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**Adoption of New Cotton Technology,**
**Kasese district, Uganda**

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**Summary**

New cotton technology in Uganda is promoted as a "technology package" of prescriptive recommendations. Experience elsewhere, however, suggests that farmers typically adopt specific components in a stepwise manner, and require conditional rather than prescriptive recommendations.

The adoption process for new cotton technology was explored through interviews with 30 Demonstration Farmers (DFs) in Kasese district and a focus group discussion (FGD) with 17 cotton growers in Kabirizi. Kasese is a relatively new area for cotton production and infrastructure is poorly developed.

Interviews with DFs showed that of the 11 "components" in the cotton technology package:

- Six components (early planting, planting in pure stand, spacing, scouting, removing stalks, and thinning/gap filling) had been almost universally adopted and these components had been quickly extended to all the fields that DFs planted to cotton;

- Components that involved cash costs (herbicide, planting with fertiliser, topdressing fertiliser) had been adopted by only one-third of growers, and growers were much less likely to extend use of these components to all the fields they planted to cotton.

Interviews also revealed that growers' scouting practices often varied from the recommended practices for the timing of scouting, counting plants, and the timing of sprays. Farmers may have been confused by the advice to scout every two weeks, which was the same interval they were accustomed to use for calendar spraying.

The FGD revealed important knowledge gaps in the potential benefits from herbicides, and in the price of herbicides and fertilizer. Shortage of cash to purchase these inputs was an important adoption constraint since most income from cotton was used to meet household expenditure. Growers requested credit for inputs to be repaid at harvest. Poor infrastructure also increased the expense of obtaining fertilizer.

Results suggest the need to replace the concept of a "technology package" with a more flexible approach. First, farmers need conditional recommendations for new cotton technology, that take account of contingencies, particularly variations in planting date due to erratic rains. Second, cash constraints in purchasing inputs can be partly overcome by packaging these expensive inputs in smaller units. "Starter Packs" of herbicide and fertilizer should be made available for sale to growers who wish to experiment with the new technology.

1.0 Introduction

In Uganda new cotton technology has been as a "technology package" combining various components. Growers may then compare yields achieved with and without the technology package on demonstration plots. This is the classic "transfer of technology" (TOT) approach in which extension delivers finished recommendations to farmers who then "adopt" the recommended technology (Chambers, 1993). The "package" approach to technology development reflects the complementarity between different components. This is important for cotton. For example, sprays may have little impact on yield if cotton is planted or weeded late (Carr, 1993). Similarly, "If farmers cannot gain good control over insect pests for any reason, there is little hope that fertiliser use will be worthwhile" (Carr, 1993).

Experience shows, however, that adoption of new agricultural technology rarely follows this pattern. Instead:

- Farmers usually adopt new technology "step-by-step", rather than as a complete technology package (eg. Orr, 1997).

- Farmers "adapt" rather than "adopt" new technology, to make it more appropriate for their own circumstances (Okali, Sumberg, and Reddy 1994).

As a result, the TOT model has come to be regarded as top-down and outdated. In Uganda, as elsewhere, agriculture extension is moving towards a more participatory and decentralized approach.

The objective of this study was to "unpack" the cotton technology package in order to identify:

- Which components were being adopted;

- Farmer adaptation of the new technology; and

- Constraints to adoption of specific components.

*2.0 Data and methods*

Information was collected through a survey questionnaire, which was administered to s sample of Demonstration Farmers (DFs) in Kasese (Table 1). We deliberately selected DFs because they were expected to have greater exposure to the new technology. Originally, it was planned to revisit the 30 DFs interviewed for the grower survey conducted in November 2002 (Orr et. al., 2003). Unfortunately, this was not possible because of the mobility of cotton growers in Kasese who migrate from nearby hills. Other DFs were substituted. In the end roughly half the DFs we interviewed had been interviewed for the 2002 grower survey. The survey questionnaire is reproduced in Appendix 1.

A Focus Group Discussion (FGD) was held with 17 cotton growers (including 10 DFs) to clarify issues emerging from the interviews and explore farmers' perceptions of the technology package (Table 2). Farmers scored technology components in terms of ease of adoption and impact on yield, and three components (herbicides, fertilisers, and IPM) were discussed in detail to identify problems with adoption. This discussion was held on 22 February 2004 at Kabirizi Cooperative store

Since the objective was to explore the adoption *process* as well as what had been adopted, the survey interviews were not conducted by enumerators but by three experienced socio-economists. Much of the information obtained was qualitative in nature and required careful probing. In order to cross-check adoption of components, interviews were conducted on one of the DFs' own fields (not the demo plot). Three site coordinators who had been enumerators for the grower survey in 2002 served as interpreters.

3.0 Results

3.1 Survey

*IPM adoption (Table 3)*

Seven growers had IPM on-farm trials on their fields, and of the remainder all except one had received training in IPM (ie. pest identification and scouting). Of the 30 growers who trained in IPM, 19 (63 %) scouted every two weeks. More than half the growers who scouted counted all 25 plants, while others counted only until the threshold was reached. Twenty-six used a pegboard, while others used their own methods of sampling. On average, spraying cost 35,114 Shillings/household of which only 19,836 shillings (56 %) was for chemical sprays.

*Fertiliser adoption (Table 4)*

Only 9 of 31 DFs (29 %) had adopted chemical fertiliser for their own cotton fields. The average quantity used was 70 kg (the recommended rate is 50 kg/acre). Most growers reported their nearest source of supply as private dealers in Kasese, approximately 50 km distance.

*Adoption of technology package (Table 5, Figure 1)*

Table 5 provides information about the adoption status of 11 separate components of the new technology package for cotton. The results show that:

- Six components (early planting, planting in pure stand, spacing, scouting, removing stalks, and thinning/gap filling) had been almost universally adopted.

- Adopters quickly extended use of these components to all the fields they  planted to cotton.

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- Components that involved cash costs (herbicide, planting with fertiliser, topdressing fertiliser) had been adopted by only one-third of growers.

- Growers were much less likely to extend use of these components to all the fields they planted to cotton.

- Adoption of components that required cash costs was more irregular and discontinuous than other components.

Figure 1 shows that of the 31 growers in the sample, only four (13 %) had adopted 10 components. The mean number of components adopted was seven and the mode was six.

3.2 Focus Group Discussion

Growers were asked to list the practices they had witnessed being done on the demonstration plots. We then asked them how easy it was to adopt each of those practices on their own fields. Table 6 shows that:

- Thinning, spacing, line planting received the maximum score of 10 as easiest to adopt;

- Scouting and spraying were relatively easy to adopt and received a score of 8;

- Fertiliser and herbicides were not easy to adopt and received a score of 2.

Growers were also asked to score the components of the technology package according to their perceived impact on yield. This exercise showed that farmers had limited knowledge to distinguish the effects of different components. All the components received high scores (Table 7).

During discussion growers made several interesting and important points about the new technology being demonstrated:

**Herbicides**

- The majority of the participants were not aware of the economic benefits of using herbicides;

- Landlords stopped those who rent their land from using herbicides from a belief that these chemicals spoiled the soil;

- The time-lag between harvest and next planting led meant that most of the income from cotton was used on other household cash obligations. Hence by the time of planting there was no money to purchase herbicides;

- Growers had an incentive to use tractor for land preparation since they could pay half of the cost for ploughing with the other half paid after harvest;

- Asked why they did not borrow from local moneylenders to finance purchasing herbicides, growers replied that borrowing increased the risk of heavy credit burden and failure to pay back might leave the farmer in a more precarious state than before.

### Fertiliser

- Participants were not aware about the prices for fertiliser and where to get it;
- Fertiliser was not available in nearby trading centres.

### Scouting

- Scouting was done at fortnightly intervals.  There was no uniformity with respect to starting scouting. Some farmers noted that they start two weeks from date of planting, others start at three weeks while others start one month after planting.  By and large scouting stops at the time of boll opening although a few farmers noted that the stop at the time of square formation.

- Sampling method used in scouting was at an interval of five rows, take five steps within the row then count five plants. This is done irrespective of size of cotton field.

- The chemicals applied included liquid soap, detergent, rain in case of aphids, Fenkill or Ambush to control ball worms. Only three of the 17 participants had ever used liquid soap or detergent to control aphids. There was a general lack of awareness of products used for spraying and most farmers referred to the chemical by the colour of the container of the emulsion.

### Growers' suggestions

- Provide physical inputs (herbicides, fertiliser) on credit and let the farmers pay at time of harvest;
- Establish linkages between input dealers and farmers for provision of inputs;
- Continue training so as to encourage farmers to adopt the demonstrated technologies;
- Increase the number of demonstration plots so that they cover a larger area and scattered in many places;
- Creating awareness by using other channels like sensitisation meetings, posters at the store and other strategic places (markets, trading centres). The radio was noted as not being effective as many do not have radios or do not buy the batteries.
- Create start-up packs that can be used by farmers on small scale for experimental purposes in their own fields. For example, Lasso-Atrozine was only available in 5 litres quantities at a price of UGS 70,000. This is prohibitive for growers who want to use herbicide. Participants recommended that it should at least be made available in litre bottles.

### 3.3 Private Dealer

The only private fertiliser supplier in Kasese is the Farm Inputs Care Centre (FICA), which has a network of stockists at various trading centres in both sub-counties in Kasese. Stockists get fertiliser on credit at reduced prices to allow them a trading margin. Many of the DFs that we interviewed buy inputs from Mbwera Mponda trading centre. This centre did not have a stockist in 2003 because he found alternative employment with APEP. This left farmers wishing to buy fertiliser with a 60 km trek into Kasese, adding significantly to overall costs. Table 9 shows the inputs available from FICA in the 2003B season and their prices.

4.0 Discussion

### 4.1 Partial adoption

Growers had adopted certain components of the new cotton technology but not the complete package. Only four growers in the sample (13 %) had adopted 10 components. Typically, growers had adopted six components, excluding zero or reduced tillage, fertiliser and herbicides. Generally, these components had not been adopted or, if adopted, had not been used on all fields planted to cotton. These findings refer not to ordinary growers but to demonstration farmers selected for their experience and skill in growing cotton.

Farmers' comments (Boxes 1 and 2) showed that they understood the benefits from fertiliser and herbicides. Adoption of these components was partial because they were expensive and not available locally. Only 8 growers (26 %) used fertiliser in the 2003B season. One bag of MAP fertiliser (enough for one acre) cost UGS 42,000. This meant that one bag was the equivalent of 70 kg of cotton, valued at the starting price of 600 UGS/kg for the 2003B season. Buying prices usually rise during the cotton season, reducing the relative cost of fertiliser.

Fertiliser was only available in Kasese Town, an average of 48 km from farm homesteads. The cost of travel and transport added significantly to the farmgate cost of fertiliser. Farmers buying one 50 kg bag in Kasese had to pay UGS 1000 for transport to Kabirizi Cooperative Store, and UGS 12,000 for the return fare from Kabirizi to Kasese. Thus, the farmgate price of one bag of MAP fertiliser in Kabirizi was UGS 55,000, equivalent to 92 kg of cotton at the 2003B starting price. This does not include the opportunity cost of the farmer's time for travel.

Similarly, only 11 growers (36 %) used herbicides in the 2003B season, though these cost much less than fertiliser and were available locally through the FICA stockist at Mponde Mbwera as well as in Kasese Town.

These findings show the:

- importance of Nyakatonzi Union Cooperative for supply of key cotton chemicals (Ambush, Fenkill, and Dimethoate), which were not stocked by FICA (they might have been available from other private dealers, with a large mark-up)

- lack of small, affordable input packages that might cover ½ or even ¼ acres. Fertiliser was only available in 50 kg bags (1-acre) and RoundUp Max was only available in sachets of 150 grams. Smaller packages ("Starter Packs" for cotton) might encourage more farmers to experiment with the new technology.

*Box 1. Growers' views on fertiliser and herbicides*

*"We need the herbicides and fertilisers to be brought nearer the farmers" (Farmer # 5)*

*"If the fertiliser was available I would have bought two bags – enough for one acre". (Farmer # 12)*

*"He applied some fertiliser to ¼ of his cotton field. He used fertiliser that had been spared from the demonstration plot". (Farmer # 31).*

*"Access to fertiliser is still a problem because it is expensive and not readily available" (Farmer # 6)*

*"I would always go and try out what I was taught in the demo on my own field. Though lack of money did not allow me to try out herbicides and fertiliser. This season I planted with fertiliser that was bought for me by a friend in Kasese". (Farmer # 29).*

*"I sold my two pigs to get money to hire labour for land preparation. I could not use herbicides as I was not aware how much they cost and they are not available in the nearby trading centres. Sending someone to Kasese to buy for you is risky. Suppose that person uses the money for their own things? If available I would use it". (Farmer # 30).*

*"With herbicides, only two touch weedings needed. Used to weed three times with a hoe before he adopted herbicides". (Farmer # 14).*

***"Zero tillage not used because she opened new land this year and the field was very bushy". (Farmer # 12).***

*"Herbicides help save money due to reduced use of hired labour and reduced weeding. Allows me to do other things and \take care of crops. You could look for labourers and even fail to get them. Now you do not go through all that trouble". (Farmer # 23).*

*"Use of herbicides reduces weeding times saves labour and I get time to attend to other things, ie planting other crops which improves household food availability". (Farmer # 24).*

## 4.2 Stepwise adoption

The components that were adopted most readily were those that required little or no cash such as spacing, thinning, and removing stalks (Box 3).

Box 2. Growers' comments on components that were easy to adopt

*"Used to plant zig-zag or random (chita chita)". (Farmer # 16).*

*"Agricultural officeers advised on spacing and I adopted it in the 1970s but later dropped it and only picked it up again in 2000. Line planting is time consuming and due to laziness it had been dropped. He has realised that correct spacing leads to higher yields". (Farmer # 21).*

*"Thinning to two plants, before used to leave 3 or 4 plants" (Farmer # 16).*

**"He used to thin to three crops but the cotton would put on fewer bolls so he has learnt and moved to two". (Farmer # 31).**

**"This year I was sick and the hired labour who did the thinning left in three plants but when I do it myself I thin to two plants". (Farmer # 30).**

*"Spacing used to be done eye-to-eye, with no use of string. General spacing was 3 x 2 feet". (Farmer # 5)*

*Farmer removes stalks because he plants maize + soybean after cotton (Farmer # 17).*

### 4.2 Farmer adaptation

Farmer adaptation was most clearly seen in the adoption of IPM scouting. Cotton growers have been accustomed to calendar spraying every two weeks. IPM training has replaced this with a spraying interval based on pest thresholds – farmers 'scout' their fields every week, sample cotton plants, and count pests using a wooden pegboard. Cotton is sprayed only if pest numbers exceed a fixed threshold.

Most growers claimed that they had adopted 'scouting' but comments recorded by interviewers make it clear that farmers used scouting in different ways (Box 4):

- Some growers scouted as recommended, spraying only if the threshold was reached. One or two farmers had not sprayed at all during the 2003B season.

- Other farmers scouted every two weeks and sprayed every two weeks as before. In this case, farmers have combined new and old practices. This is based on a misunderstanding of the purpose of scouting. Farmers may have been confused by the advice to scout every two weeks, which was the same interval they were accustomed to use for calendar spraying. Whatever the reason, scouting and calendar spraying have been combined.

- Some farmers scouted every week rather than every two weeks, while others counted 25 plants ("to make sure" or "because the field is big") rather than stop counting once the threshold had been reached.

Sometimes farmer adaptations may improve new technology but in this case it seems clear they do not. Instead, they reflect farmers struggling to understand a new practice that is very different from what they have previously been taught. Some have embraced the new practice, others are still some way down the learning curve.

*Box 3. Growers' use of scouting and chemical sprays*

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**"IPM reduces the number of sprays, hence cost of production. It's a good thing that should be promoted" (Farmer # 1)**

*"First spray given after 1 month, 2$^{nd}$ at square formation, 3$^{rd}$ at boll formation" (Farmer # 4).*

*"Spraying done every fourteen days. Before, would visit field and see if leaves were curled, then spray. (Farmer # 11)*

*"Scouting guides the spraying when there are not many pests I do not spray". (Farmer # 29).*

**Farmer did not need to spray this year. (Farmer # 13).**

*"He started spraying when the cotton was about 15-20 cms tall when aphids were seen on the plants. Thereafter sprayed every two weeks but after seeing bollworms. Scouting done every week". (Farmer # 21).*

*"Spraying after every two weeks. Start spraying when cotton is 15 cms. Decision largely based on routine rather than scouting though he does scout". (Farmer # 22).*

*"The day you spray, you don't sleep at night from the effect of the chemicals". (Farmer # 18).*

**"Used to spray every two weeks but now can even spray after 3 weeks". (Farmer # 14).**

*"Scouting guides spraying. Previously I would spray every two weeks. Scouting has enabled me to identify the type of pest and know which chemical to use. And it helps to warn you that your crop is being attacked so that you act in time". (Farmer # 28).*

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## 4.3 Flexible recommendations

Current blanket recommendations don't take account of variations in rainfall. Rainfall determines the optimum number of sprays (Farrington, 1977) and the optimum fertiliser rate (Carr, 1993). Farmers usually reduce input use in bad seasons. Hence, recommendations can be made *conditional* rather than prescriptive (eg. if you plant on

date X, do Y). This would allow farmers to make decisions based on contingencies (Byerlee, 1987).

*Box 4. Contingencies affecting timely tillage, planting, and weeding*

*Tillage*

*Field planted late, because of competition for ploughing by tractor. If tractor ploughing had been available, she would have planted at the same tiime as the demo. She paid 30,000 Sh/acre, and had to borrow money. If you pay half the cost, they will plough for you and you pay the rest after harvest. Those who pay the full amount up-front have their fields ploughed first". (Farmer 12).*
*Planting*

*"Planted 12 August in 2002. Other years had early rain. This year planted September. (Farmer # 14).*

*"Planted cotton early but didn't germinate as expected because of a dry spell, only 75 % of plants germinated. Normally rain arrives in mid-August, but this year rains actually came at start of September. Seed can stay up to three weeks without rain". (Farmer # 16).*

*"Rainmakers (*abahangi bembulha*) come and ask for food and you can say no, then at weeding there is a dry spell, and you blame those people". (Farmer # 18).*

*Weeding*

**"This year he planted on 8$^{th}$ August. Last year he was late because he was opening a new field and it was weedy". (Farmer # 13).**

*"Weeding was done 2 weeks after planting then again after one month. No weeding was done subsequently as it was a dry spell hence few weeds" (Farmer # 18).*

*"Gap filling depends on germination, which depends on rain". (Farmer # 14).*

## 4.4 Yields with new cotton technology

Farmers reported increased yields with new technology. Estimates of yield increases varied widely. But comments made clear that farmers had increased yields through adoption of low-cost components such as plant spacing. Generally farmers were achieving 800 kg/acre with the cotton technology package. This figure corresponds

closely to the yields reported from non-IPM plots in Kasese in the 2003B season, where farmers obtained 882 kg/acre on high-input plots and 816 kg/acre on low-input plots.

*Box 5 Changes in cotton yields*

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*"Since the introduction of the demonstration program my yield has increased from about 300-400 kg/acre to 700-800 kg/acre. I have been able to construct a house with the income" (Farmer # 1).*

*"I now get about 300 kg from my ½ acre block compared to only 150-200 kg in 2000/01" (Farmer # 2).*

*"I used to get 300 kg/acre, now I get 400 kg/acre thanks to the practices I have adopted". (Farmer # 9).*

*"Due to proper spacing and pest control my yields have increased from only 500 kg/acre to 800 kg/acre" (Farmer # 10).*

*"Our yields have increased from an average of 500 kg to 700 kg/acre. With fertilisers, we can easily reach 1000-1200 kg/acre" (Farmer # 8).*

*"Now our yields have increased from 300-500 to 800-1200 kg/acre" (Farmer # 5).*

*"I have seen increase in yield from 500 to 800 kg/acre" (Farmer # 3).*

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**Conclusions**

Recommendations on new technology to improve cotton yields might be more farmer-friendly if they were more *flexible* and presented as a "menu" rather than a "package". This means "unwrapping" the package to give farmers more options in how to use the new technology and more information about the economic returns from different components. Presumably we will learn this from the OFTs that are being conducted by Soroti in  Pallisa and other districts.

For example, it might be possible to develop *conditional* recommendations based on a range of planting dates that accommodate variability between years and between growers. For example, if you plant later than others, are plants more likely to suffer damage and require more sprays?

The definition of high- and low-input technology needs to be revised. Low-input should refer to components that do not require additional cash investment, and high-input refer to use of components like fertilizer and herbicides that require additional cash resources. Comparison between demonstration plots along these lines would be more appropriate for farmers' circumstances, and help compare the yield increases from high- and low-cost components. Farmers reported yield increases from adoption of low-cost components like

plant spacing. It seems likely that poorer growers can also benefit from some components of the new technology package.

Affordability and availability of cash inputs remain important constraints on adoption of new technology in Kasese. This underlines the importance of the role of cooperatives in providing access. Private enterprise in this district has not yet succeeded in supplying inputs at the right place, in the right time, and in the right quantity for large numbers of small growers.

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Table 1. Sample demonstration farmers

| Name | Subcounty | Parish | Village |
|------|-----------|--------|---------|
|  | Kisinga | 4 |  |
|  | Nakiyumba | 11 |  |
|  | Lake Katwe | 10 |  |
|  | Kyalumba | 3 |  |
|  | Nyakyoma | 3 |  |
|  | Total | 31 |  |

Table 2. Growers who participated in focus-group discussion, Kabirizi

| Name | Area planted to cotton (2003b) | Demo Farmer | Years as demo farmer |
|------|-------------------------------|-------------|----------------------|
| Issah Kyeyune | 3 | Yes | 1 |
| Yona Mughanda | 2 | No | - |
| Kahigwa Blasio | 2 | Adopter | - |
| Masereka Zakayo | 1.5 | No | - |
| Ndungo Edison | 2 | Yes | 2 |
| Batrumao Kalemba | 1.5 | Yes | 2 |
| Biira Beatrace | 1 | No | - |
| Josi Biira | 1 | Yes | 1 |
| Regina Masika | 2 | Yes | 2 |
| Yosinta Kabatabazi | 2 | Yes | 2 |
| John Baluku Ntomera | 2 | Yes | 2 |
| Muhindo Miriam | Missing | Yes | 1 |
| Kabugho Lakeri | Missing | No | - |
| Muhindo Getridek | Missing | No | - |
| Musabuli Jetrace | Missing | Yes | 2 |
| Karabyo Lazarous | Missing | No | - |
| Bwambale Martin | Missing | Yes | 3 |

Table 3. IPM adoption among demo farmers

| Variable | Yes | No |
|---|---|---|
| IPM OFT farmers | 7 | 24 |
| Use scouting | 30 | 1 |
| Frequency of scouting: One week / Two weeks / Three weeks | 10 / 19 / 1 | |
| Count all 25 plants? | 13 | 17 |
| Decision to spray based on scouting? | 17 | 12 |
| Use pegboard? | 26 | 4 |
| Average number of sprays | | |
| Cost of spraying: Pump hire / Chemical / Labour spraying / Labour for water / Total | 4,565 / 19,836 / 6,436 / 4,277 / 35,114 | |

Table 4. Fertiliser adoption among demo farmers

| | Yes | No |
|---|---|---|
| Number using fertiliser | 9 | 22 |
| Type of fertiliser (bags) NPK / SSP / TSP / MAP / Other | 2 / 4 / 3 / 4 / 1 | |
| Quantity purchased (kg) | 71 | |
| Cost of fertiliser (Sh.) | 46,975 | |
| Source of fertiliser: Cooperative / Private ginnery / Private dealer / Friend/neighbour / Other | 1 / 0 / 8 / 0 / 0 | |
| Distance to nearest source (km) Kasese | 48 | |

Table 5. Adoption of cotton technology package by demo farmers

**(n=31)**

| Component | Adopters | Adopted on all fields | Discontinued? | Year used this practice | | |
|---|---|---|---|---|---|---|
| | | | | 2003 | 2002 | 2001 |
| Zero tillage | 9 | 4 | 3 | 7 | 5 | 0 |
| Reduced tillage | 3 | 1 | 0 | 3 | 3 | 1 |
| Herbicides | 11 | 4 | 2 | 9 | 6 | 0 |
| Earlier Planting | 30 | 30 | 1 | 28 | 27 | 20 |
| Planting with fertiliser | 8 | 3 | 1 | 8 | 4 | 1 |
| Planting in pure stand | 31 | 30 | 0 | 31 | 30 | 21 |
| Spacing | 31 | 30 | 0 | 31 | 29 | 11 |
| Topdressing with fertiliser | 6 | 2 | 0 | 6 | 4 | 0 |
| Scouting for pests | 30 | 30 | 0 | 30 | 24 | 2 |
| Removal of stalks after harvest | 31 | 31 | 0 | 31 | 31 | 28 |
| Thinning | 31 | 31 | 0 | 30 | 31 | 24 |

Table 6. Adoption of technology components, by ease of adoption.

| Practice Demonstrated | Score assigned to ease of using practice on own fields (10= easiest) | Reasons given for assigning that score |
|---|---|---|
| Thinning | 10 | |
| Spacing | 10 | |
| Line planting using a string | 10 | |
| Scouting | 8 | Scouting is easy to adopt but we still need information on identifying different types of pests so that we can ably distinguish the natural enemies from the pests. Interval of spraying hence no wasting chemical. |
| Spraying | 8 | Spaying is labour intensive/tedious during actual spraying, requires buying the chemical, water, hiring the pump. However once one has cash to meet these costs, it is fairly easy to adopt. |
| Interval of spraying | 8 | |
| Beneficials (natural enemies) | 6 | **See Scouting** |
| Basal fertiliser application | 2 | Actual application of fertiliser is easy but cost, and unavailability in near trading centre has limited its use on fields |
| Top dressing | 2 | -do- |
| Herbicides | 2 | Gets a low score because of its price, it is supplied in large quantities, not available in local trading centres, land owners do not allow its use on large plots other than the demo. |

Table 7. Impact of technology components on yield.

| Practice Demonstrated | Score assigned to practice due to its impact on yield (10 = greatest effect) | Reasons given for assigning that score |
|---|---|---|
| Scouting | 10 | Scouting when done properly allows time action against pests and this has a positive advantage to yield. Scouting determines the interval of spraying hence no wasting chemical |
| Line planting using a string | 10 | |
| fertiliser application | 10 | Application of fertiliser increases weight of seed cotton and increases endurance of the crop in case of prolonged dry spell. The crop has more vigour and withstands prolonged dry spells |
| Spraying | 10 | Spraying is related and dependant on scouting. Without spraying pests can damage all the crop |
| Timely Planting | 10 | **Early planting is dependant on onset of rains. With timely rains, early planting is vital and greatly influences yield** |
| Spacing | 8 | If you do not follow the right spacing (close spacing) you get vegetative growth, fewer balls and hence low yields. Wider spacing leads to fewer plants and still reduced yields |
| Interval of spraying | 8 | |
| Herbicides | 8 | Help reduce weeding pressure |
| Thinning | 8 | Reduces competition, branches develop very well, hence more balls and subsequently more yield |
| Beneficials (natural enemies) | 6 | **These will reduce the burden of spraying** |
| Weeding | | |

Table 8. Partial budget for herbicide, Kasese

| Input | Cost/acre |
|---|---|
| A. Additional Cost due to use of herbicide | |
| Lasso + Atrozine or round up (4 Sackets of 150 gm @ 4500/=) | 18000 |
| Travel to and from Kasese | 5000 |
| Hire Pump | 1000 |
| Water | 900 |
| Labour | 1000 |
| **Total** | **25900** |
| B. Costs offset due to herbicide use | |
| Ploughing | 30000 |
| First Weeding | 15000 |
| Second Weeding | 10000 |
| **Total** | **55000** |
| Savings due to use of Herbicide (B-A) | **29100** |

Table 9. Retail prices for inputs, FICA, 2003B season

| Input | Quantity | Retail Price (UGS) |
|---|---|---|
| RoundUp Max | 150 grams sachets | 3,600 |
| RoundUp Max | 50 grams sachets | Not available |
| Atrazine | 5 litres package | 14,500 |
| Atrazine | Smaller packages | Not available |
| Ambush | " | Not available |
| Dimethoate | " | Not available |
| DAP | 50 kg bag | 42,000 |
| MAP | 50 kg bag | 40,000 |
| Urea | 50 kg bag | 40,000 |
| NPK | 50 kg bag | 42,500 |

UPTAKE OF NEW COTTON TECHNOLOGY, UGANDA
**SURVEY QUESTIONNAIRE**
**KASESE DISTRICT, FEBRUARY 2004**

| Enumerator | |
|---|---|
| Date of interview | |

| Farmers' name | |
|---|---|
| Village | |
| Parish | |
| Sub-county | |
| District | Kasese |
| IDEA/SPEED Demo farmer (Yes/No) | |
| Field days attended (for non-demo farmer) | |
| IPM OFT farmer (Yes/No) | |
| Number of cotton fields this season | |
| Area planted to cotton this season | |

After seeing IDEA/SPEED demonstrations, have you changed anything about the way you grow cotton ON YOUR OWN FIELDS? _____ (Yes/No)

| Tick if adopted | New practice | Which seasons have you used this new practice? | | | Are you trying this practice on ALL your cotton fields this season? | Did you adopt then discontinue this practice | Why did you discontinue? |
|---|---|---|---|---|---|---|---|
| | | This year (2003) | Last year (2002) | Year before last (2001) | Yes/No | Yes/No | |
| | Zero tillage (no plow) | | | | | | |
| | Reduced tillage (1 plow) | | | | | | |
| | Herbicides | | | | | | |
| | Earlier planting | | | | | | |
| | Planting with fertiliser (SSP) | | | | | | |
| | Planting in pure stand | | | | | | |
| | Spacing of cotton plants | | | | | | |
| | Topdressing with fertiliser (N) | | | | | | |
| | Scouting for pests | | | | | | |
| | Number of chemical sprays | | | | | | |
| | Time of spraying | | | | | | |
| | Number of hand- weedings | | | | | | |
| | Time of hand- weeding | | | | | | |
| | Removal of stalks after harvest | | | | | | |
| | Other (specify) | | | | | | |
| | | | | | | | |

Did you copy what you saw in the demonstration exactly, or did you change it in some way?

| Tick if ADOPTED | New practice | Changed from demo plot? | | What did you change? | Please give reasons for the change |
| --- | --- | --- | --- | --- | --- |
| | | Yes | No | | |
| | Zero tillage (no plows) | | | | |
| | Reduced tillage (1 plow) | | | | |
| | Herbicides | | | | |
| | Earlier planting | | | | |
| | Planting with fertiliser (SSP) | | | | |
| | Planting in pure stand | | | | |
| | Spacing of cotton plants | | | | |
| | Topdressing with fertiliser (N) | | | | |
| | Scouting for pests | | | | |
| | Number of chemical sprays | | | | |
| | Time of spraying | | | | |
| | Number of hand-weedings | | | | |
| | Time of hand-weeding | | | | |
| | Removal of stalks after harvest | | | | |
| | Other (specify) | | | | |
| | | | | | |

**Which practices have you NOT adopted and why? (include any practice farmer tried but then discontinued)**

| Tick if NOT adopted | Practice | Why have you not adopted this practice? |
|---|---|---|
| | Zero tillage (no plow) | |
| | Reduced tillage (1 plow) | |
| | Herbicides | |
| | Earlier planting | |
| | Planting with fertiliser (SSP) | |
| | Planting in pure stand | |
| | Spacing of cotton plants | |
| | Topdressing with fertiliser (N) | |
| | Scouting for pests | |
| | Number of chemical sprays | |
| | Time of spraying | |
| | Number of hand-weedings | |
| | Time of hand-weeding | |
| | Removal of stalks after harvest | |
| | Other (specify) | |
| | | |

**Iintegrated Pest Management**

Do you use scouting? _____(Yes/No)

If "No", how do you decide when to spray?

_____

_____

If "Yes", how often do you scout? _____

Do you do it all season?_____(Yes/No).

If not, when? _____

Do you decide to spray based only on scouting? _____(Yes/No)

If "No", what other things help you decide when to spray?_____

_____

How do you decide which chemical to use when you spray?

_____

Do you use the pegboard to help you scout? _____(Yes/No)

If "No", why not? _____

_____

_____

Do you always count the full 25 plants per plot? _____(Yes/No).

If not, why not? _____

**Input Use**

What was the TOTAL COST of chemical sprays to cotton ON YOUR OWN FIELDS this season (2003B)?

| Field | Number of sprays | TOTAL cost of spraying (shillings) | |
|---|---|---|---|
| | | Pump Hire | Spray |
| 1 | | | |
| 2 | | | |
| 3 | | | |
| Total | | | |

What was the TOTAL COST of fertiliser applied to cotton ON YOUR OWN FIELDS this season (2003B)?

| Fertiliser | No. of Bags | Kg/bag | Cost /bag |
|---|---|---|---|
| SSP | | | |
| TSP | | | |
| Other (specify) | | | |
| Total | | | |

What was the TOTAL COST of herbicide applied to cotton ON YOUR OWN FIELDS this season (2003B)?

| Herbicide | No units | Qty/unit | Cost/unit |
|---|---|---|---|
| | | | |
| | | | |
| Total | | | |

Where did you get these inputs? (Tick)

| Source | Sprays | Fertiliser | Herbicide |
|---|---|---|---|
| Cooperative | | | |
| Private ginnery | | | |
| Private dealer | | | |
| Friend/neighbour | | | |
| Other (specify) | | | |

Where is your nearest private dealer for fertiliser/chemical sprays? _____

Distance from farm homestead _____(km)