PN-ABS-099

Consultancy Report

Consultancy Report: Commercial Viability of Snowpea Exports from Uganda

Uganda: Cooperative Agriculture and Agribusiness Support Project 617-0111-C-00-9100

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March 23, 1994

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PN-ABQ-099

Commercial Viability of Snowpea Exports from Uganda

Conclusions from Recent Trials in the Western Highlands

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23 March 1994

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I. EXECUTIVE SUMMARY

In February 1993, USAID/Uganda's CAAS project initiated trial plantings of snowpeas in Uganda's Western Highlands, an area about 250 miles west of Kampala famous in the 1960s for its vegetable production for the Kampala market. In the fall of 1993, the trials were expanded with an objective of determining the commercial viability of Uganda-produced snowpea exports to European markets. Although these trials experienced serious quality and disease problems in the end, they demonstrated that Ugandan snowpeas could fetch high market prices in European markets, and that infrastructure for delivery to these markets existed. The purpose of this evaluation, occurring one year after the initial plantings, is to evaluate the problems encountered thus far and to make recommendations relative to the future development of snowpea exports from Uganda.

During the trials, snowpeas were produced by individual growers on relatively small, drip-irrigated plots, with the growers promised a fixed price per kilo of exported snowpeas. The post-harvest facilities (and the payment of growers) was managed by the Kigezi Cooperative Vegetable Union in the Western Highlands, and was financed by funds provided under the CAAS project. The same Union was responsible for arranging delivery to Entebbe, again using funds (for vehicle purchase and operation) provided under the CAAS project. At Entebbe, a Ugandan exporter took charge of the produce, and arranged for shipment to European wholesale markets, introduced through another USAID project. Between 10 and 15 successful shipments reached European markets, demonstrating the technical viability of the experiment.

Despite this, the trials proved less than viable from both financial and managerial standpoints. Nevertheless, they provided sufficient information to the evaluation team to suggest cautious optimism about the commercial viability of snowpea exports from the Western Highlands. First, the scale of production must take full advantage of the post-harvest and inland transport facilities. Second, it is critical that production extension activities be vastly improved. Third, it is important that growers face price incentives that accurately reflect costs, of production, of harvesting, and of subsequent marketing. Fourth, it is absolutely vital to the success of any commercial operation that entrepreneurial management practices be put in place, preferably by the exporter, covering the entire chain from grower delivery of product to arrival in European markets. This element cannot be overemphasized. Fifth, the availability of credit to finance most aspects of the production and marketing chain is a key consideration.

The cautious aspect of our optimism on commercial viability stems from a couple of findings. First, we believe it important to reiterate the necessity of careful management of all elements of

the production and marketing chain. Second, our positive results are extremely sensitive to the wholesale price on European markets. A mere fifteen-percent reduction in that price appears to render the venture unviable, underscoring the necessity of producing for export only during the height of prices on the European markets.

The recommendations which follow from the foregoing are simple. First, rather than immediately engaging in another round of commercial trials, it would be preferable to focus on varietal trials during the next four-plus months. If such trials are properly conducted, they should reveal whether the "Pennine" variety used in the recent trials is the most viable variety, or whether one or more other varieties is superior. In addition, these trials will attempt to determine whether a peat swamp environment is superior to the environment used in the recent trials. Second, after obtaining results from the varietal trials, a series of trial plantings should be initiated in August 1994, aimed at exporting during the October-May "high" season in Europe. This commercial trial will be on about double the scale of the recent trials, taking full advantage of the existing post-harvest and transport facilities. Management arrangements for all elements of such a commercial trial should be carefully established, with an eye to persuading exporters of the commercial gains inherent in their full participation in snowpea production for export. Third, we also examined a yet larger expansion of scale, one which would require expanding both post-harvest and inland transport facilities. It appears that such an expansion would benefit all commercial entities involved, including the growers.

Finally -- and to provide a broader perspective on this experiment in snowpea exports -- it is important to understand that the proposed trials are likely to represent a key learning experience for the Mission's IDEA project. This provides an additional and compelling reason to plan and execute the recommended trials in a more careful manner than seen in the recent trials.

II. BACKGROUND AND PURPOSE OF EVALUATION

The area around Kabale, located about 250 miles from Kampala in the Western Highlands of Uganda, has a history of production of high quality vegetables for sale primarily in Kampala. In the sixties with the expulsion of the Asian population from Uganda a large part of the market was lost and some vegetable production began closer to Kampala. At the same time there was a loss of morale due to the political turmoil and the Kigezi Cooperative Vegetable Union has never made serious attempts to regain their markets. The result has been that there is a dearth of cash crops in the area resulting in a lack of cash income.

In February 1993, in an attempt to develop profitable cash crops in the area, initial trial plantings of snowpeas (Mangetout) were made in Kigezi, Uganda, near Kabale. These initial plantings, though plagued by disease, demonstrated that snowpeas grew well in the area. This led to larger plantings in the fall of 1993 involving 72 farmers, aimed at demonstrating that peas could be successfully grown on a larger scale and that they could be successfully exported to European markets. Due largely to lack of continuous technical assistance, these plantings also experienced problems mainly related to disease control and to correct picking and post-harvest handling. However, export shipments were made and were received enthusiastically in Europe by importers anxious to diversify their sources of supply. The purpose of this evaluation, occurring one year after the initial plantings, is to evaluate the problems encountered thus far and to make recommendations relative to the future development of snowpea exports from Uganda.

The terms of reference for the evaluation were divided into two parts, one for a production/marketing analyst and one for an economist/financial analyst.[1] Briefly, the production/marketing analyst was to focus on non-financial aspects of the operation, discussing (1) experience under the trials with grower skills, snowpea varieties, post-harvest facilities, and extension activities, (2) appropriate management roles for the exporter and the cooperative union under commercial production, and (3) environmental concerns. The economist/financial analyst was to describe (1) financial aspects of the marketing chain from production to market, (2) financial implications of alternative approaches to production and marketing, (3) the requirements for and availability of credit assuming commercial production, and (4) grower welfare under commercial production. The following sections of this evaluation deal with all these aspects of the terms of reference, although not necesssarily in the order listed in those terms. Rather, we have elected to organize the evaluation report along lines that fit more logically in report

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[1] The terms of reference are included in full in Appendix A.

form.

The key question we seek to answer is a prospective one, rather than a retrospective one dealing specifically with the recently conducted trials. That question is whether one can better define whether snowpeas can be grown and exported on a commercially profitable basis and, if so, how one should proceed with encouraging such commercial activity.

III. DESCRIPTION OF RECENT TRIALS

A. Essentials of the Trials

This section describes the trials in their bare essentials, without discussing either technical or financial aspects of the trials; these are discussed separately further below.

1. Production (The Growers)

During the second trial, two plantings of snowpeas occurred. The first involved 41 growers planting about 1.7 hectares, while the second involved another planting by 30 of the original 41 growers plus an additional 42 new growers. Total planted acreage during the two plantings was just over 3.2 hectares. Plot sizes varied, but were primarily between 300 and 500 square meters.

Growers were advanced all inputs in commodity form by the Kigezi Cooperative Union and, in addition, were provided with USh25,000 as a cash advance to cover other costs (such as hired labor inputs). Generally, the amount of the loans appeared to be on the order of about USh500 per square meter planted, with about 40 to 50 percent of the loans dedicated to fixed costs (such as irrigation equipment). Growers were expected to pay simple interest assessed at 23 percent per annum.

Land preparation, planting, and caring for the crop were carried out under the supervision of one farm manager and two extensionists, who purported to visit each grower's land once a day during the season. The extensionists were responsible for applying chemicals, and assisted in the laying out of drip irrigation facilities.

Harvesting was carried out, with the intention that it be done daily. Harvested snowpeas were delivered by individual growers to the post-harvest site.

2. Post-Harvest Handling (Kigezi Union)

Snowpeas were delivered to a handling and packing location in Mparo, where facilities were managed by employees of the cooperative union. Each farmer's basket was weighed, after the weigher had briefly examined the basket contents. The weight of

the basket (500 grams) was deducted from the gross weight and the remaining weight was discounted by a subjective factor based on the visual check of each basket's contents. This discounted weight was then recorded in a ledger by the weigher.

Growers generally brought their produce in prior to ten a.m., and packing continued until mid-afternoon. On a biweekly basis, the post-harvest team calculated the ratio of packed weight to the (already once-discounted) weight recorded for each grower, to obtain a "true" version of required payments to growers. The biweekly payment to growers consisted of a sum calculated by multiplying the recorded weight by this ratio, and then deducting a portion of outstanding production loans.

Baskets were then moved into the packing shed where they were dumped on the sorting table, mixing produce of growers. Sorters then moved through the snowpeas on the tables, packing cartons in sentry fashion. At the same time, the sorters scraped rejected snowpeas on the floor under the tables.

Packers were paid according to the number of cartons packed, with a differential provided depending on whether the carton contents were 70 or 90 millimeter snowpeas. As each packed carton was brought to the center of the packing shed, it was weighed and its contents adjusted for excess or insufficient weight. The objective was to have 2.7 kilo cartons, gross weight. (The weight of the carton was about 200 grams and weight loss from packpoint to market was estimated to be about 300 grams. The resultant net weight, at market, would then be just under 2.3 kilos, or five pounds.) Packed cartons were then moved into the evaporative cold storage house, constructed using project funds, awaiting shipment to Entebbe.

3. Shipment to Entebbe (Kigezi Union)

At about midnight on given nights, packed cartons were removed from the evaporative storage house to a pickup truck for shipment to Entebbe. The truck made two-three trips per week, and would arrive early in the morning at Entebbe. This element of the chain was managed by the cooperative union, using a truck purchased by project funds.

4. Shipment to Market (The Exporter)

At the Entebbe drop-off point, the exporter took over. Upon delivery to Entebbe, cartons were placed in a cold storage facility, where they generally remained for about twelve hours. Cartons were placed aboard one of three airlines and shipped to the U.K. market, on consignment. Generally, Mr Katumba was responsible for paying Entebbe handling charges and airfreight, with his gross remuneration to be based on actual market prices, as negotiated in advance by him.

B. Technical Aspects of the Trials

1. Grower Skills

The farmers involved in the snowpea project are in general good farmers and have demonstrated a good understanding of soil preparation up to and including the processes of planting and trellising. The main areas of problems are in disease recognition and control, harvesting, grading, field sanitation, and irrigation. A considerable amount of extension effort will be necessary to provide the needed training to farmers who participated in the earlier plantings. As the project expands to provide season-long exports, a well designed and implemented extension program will be necessary to train the over 200 anticipated new farmers.

2. Snowpea Varieties

The cultivar currently being used, Pennine, was selected for trial because it is the main commercial cultivar in Kenya. Another cultivar was tried on a very limited scale, but it was grown from poor quality seed produced in Kenya. Pennine produced good quality pods which were generally acceptable to the market. However, some market reports indicated that pod color was lighter than optimum and that pods were slightly bitter and in some cases stringy. Though these characteristics were most likely related to post-harvest handling, the development of these undesirable qualities can also be related to cultivar choice and adaptation to the environment. Other undesirable qualities of Pennine include susceptibility to disease, and height which requires tall trellises. Though snowpea germplasm does not have a great deal of resistance to disease, this character should be evaluated in varietal trials. Additionally, shorter varieties would be useful when used with the bamboo trellising system, providing that other characteristics were the same.

3. Post-Harvest Handling

Harvesting and post-harvest handling were a problem in the latest commercial trial. The greatest problem was due to ineffective extension and an unfair compensation system for farmers which resulted in harvesting of peas at an over-mature stage. Since the peas were over-mature, well over 60% of them had to be thrown away at the packhouse. This greatly reduced the efficiency of grading and overtaxed the capacity of both the cooling and packing sheds.

a. Packing Facilities

The present packhouse was made by partitioning part of an existing community building and constructing grading benches. This building is adequate for the follow-on experimental

commercial trials suggested. When full commercial scale production commences a packhouse about 4 times as large will be necessary to efficiently pack the increased output.

b. Cooling/Pre-Cooling

The adiabatic cooling shed in use for the last trial was well suited for the small commercial trial and could if necessary be used for the next step of commercial trials suggested. It is definitely not adequate for commercial production. During the coming year, for the commercial trial, the purchase or rental of a refrigerated container should be investigated. Though this would be more expensive than the present structure, the ability to lower temperatures much closer to the ideal 0-4 C would increase the chance of success of the trial.

c. Transportation to Point of Export

Transportation using the present Mitsubishi pickup truck is barely adequate for the trial suggested and assumes that no serious breakdowns occur which, since the truck is new, is probably not unreasonable. Additionally the sides will have to be raised to accommodate 450 boxes/trip which is the anticipated output. When commercial production begins a larger insulated truck will be necessary. The closed insulated truck will help to maintain low temperatures during the 9-10 hour trip to Entebbe. A second truck may be necessary since trips will be made 4 times per week and the risk of breakdown may be too great to operate for long with only one truck. Since the cost of transport from packhouse to airport is a major cost the economy of scale in using the larger truck will be critical to the viability of the venture.

4. Extension Services

As mentioned in several contexts above, extension services were a major problem in the previous trial. Present extension is totally inadequate for the number of farmers involved in the recent trials. A suggested modification of the existing approach is spelled out below (in Section IV.B.1.).

C. Financial Aspects of the Trials

1. Methodology Employed

The discussion of financial aspects in various places below is based on data displayed in Table 1 (see Appendix B). Table 1.A contains a set of variable assumptions and some results of those assumptions, for each stage of the marketing chain. The basic approach taken was:

[1] to prepare a farm budget for snowpeas, arriving at the

costs of production;

[2] to work backward from the market end toward the point at which snowpeas are delivered by growers to the post-harvest handling stage; and

[3] to compare these figures to see how the amount of financial returns per kilo available after working backward through the marketing chain compared with the costs of production per kilo.

Table 1.B describes the production segment, deriving a per-kilo cost of producing snowpeas. It also displays the residual available to pay at the farmgate, given the financial data derived in Tables 1.C and 1.D. Table 1.C describes the remainder of the forward marketing chain, including details of the postharvest segment, the Kabale-border segment, and the border-market segment. Table 1.D details different assumptions about transport (smaller versus larger truck from Kabale to Entebbe) and about postharvest handling (existing packing-cum-storage facilities versus expanded ones).

2. Results

At no time during the recent trials is it apparent that any actors in the process took stock of the financial aspects of the trials as a whole. Inasmuch as there was no objective under the project to carry out such an analysis, there was little ex ante provision for adequate bookkeeping to permit such an analysis. The evaluation team attempted to reconstruct financial aspects of the trials, but the results in this section should obviously be viewed somewhat tentatively.

A number of subsidies were required to keep the trials going, and these were financed by a $50,000 **???plus $38,000???** grant under the project, managed by the cooperative union. The union used these funds for three purposes: input loans to growers, product payment to growers, and operating costs for the Kabale-Entebbe pickup truck. We estimate that approximately USh9 million was the value of production loans extended, of which one-third to one-half were repaid (in the form of deductions from biweekly payments to growers for product delivered). USh8.1 million was paid (on a gross basis) to growers. Nineteen delivery trips from Kabale to Entebbe were made, the costs of which would account for another approximately USh3.8 million from the project account. In addition, all costs at the postharvest handling facility were paid from the account.

The general financial picture emerging from the trials appears

grim.[2] First, Kabale-Entebbe transport costs were higher than they should have been, because the pickup truck never traveled fully loaded. We estimate that, on average, only 250 5-pound cartons were loaded into a pickup truck with the capacity to carry 450 cartons. Transport costs were therefore nearly double what they might have been. Second, unit extension costs were approximately double what they might have been, given yields lower than ideal. Consequently, when all post-harvest costs are deducted from the market price in the U.K., a scant USh240 would have remained to pay growers for each kilo of acceptable produce.

By contrast, lower than acceptable yields (2,500 kilos per hectare vice 4,500 kilos) resulted in increased production costs to the grower. Total costs of production per kilo, including labor, were on the order of USh1,180. Part of the reason for a high unit cost of production lies in excessive use of chemical inputs and seeds, as well as higher-than-normal unit prices for some of these inputs. Another reason for the high unit cost was that reported labor inputs were higher than, apparently, they would normally have to be.

Growers were paid USh950 per kilo of acceptable produce delivered to the packing location. This figure was likely excessive, judging from continued grower interest in further plantings under the program. Although production costs, as we have said, appear to exceed this per-kilo figure, only a portion of the loans extended for production costs were actually deducted from payments to growers, thereby giving them actually large net returns, at least from their perspective as of the time of this writing.

Finally, it appears that the exporter was unable to cover costs incurred in taking over the product upon its arrival at Entebbe.

IV. EXAMINING COMMERCIAL VIABILITY

A. Alternative Production and Marketing Approaches

The following discussion looks at different scales of operations, different locations for operation, different product varieties, and different levels of value added. The first of these is discussed in some detail, while the latter three are presented in more abbreviated form, because we lack sufficient information to provide more detail. Some of the details on the latter three should be available following planned varietal trials.

1. Different Scales of Operation

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2 The first of three data columns in Table 1 (labelled "trials") contains a financial description of the recent trials.

The recent snowpea trials relied on production from just over 3 hectares of land, and produced output that was unable to take full advantage of the major scale constraint: the size of the truck delivering packed cartons from Kabale to Entebbe and the capacity of the cooling shed in Kabale. The two "different" scales of operation described immediately below are based on (1) increasing the scale of operations to take full advantage of the existing truck, without overwhelming the scale of packing and cooling facilities, as they now exist, and (2) further expanding the scale of production.

a. Expanded Scale: Existing Handling Facilities

Were one to stop at the information provided by the recent trials, one would judge the commercial viability of snowpea production in Kabale to be open to serious question. However, the evaluation team believed it critical to take a slightly different look at the trials, particularly because of problems encountered during the trials and because the trials were not set up to test commercial viability. (The second column of data in Table 1 -- labelled "current" -- contains this revised financial perspective, using the same acreage and transport facilities observed in the trials.)

Three changes in assumption are key in looking at the trials from a revised standpoint. First, it was assumed that a more accurate figure for per-hectare yields would be 4,500 kilos, rather than the 2,500 kilos demonstrated during the trials. Key reasons for changing this assumption are three: (a) observed yields were abnormally low due to disease hitting the crop as a result of poor extension practices; (b) yields in other countries were as high as 4,500 kilos per hectare, and Kabale agronomically appears a very efficient place to produce snowpeas; and (c) the procedures followed for calculating payment to growers actually provided an incentive to harvest sloppily. This altered assumption affects unit production costs, as well as extension costs. Second, it was assumed that unit inputs (and their costs) could be lowered, compared with actual experience during the trials. Third, it was assumed that the Kabale-Entebbe delivery truck would operate at full capacity, thereby lowering unit transport costs. Full capacity is 450 cartons, which is precisely the capacity of one LD3, a standard unit airfreight volume. These changes in assumption would entail increasing planted area to about 7.5 hectares.

The results of these altered assumptions are instructive, and suggest that it is perhaps commercially viable to export snowpeas grown in Kabale. After removing all costs incurred from the farmgate to the U.K. market from the price realizable at the latter point, USh558 is remaining to remunerate growers on a per-kilo basis. While that figure is still lower than the USh950 actually paid to growers during the trial, it exceeds the total

costs of production, as estimated using revised assumptions.

b. Expanded Scale: Larger Handling Facilities

In order to consider an alternative, expanded export scenario, one which would be more likely to attract commercial interest, the evaluation team looked at "choke-points" in the production and marketing chain.[3] First, the cold storage facility at the current packing point attains capacity under the "ideal" version of the trials scale, implying a need to move to larger facilities if scale is expanded. Second, expanding the scale of operations would mean increasing Kabale-Entebbe transport facilities, which are also at capacity under the "ideal" version of the trials scale. For example, moving from the pickup truck (with capacity at 450 cartons) to a larger lorry (with capacity at 2,000 cartons), would halve unit transport costs. We defined the next increment to the scale of operations as defined by the capacity of such a lorry.

Expanding scale of operations to this magnitude implies the following changes. First, Kabale-Entebbe transport costs are reduced by over USh200 per carton. Second, we assumed that Entebbe airport handling charges would be reduced to previous levels, from which they have increased astronomically for no apparent reason. This would further reduce the per-carton costs by USh150. Third, more efficient extension support to growers could reduce per-carton costs by nearly USh500. ???need to get a precise definition of how this per hectare calculation done from Bob Rice??? Fourth, the provision of expanded, more sophisticated postharvest handling facilities required for the expanded capacity of the operation would <u>increase</u> unit costs by about USh270 per kilo. These combined would permit a payment to growers of USh788 per kilo, or more than USh200 above what would be available under the "ideal" version of the trials scale. This would compare favorably with a per-kilo production cost of USh374, which itself is about USh40 per kilo below the production costs implicit in the "ideal" version of the trials scale.

In any event, at this alternative, expanded scale of operations, snowpeas produced in Kabale for export appear potentially viable, from a commercial standpoint. Margins available to compensate growers, the manager of the postharvest chain, and the exporter appear comfortable.

c. Sensitivity To Assumptions

What happens to the financial picture if we modify some of our assumptions? Moving the exchange rate used from USh1,200 per

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3 The column labelled "expanded" provides our financial assessment of this scenario.

dollar to USh1,100 per dollar reduces the margin available to pay the grower by about ten percent, a large but not overwhelming drop. If actual yields are 3,000 kilos per hectare -- vice the 4,500 kilos used in the analysis -- unit production costs increase and unit marketing costs increase, reducing the margin between the two from about USh400 per kilo to only USh200 per kilo. This would seriously challenge commercial viability. Increasing the airfreight rate by ten percent would shave about forty percent off the margin between production and marketing costs, also affecting commercial viability. (Such an increase in airfreight rates would be comparable to relaxing the assumption that Entebbe handling charges will be reduced to a more reasonable level.) Margins made available to the exporter and to the in-country marketer are set at a reasonable ten percent of the FOB price each. If this combined margin of twenty percent (of FOB price) is raised by half -- to thirty percent -- the effect on the margins between production and marketing costs is reduced by about the same amount as either of the two foregoing changes. Finally, if the U.K. market price drops from the assumed level of $4.25 per kilo by as much as 60 cents, then the entire margin between marketing costs and production costs is erased. In other words, such a fifteen percent drop in the U.K. market price has far more serious consequences than a one-third reduction in yields on the commercial viability of the operation.

2. Different Modes of Operation

a. Different Locations of Operation

Varietal trials could also occur at different locations. These would include (1) the same environment used in the recent trials, (2) a peat swamp environment close to the recent trials, and (3) an environment closer to Kampala (or Entebbe). The benefit of the second over the first would probably be a reduction in irrigations costs, although there are some unclear aspects of peat swamp production that should be subjected to examination during the varietal trials we propose below. The benefit of the latter over the first two is a reduction in inland transport (and perhaps cooling) costs. However, it is very likely that producing closer to Entebbe would reduce yields, given the reduced altitude compared with the Western Highlands.

b. Different Varieties of Snowpeas

As a third variable, one can examine how different varieties of snowpeas would affect viability of the operation of a snowpea venture in Uganda. As to the differences here, we can only speculate; actual calculation of differences would have to await the varietal trials proposed in the recommendations below.

c. Adding Value to Snowpeas

Packing and delivering snowpeas to the European retail (as opposed to wholesale) market would significantly increase value added in exports of snowpeas and, thus, the FOB price realized. It is not clear whether additional post-harvest costs in Uganda would increase so much, given such a variation, to warrant attempting this. However, we believe that retail delivery would almost certainly increase margins in Uganda because of the high labor input in moving snowpeas from wholesale cartons to retail containers, and because of the low cost of Ugandan labor relative to European labor. Clearly, any successful exporter of wholesale snowpeas should investigate this modification in post-harvest handling.

B. Additional Production Issues

There are two production issues not raised in the preceding section that were key questions raised in the evaluation terms of reference, and thus deserve separate treatment. First, how can extension be better provided? Second, how does grower welfare compare under the alternative approaches?

1. Improving Extension Techniques and Delivery

As mentioned previously, extension services were a major problem in the previous trial. Present extension is totally inadequate for the number of farmers involved in the previous trial and with an anticipated increase in farmers from about 72 to over 300 in the next stage of trials a well planned and executed extension program will be necessary.

A two step approach to extension is suggested in order to (a) get the next stage off to a running start and (b) insure that adequate extension is available for problem solving during the production season.

The first step would be to organize demonstration plots during the coming season. Two plots are suggested, one on the Bunyoni road and one in Mpalo. These plots would accomplish two objectives: (1) the extension workers would provide all the labor for the plots so that they would gain hands-on experience with all phases of crop production, (2) field days would be organized to demonstrate all phases of production. Farmers who plan to grow during the next commercial stage would be required to participate and would be trained at the demonstration plots. This phase is necessary because when production actually begins, there will be too many new farmers to effectively educate them during the production season. During this phase, farmers should actually be involved in as many processes as possible. For example, during harvest, farmers should actually perform some of the harvesting and grading in the demonstration plots.

The second step will be to have in place a well organized

extension system to visit farmers during the production season. The suggested organization of the project management/extension system follows:

```
                    Project Manager
                          /\

Packing Manager                Production Manager
                                      I
                                      I
                             Extension Assistants (6)
                                      I
                                      I
                              Spray Assistants (4)
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Initially, the project manager position would be filled by an expatriate advisor and a Ugandan counterpart. Eventually as the project matures and there is less training necessary the Project manager could probably do the jobs of both the Packing manager and the production manager thus decreasing the cost of the extension program. The main cost of the extension systems will be for transport. One pickup truck and one motorcycle will be necessary as well as bicycles for each extension worker. Extension workers should be assigned farmers to visit and should be required to keep a notebook which is signed by farmers when visited. Likewise the extension workers will sign the farmer's notebooks during each visit. This will ensure that visits actually occur as frequently as desired.

2. Grower Welfare Issues

A few general points should be considered when evaluating the economic impact of the snowpea project on the Kabale area. First, since there are few marketable cash crops in the area, even a relatively small profit margin on snowpeas will be attractive to the farmers whose main cash crops now are wheat, sorghum, potatoes, and pyrethrum. The land in the area is largely terraced hillsides and do not lend themselves well to production of any quantity of wheat and sorghum. The addition of another cash crop, especially one that is labor intensive and will provide employment is desirable. Second, the Kabale area can produce very high quality vegetables, the problem being that the local market is small and transport to the main market in Kampala is too expensive. Once regular transport of snowpeas to Kampala begins it is highly likely that surplus freight capacity can be used for other vegetables and thus snowpeas may be the engine for a much wider development of crops in the area. A third point is that there are strong indications that snowpea yields are much higher than those used in the economic models. Unfortunately, the data are not reliable enough to be sure of

these yields, so they have not been used in profit projections. If during subsequent trials, the higher yields are verified, farmer profits will be much greater than projected.

The evaluation team was asked to discuss how growers would view production of snowpeas as opposed to their use of land and other inputs for alternative production, from a financial (or commercial) standpoint. We have assembled data on gross margin per hectare (a standard means of comparison) for various crops[4] at the bottom of Table 1.A. Under the expanded scale version, gross margins per hectare for snowpeas far exceed those for traditional crops, and compare favorably with non-traditional crops, at least in some cases.**???check on labor inputs???**

A note of caution is necessary here, however. Per hectare labor inputs required in snowpeas appear to far exceed those for any of the alternative crops examined. This raises a question about whether the sheer labor input requirements in producing snowpeas would mean that growers would be unable to tend to their other crops, thereby affecting their welfare. This aspect of snowpea production should be examined more carefully, we believe.

Growers engaged in the recent Kabale trials appear very eager to continue with production of the crop. However, there are clear risks to growers, if snowpeas are to be produced on a commercial basis. First, input loans must be repaid. Second, growers cannot be remunerated at the rate they received during the previous trials, and must be given to understand this. (These two points reduce grower remuneration, compared with the amounts growers perceived they received during the trials.) Third, and on the positive side, growers should have their remuneration more directly related to their delivered product than occurred during the trials. (In this respect, the evaluation team explored options for accurately grading each grower's delivered product upon delivery.) We believe that an alternative approach will act as an incentive to harvest more efficiently and correctly. Finally, it is critical to reducing grower risk that well-managed extension facilities be provided (and perhaps charged) to the growers.

C. Additional Post-Harvest Management Issues

A key issue raised in the SOW was one of most appropriate management of the activity as a whole. This question was raised in terms of (1) describing an ideal role for the exporter, and (2) describing an ideal role for the cooperative union. Each of these is discussed below, in turn.

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[4] Data on other crops are from regular reports published by the Agricultural Secretariat of the Bank of Uganda.

1. The Role of the Exporter

During the last commercial trial, the exporter with assistance from EPADU (Export Policy Analysis and Development Unit) and High Value Horticulture assumed responsibility for the produce from the time of delivery at the airport to its sale on the European wholesale market. This arrangement would probably remain the same in the next trials. However, once the exporter is convinced of the viability of the project, he should be encouraged to take charge of the product from the time of delivery to the packing shed to sale in Europe. The advantage of this is that the exporter would control quality throughout the entire post-harvest handling chain. Eventually, he might want to operate the entire scheme including production. Ultimately, placing the entire project in private hands would be beneficial however, no exporter will assume that risk until it has been amply demonstrated that the project is profitable. Even at that stage, the exporter would require credit assistance to construct a cooler and a packing shed, and buy trucks.

The key to sustainable export production of snowpeas in Uganda is clearly the exporter. Under the recent trials, the exporter is claiming losses, even though the exporter had no part in the financing of the marketing chain between grower delivery of product and delivery of the product to Entebbe. The evaluation team believes, on the other hand, that a most effective means of sustaining commercial production will be for the exporter to be responsible for that intermediate stage in the marketing chain. Only with such involvement will it be possible for the exporter to be comfortable that he will get adequate produce for export.

Our financial analysis suggests that, under the expanded production scenario, fully twenty percent of the FOB value of snowpeas can accrue to individuals managing the postharvest segments of the marketing chain, surely a sufficient compensation to attract entrants. The only element of the marketing chain that would perhaps not be attractive to prospective entrants would be the capital outlay for the expanded packing and cooling facilities in Kabale that will be required under the expanded scenario. Indeed, the prospect of these required capital facilities will probably deter any potential entrepreneur. (We will discuss this further in the section on credit requirements below.)

2. The Role of the Cooperative Union

In the previous trials the union provided the following services:

-- provision of credit to farmers;
-- bookkeeping;
-- provision of some employees;
-- transport; and

-- knowledge of farmers including skills and creditworthiness.

In the most recent trial there was not a clear division of responsibility between the Union and personnel provided by the CAAS (Cooperative Agriculture and Agribusiness Support) project, resulting in confusion and mischarging of farmers for inputs. This has resulted in farmer resentment and distrust of the union. It is likely that if communication were improved, the union could provide the above services at a low overhead cost. The main problem associated with using the union as the main overseeing organization for the project is that the union lacks aggressiveness and business acumen, and without strengthening of these skills, the union is not the ideal organization to provide overall management for the project. In the period until a private firm can be interested in the project by demonstration of its profitability they should however continue in this role. Their ability to perform can be strengthened by working closely with the proposed expatriate advisor. Consideration should also be given to employing a business oriented manager who might be paid on a salary-plus-commission basis to try to turn the union around.

The most serious management problem in the last trial was associated with farmers being charged for inputs they didn't receive or farmers not understanding how much certain inputs were going to cost. These problems would be eliminated by using the notebook system discussed above. All inputs would be entered in both the farmer's notebook and in the union record book and the parties involved would cross-sign the books. The same system should be used upon receipt of produce at the packing shed.

A Snowpea Committee consisting of farmers elected by the other snowpea growers in Mpalo has formed. This group is useful in insuring good communications between the growers and the union or other managing body. It has been suggested that they might take over the management duties of the union, but they lack the bookkeeping and business skills of the union so it is doubtful that this will work. They will serve as a useful information conduit in the coming trials.

D. The Role of Credit in Snowpea Production

During the recent snowpea trials, the operation largely abstracted from credit considerations. First, production credit was provided from a project grant fund, rather than from commercial sources. (The union provided the credit from the project grant, and used assessed market-based interest payments to defray a portion of its snowpea-related costs.) In the end, growers were not charged the full market value for the loans they had received. Second, funds for the packing and storage facility at Mparo also came from the project grant, effectively subsidizing these fixed costs. Third, and similarly, funds to

operate these facilities also came from the same grant. Fourth, funds to transport exportable product to Entebbe were defrayed from the same grant. **????I need to find out how Sam financed his payments of airport charges and airfreight, prior to receiving payment from the U.K. end????**

One potential source of credit for such an operation would be the Bank of Uganda's export credit refinance and guarantee schemes. However, it is not clear that these schemes provide effective pre-shipment credit, as currently designed, thus perhaps precluding their applicability to any segment of the marketing chain prior to shipment of the goods from Entebbe. At the same time, the schemes were not usable by the exporter, because his sales were on a consignment basis rather than based on firm orders backed by Letters of Credit. **????Need to check on this, in Nyiri paper and other documents. Okema presented a paper in which he asserted that pre-shipment financing is part of the program.????**

Another potential source of credit -- and one that could well have been used were the project grant not available -- would have been financing from the Cooperative Bank, backed by the cooperative union. It is for this reason -- and this reason alone -- that the union can be perceived as having a comparative advantage in participating in the marketing chain.

Clearly the most efficient means of providing credit through all stages of the production and marketing chain is to have this credit obtained by the exporter (who is also responsible for managing the post-harvest segments of the chain in full. One alternative would be to have an export refinancing and guarantee scheme that was of sufficient term to permit forward financing of costs, including production costs. (There is about a two-month period between planting and first harvest.) Another -- probably more expensive -- alternative would be to have an exporter involved who has sufficient entree with the banking system to borrow the funds in full. However, were this the case, the financial structure of the operation would change, reducing the amount available for payment to the growers.

V. EXAMINING ENVIRONMENTAL VIABILITY

At the present time, no detrimental environmental impact has occurred, however the potential for adverse environmental impact exists if it is not managed carefully. The following are the primary concerns.

A. Deforestation

As the area under snowpea cultivation increases there will be a large demand for trellises. If the original trellising system which utilized gum poles were continued a significant impact on

the limited tree lots in the area would occur. Fortunately in the last planting a trial was initiated using bamboo tops which are waste from the cutting of bamboo in a bamboo forest about 30 km away. This has worked well although some selection is necessary since some were too short. This system will have no adverse environmental impact and will be more cost effective as well.

B. Capacity of Gravity Water System

A domestic gravity water system was utilized in Mpalo to provide irrigation water for approximately 4 acres of peas. During the last crop, problems developed in the system and there was some concern that this was due to the irrigation demand exceeding the capacity of the system. It was found that the problem was not due to lack of capacity in the system but rather to users leaving taps running all the time and to several unrepaired breaks in the system. Since then, an additional feeder source has been added to the system and another is nearly completed. The district water engineer has advised that the water usage for irrigation could double without a problem and that he is in favor of this usage of the overcapacity of the system. The impact of water consumption for irrigation can be further decreased by:

-- less irrigation as plants are currently being over-irrigated;
-- irrigation at night when domestic use is minimal; and
-- the use of mulches to conserve water.

It should be noted that there will eventually be competition for the water in the gravity water system but this should not occur for many years.

C. Fertilizer

Due to the inherent fertility of the soil no fertilizer other than manure is recommended, and since the peas fix nitrogen some soil enrichment utilizable by rotation crops will occur.

D. Pesticides

Pesticide usage is minimal and if recommendations in this report are followed impact will be minimal. Switching to smaller plots will also increase the likelihood that insect populations (aphids) will be at least partially controlled biologically.

E. Soil Erosion

Part of the land is hilly and is currently partially terraced decreasing soil erosion. Peas are grown on ridges which if located along the contours will also help to control erosion.

Suggestions for improvement include teaching farmers to determine where the contours are using a simple A-frame, and mulching.

F. Land Use

Some shifting from subsistence crops to snowpeas occurred in the last trial because plots were too large. Limiting plot size will insure that farmers continue to grow their subsistence crops and that only land used for other lower value cash crops is diverted to snowpeas.

VI. CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

1. The Kabale Trials

These trials demonstrated that (a) snowpeas could be grown in the Western Highlands, (b) quality snowpeas could be shipped to European markets, and (c) these markets would purchase snowpeas at favorable prices. However, the outcome of the trials raised fundamental questions without providing solid data for answering these in an appropriate manner, thereby demonstrating the importance of thoughtful planning in any such trial endeavor.

2. Commercial Viability of Snowpeas

The foregoing said, our technical and financial analysis suggests that snowpeas are a potentially viable commercial export crop for Uganda. However, exports must be targetted to peak seasons, with peak prices, to be so viable. Furthermore, commercial activity should focus on the expanded version of production laid out above, and assumes appropriate management input, from extension, to post-harvest handling and ultimate export. Finally, credit must be available to the exporter to pass down to producers.

B. Recommendations

1. Varietal Trials

Varietal trials should begin immediately, and should be conducted in three locations (Highland areas where the trials previously occurred, Highland peat swamps, and in a location closer to Kampala). These trials should be conducted in a manner far more rigorous than were the previous trials. These plans for these trials should be approved by the evaluation team, who are in the best position now to understand what must be learned from such trials. Failing such approval -- and given the experience of the previous trials -- it is not clear that the trials will produce data sufficient to recommend proceeding with the project in the manner described below.

2. Further Commercial Trials

Depending on the outcome of the varietal trials, commercial trials should commence in August/September 1994, focussing on sales in the European market in the subsequent October-May period. Such trials should be aimed at demonstrating to exporters that snowpea exports are commercially viable and worth their investment in subsequent seasons. These trials should be on a scale somewhat larger than the previous Kabale trials (i.e., about 8 hectares), and should focus on improving management elements.

3. Detailed Recommendations

a. The snowpea project should continue and be gradually expanded to reach a minimum level of production equal to 900 boxes per day of packable output (18 ha/planting or a maximum of 36 ha in the ground at one time). Expansion must occur in phases and be carefully coordinated with provision of infrastructure and extension services.

b. Production for export should be timed to produce exportable product only during the months of October through May inclusive, when market prices in the U.K. average better than US$4.25/ kg making production profitable.

c. Farmers who grew snowpeas in the last trial should be advised immediately that commercial plantings will not occur until August and they should therefore plant other crops in the meantime. Those who will participate during the next season should plan to have irrigable land ready for an August planting. Farmers whose land is not close to a water source should not be permitted to grow snowpeas as a good quality product cannot be produced reliably without irrigation.

d. The months of March to July inclusive should be utilized to hire and train personnel, recruit an expatriate advisor for a minimum of a one year and preferably longer contract, select and organize farmers, obtain inputs, plant variety trials (see following paragraph), and plant demonstration plots for farmers, in order to maintain enthusiasm and develop snowpea production, harvesting, and grading skills.

e. Since the choice of cultivar is the single largest horticultural factor in determining the success of a crop, cultivar evaluations should be conducted as soon as possible. Trials should be conducted at three sites including one with peat soil, one in the Mpalo area, and one along the

Bunyoni road.[5] Qualities to be evaluated include yield, quality, powdery mildew and aschochyta/bacterial blight resistance, length and distribution of production, height, pod size and quality after simulated storage. In addition to snowpea cultivars sugar snap peas should be included in the trials since there is a growing market for these in Europe.

f. Demonstration trials should be conducted at Mpalo and along the Bunyoni road. Extension personnel should manage and perform all the labor for these trials to ensure that they are knowledgeable and have actually experienced the problems inherent in snowpea production. Field days/classes should be held at an appropriate time relative to the production of the crop to teach the following in particular:

-- soil preparation, contour ridging utilizing an A-frame, manuring, trellising, and planting;

-- pest control--including birds, recognition of cutworm, aphid, and thrip damage, recognition of aschochyta/bacterial blight, and powdery mildew;

-- irrigation--including frequency and quantity utilizing watering cans and trickle (as appropriate in each area;

-- mulching--for water and soil conservation and to decrease weeding;

-- picking--to include methodology to prevent plant damage, timing and frequency, stage of pod development, and handling of pods between picking and packhouse;

-- grading--each farmer should grade peas until they are able to successfully distinguish between exportable and non-exportable peas;

-- field sanitation and composting--farmers should be shown how and when to remove plants from the field and how to make compost pits; and

-- rotation--the importance of rotation and the need to keep new plantings a minimum of 500 m away from old plantings to minimize disease must be stressed.

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5 Earlier in this paper, we raised the possibility of producing snowpeas closer to Entebbe. The purpose of this would be to reduce inland transport costs. The recommendations herein exclude that alternative for the moment, because the logistics of conducting trials in widely separated locations would be too taxing. The option could be explored later.

g. Farmer production plots should be limited to 300-500 square meters in size in order to improve plot maintenance and timeliness of harvest. Limiting plot size will also permit family members to provide most of the labor without competing for labor needed for subsistence crops. With smaller plots, supplemental irrigation with watering cans will also be possible.

h. The present cooler and packing facilities can be utilized for one more trial beginning with August plantings. If possible, cooling facilities should be augmented by leasing or purchase of a reefer. Plans should be initiated to finance and build a refrigerated cold store and packing shed at Mahanga to handle 900 boxes/day minimum of exported peas. This facility must be in operation by September of 1995. The facility should be designed to be expandable to handle a larger throughput of peas as production increases.

i. The trial planting to begin in August should be large enough to produce continuous production of 225 exported cartons per day during the export season. This will involve approximately 4.5 hectares per planting and 4 plantings spaced 7 weeks apart, which means that at any given time, 9 hectares will be in snow peas. Goals of this trial will be as follows:

-- Resolve management and extension problems
-- Obtain financial data to demonstrate profitability
-- Train at least an additional 120 farmers in snowpea production and harvesting
-- Fine tune production, packing, and harvesting systems
-- Devise rotation and sequential planting plans to insure continuous sustainable production
-- Train an additional 6 extension workers and ensure that the extension system is working well.
-- Improve the operation and efficiency of the Kigezi Cooperative Union in management of the project.

???check above against spreadsheet???

j. Cultural practices should be somewhat revised as follows:

-- Spraying for disease prevention must emphasize thorough coverage and should occur on a 10 day average schedule but must be responsive to discovered disease outbreaks. Farmers must know what the schedule is and must be told to identify and report disease outbreaks immediately so that curative sprays can be used so that plants enter the harvest period disease free.

-- An anionic surfactant should be substituted for the present non-ionic surfactant being used.

-- Heavy use of benomyl (Benlate) should be stopped. Preventative sprays should consist of copper oxychloride, wettable sulphur, and dithane in rotation. Benomyl should be used immediately upon and only after discovery of disease symptoms. Resistance to benomyl develops rapidly and therefore it should be used only when absolutely necessary. If bacterial blight is present, the only pesticide which will limit its spread is copper.

-- Amounts of water applied should be carefully monitored and decreased from the amounts applied by drip irrigation during the last planting. Eventually a class-A evaporation pan should be used to schedule irrigation.

-- Mulches should be used in all plots but growers should watch for rodent damage.

-- Bamboo tops should be used for trellising in all plots and selection of tops for the tallest ones should be done.

-- Sequential plantings should be isolated from existing plantings by at least 500 m to limit disease spread.

-- Mature plants should be removed from the fields and composted in compost pits (technique to be taught at demonstration plots) immediately after harvest is completed.

-- Rotations to non-leguminous crops to follow snowpeas, preferably sorghum, maize or wheat.

-- Plants in individual plots should be examined for nodulation and if this is not occurring, innoculant should be used on subsequent plantings to insure that adequate nitrogen fixation is occurring.

C. Broader Considerations

It is important to understand that the CAAS-managed snowpea trials -- and their follow-on -- are really at the heart of at least one potential model for the Mission's IDEA project. This being the case, the critical nature of any follow-on to the snowpea trials are of broader importance than they would be in the CAAS framework itself. They are also of more importance than merely establishing one or more exporters in the marketing of snowpeas from Uganda.

As a result, the Mission should be meticulous in its design of any activities that are a follow-on to the recent Kabale snowpea trials. Any such design work should involve not only those who carried out the evaluation of the Kabale trials, but also Mission staff involved in the IDEA project design.

APPENDIX A

Evaluation Scope of Work

APPENDIX A

Evaluation Scope of Work

EVALUATION OF SNOW PEA PRODUCTION/MARKETING ACTIVITY CURRENTLY UNDERWAY AT THE KIGEZI COOPERATIVE UNION

BACKGROUND:

There is little tradition in Uganda for commercial truck-farm operations and the export of high value produce to foreign markets. During the past year, two sets of trials for the production of snow peas, and later for the export of snow peas to European markets have been carried out.

The first farm trials were carried out during February through May 1993. Small plots of snow peas were planted on several sites in the Mparo, Kigata and Bunyonyi Road areas located in Kabale District of southwestern Uganda. The Penine variety produced an early harvest of export quality snow peas on vigorous plants. Based on recommendations and conclusions from the data generated during these trials, it was decided that an expanded export trial of snow peas be carried out. During September 1993, some 80 farmers were selected to continue with snow pea trials for export. In September and October, two plantings of snow peas were made covering 7 acres in area. Export commenced in early December and except for gap due to disease problems, will continue through February 1994.

An evaluation of the snow pea activity shall take place in order that the production and post harvest handling of snow peas can be analyzed to determine whether the project should be continued or expanded and the appropriate timing can be made regarding the next phase of the project or activity.

TERMS OF REFERENCE FOR THE TECHNICAL PRODUCTION/MARKETING ANALYST

A. General:

USAID, UCA and the CAAS Project are seeking the services of an individual to conduct an evaluation of the snow pea project. The individual should have expertise in the areas of highland vegetable production, specifically snow peas, and the post harvest handling procedure necessary to compete the European markets.

B. Specific:

1. Evaluate and appraise the extent to which farmers understand production of high value crops for export including cultural practices, pest/disease control, timeliness of harvest and the importance of proper field sanitation.

2. Determine if the varieties currently being used are appropriate.

3. What are the cost/benefits to the farmers for production of snow peas?

   a) Production costs
   b) Labor, harvesting requirements

4. What is the effect of post harvest handling?

   a) Appropriate packing facilities
   b) Cooling/pre-cooling
   c) Transportation to point of export

5. Examine the extension services provided to farmers on production and recommend how they can be strengthened and made more effective.

6. Examine the actual role played by the exporter and recommend if the role is adequate of should be revised.

7. Examine the actual role played by the Kigezi Vegetable Cooperative Union and recommend what their role should be, if any, and how it can be modified.

8. Examine what environmental impact the project has had or may have in the future, especially in regard to use of chemicals, fertilizers, irrigation, and land use.

SNOW PEAS

General

Snow pea production trials began during 1993 in the Western Highlands on a small scale. During the course of these trials, a portion of the crop was exported successfully to the UK market. Snow peas are also one of the few vegetable crops that USAID consultants, in background work for the IDEA project, have selected as being apparently financially viable as exports. However, inasmuch as these were trials, the fact that exports occurred is not conclusive evidence that the latter consultants were correct. During trial production, for example, a significant subsidy element was provided to producers. Thus, USAID believes it now necessary, at the end of one harvest season, to examine whether snow peas can be viably produced for export, and what scale of production is most financially efficient.

Terms of Reference for Economist/Financial Analyst

1. Carry out a financial assessment of the marketing chain for snow peas, including production and extending to product sale in foreign markets, and defining financial aspects of each stage in the chain. Financial assessment will involve calculation of margins (gross and net) in standard fashion. Inasmuch as the technical expoert will provide alternative approaches to production, post-harvest handling, and delivery to the exporter, each of the alternatives should be subjected to financial assessment.

2. What incentives are required to attract individuals into this infant industry? Here, assume that producers pay all normal costs of production and processing, but that technical support outside those normal costs of production may be needed. If it is needed, what is its cost likely to be and how can this be supported?

3. Explore alternative scales of operation to shed light on what the most efficient scale is, from the financial standpoint. To the extent that this suggests a need for additional infrastructure, including transport facilities, provide a financial assessment of that infrastructure.

4. Investigate credit requirements of the marketing chain, and discuss how credit is likely to be obtained, assuming viability of snow pea production for export.

5. Compare farm-level returns (primarily to land and labor) to some measure of financial opportunity cost, such as more traditional crop production. This element of the analysis should lead to conclusions about the likely impact on producer welfare.

APPENDIX B

TABLE

The first four pages of tables which follow provide the basis for the analysis of financial viability of snowpea production in Uganda. The second four pages mirror the first four, but contain the formulas used to calculate the findings in the first four. Finally, several pages of additional notes on assumptions used in the tables follow.

THIS SPREADSHEET IS USED TO ASSESS CAAS SNOWPEA PROJECT IN KABALE

FILENAME SNOWPEA7.WK4
UPDATED: 34,416.5

TABLE OF VARIABLE INPUTS	Trial	Current	Expanded
Yield (kg/ha; exportable product)	2,500	4,500	4,500
Exchange Rate (USh/US$)	1,200	1,200	1,200
International Freight Rate (US$/k	1.5	1.5	1.5
Field Labor Rate (USh/personda	500	500	500
Price at Market (US$/kg)	4.25	4.25	4.25
Exporter Margin/FOB Price (pct)	10	10	10
Pre-Entebbe Management Costs	0	10	10

TABLE OF KEY RESULTS			
FOB Entebbe/Wholesale Price (	37	37	37
Transport/Wholesale Price (%)	38	38	38
FOB Entebbe Price (USh/ctn)	4,298	4,298	4,298
Kabale-Entebbe Costs (USh/ct	2,520	1,365	510
Out-of-Kabale Price (USh/ctn)	1,777	2,933	3,788
Post-Harvest Costs (USh/ctn)	2,608	1,555	1,244
Residual for Farmgate (USh/ctn)	(831)	1,378	2,543
Residual for Farmgate (USh/kilo)	(332)	551	1,017
Production Costs (USh/kilo)	1,124	412	371
Post-Labor Margin (USh/kilo)	(1,456)	139	646
Post-Labor Margin (USh/hectare)	(3,640,183)	627,161	2,906,735
Area Required for Planting (ha)	4	8	30
Labor Required for Packing	8	30	90

SOME COMPARISONS WITH OTHER CROPS

	Trial Snowpeas	Current Snowpeas	Expanded Snowpeas	Maize	Sorghum	Ginger	Vanilla	Silk
Gross Margin (USh/hectare)	235,919	1,102,161	3,381,735	119,905	168,075	361,243	1,228,111	731,110
Labor Input (Manday/ha)	1,340	950	950	125	134	162	240	260
Return per Manday (USh)	176	1,160	3,560	959	1,254	2,230	5,117	2,812

BEST AVAILABLE DOCUMENT

PRODUCTION SEGMENT (per 500 sq m)

	Quantity	Unit Price	Trial	Current	Expanded
INPUTS			140,454	92,634	83,548
Seeds	3	8,000	38,000	18,000	18,000
Irrigation			28,639	28,639	20,047
Biwall Tubing	500	160	20,000	20,000	14,000
Pipe	30	650	4,875	4,875	3,413
Filters	1	6,080	507	507	355
Brass Valve	1	3,000	250	250	175
Ball Valve	1	3,000	250	250	175
Pressure Regulator	1	8,333	694	694	486
Take Offs	1	7,500	1,875	1,875	1,313
Coupling	1	750	188	188	131
Trellising	1	6,000	1,500	1,500	1,500
Pesticides			31,000	15,000	15,000
Manure			2,000	2,000	2,000
Labor			33,500	23,750	23,750
Field Preparation		500	7,500	5,000	5,000
Planting		500	1,500	1,500	1,500
Weed Control		500	12,000	6,000	6,000
Spraying		500	0	0	0
Harvesting		500	12,500	11,250	11,250
Interest Charges		6	5,815	3,745	3,251
NOTE: Labor Days			67	48	48

	Trial	Current	Expanded
NOTE: Input Cost per Exported Kilo	1,124	412	371
NOTE: Input Cost per 2.5-kilo Box	2,809	1,029	928
Non-Labor Input Costs per kilo	856	306	266

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EVERYTHING BELOW THIS POINT WORKS BACKWARD FROM
THE WHOLESALE MARKET PRICE; EVERYTHING ABOV ++++++++++++++++++
THIS POINT IS BASED ON ESTIMATED PRODUCTION COSTS;
THE GROSS MARGIN/KILO IS THE NET OF THE TWO SETS OF NUMBERS

	Trial	Current	Expanded
GROSS MARGIN Per Kilo	(1,188)	245	751

Available farmgate pric

	Trial	Current	Expanded
PRICE AT FARMGATE (USh per kilo)	(332)	551	1,017
PRICE AT FARMGATE (USh per 5-lb at-market	(831)	1,378	2,543

BEST AVAILABLE DOCUMENT

	Trial	Current	Expanded
POSTHARVEST SEGMENT (per 5-lb at-market carton)	2,608	1,555	1,244
Packing	80	80	80
Cost of Box	480	480	480
Union Costs (Overhead)	2,027	989	570
—Management	13	430	430
—Extension	2,014	559	140
Pre-Transport Cooling and Storage	21	6	115
NOTE: Extension Costs (USh/hectare)	2,014,182	1,007,091	251,773

	Trial	Current	Expanded
PRICE AT KABALE (USh per 5-lb at-market carton)	1,777	2,933	3,788

	Trial	Current	Expanded
KABALE-TO-BORDER COSTS (per 5-lb at-market carton	2,520	1,365	510
Transport (Kabale-Entebbe)	1,600	444	222
Storage at Entebbe	210	210	210
Handling at Entebbe	210	210	60
Airway Bill Preparation	67	67	17
UI1 Form and CD3 Form	4	4	1
Exporter Margin	430	430	0

	Trial	Current	Expanded
FOB ENTEBBE PRICE (USh per 5-lb at-market carton)	4,298	4,298	4,298
FOB ENTEBBE PRICE (US$ per 5-lb at-market carton)	3.58	3.58	3.58

	Trial	Current	Expanded
BORDER-MARKET COSTS (US$ per 5-lb at-market cart	6.19	6.19	6.19
Transport (Entebbe-Market)	3.75	3.75	3.75
Marketer Margin	2.44	2.44	2.44

	Trial	Current	Expanded
PRICE AT MARKET (US$ per 5-lb at-market carton)	9.78	9.78	9.78

BEST AVAILABLE DOCUMENT

THIS SPREADSHEET PLAYS WITH GROUND TRANSPORT AND POST-HARVEST OPTIONS FOR SNOWPEAS

34,416.5

VARIABLES	Trial	Current	Expanded
Yield per Hectare (kg)	2,500	4,500	4,500
Exchange Rate (USh/$)	1,200	1,200	1,200
		Mitsubishi	Tata
Full Capacity (cartons)	450	450	2,000
Number of Full LD3s	1	1	4
Usable Full Capacity (cartons)	125	450	1,800
Cost per Trip (USh)	200,000	200,000	400,000
Cost per Kilo (USh)	640	178	89
TO TAKE FULL ADVANTAGE:			
Yield per Hectare (kg)	2,500	4,500	4,500
Harvest Season (days)	60	60	60
Yield per Hectare per day (kg)	42	75	75
Number of Cartons per Day	63	225	900
Number of Hectares to Fill Truck	3.8	7.5	30.0
Ratio to Current Planted Area	1.2	2.3	9.3
Pack-Rate per Packer (ctn/day)	8	8	10
Number of Packers Required	8	30	90
Cooling/Storage Capacity Needed		Current	New
(U.S. dollars)			
Fixed Costs:			
Construction	2,000	2,000	75,000
Power Connection	2,000	2,000	50,000
Generator (25 kVa)	0	0	10,000
	0	0	15,000
Operating Costs: (per 8-week season))	67	67	5,169
Generator (1/3 time)			2,669
Fuel			2,091
Lubricants			299
Servicing			168
Major Service			112
Depreciation	67	67	2,500
Operating Costs (US$ per kilo)	0	0	0
Operating Costs (USh per kilo)	8.5	2.4	45.9

1,344.0 Hours per season

7.0 Liters of diesel per hour
1.0 Liter of oil per hour
75.0 Dollars per 200 hours
500.0 Dollars per 2000 hours

BEST AVAILABLE DOCUMENT

1 THIS SPREADSHEET IS USED TO ASSESS CAAS SNOWPEA PROJECT IN KABALE

FILENAME: SNOWPEA7.WK4
UPDATED: @NOW

		Trial	Current	Expanded
7	TABLE OF VARIABLE INPUTS			
9	Yield (kg/ha, exportable product)	2500	4500	4500
10	Exchange Rate (USh/US$)	1200	1200	1200
11	International Freight Rate (US$/k	1.5	1.5	1.5
12	Field Labor Rate (USh/personday	500	500	500
13	Price at Market (US$/kg)	4.25	4.25	4.25
14	Exporter Margin/FOB Price (pct)	10	10	10
15	Pre-Entebbe Management Costs	0.3	10	10
17	TABLE OF KEY RESULTS			
19	FOB Entebbe/Wholesale Price (	100*H124/H133	100*I124/I133	100*J124/J133
20	Transport/Wholesale Price (%)	100*E130/H133	100*F130/I133	100*G130/J133
21	FOB Entebbe Price (USh/ctn)	+H123	+I123	+J123
22	Kabale-Entebbe Costs (USh/ct	+C21-C23	+D21-D23	+E21-E23
23	Out-of-Kabale Price (USh/ctn)	+H108	+I108	+J108
24	Post-Harvest Costs (USh/ctn)	+C23-C25	+D23-D25	+E23-E25
25	Residual for Farmgate (USh/ctn)	+H93	+I93	+J93
26	Residual for Farmgate (USh/kilo)	+H92	+I92	+J92
27	Production Costs (USh/kilo)	+E79	+F79	+G79
28	Post-Labor Margin (USh/kilo)	+C26-C27	+D26-D27	+E26-E27
29	Post-Labor Margin (USh/hectare)	+C28*C9	+D28*D9	+E28*E9
30	Area Required for Planting (ha)	+D160	+E160	+F160
31	Labor Required for Packing	+D164	+E164	+F164

SOME COMPARISONS WITH OTHER CROPS

		Trial Snowpeas	Current Snowpeas	Expanded Snowpeas		Maize		Sorghum	Ginger	Vanilla	Silk
40	Gross Margin (USh/hectare)	(950*C9)-(20*(E54-	(I92*D9)-(20*(F54-	(J92*E9)-(20*(G54-G69))		119905		168075	361243	1228111	731110
41	Labor Input (Manday/ha)	+C40/C42	+D40/D42	+E40/E42	+F40/F42		+G40/G42		+H40/H42	+I40/I42	+J40/J42
42	Return per Manday (USh)	+C40/(20*E76)	+D40/(20*F76)	+E40/(20*G76)		959		1254	2230	5117	2812

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PRODUCTION SEGMENT (per 500 sq m)

	Quantity	Unit Price	Trial	Current	Expanded
INPUTS			@SUM(E56..E57,E66..E69,E75)	@SUM(F56..F57,F66..F69,F75)	@SUM(G56..G57,G66..G69,G75)
Seeds	3	8000	4*9500	3*6000	3*6000
Irrigation			@SUM(E58..E65)	@SUM(F58..F65)	+F57*0.7
Bwall Tubing	500	160	+F58	+C58*D58/4	+F58*0.7
Pipe	30	650	+F59	+C59*D59/4	+F59*0.7
Filters	1	6080	+F60	+C60*D60/12	+F60*0.7
Brass Valve	1	3000	+F61	+C61*D61/12	+F61*0.7
Ball Valve	1	3000	+F62	+C62*D62/12	+F62*0.7
Pressure Regulator	1	8333	+F63	+C63*D63/12	+F63*0.7
Take Offs	1	7500	+F64	+C64*D64/4	+F64*0.7
Coupling	1	750	+F65	+C65*D65/4	+F65*0.7
Trellising	1	6000	+F66	+C66*D66/4	+F66
Pesticides			31000	15000	+F67
Manure			2000	2000	+F68
Labor			@SUM(E70..E74)	@SUM(F70..F74)	+F69
Field Preparation		+D$12	15*500	10*500	10*500
Planting		+D$12	3*500	3*500	3*500
Weed Control		+D$12	24*500	12*500	12*500
Spraying		+D$12	+B73*C73	+C73*D73	+D73*E73
Harvesting		+D$12	500*C9*(1/20)*(1/5)	500*D9*(1/20)*(1/10)	500*E9*(1/20)*(1/10)
Interest Charges		100*0.23/4	@SUM(E56..E57,E66..E68)*($D75/100)	@SUM(F56..F57,F66..F68)*($D75/100)	@SUM(G56..G57,G66..G68)*($D75/100)
NOTE: Labor Days			+E69/500	+F69/500	+G69/500
			Trial	Current	Expanded
NOTE: Input Cost per Exported Kilo			+E54/(C9/20)	+F54/(D9/20)	+G54/(E9/20)
NOTE: Input Cost per 2.5-kilo Box			2.5*E79	2.5*F79	2.5*G79
Non-Labor Input Costs per kilo			(20*(E54-E69))/C9	(20*(F54-F69))/D9	(20*(G54-G69))/E9

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EVERYTHING BELOW THIS POINT WORKS BACKWARD FROM THE WHOLESALE MARKET PRICE, EVERYTHING ABOVE THIS POINT IS BASED ON ESTIMATED PRODUCTION COSTS, THE GROSS MARGIN/KILO IS THE NET OF THE TWO SETS OF NUMBERS

++++++++ +++++++++

	Trial	Current	Expanded
GROSS MARGIN Per Kilo	+H92-E81	+I92-F81	+J92-G81

Available farmgate price

Trial	Current	Expanded
+H93/2.5	+I93/2.5	+J93/2.5
+H108-E97	+I108-F97	+J108-G97

PRICE AT FARMGATE (USh per kilo)
PRICE AT FARMGATE (USh per 5-lb at-market box)

BEST AVAILABLE DOCUMENT

			Trial	Current	Expanded
96					
97	POSTHARVEST SEGMENT (per 5-lb at-market carton)	@SUM(E99..E101,E104)	@SUM(F99..F101,F104)	@SUM(G99..G101,G104)	
98					
99	Packing				
100	Cost of Box	0.4*C10	0.4*D10	0.4*E10	80
101	Union Costs (Overhead)	@SUM(E102..E103)	@SUM(F102..F103)	@SUM(G102..G103)	
102	—Management	+C15/100*H123	+D15/100*I123	+E15/100*J123	
103	—Extension	+E106/C9*2.5	+F106/D9*2.5	+G106/E9*2.5	
104	Pre-Transport Cooling and Storage	2.5*D182	2.5*E182	2.5*F182	
105					
106	NOTE: Extension Costs (USh/hectare)	7553181/D160	7553181/E160	7553181/F160	
107					
108	PRICE AT KABALE (USh per 5-lb at-market carton)				Trial Current Expanded
109					+H123-E11 +I123-F112 +J123-G11
110					
111					
112	KABALE-TO-BORDER COSTS (per 5-lb at-market carton))	@SUM(E114..E119)	@SUM(F114..F119)	@SUM(G114..G119)	
113					
114	Transport (Kabale-Entebbe)	2.5*D152	2.5*E152	2.5*F152	
115	Storage at Entebbe	0.07*2.5*C10	0.07*2.5*D10	0.07*2.5*E10	
116	Handling at Entebbe	0.07*2.5*C10	0.07*2.5*D10	0.02*2.5*E10	
117	Airway Bill Preparation	25*C10/450	25*D10/450	25*E10/1800	
118	UI1 Form and CD3 Form	(1500+200)/450	(1500+200)/450	(1500+200)/1800	
119	Exporter Margin	+H123*C14/100	+I123*D14/100		0
120					
121					
122					
123	FOB ENTEBBE PRICE (USh per 5-lb at-market carton)				Trial Current Expanded
124	FOB ENTEBBE PRICE (US$ per 5-lb at-market carton)				+H124*C10 +I124*D10 +J124*E10
125					+H133-E12 +I133-F128 +J133-G12
126					
127					
128	BORDER-MARKET COSTS (US$ per 5-lb at-market carton)	@SUM(E130..E131)	@SUM(F130..F131)	@SUM(G130..G131)	
129					
130	Transport (Entebbe-Market)	+C11*2.5	+D11*2.5	+E11*2.5	
131	Marketer Margin	0.25*H133	0.25*I133	0.25*J133	
132					
133	PRICE AT MARKET (US$ per 5-lb at-market carton)				Trial Current Expanded
					+C13*2.3 +D13*2.3 +E13*2.3

BEST AVAILABLE DOCUMENT

134								
135	THIS SPREADSHEET PLAYS WITH GROUND TRANSPORT AND POST-HARVEST OPTIONS FOR SNOWPEAS							
136								
137								
138								
139								@NOW
140	VARIABLES		Trial		Current		Expanded	
141	Yield per Hectare (kg)		+C9		+D9		+E9	
142	Exchange Rate (USh/$)		+C10		+D10		+E10	
143								
144								
145					Mitsubishi		Tata	
146								
147	Full Capacity (cartons)		450		450		2000	
148	Number of Full LD3s		@ROUND(+D147/4		@ROUND(+E147/450,0)		@ROUND(+F147/450,0)	
149	Usable Full Capacity (cartons)		125		450*E148		450*F148	
150								
151	Cost per Trip (USh)		200000		200000		400000	
152	Cost per Kilo (USh)		+D151/D149/2 5		+E151/E149/2 5		+F151/F149/2 5	
153								
154	TO TAKE FULL ADVANTAGE							
155								
156	Yield per Hectare (kg)		+D141		+E141		+F141	
157	Harvest Season (days)		60		60		60	
158	Yield per Hectare per day (kg)		+D156/D157		+E156/E157		+F156/F157	
159	Number of Cartons per Day		+D149/2		+E149/2		+F149/2	
160	Number of Hectares to Fill Truck		2 5*D149/D158/2		2 5*E149/E158/2		2 5*F149/F158/2	
161	Ratio to Current Planted Area		+D160*2 471/8		+E160*2.471/8		+F160*2 471/8	
162								
163	Pack-Rate per Packer (ctn/day)		7 5		7 5		10	
164	Number of Packers Required		+D159/D163		+E159/E163		+F159/F163	
165								
166	Cooling/Storage Capacity Needed				Current		New	
167	(U S. dollars)							
168	Fixed Costs		@SUM(D169 D17		@SUM(E169 E171)		@SUM(F169 F171)	
169	Construction		2000		2000		50000	
170	Power Connection		0		0		10000	
171	Generator (25 kVa)		0		0		15000	
172								
173	Operating Costs (per 8-week season))		@SUM(D174,D179		@SUM(E174,E179)		@SUM(F174,F179)	8*7*24
174	Generator (1/3 time)						@SUM(F175 F178)	Hours per season
175	Fuel						+G175*G$173/3*800/1200	7 Liters of diesel per hour
176	Lubricants						+G176*G$173/3*800/1200	1 Liter of oil per hour
177	Servicing						+G173/3/200*75	75 Dollars per 200 hours
178	Major Service						+G173/3/2000*G178	500 Dollars per 2000 hours
179	Depreciation		+D168/(10*3)		+E168/(10*3)		+F168/(10*3)	
180								
181	Operating Costs (US$ per kilo)		+D173/(D141*D160		+E173/(E141*E160)		+F173/(F141*F160)	
182	Operating Costs (USh per kilo)		+D181*D142		+E181*E142		+F181*F142	

BEST AVAILABLE DOCUMENT

SELECTED COMMENTS ON TABLE 1

(T=Trial, C=Current, E=Expanded)

Line	Note
9	For T, yield is that estimated from the trials, and may be overstated. For C and E, this is a respectable maximum yield in most producing countries.
10	The exchange rate is higher than the rate prevailing during the past couple of months, but is probably what is a realistic "market-clearing" rate.
11	This is the current freight rate out of Entebbe, and will likely remain the same until overall demand increases significantly.
12	This is the quoted rate in Kabale.
13	This price was realized during the recent trials, and appears to be that available for delivery during the October-May season in the U.K.
14	This percentage of FOB price appears to be sufficient to entice an exporter into managing the Entebbe-onward end of the marketing chain.
15	For T, this figure was calculated from actual Union management costs. For C and E, the figure must be adjusted substantially upward to compensate an entrepreneur (presumably the exporter) for managing the farmgate-to-Entebbe elements of the marketing chain.
40	For T, this figure uses the actual promised payment (USh950/kilogram) as the basis for the gross margin, less non-labor inputs to production. For C and E, the actual available payment (in line 92) is used in lieu of the USh950/kilogram. For non-snowpea crops, the data are from various publications of the Bank of Uganda's Agricultural Secretariat, who prepare semiannual crop budgets on a variety of crops.
41	Labor inputs per hectare are calculated from the preceding and following lines.
42	This figure is derived -- in the case of snowpeas -- by dividing the gross margin figure by the per-hectare labor inputs, derived as a multiple of the line 76 figures. For other crops, this figure comes from the same source as in line 40.
56	For T, this was 4 kilograms times USh9,500 per kilogram; for C and E, we estimate that only 3 kilograms of seed are

needed, and that a more realistic bulk purchase price is USh6,000 per kilogram.

57 Irrigation equipment inputs are based on the unit costs in the first two columns of the relevant lines. These fixed costs are distributed over between four and twelve seasons, depending upon the durability of the equipment item. For T and C, costs are assumed to be identical; for E, it is assumed that costs can be lowered by an additional 30 percent.

66 Trellising costs -- which include only installation labor, since the bamboo tops used are a free byproduct of a basket-weaving endeavor -- are assumed to be distributed over four seasons.

67 Pesticide costs charged during T were excessive. These have been reduced by about half for C and E.

68 Although manure is provided free, approximately four persondays per 500 square meters is required to apply this fertilizer.

69 Labor inputs under T were very high, at least as reported. For C and E, these have been reduced somewhat.

75 Interest charges are assessed at 23 percent annually on all non-labor inputs, the funding for which were all borrowed by growers. Given a four-month season, with repayments during the final two months (of harvest), the average loan length was assumed to be three months.

99 The per-box cost of packing is an average of the USh70 and USh90 for the two standard sizes of packed snowpeas.

100 The cost of the box is a standard.

106 Extension costs (USh7,553,181 for the entire harvest) are divided by the number of hectares in production, to derive a per-hectare figure. This overall figure includes USh3,480,000 for personnel costs and USh4,073,181 for transport costs.

- The personnel costs consist of (1) a manager, at USh600,000 per month, (2) 6 extension assistants at USh30,000 per month, and (3) 3 spray technicians at USh30,000 per month. These costs are multiplied by four, given the four-month period of each crop.

- The transport costs consist of (1) a pick-up truck, at USh36,000,000, amortized over 20 crops, (2) operating costs for the truck, at USh1,761,400 per crop, (3) two motorcycles at USh3,836,496, amortized over 16 crops, and (4) operating costs for the motorcycles, at

USh272,000 per crop.

Extension costs for the entire crop period are assumed to be the same in C and E.

115 Storage at Entebbe is reported to be 7 (US) cents per kilogram.

116 Handling at Entebbe is also reported to be 7 (US) cents per kilogram. This and the previous (storage) figure are very high, and should be forced down.

117 Airway bill preparation reportedly costs US$25 per shipment.

118 Other export form preparation reportedly costs USh1,700 per shipment.

148 This figure looks at the number of full LD3s, because generally freight rates are based not on weight but on volume. This figure is used to determine the optimal inland transport shipment size.

149 For T, only an estimated 125 cartons were shipped per international shipment. For C, this figure must be 450 cartons and, for E, it must be 1,800 cartons.

151 For T and C, this figure is an estimate from Kigezi Union records, and includes amortization of the truck. For E, we understand that the per-trip rate is about double that in the smaller truck.

157 The harvest season is approximately 8 weeks (rounded here to 60 days).

163 From T, it appeared that at optimum rate, 7.5 cartons could be packed per packer per day. This figure is retained for C, where the same packing facilities are in use. For E, with more advanced packing facilities, the rate is postulated to increase to 10 cartons.

168 For T, it was very conservatively estimated that costs of constructing the cooling shed in Mparo were US$2,000. This figure is identical for the proposed C version. However, for E, much larger facilities will be required. These will amount to US$75,000, we estimate.

174 This calculation is for E, alone, because that is the only alternative that will require operating a generator, for an estimated 1,344 hours per season. This calculation includes (1) 7 liters of diesel per hour, (2) 1 liter of lubricant per hour, (3) US$75 to service the generator every 200 hours, and (4) US$500 to carry out major service on the generator, every 2,000 hours.

179 Depreciation is calculated, in all cases, on fixed assets, and it is assumed that a ten-year recovery period is reasonable.