements for potatoes using different farming methods were worked out together (Appendix 3, 4, 5, 6, and 7).

Similarly the groups worked out the PIS for seed potato production both using fertilizers, and without fertilizers. The farmers realized that investing in production inputs like improved seed and fertilizers brings higher returns, hence a bigger profit margin per bag.

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4.1.1.2 Group Savings and Credit Scheme

The training was conducted to KASPPA members and FPRAs on how to manage a Group Saving and Credit Scheme. Saving mobilization, emphasized the importance of having a saving culture. Members were trained on how to avoid mishandling of group funds and how a saving mobilization and credit management can be operated. By the end of the training it was agreed that the saving and credit should be treated separately from the core business of the association (KASSPA). Two Saving and Credit groups were formed; Kaptanya Saving and Credit group and Kaproron Saving and Credit group. Each group came up with its own Byelaws (see Appendix 8 and 9).

4.1.1.3 Training on Collective Marketing

The marketing training for KASPPA members and FPRAs was held from 2nd to 3rd June 2003 at Noah's Arc -Kapchorwa. It was conducted by Mr. Fred Kagimu Bikande (CEDO). He handled contractual marketing, collective bargaining and marketing, quality control and stores management. The time table is presented in Appendix 10).

The marketing training was intended to provide KASPPA members with knowledge about the importance of market/marketing and their roles in marketing.

4.1.2 Demonstrations

One demonstration plot was set in each parish using the clean improved varieties of Victoria and Nakapot 5. The demonstrations acted as learning sites for farmers. Five field days were organized at each site and farmers mobilized at the time of (a) planting, (b) one month after planting, (c) at flowering, (d)dehauling, and (e) harvesting.

4.1.3 Exchange Visits

Twenty multipliers and eight extension staff/field assistants and two artisans participated in exchange visits to the research station in Kabale. The visit to Kabale was organized twice. The first group visited in November 2002 and the second group in November 2003. They visited their fellow seed potato multipliers in Kabale, to share experiences in seed potato multiplication. The full report of the farmers' experiences on the exchange visits can be found in Appendix 11. The objectives of the exchange visit were

1. To build the capacity of Kapchorwa seed potato producers in potato production management and post-harvest management.
2. To enable farmers from Kapchorwa to share experience with Kabale seed potato multipliers.
3. To expose Kapchorwa artisans to the established DLS in Kabale to help them gain skills on diffused light stores (DLS) construction.

The KASPPA members expressed their need for access to a less costly source of seed, given the high transport costs from Kabale. Its strengthen, Buginyanya a research station in Mbale a neighbouring district, can be a well positioned source of seed for Kapchorwa. AT Uganda Ltd, therefore organized a visit for seed potato multipliers (KASPPA) and field assistants to Buginyanya research in May 2004 to find whether Buginyanya station can be an alternative source of seed for KASPPA. Members. Seventeen multipliers and four field assistants participated in the exchange visit. The overall objectivesof the visit was to find out whether Buginyanya station can be an alternative source of seed for KASPPA.

1. See the activities being carried out at the station.

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2. Understand how seed potato crop is managed at the station.
3. Determine the capacity for seed production by the station.

Buginyaya Research Station is therefore being considered as a source of seed for Kapchorwa farmers. This calls for continued monitoring of seed health by KASPPA to ensure seed quality. The seed will therefore require routine ELIZA testing to verify seed health. The research station needs to build up its capacity to multiply clean foundation seed in sufficient quantities to meet the needs of Eastern Uganda.

4.1.3.1 Internal Exchange Visits

Four, one-day internal sub-county exchange visits were organized for SPS farmers from 80 groups and 40 partner groups. The objective of the internal exchange visits was to reinforce learning of best practices taught through farmers themselves. The visits were made to successful farmers adopting the recommended practices.

4.1.4 Seasonal Evaluation

Primary Seed Multipliers and SPS farmers hold end of season review meetings. SPS farmers conduct end-of-season evaluation at the group level. They then have a joint review meetings one per sub-county where the key issues are discussed (see Appendix 20, issues raised during KASPPA review meeting held in February 2004). At the same time, farmers carry out the next season's planning. KASPPA members have developed a Seasonal Planning Sheet (See Appendix 13). KASPPA Seasonal Plan for season 3B, developed by members is presented in Table 1, Appendix 12.

4.2 Output 2. Multiplication of Foundation Seed Multiplied by Farmer Group Members

The project had set out to develop a mechanism of disseminating improved potato seed to small scale farmers through first identifying medium sized landholders as primary multipliers of basic seed that would then distribute small quantities of seed for further multiplication by farmer group members (more numerous smallholders) using traditional [ridge / furrow] or small plot system multiplication. Foundation seed for new varieties was obtained from Kalengyere ARDC for multiplication by the seed multipliers for 2 consecutive seasons. Seed was loaned to multipliers and they repay three times the amount received per season.

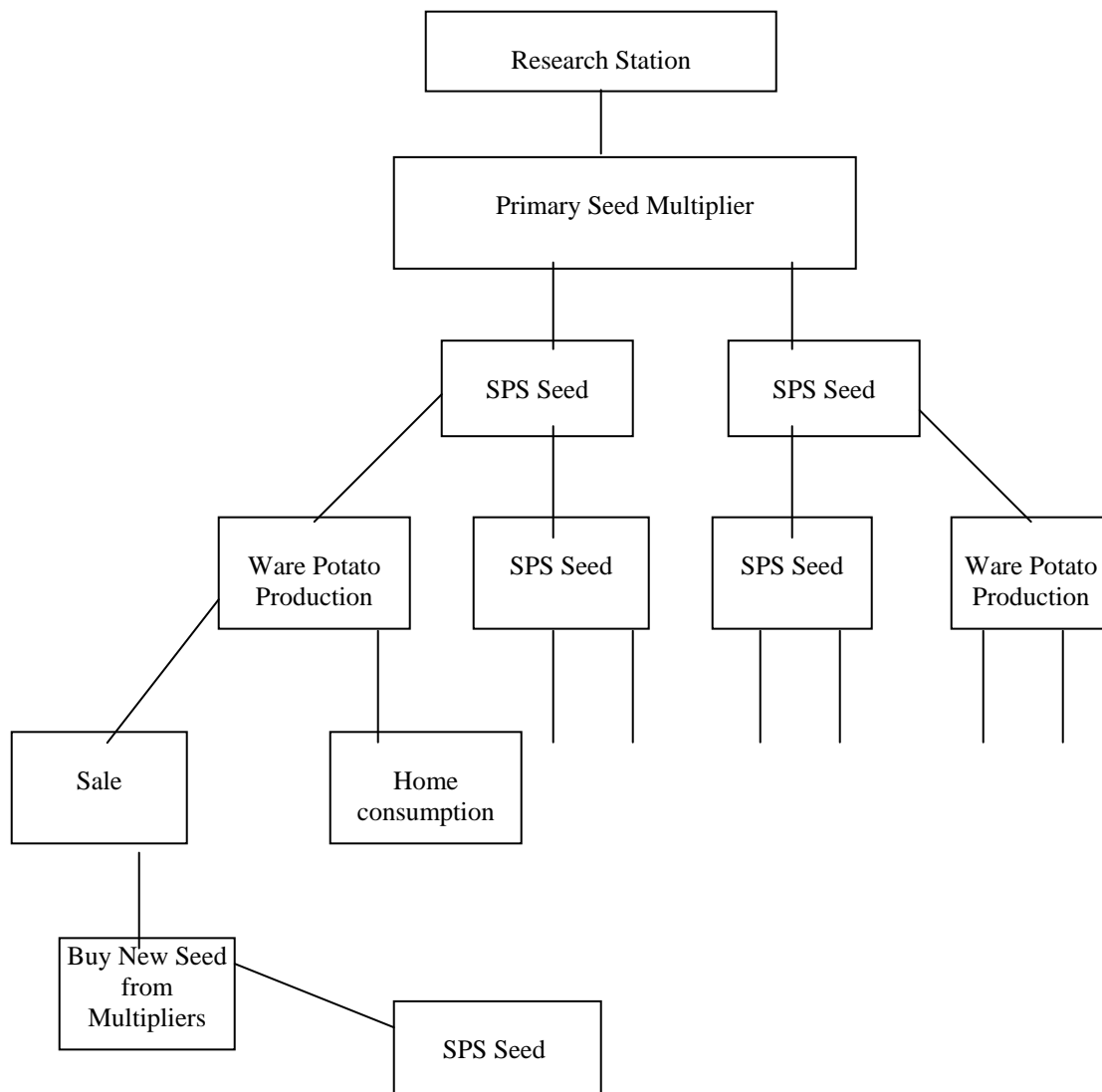
The project purchases additional seed from multipliers, to add to the repayments, and distributes it to the farmer group members who use the Seed Plot System (SPS). Though the Seed plot System, the farmers access affordable and small quantities of good quality seed for multiplication. This seed is then used for table production in the next growing season.

4.2.1 Seed Multiplication

Two potato new improved potato varieties (Victoria and Nakpot 5) were multiplied. 395 bags of seed potatoes were procured from Kalengyere research and given to primary seed multipliers to multiply. The multipliers paid back three times as much seed tubers as they received. This seed was supplied to groups of poor farm households for planting into multiplication plots using small seed plot system to raise their own seed for subsequent ware potato production. Of the ware potato produced, some is reserved for home consumption and the rest used for sale to raise money for purchase of new seed potato from the multipliers. (A diagram of the Seed Potato Multiplication system is presented in Figure 1).

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Figure 1: Diagram Of Seed Potato Multiplication System.



4.2.2 Disease threshold standards

Special consideration was given to bacterial wilt (BW) disease because of its importance in seed potato. To date attempts have been made to monitor BW among the seed lots by ELISA testing and through a locally developed bacterial wilt on-farm incubation system (see Appendix 13, on Establishing a Field Incubation test for Bacterial wilt). Test results from three seasons have shown a high correlation between these two testing methodologies. An example of data obtained from the 2003A season is presented in Appendix 12 Table 2a & b.

This framework provides KASPPA with a management tool to deliver non-subjective decisions on whether to accept or reject a crop for sale as suitable-for-use in seed or table production, or direct consumption.

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This system was still in its first few seasons of implementation and thus the Disease threshold levels can be adjusted to the more exact levels, it requires after several seasons.

However, the farmers must decide at mid-season, when they observe their crop stand, whether the production should go towards table production [consumption] or forward as seed. This is important as it reduces the loss risk to the multiplier of waiting for the final ELISA and On-farm incubation test results when the tubers have already sprouted and therefore have low market value for table consumption. The standards on bacterial wilt incidence observed in the field at flowering should be less than 1% for seed, 1-2% for table production. If it is more than 2%, the field should go for table consumption (see appendix 12, Table 3)

4.2.3 Quality Monitoring and Sustainability

At the outset of the project, first season 2002, seed was purchased from UNSSPA and after 6 weeks growth of the crops, the seed multipliers experienced high incidence of bacterial wilt, which resulted in the loss of the potato stands as seed. The cause was due to infected seed, but UNSPPA could not verify where the seed had come from. In response, the project developed quality management and seed health monitoring protocols. The project developed various materials on Best Practices for potato production (see Appendix 12). The Primary Seed Multipliers were trained. The best practice material on seed production include:

1. KASPPA Farmers Crop History Sheets
2. KASPPA Field Inspection Officers’ Sheet.
3. KASPPA Crop History Support Sheets

8.2.3.1 The KASPPA Farmers Crop History Sheets: Provides a record of the farmer’s field and in-store planning and management practices (Appendix 13). It consists of the following:

1. Seasonal Planning –
2. Farmers’ Diary of Management, including Pest Maps.
3. Notes to Farmers from KASPPA Field Inspection Officers
4. Signing off sheets between farmer and field inspection officers in total agreement with the information provided

Table 2. The KASPPA Farmers Crop History Sheet Tools

	Tools	Purpose
1	Seasonal Planning	For planning ahead to anticipate actions and resources i.e. timely purchase of input..
2	Farmers’ Diary of Management, including Pest Maps	Tools for recording the management practices the farmer has undertaken.
3	Notes to Farmers from KASPPA Field Inspection Officers	Comments by the field inspector on crop management, health and recommendations.
4	Signing off sheets	Sheets signed on between farmer and field inspection officers in total agreement with the information provide

8.2.3.2 KASPPA Field Inspection Officers’ Sheet: Provides a framework for the Field Inspection officer to observe and record the management practices by KASPPA farmers and to quantify the Pest System Class within their field and store. The Pest Symptom Class assessment is done in the field, during

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the store inspection and during Field Incubation (Appendix 13, KASPPA Field Inspection Officers Sheets).

1. For field assessment: inspections are done during post emergence to observe the germination rate; at flowering to quantify the field pest symptom classes in the field and estimate the risk and at pre-dehauling.
2. For store assessment: inspection is done during entry to verify correct separation on the shelves; prior to distribution.
3. For field incubation for bacterial wilt: This is the main test for bacterial wilt. Potato tubers (approx. 200 tubers) are randomly selected from the harvest products and placed in a sisal bag, along with an equal volume of damp soil. These are laid flat on raised wood under shelter from rain and with an aspect for receiving the morning sun until midday for 6 weeks. These tubers are sliced at the stolon end and observations made on presence or absence of bacterial wilt symptoms (see Appendix 13).

9.2.4.3 KASPPA Crop History Support Sheet: This is a tool to promote a common understanding of Best Management Practices, identification of pests and their control. This material was developed with KASPPA and it focuses mainly on disease or pest recognition rather than identification. The Crop History Support Sheets (Appendix 13) contain:

1. Farmers' Guide to Potato Production for general best practice management and pest control.
This guide was developed with the KASPPA farmers outlining the main features of the advocated best practices in seed and table potato production (Appendix 13) Farmers' Guide to Potato Production).
2. The Seed Plot System for best use of small seed and limited land in seed production.
This guide describes the method of seed multiplication that was developed with smallholder farmers. The tubers harvested are medium sized (Appendix 13, on Introduction to Potato Seed Plot System).
3. Potato Seed Pest Symptom Sheets and Codes: Pest Symptom Classes.
These were developed on the basis of the most important pests in the KASPPA area of operation. These include the Late blight, insect damage, Green wilts, Leaf mosaics and Storage pests. The Pest Symptom Class Sheets associate plant pest, symptoms, and an appropriate control (Appendix 13, Pest Symptom Class). These sheets are used together with the farmers' Guide to Potato Production.
4. Field incubation for bacterial wilt.
This is a locally developed bacterial wilt incubation system that is carried out to measure bacterial wilt infestation within seed lots. It is a simple field test which was developed by the KASPPA farmers (Appendix 13, Establishing a Field Incubation for Bacterial Wilt).

The effort of local disease thresholds establishment managed by KASPPA has remarkably improved crop management. Members of KASPPA quality control committee (KASPPA Field Inspection Officers) conduct regular joint field inspections with technical staff from CABI, AT Uganda, MAAIF (National Seed Certification Services) and NARO (see technical reports in Appendix 14, 15, 16, 17,18 and 19). KASPPA has managed to keep Bacterial wilt level below 1% for the tubers passed as seed.

4.3 Output 3. Distribution:

Multipliers Return Equal Amount of Planting Materials Received for Redistribution and Further Multiplication.

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The local leaders i.e. Production Committees (PCs), at the group level, and Parish Development Committees (PDCs) at parish level, have been involved in planning, implementing and monitoring the seed distribution. A seed potato distribution plan for each group of farmers was developed and agreed upon with the local authorities in each community.

A total of 395 bags were purchased from Kalengyere Research Station and loaned to the Primary Seed Multipliers. From repayments and additional purchases by the project, a total of 1,340 bags of seed (420+ 400+ 520) were distributed to small seed plot farmers and partner groups. As a result of further multiplication, from the compiled field reports, 550 acres of potatoes were planted with the seed multiplied under the small plot system. The production estimates for season B, 2004 indicate that the seed tubers harvested by small seed plot multipliers can plant 1,907 acres if all the harvest will be committed to seed.

Seed was distributed to small farmers three times during the project lifetime. The quantities planted in each distribution and the reported harvests are indicated in the tables below. While we know that a good proportion of the harvested seed was later used to plant additional fields for both seed and ware production, it is not possible to estimate accurately the exact proportions that went for each use.

Table 3. Seed distribution process

First distribution by the project:

Season 2003 A, distributed 420 bags to small scale farmer	
Season 2003 A	Total production = 1,260 bags

Second distribution by the project:

Season 2003B, distributed 400 bags	
Season 2003B	Total production = 1,100 bags

Third distribution by the project:

Season 2004A, distributed 520 bags	
Season 2004A	Total production = 1,394 bags

Source: Field reports

4.4 Output 4. Commercial Sustainability:

Process of Procurement of Clean Seed, Multiplication and Sales Collection and Redistribution of Multiplied Seed-Tubers Effectively Handed Over to Local Branch of the Uganda Seed Potato Producers Association.

4.4.1 Formation Kapchorwa Seed Potato Association (KASPPA)

The project had set out to develop a mechanism of disseminating improved seed potato to small-scale farmers through first identifying primary multipliers of basic seed that would then distribute small quantities of seed for further multiplication to small scale farmers. The production and distribution of good seed from the primary multipliers to the small-scale farmers is the primary focus of the project.

Kapchorwa Seed Potato Producer Association was formed in 2003 in Eastern Uganda to provide a sustainable commercial source for quality seed potatoes. Currently, KASSPA member are those primary multipliers of basic seed. The KASPPA constitution provides for various types of memberships in the

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interest of exploiting both seed and table potato markets. The KASPPA constitution is given in the Appendix 21, and this document is recognized by KASPPA as an evolving document.

It is important to note that KASPPA is not registered as a seed producer with the MAAIF and is therefore not producing seed in the strictest of senses. Instead, it is providing potato of improved quality that is suitable for planting.

The tools development for KASPPA as the Best Practice and documented in Appendix 12 and 13. include:

1. Best Crop Management Practices
2. Best Working Practices
3. Best Marketing Practices

Recognized disease threshold levels are being established. KASPPA has been specifically restructured to handle the seed health monitoring procedures by managing and monitoring the compliance with seed health procedures. Seed health monitoring procedures include crop history sheets, labeling, on-farm incubation and bacterial wilt tests.

4.4.2 Potato Impact Survey

A potato impact survey was carried out in September 2004. The survey was conducted in order to assess the impact of the project on the local cropping system, diet, income of the beneficiaries, and non-beneficiaries and how the challenges have been addressed. The impact survey was conducted in Kapchorwa district in the four project sub-counties; Kaserem, Kaptanya, Kapraron and Bukwa.

In order to assess the extent of technology diffusion, the non-beneficiaries were categorized into 3 control groups; (a) immediate neighbours to the beneficiary; (b) same parish but different village and (c) outside parish. A total of 16 multipliers, 64 beneficiaries, and 240 non-beneficiaries (80 from immediate neighbour, 80 from immediate village, 80 from immediate parish) were interviewed. A detailed report of the findings is presented in Appendix 22.

The results indicate that the project has made an impact on both the multipliers and direct beneficiaries. The impact has further diffused to the neighbouring non-beneficiaries to a greater extent than to non-beneficiaries who are more distant from the project.

The results indicate that more land has been put under cultivation by beneficiaries since the project started (2002). The land allocation to potato production after the project intervention has increased and potato is now ranked second in area by multipliers and third by beneficiaries. The out come of the project activities show a clear influence on household income. The results also indicate that potato has gained preference as a staple food among the beneficiaries and multipliers, with a current consumption of 1-2 times a week, yet before the project, potato was rarely eaten.

The results also indicate that beneficiaries are increasingly adopting technologies like improved variety and regular field inspections, while multipliers now adopt all the technologies. Adoption of potato growing since 2002 among the non-beneficiaries is more prominent with the neighbours to the beneficiaries than those in non-beneficiary villages and parishes.

The problem ranked as most important was potato diseases. Among the diseases, the bacterial wilt disease was ranked highest.

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Conclusion: The impact results show clearly that beneficiaries and multipliers are adopting the potato production technologies introduced by the project. Increased income and food security among the beneficiaries and multipliers has contributed to improvement in the standards of living for their families. The major challenges were pests/diseases and drought, but these were being handled through Best Management Practices.

5. CONTRIBUTION OF OUTPUTS TO DEVELOPMENTAL IMPACT

5.1 Training:

Through the trainings, which have been done through workshops, end of seasonal evaluations, field days, and exchange visits, the following results have been achieved:

- (a) The level of on-farm incidence of bacterial wilt has been reduced leading to production of high quality seed.
- (b) The level of proficiency in seed and ware potato production has increased leading to higher yields and better quality of ware potato.
- (c) It provided a clear understanding of the difference between producing potato for seed and for table consumption. In particular, the training emphasized the need to manage bacterial wilt and also optimize the choice of tuber size for seed as compared to what is best for food.
- (d) Farmers have begun to appreciate the use of suitable stores (Diffused Light Stores) for seed , which encourages strong healthy sprouts and resulting plant vigor.

5.2 Multiplication:

Through a multiplication system, which involves **basic** seed obtained from Kalengyere NARO that is multiplied by the primary seed multipliers using ridge/furrow system under strict monitoring, seed quality has been assured. From the harvested seed, primary multipliers pay back three times the quantity of seed they received. This seed is distributed to numerous small-scale farmers (beneficiaries) who further multiply it for their own use employing small plot techniques. The poor farmers, who had previously failed to access healthy seed potato, now have access to clean seed as a result of this multiplication system. All 1,200 of the target number of farmers and 420 other partner group members have received the improved seed, Victoria, which they further multiply for one generation, and then produce table potato. Some of this table potato is sold and the money used to purchase clean seed from the primary multipliers. An agreement on disease threshold levels has not yet been finalized with NARO. Best Crop Management Practices have been developed, and are being implemented by the Primary Seed Multipliers.

5.3 Distribution:

The seed potato distribution has been successfully tracked by the local leaders i.e. Production Committees (PCs), at the group level, and Parish Development Committees (PDCs) at parish level. The local leaders have been involved in planning, implementing and monitoring the seed distribution. As a result, a total of 1,200 target farmers received the seed. Additional seed was even distributed to 420 members of the partner groups. A total of 1,340 bags of improved seed were distributed to small seed plot multipliers. As a result of the further multiplication, we estimate that 550 acres of potatoes were planted with the seed multiplied under the small plot system - more than the overall project target of 400 acres. The production estimates for season B, 2004 indicate that there is sufficient seed tubers to plant 1,907 acres if all the harvest will be committed to seed. This is much more than the end of project target of 300 acres.

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The Primary Seed Multipliers and small poor households who benefited have improved in terms of financial returns (from selling seed and ware potato respectively) and food security, leading to improved livelihoods.

5.4 Commercial Sustainability:

The seed multipliers formed a local association KASPPA , which carries out procurement of clean basic seed from the research stations, manages the Crop Best Practices thus carrying out seed health monitoring to ensure production of quality seed (planting material). This has led to:

- (a) Improved maintenance of on-farm seed health;
- (b) The flushing out of degenerated on-farm seed.

6. FOLLOW UP

What action/research is necessary to promote the findings of the work to achieve the development benefit?

As a result of the strong foundation that has been laid in this project, a new project entitled ‘ Sustainable Potato Seed - Tuber Management and Marketing through Commercialization’ is to be implemented by AT Uganda. AT Uganda is now well placed to expand project impact to new communities and to facilitate linkages through greater market orientations, using the funding by CPP under a 9-month extension. The project extension will contribute towards the following outputs:

- 1. Expansion and Training
- 2. Strengthening of KASPPA
- 3. Market linkages

The proposed activities will build on previous efforts by:

- 1. consolidating farmer awareness of the importance of seed health,
- 2. expanding the distribution network to reach an additional 600 secondary level beneficiary farmers,
- 3. strengthening the seed producer’s association to ensure commercial sustainability, and
- 4. building market linkages that will provide a clear incentive for farmer investment in potato production.

Doing so will cement the local management and sustainability of the project and ensure continued impacts.

In addition there may be opportunities for sharing of ideas and approaches with other CPP potato projects in Kenya and Bolivia – in particular the introduction from Bolivia (R8044, R8182) of IPM training for potato producers in Uganda. It is also worth noting that the model being piloted here is even adaptable to other vegetatively propagated crops, so there is the potential for diffusion to other promotion projects such as R8040 and R8167 for sweet potatoes and R8278 for yams.

7. KEY PUBLICATIONS/OUTPUTS

- 1. Smith, Julian (2002); Farmer’s Guide on Potato Seed Plot System
- 2. Smith Julian (2002); Potato Pest Symptom Sheets and Hazard to Tuber Health

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3. Smith Julian (2003); Locally Assured Best Practice Production and Marketing of Potato for Seed. Experience of Kapchorwa Seed Potato Producer's Association (KASPPA).
4. Namisi, Sarah and Julian Smith (2004); Promoting Potato Seed Tuber Management for Increased Ware Yields in Kapchorwa, Eastern Uganda, a paper prepared for the A Paper prepared under Theme 4: "Technological Options That Respond To Demand" for the NARO Conference, September, 1 - 4, 2004, Kampala
5. Namisi Sarah, Julian Smith and Grace Tino (2004); Farmer's Guide on Potato Production.

8. DISSEMINATION OF RESULTS

1. Farmers' Guide on Potato Production, 3000 copies were distributed to farmers, district authorities, and extension staff.
2. Copy of the summary of the final project report to be submitted to the District and four sub-counties.
3. Impact Survey Report on Promoting Potato Seed Tuber Management for increased Ware Yields in Kapchorwa, Eastern Uganda. Sarah Namisi, Rita Laker-Ojok, and Julian Smith December 2004. Draft Report not published.

Biometrician Signature,

Not applicable as the project started in February 2002, not after August 2002.

I confirm that the biometric issues have been adequately addressed in the Final Technical Report.

Signature:

Name:

Position:

Date:

Appendix 1 Project LogFrame:

Narrative Summary	Indicators of Achievement	Means of Verification	Risks and Assumptions
Goal			
Livelihoods of poor people improved through sustainably enhanced production and productivity of RNR systems..	<i>These are under discussion with DFID. Leave blank.</i>	<i>These are under discussion with DFID. Leave blank.</i>	
Purpose	OVI	Means of Verification.	Risks/Assumptions
Promotion of pro-poor strategies to reduce impact of key pests, improve yield and quality of crops, and reduce pesticide hazards in peri-urban systems.	1. Annual production of potatoes by 500 poor farmers participating in the project increased by 20% by EOP.	1.1 Baseline Data 1.2 Annual Impact Survey results.	1. <i>National Plan for Modernization of Agriculture (PMA), maintains its pro-poor focus under pressure for hand over to private sector service providers.</i> 2. <i>Production conditions (weather, pest, diseases, etc.) remain reasonably favourable.</i>
Outputs	OVI	Means of Verification.	Risks/Assumptions
1. Training <i>Extension staff, local authorities and farmers trained in potato production, multiplication and storage.</i>	1.1 4 extension staff trained in potato seed-tuber management, storage and multiplication by EOP. 1.2 At least 40 contact farmers participate in exchange visit for training in potato seed-tuber management and multiplication by EOP. 1.3 At least 600 poor households and community leaders trained in potato seed-tuber management and multiplication by EOP.	1.1 Training Reports 1.2 Participatory Poverty Assessment Results 1.3 Focus Group Discussions with Farmer Groups	1. Skills of the trained extension staff will not be made redundant during the process of transition to private sector service providers.

Comment: I think we should settle on logframe or LogFrame, but not logFrame! I prefer logframe (or Logframe in headings where first letters are capitalised)

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Outputs	OVI	Means of Verification.	Risks/Assumptions
<p>2. Multiplication Foundation seed for the new varieties obtained and multiplied by farmer group members; formation of local seed health quality standards</p>	<p>2.1 At least 940 bags of high quality disease free seed potatoes of the new varieties will be obtained from Kalengyere Research Institute (KARI) and/or Uganda Seed Potato Producers Association and multiplied by the end of year 3.</p> <p>2.2 Disease threshold standards established and imbedded in health monitoring process with local policy change by end of Year 2</p>	<p>2.1 Delivery Notes & Multiplication Contracts</p> <p>2.2 Seed health documents and quality labels</p> <p>2.3 Community / parish level agreement on informal quality standard with recognition by NAADS</p>	<p>2. Sufficient seed can be obtained on contract from seed potato producers.</p>
<p>3. Distribution Multipliers return equal the amount of planting materials received for redistribution and further multiplication.</p>	<p>3.1 Redistribution storage and further multiplication of selected potato varieties produces sufficient seed-tubers to plant at least 400 acres by EOP.</p>	<p>3.1 Community Distribution Records</p>	<p>3.1 Social pressure will be sufficient motivation for multipliers to comply with the terms of their multiplication contracts.</p>
	<p>3.2 Sufficient seed-tubers to plant at least 300 acres the following season will be in storage at the EOP.</p>	<p>3.2 Annual Impact Survey Results</p>	<p>3.2 Farmer training will be adequate to control wilt and blight to ensure sufficient clean planting material for distribution.</p>
<p>4. Commercial Sustainability Process of procurement of clean seed, multiplication and sale seed-tubers effectively handed over to local branch of the Uganda Seed Potato Producers Association for long-term commercial sustainability.</p>	<p>4.1 At least 40 seed potato multipliers trained and at least 20 actively engaged in commercial seed potato production by EOP.</p>	<p>4.1 Association records.</p> <p>4.2 Community Distribution Records</p>	<p>4. PMA policy continues to emphasize local control of the agricultural development process and provides appropriate incentives for effective private sector service provision.</p>
	<p>4.2 At least 800 farmers benefit from the planting material multiplication by EOP.</p>	<p>4.3 EOP Impact Survey Results</p>	

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Activities	OVI	Means of Verification.	Risks/Assumptions
1.1 Researchers from NARO Train Project Staff and Extension Staff	1.1 4 government extension staff from the District of Kapchorwa trained by end of Feb 2002, Refresher on disease control and storage by August 2002	1.1 Training Report	1. Policy of Collaboration with District extension staff can be continued to the end of the project.
1.2 Extension Staff Train Contact Farmers and Community Leaders	1.2 5 Contact Farmers per subcounty participate in exchange visit and trained in production by by end March 2002. Storage training for contact farmers by September 2002	1.2 Training Report	2. Committed contact farmers find the incentives adequate to compensate for their efforts.
1.3 Contact Farmers train Group members	1.3 Contact Farmers each train their group in time for first season planting.	1.3 Focus Group Discussions	
1.4 Group Members Evaluate Training	1.4 Groups hold end of season evaluation meeting. Extension Staff observe.	1.4 Focus Group Discussions	
1.5	1.5 Second group of 20 contact farmers participate in exchange visit by March 2003.	1.5 Focus Group Discussions	
1.6 Disease threshold value set based on scientific and local knowledge.	1.6 Refresher course for Extension staff on disease control by August 2002	1.6 Disease identification keys; framework for monitoring health through field and storage inspections	
2.1 Planting seed procured from USPA.	2.1 AT least 80 bags (80 kg each) of seed-tubers procured.	2.1 LPO	2.1 Contracted seed-tubers are disease free, prove to have the promised germination, and are not bought up by other sources at awkward times.
2.2 Transport seed and deliver to groups	2.2 Each sub-county to receive 20 bags (80 kg bags) of seed tubers first season 2002 (4 bags per group for 5 groups).	2.2 Delivery Notes	2.2 Farmer sufficiently committed to invest time and local materials into construction of simple diffused light storage.
2.3 Groups decide on multiplication strategy for seed-tubers. (Recommend that selected Contact farmers be the first group members to multiply seed-potatoes in compensation for expected training and monitoring services.)	2.3 Groups select their contact farmers and multiplication sites by end of Feb. 2002.	2.3 Focus Group Discussions	
2.4 Multiplication contracts signed and witnessed by group.	2.4 20 multiplication contracts signed by contact farmers by March 2002.	2.4 Multiplication contracts	
2.5 Planting of seed-tuber beds used as mechanism for group training in disease control.	2.5 Group members participate in planting and management of seed plots and receive training on disease control conducted by the Contact farmer under supervision of the Extension Agent first season 2002.	2.5 Focus Group Discussions	

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Activities	OVI	Means of Verification.	Risks/Assumptions
2.6 Disease identification keys used as framework for monitoring health through field and storage inspections	2.6 Each of the 5 groups per sub-county construct a group demonstration diffused light store by the time of first season harvest.	2.6 Store inspection	
2.7 Group training in diffused light storage construction and management.	2.7 In second season 2002 an additional 80 bags of seed tubers distributed to the multipliers that successfully managed their seed plots in first season.	2.7 Multiplication Contracts	
2.8 Additional seed-tubers distributed in each of the following seasons.	2.8 Field and in-store inspections carried out for disease and pest levels	2.8 Store inspection & Health documents	
2.9 First multipliers plant their seed-tubers to ware plots first season 2003 and replant seed-tuber plot for subsequent season.	2.9 20 acres of ware potatoes planted by multipliers first season 2003.	2.9 Field inspection	
3.1 Group leaders collect repayment of seed-tubers from the Multipliers.	3.1 Multipliers obliged to return an amount of seed-tubers equal to three times what they received. Project purchases and additional 160 bags of seed tubers per season from multipliers for distribution to poorer group members. Multipliers also retain seed-tubers for their own future seedbed planting. Recipients are responsible for their own seed-tuber storage.	3.1 Group Redistribution records	3.1 Seed-tubers will be available for timely planting and Weather conditions will be sufficient to produce a normal crop during the multiplication periods. 3.2 That fields selected for multiplication remain disease free and are not infected with blight and wilt by means of other external factors outside farmer control
3.2 Group members agree on Distribution and multiplication plan.	3.2 Groups provided with copies of the multiplication tree for use in drawing up their multiplication plan. Starting second season 2002, poor group members must be given priority in receiving the multiplication materials.	3.2 Purchase orders and delivery notes	3.3 Multipliers will be sufficiently impressed with the new varieties that they will retain seed for own future production in addition to repayment of contract.
3.3 Poorer group members receive one bag of seed tubers each season for two seasons. These seed tubers are planted using the SSPS system for ongoing sustainable seed tuber production. Planting of seed-tuber beds used as mechanism for group training in disease control.	3.3 By end of year 3, 800 farmers have a potato seed-tuber plot planted and one bag of seed tubers in storage waiting to plant the seed plot for the following season.	3.3 Field inspection	3.4 Poor households will be able to profit sufficiently from potato production to be able to afford to buy clean replacement seed from seed multipliers on a periodic basis as needed after the project.

Promoting Potato Seed-Tuber Management For Increased Ware Yields in Kapchorwa District, Eastern Uganda

Activities	OVI	Means of Verification.	Risks/Assumptions
3.4 After two years poor farmers purchase clean replacement seed from the multipliers.	3.4	3.4 Impact Monitoring survey results	3.5 There will be sufficient demand from other potato producers in the District to make multiplication of clean potato seed tubers a viable enterprise for the multipliers.
4.1 Mobilization meetings to inform community and local leadership about the project	4.1 Public information meetings held in all sub-counties by end of June 2002.	4.1 Project Reports	4.1 Market for potatoes remains buoyant, and demand for new varieties is high enough to encourage participation in multiplication and production of potatoes.
4.2 Negotiate MOU with Sub-Counties, countersigned by Parish and Village leaders	4.2 Four MOU's for participating sub-counties signed by end of July 2002.	4.2 MOU's	4.2 Potato production profitable enough to encourage poor farmers
4.3 Village leaders witness first repayment and redistribution.	4.3 Witnessed multiplication contracts to be returned to ATU by extension staff by September 2002.	4.3 Contracts	
4.4 Villages develop Community Distribution Plans	4.4 Village distribution plans to ATU by February 2003. (Villages without distribution plans will be left out of this round of distribution.)	4.4 PPA Report	
4.5 Village leaders witness delivery of seed-tubers from Groups and distribution to new groups at public meeting.	4.5 Village leaders witness handover to recipients at public meetings by March 2003.	4.5 Distribution Plans	
4.6 Repayment and redistribution at end of season witnessed by community leaders	4.6 Second round of distribution witnessed by Village leadership by September 2003.	4.6 Delivery Sign up sheet	
4.7 M&E office monitors distribution.	4.7 Random sample survey of recipients to confirm distribution and planting by March 2004.	4.7 Impact Report 4.8	
4.8 Health standards on seed health are imbedded into local policy and communicated up through the NAADS	4.8 Formalisation of seed health monitoring process in local policy	4.9 Policy document	

Appendix 2: Business Management Training Materials
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Appendix 2: Business Management Training Materials

“Comparing A Shop Keeping Business To Farming “

Shop keeping	Farming
Inputs	
Capital	Capital
Premise	Land
Selves	Seed
Counter	Hoes, pangas, slashes, axes, oxen, ox plough
Commodities e.g. sugar, salt, soap etc	Fertilizers/ chemicals
Transport	Labor
Record book for commodities bought and sold	Transport
Receipt books	Gunny bags
Cash books	Ox cart
A sign post	Donkeys
Operational Activities	
Purchasing commodities	Land preparation
Transporting	Planting
Displaying	Weeding
Advertising	Harvesting
Selling	Transporting
	Storage
Marketing Activities	
Business language	Threshing
Packaging	Bagging
Grading	Weighing
Advertising	Transporting
Displaying	Selling
Asking	
Receipting	
Risks involved	
Theft	Draught
Expiring dates of commodities	Hailstorm
Debts	Floods
Breakages	Animal destruction
Poor infrastructure	Theft
Similarities	
Capital Supervision Management Marketing	Labor Stores Transport

Appendix 3: Projected Income Statement (Traditional).
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Appendix 3: Projected Income Statement For Potato Using Traditional Farming Methods.

PARTICULARS	UNITS	UNIT COST	COST PER ACRE
Input costs			
Seed	10	25000	250,000/=
Hoes	3	3500	10,500/=
Pangas	1	3000	3,000/=
			263,500/=
Labor costs			
Ploughing 1	10MD	2000	20,000/=
Ploughing 2	10MD	2000	20,000/=
Planting	10MD	2000	20,000/=
Weeding	10MD	2000	20,000/=
Earthing up	10MD	2000	20,000/=
Harvesting	40 bags	1000	40,000/=
			140,000/=
Post harvest costs			
Transporting	40 bags	1000	40,000/=
Bags	4	600	2,400/=
			42,400/=
Total production costs			445,900/=
OUTPUT	UNITS	SALE PRICE	INCOME PER ACRE
Yield harvested	40	10000	400,000/=
Post harvest losses 10%	4	10000	(40,000/=)
Total Expected Gross Income			360,000/=
Total Production Costs			445,900/=
Total Expected Net Profit/Loss			(85,900)
Break Even Point : Total Production Costs/Amount actually sold = 445900/36 bags			
Production cost per bag (Break Even Price) = 12,386/= per bag			

The production cost per bag helps the farmers to decide on the selling price. Its clear that for a farmer to make profit, would sell at more than 12,386/=per bag.

Appendix 4: Projected Income Statement For Ware Potatoes (Improved Seed, No Fertilizer)
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Appendix 4: Projected Income Statement For Ware Potatoes Using Improved Seed Without Using Fertilizers

PARTICULARS	UNITS	UNIT COST	COST PER ACRE
Input costs			
Seed	10	25000	250,000/=
Hoes	3	3500	10,500/=
Pangas	1	3000	3,000/=
Fungicide	3 kg	7000	21,000/=
Insecticide	½ kg	15000	7,500/=
			292,000/=
Labor costs			
Ploughing 1	10MD	2000	20,000/=
Ploughing 2	10MD	2000	20,000/=
Planting	10MD	2000	20,000/=
Weeding	10MD	2000	20,000/=
Spraying 1 st	2MD	2500	5,000/=
Spraying 2nd	2MD	2500	5,000/=
Earthing up	10MD	2000	20,000/=
Harvesting	70 bags	1000	70,000/=
			180,000/=
Post harvest costs			
Transporting	70 bags	1000	70,000/=
			70,000/=
Total production costs			542,000/=
OUTPUT	UNITS	SALE PRICE	INCOME PER ACRE
Yield harvested	70	15000	1,050,000/=
Post harvest losses 10%	7	15000	105,000/=
Total Expected Gross Income			945,000/=
Total Production Costs			542,000/=
Total Expected Net Profit/Loss			403,000/=
Break Even Point : Total Production Costs/Amount actually sold = 542,000/63 bags			
Production cost per bag (Break Even Price) = 8,603/= per bag			

Appendix 5: Projected Income Statement For Ware Potatoes (Improved Seed +Fertilizers)
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Promoting Potato Seed-Tuber Management For Increased Ware Yields in Kapchorwa
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Appendix 5: Project Income Statement For Ware Potatoes Using Improved Seed And Fertilizers

PARTICULARS	UNITS	UNIT COST	COST PER ACRE
Input costs			
Seed	10	25000	250,000/=
Hoes	3	3500	10,500/=
Pangas	1	3000	3,000/=
Fertilizer	1 bag	36,000	36,000/=
Fungicide	3 kg	7000	21,000/=
Insecticide	½ kg	15000	7,500/=
			340,000/=
Labor costs			
Ploughing 1	10MD	2000	20,000/=
Ploughing 2	10MD	2000	20,000/=
Planting	10MD	2000	20,000/=
Weeding	10MD	2000	20,000/=
Spraying 1 st	2MD	2500	5,000/=
Spraying 2nd	2MD	2500	5,000/=
Earthing up	10MD	2000	20,000/=
Harvesting	100 bags	1000	100,000/=
			210,000/=
Post harvest costs			
Transporting	100 bags	1000	100,000/=
			100,000/=
Total production costs			650,000/=
OUTPUT	UNITS	SALE PRICE	INCOME PER ACRE
Yield harvested	100	15000	1,500,000/=
Post harvest losses 10%	10	15000	150,000/=
Total Expected Gross Income			1,350,000/=
Total Production Costs			650,000/=
Total Expected Net Profit/Loss			700,000/=
Break Even Point : Total Production Costs/Amount actually sold = 650,000/90 bags Production cost per bag (Break Even Price) = 7,222/= per bag Profit margin per bag = Sale Price – Production per bag 15,000 – 7,222 = 7,778/= per bag			

Appendix 6: Projected Income Statement For Seed Potato (Without Fertilizers).
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Appendix 6: Project Income Statement For Seed Potato Without Fertilizers Use.

PARTICULARS	UNITS	UNIT COST	COST PER ACRE
Input costs			
Seed	10	50000	500,000/=
Hoes	3	3500	10,500/=
Pangas	1	3000	3,000/=
Fungicide	3 kg	7000	21,000/=
Insecticide	½ kg	15000	7,500/=
			542,000/=
Labor costs			
Ploughing 1	10MD	2000	20,000/=
Ploughing 2	10MD	2000	20,000/=
Planting	10MD	2000	20,000/=
Weeding	10MD	2000	20,000/=
Spraying 1 st	2MD	2500	5,000/=
Spraying 2nd	2MD	2500	5,000/=
Earthing up	10MD	2000	20,000/=
Dehaulming	2MD	2500	5,000/=
Harvesting	70 bags	1000	70,000/=
			185,000/=
Post harvest costs			
Transporting	70 bags	1000	70,000/=
Sorting and grading	10MD	1500	15,000/=
Bagging	67bags	200	13,400/=
Bags	67bags	600	40,000/=
			138,600/=
Total production costs			865,600/=
OUTPUT	UNITS	SALE PRICE	INCOME PER ACRE
Yield harvested	70 small (10%)	6.7x100,000	670,000/=
	medium (50%)	33.5x50,000	1,675,000/=
	Large (30%)	20.1x30,000	603,000/=
	Extra large(10%)	6.7x20,000	134,000/=
Post harvest losses 5%	a. bags		
	small	0.3x100,000	30,000/=
	medium	1.5x50,000	75,000/=
	large	0.9x30,000	27,000/=
	extra large	0.3x20,000	6,000/=
			138,000/=
Total Expected Gross Income			3,082,000/=

Total Production Costs	865,600/=
Total Expected Net Profit/Loss	2,216,400/=
<p>Break Even Point : $\frac{\text{Total Production Costs}}{\text{Amount actually sold}}$ $= 865,600/67 \text{ bags}$</p> <p>Production cost per bag (Break Even Price) = 12,900/= per bag</p> <p>Profit margin per bag = Sale Price – Production per bag</p> <p>Small 100,000 - 12,900 = 87,100/=</p> <p>Medium 50,000 – 12,900 = 37,100/=</p> <p>Large 30,000 – 12,900 = 17,100/=</p> <p>Extra large 20,000 - 12,900 = 7,100/=</p>	

Appendix 7: Projected Income Statement For Seed Potato (Including Fertilizer).
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Appendix 7: Projected Income Statement For Seed Potato With Fertilizer Use.

PARTICULARS	UNITS	UNIT COST	COST PER ACRE
Input costs			
Seed	10	50000	500,000/=
Hoes	3	3500	10,500/=
Pangas	1	3000	3,000/=
Fertilizer	1 bag	36000	36,000/=
Fungicide	3 kg	7000	21,000/=
Insecticide	½ kg	15000	7,500/=
Gunny bags	10 bags	600	6,000/=
			584,000/=
Labor costs			
Ploughing 1	10MD	2000	20,000/=
Ploughing 2	10MD	2000	20,000/=
Planting	10MD	2000	20,000/=
Weeding	10MD	2000	20,000/=
Spraying 1 st	2MD	2500	5,000/=
Spraying 2nd	2MD	2500	5,000/=
Earthing up	10MD	2000	20,000/=
Dehauling	2MD	2500	5,000/=
Harvesting	10MD	5000	50,000/=
			165,000/=
Post harvest costs			
Transporting	100 bags	1000	100,000/=
Sorting and grading	10MD	1500	15,000/=
Bagging	100bags	200	20,000/=
Bags	100bags	600	60,000/=
			195,000/=
Total production costs			944,000/=
OUTPUT	UNITS	SALE PRICE	INCOME PER ACRE
Yield harvested	100 small (10%)	10x100,000	1,000,000/=
	medium (50%)	50x50,000	2,500,000/=
	Large (30%)	30x30,000	900,000/=
	Extra large(10%)	10x20,000	200,000/=
			4,600,000/=

Appendix 7: Projected Income Statement For Seed Potato With Fertilizer Use.
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Post harvest losses 5%	5bags small medium large extra large	0.5x100,000 2.5x50,000 1.5x30,000 0.5x20,000	50,000/= 125,000/= 45,000/= 10,000/=
			(230,000/=)
Total Expected Gross Income (4,600,000-230,000/=)			4,370,000/=
Total Production Costs			885,000/=
Total Expected Net Profit/Loss			3,485,000/=
Break Even Point : Total Production Costs/Amount actually sold = 885,000/95 bags			
Production cost per bag (Break Even Price) = 9,316/= per bag			
Profit margin per bag = Sale Price – Production per bag			
	Small	100,000 – 9,316 = 90,684/=	
	Medium	50,000 – 9,316 = 40,684/=	
	Large	30,000 – 9,316 = 20,684/=	
	Extra large	20,000 - 9,316 = 10,684/=	

Appendix 8: KAPTANYA SAVINGS AND CREDIT GROUP BYE LAWS
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SAVING MOBILIZATION AND CREDIT MANAGEMENT BYE -LAWS

Appendix 8: KAPTANYA SAVINGS AND CREDIT GROUP BYE LAWS

Name of the group: Kaptanya Savings and Credit Group

Location: Kaptanya sub county headquarters.

Objectives:

1. To mobilize savings for the group and individual members.
2. To generate income through loaning to members
3. To improve the standards of living members.

Membership: Is one who is able to abide by the Bye- laws.
He/ she must be from within the area of jurisdiction.

Membership fee: 10,000/= (Ten thousand shillings) annually.

Meetings: Once a month

Meeting day: Every 2nd Saturday

Meeting time: 2:00pm

Meeting venue: Kaptanya sub county headquarters.

Saving deposits: A regular saving deposit at every meeting
A minimum saving deposit of five thousands (5,000/=) per meeting.

If a member fails to deposit his/her minimum savings, the solidarity group have to pay then they settle their issue after.

Each member should possess a passbook

Quorum: The quorum for loan approval shall be two thirds (2/3) majority

Eligibility for loans:

Must be a member who is credit worthy, hardworking, with solidarity guarantee and provides a security and a family consent.

He/she with a saving deposit of 25% of the loan he/she intends to request.

He/she should have completed the repayment of the previous loan.

Interest rate on the loan: 5%

Loan repayment period: Two (2) months

Loan repayment mode: In two equal installments; 2 meetings.

If a member defaults, the solidarity group pays then they settle their issue after the meeting.
If the member fails to settle with the solidarity group, then the entire group members have to get his security.

When a new member should get a loan:

- Should be in-group for at least 4 months.
- Priority to be given to productive purpose.
- Social purpose given a shorter period one (1) month.

Loan supervision

- Loan committee

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- Solidarity group members
- Executive committee members.

Dividends:

Dividends shall be paid once every year according to the ratio of each members' savings
The 10% of the total interest will be retained for group saving

Fines:

Late coming:	500/=
Absenteeism from the meeting:	1000/=
Bad language/ misconduct:	500/=
Rumour mongering:	5,000/= given two chances and the third time is expelled from the saving and credit programme
Bad conduct:	5,000/=

The treasurer or secretary at every end of the meeting shall report financial records & information to members.

Withdrawal of from members from the group: Shall be voluntary and dismissal with their savings.

Appendix 9: KAPRORON SAVINGS AND CREDIT GROUP BYE LAWS
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Appendix 9: KAPRORON SAVINGS AND CREDIT GROUP BYE LAWS

Name of the group: Kaproron Savings and Credit Group

Location: Kaproron Sub-County

Objectives:

- 1 To mobilize savings for the group and individual members.
 - 2 To generate funds to loan to members for productive purposes loaning to members
- i) To improve the standards of living members i.e. to raise interest which at the end of trading period will be shared to help in domestic issues.
- a. To share experiences and solve other problems

Membership: Is one who is able to abide by the Bye- laws.

He/ she must be from within the area of jurisdiction.

Membership fee: 10,000/= (Ten thousand shillings) annually. (Non-refundable)

Meetings: Once a month

Meeting day: Every 1st Friday of the month

Meeting time: 2:30pm

Meeting venue:

Saving deposits: A regular saving deposit at every meeting

A minimum saving deposit of four thousands (4,000/=) per meeting.

If a member fails to deposit his/her minimum savings, the solidarity group have to pay then they settle their issue after.

Each member should posses a passbook

Quorum: The quorum for loan approval or any new ideas shall be two thirds (2/3) majority

Eligibility for loans:

Must be a member who is credit worthy, hardworking, with solidarity guarantee and provides a security and a family consent.

He/she with a saving deposit of 25% of the loan he/she intends to request i.e. A member shall not take a loan beyond 4 times his/her saving deposit.

He/she should have completed the repayment of the previous loan.

Interest rate on the loan: 5%

Loan repayment period: One (1) month

Loan repayment mode: Once i.e. In the next meeting.

If a member defaults, the solidarity group pays then they settles their issue after the meeting.

If the member fails to settle with the solidarity group, then the members have to get his security.

When a new member should get a loan:

A new member shall take a loan after 3 months in the group..

Purpose of the loan:

Priority to be given to productive purpose.

Social purpose given a shorter period one (1) month.

Loan supervision

- Loan committee
- Solidarity group members
- Executive committee members.

Appendix 9: KAPRORON SAVINGS AND CREDIT GROUP BYE LAWS
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Dividends:

Dividends shall be paid once every year according to the ratio of each members' savings

Fines:

Late coming: 500/=

Absenteeism from the meeting: with no apology 1,000/=

Bad language/ misconduct: 5,000/=

Rumour mongering: 5,000/= first and second times, the third time dismissal.

The treasurer or secretary at every end of the meeting shall report financial records/information to members.

If a member wishes to withdraw from the group is free to withdraw all his/her savings without interest for that year.

Appendix 10: TIME TABLE FOR MARKETING TRAINING
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Appendix 10: TIME TABLE FOR MARKETING TRAINING

TIME	TOPIC	FACILITATOR
<hr/>		
Day 1:	Monday	2nd June 2003
8:30 am	Welcome/introductions	Sarah
8:45 am	Introduction to Marketing What is a market/marketing	Sarah
	<ul style="list-style-type: none"> • Importance of marketing 	
10:00am	T E A B R E A K	
10:30 am	Contractual marketing** Buy back arrangement**	Fred Bikandi
1:00 pm	T E A B R E A K	
2:00 pm-5:00pm	Quality control/stores management **	Fred Bikandi
<hr/>		
Day 2	Tuesday	
8:00 am	The concept of collective bargaining and marketing for farmer's groups** <ul style="list-style-type: none"> • Organizing transport** • Obtaining inputs** • Capital acquisition/investments** 	
12:30	Training evaluation/Closure	

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Appendix 11: REPORT ON FARMERS' EXCHANGE VISIT TO KABALE

A) REPORT ON THE VISIT OF FIRST GROUP OF SEED POTATO FARMERS TO KABALE

Introduction

The Kapchorwa farmer exchange visit to Kabale took place from 24/11/2002 to 28/11/2002. The team Constituted of 10 potato seed multipliers, 4 artisans, 4 assistants FPRAs, 2 AT technical staff and 2 AT drivers.

Objective

1. To build capacity of Kapchorwa farmer seed producers on potato husbandry and post-harvest management.
2. To enable farmer from Kapchorwa to share experiences with/and benefit from the well established Kabale farmers
3. To expose Kapchorwa artisans to the established DLS in Kabale to help them gain skills on construction of DLS for Kapchorwa farmers.

Activities

Farmers first visited Kachwekano ARDC where they were handled by one technical officer (Rogers Kakwenzire) who did the explanations and guided the team through different experiments. The farmers were informed the need to ensure the quality of the seed thus, good size, well sprouted (mature), disease/pest free, right source of seed, etc.

Farmers were further told that seed potato production should be commercialized (should be a business), that is, to be able to calculate benefits/profit. Rogers further emphasized that timeliness in disease/pest control and weed management can save money, i.e. the earlier one goes in for fungicide spray against blight the less fungicide is used.

With seed potato, a minimum inspection of the field once week is required. He also talked of the importance of dehauling the potatoes before harvest and discouraged the farmers to do the harvesting when its wet as the crop can get Erwinia bacteria disease. Farmers were told not to store potatoes when wet. Rogers advised farmers to store the seed potato in a diffuse light store that has to be opened once a week and potatoes turned once in a while at the same time removing tubers that have been attacked by insects (potato tuber moths) and diseases (bacteria wilt).

Farmers were told to minimize crop volunteers by having a second round of harvesting and to treat volunteers as a weed. Demarcation of diseases by field mapping was briefly introduced to farmers.

Estimates Of Costs For A DLS

The materials required for DLS and the cost estimates were done at the end of two field days .by the artisans, farmers, Assistant FPRAs, AT Uganda staff, Kachwekano staff and the Chairman UNESPA. The total contribution by AT Uganda per DLS is 799,760/= and Farmers 1,238,000/=. The cost for farmers came up to be high for the farmers to afford at ago or within the limited time remaining. With consultation of Kachwekano staff, the

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construction of a concrete floor was left optional for a start. This left a minimum balance of 729.000/= as a contribution by the farmer, which was a 50%:50% contribution by farmer and the project. An artisan from Karyengyere, continued to Kapchorwa to demonstrate to Kapchorwa artisans how to construct a DLS. Thereafter, the Kapchorwa artisans constructed the remaining DLS.

B) SECOND VISIT TO KABALE

Introduction

The exchange visit of the second group of Kapchorwa seed multipliers to Kabale took place from 23rd to 26th November 2003. The team constituted of 10 multipliers, 1 Field assistant from Bukwa subcounty and 2 ATU staff.

Objectives Of The Visit

- 1 To build capacity of Kapchorwa farmer seed producers on potato production management and post-harvest management.
- 2 To enable farmers from Kapchorwa to share experience with Kabale seed potato multipliers.

The farmers were welcomed to Kachwekano ARDC by Dr. Wagoire- Head of Potato Program NARO. He encouraged farmers to aim at producing good and quality seed which can be accepted by the people (market). He stressed the importance of farmers to take seed potato production farming as a business. He challenged Kapchorwa farmers to leave maize growing which generate little money and go for potato production which fetches a lot of money within the shortest period. Dr. Wagoire ended by remaining the farmers to find a way of sustaining themselves, by the time AT project comes to the end.

The team was then led to Kalengyere by the chairman of UNSPPA. In Kalengyere, they were received by Rogers Kakuhenzire and 2 technicians. Rogers covered the diseases and pest identification and control. He guided them through different experiments, where they saw the effect of blight on potato yields. They were able to see how different varieties respond with different level of spray against blight. Victoria variety came out as more susceptible to blight and the yields are reduced substantially. However, Nakapot 5 variety was found out to be less susceptible to blight that even at one spray, the yields were good. Rogers stressed the importance of initial spray against blight within 21- 30 days after planting (when the crop is 80-100% emergency). Then advised to keep monitoring/ inspecting the fields, spray again if any stress of blight is observed at an interval of 1 week.

For the cutworms, farmers were informed as are hard to kill even in Kabale. They were advised to continue picking them and then kill mechanically, or to use marathione powder, by first opening the soil and pour the powder around the plant.

Rapid multiplication and seed storage was covered by the technicians. The farmers raised the cumbersome of raising up a small seed plot. The technicians told them they do not need to pour a lot of soil. They just need to use the top soil around the plot, which is just enough.

The team visited seed potato multipliers. It was observed that Kabale farmers, care for their crops and the Kapchorwa farmers appreciated it. Kabale seed potato producers do not grade

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their seed, they only remove the small and big tubers and use them for their seed for ware potato production, then sell the remaining mixed seed at a price of 40,000/= per 80 kg bag. No seed multiplier in Kabale has ever had any problem with lack of market of the seed. The UNSPPA help the farmers to sell their seed potato.

Kapchorwa farmers were provoked when they visited one of the multipliers practicing rapid multiplication. Some farmers promised to try it out too. When they get back to Kapchorwa. Kapchorwa farmers got impressed with the investments their fellow seed potato producer have made from seed potato production i.e. constructing permanent houses.

During the communication with farmers, Dr. Wagoire advised the farmers to be buying seed from Buginyanya to be able to reduce on transport costs. It was a good idea, but AT Uganda Technical staff advised farmers to be establishing the type of seed, whether pre-basic? Also farmers to be going to Buginyanya to supervise the crop in the field at 45 to 60 days to establish whether it is clean from bacterial wilt.

AT Uganda staff had in-depth discussion with how dormancy in potato can be broken (stimulating sprouting)? Two possibilities were looked at. (a) Emphasizing on early planting (b) Immediately after harvesting, potato tubers to be put at thick layers on shelves, then cover them with dry grass. At sprout initiation, the grass is removed and the layer of tubers reduced.

Otherwise it was a successful trip to the farmers. They learnt a lot from the researchers and their fellow farmers.