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SOYA BEAN CROP DEVELOPMENT IN KENYA

By

S. Schonherr

&

E.S. Mbugua

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INSTITUTE FOR DEVELOPMENT STUDIES
UNIVERSITY OF NAIROBI
P.O. Box 30197,
NAIROBI, KENYA.

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ABSTRACT

The paper describes the introduction of commercial Soya Bean growing in the Districts of Kisii, South Nyanza and Narok. Focus is put on agronomic and infrastructural problems and proposals are being made on further expansion of Soya Bean growing in Kenya.

SOYA BEAN CROP DEVELOPMENT IN KENYA

The introduction of commercial Soya Bean growing in Kenya was done in the context of extension experiments to reach "less progressive" or "average" smallholding farmers.[1] For the experimental purpose one had to identify a useful innovation not yet adopted by farmers. After a careful examination of crop alternatives, Soya Beans were selected. But although the introduction of Soya Beans originally was only a side effect of the extension pilot experiments, after some time the development of Soya Beans as a crop became a project of its own. After the completion of the extension experimentation the new crop was considered as important for Kenya by the Ministry of Agriculture which intended large scale expansion for industrial processing.

The paper tries to summarize experiences gained during the pilot projects introducing Soya Beans as a smallholder crop innovation. Finally some proposals are made for future crop development strategies.

1 KNOWLEDGE BASE FOR SOYA BEANS PRODUCTION IN KENYA

11. The history of introduction of commercial and subsistence growing of Soya Beans in Kenya

(a) Experiments before 1974.

Until 1973 no commercial or subsistence growing of Soya Beans in Kenya worth to be mentioned was done. But, Agricultural Research Stations, Irrigation Schemes and a few Mission Stations have done trials since the late 1940s. 1973, when the most severe shortage of Soya Beans in the international markets occured, the University of Nairobi's Institute for Development Studies sent a team of Researchers around the country to find out whether Soya Beans can be grown commercially in Kenya.

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1) Described in : I.D.S. DP 200; DP 230; WP 186; OP 12, Chapter 8.

The following table shows the results of the brief survey:

Table: 1. Results of Soya Bean trials in Kenya before 1973.

Place of trial:	Number of trials:	Average yields per season (90 kg bag per hectare)
Nyanza Province		
Nyanza Research Station: (a) Keroka	regular research trials	8 - 15
(b) Kisii (town)	regular research trials	15 - 20
	commercial growing*	13 - 15
	one farmer trial	19
(c) Homa Bay	regular research trial	30
Ahero Irrigation Scheme	regular research trials (under irrigation)	30
Sikri Mission	trials for subsistence*	15
Western Province		
Kakamega Agricultural Research Station	few trials	(not available)
Kenya Seed Company, Kitale	few trials	8 - 10
FAO Fertilizer trials	fair number of trials	10 - 15
Rift Valley Province		
Baringo (Irrigation)	one trial	25
Eastern Province		
Mwea (Irrigation)	few trials	30
Mwea (Outgrowers)*	about 10 farmers surveyed	15
North Eastern Province		
Garissa (Irrigation)	one trial	20 - 30[1)]

Source: I.D.S. Survey.

* No fertilizers and no inoculants were applied.

1) Crop estimation.

The result of the survey was interpreted by the I.D.S. team that Soya Beans can be grown commercially by farmers very well in many areas of Kenya, except in the very high altitude areas (Kitale, Keroka).

Furthermore, the Soya Bean experts in Ahero and Kisii strongly recommended to bring the Soya Beans to the farmers. They recommended - according to their local experience - as most appropriate areas to start with: Lower Kisii, South Nyanza, Kisumu.

(b) The Soya Bean Pilot Projects with smallholder farmers.

The findings were presented to the Ministry of Agriculture. Since the most systematic Soya Bean research work was done at the Nyanza Agricultural Research Station (Kisii) a pilot project proposal was discussed and elaborated by I.D.S. in collaboration with District Level Officers in Kisii. Officers from South Nyanza showed interest as well and in the Pilot Project a South Nyanza Branch was incorporated. The project started with the Long Rains 1974. Its first two phases were monitored carefully by I.D.S. Researchers.

Table: 2. Soya Bean growing by smallholding farmers (Pilot Extension Project - Kisii/South Nyanza):

		No. of Participants.
First phase (L.R. 1974)	Kisii	84
	South Nyanza	22
Second phase (S.R. 1974)	Kisii	180[1]
	South Nyanza	350

Source: I.D.S. Survey.

Since the long rains 1975 the Trans Mara Division of Narok District has started to introduce Soya Beans as well. The first group of participants comprised about 60 farmers.

In Kisii and South Nyanza the extension of Soya Beans (after the second phase) stagnated due to problems of coordination of seed redistribution[2] and promised credits for seeds. South Nyanza was left with no seeds at all. The harvest was marketed by Maize and Produce Board and taken out of the area. In Kisii, farmers later were asked to purchase seeds and most of them refused since - they argued - it was promised to them to get the seeds on credit.

Farmers who had kept their own seeds replanted. During the short rains 1975 a private Soya Bean Processor, who was attracted by the Extension Project and who intends to establish a Soya Food Processing Enterprise in Kisii, sold seeds to 250 farmers in Kisii.[3]

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1. Estimated only.

2. After marketing farmers had to be resupplied with seeds from the marketed crop.

3. A later information given by the Processor was above 700. But there are doubts that the seeds had been planted by most of the farmers.

In Trans Mara the extension goes ahead with no problems monitored so far.

Finally we would like to mention that the Ministry of Agriculture recently has sent 5 bags of seeds to Machakos and 5 bags to Kitui for seed bulking through farmers.

12 Agronomy of Soya Beans

The agronomy of Soya Beans is reflected in the guidelines for the Pilot Projects. They were developed in collaboration with Kenyan Agricultural Research Stations and amended by the experience of the first phase of the Pilot Project:

"GUIDELINES FOR HUSBANDRY METHODS
FOR GROWING SOYA BEANS[1)]

....

2. Planting

a) Your seeds should not be older that 12 months. After 12 months the viability is low. That means a bad germination. (If there are only seeds available which are a bit older that 1 year you may get still a somehow satisfying germination if you put 2 beans - instead of 1 - every 3 inches.)

b) The variety "Belgian Congo" is the highest yielding; its maturing time is about 4 months. Hill yields less but matures within 3 months.

c) Plant late in the long rains (after maize is planted) and early in the short rains (Kisii, South Nyanza, Trans Mara).

d) Plant only when the soil contains sufficient moisture.
DANGER: DRY PLANTING SPOILS GERMINATION!

e) Plant in furrows 2-3 inches deep[2)]. Put loose soil on top and do not press the soil.

f) Plant in pure stand. Do not interplant Soya Beans. Soya Beans do not grow well in shady places.[3)]

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1. Quoted from I.D.S. Working Paper no. 186 (Staff Training for more efficient Extension) pp. 16 - 18 and used by the extension staff during the Project's second phase.

2. This may be controversial in the literature. In Kisii where 1-2 inches as well as 2-3 inches were recommended germination was much better (over 100 cases were monitored) if planted the deeper alternative.

3. It seems that in Tanzania a method has been developed where interplanting with Maize has positive results.

g) Spacing:

Seed Variety	Spacing between rows	Spacing within rows	Seed amount for ½ acre
Belgian Congo	1½ ft.	3 inches	8 kg.
Hill	1 ft.[1]	3 inches	12 kg.

The spacing between rows is shorter with the variety Hill, because Hill grows considerably smaller than Belgian Congo and its root system is smaller as well.

3. Weeding

a) After all weed seeds have germinated (about 3 weeks after planting) weeding must be done.

Leave the uprooted weeds between the rows - it improves soil fertility and prevents soil erosion. (Only couch grass should be removed from the shamba completely.)

b) Make a second weeding later if necessary.

4. Protection of the Soya Beans' growth

a) Right after germination birds can do damage if they come in large numbers (especially doves). (Put skycrows or watchman).

b) Rabits and antelopes like growing Soya Beans. (Dogs can chase them away.)

c) Moles can do also some damage (poison: "Rodent", "Pangabloc").

5. Harvesting

a) When the pods are brown and the leaves have fallen off, the plants should be uprooted.

DANGER: IF THE PLANTS OVERMATURE THE PODS WILL BURST AND THE BEANS GET LOST.

Remove the soil a bit from the roots. It will ease the grading later.

b) The uprooted plants must be dried by putting them in the sun. If there is rain continuously there is danger of rotting. To avoid rotting the plants have to be put on drying racks. Never stock the uprooted plants for more than 3 days on a heap if they are wet.

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1. This is unusally narrow. But yields were considerably higher compared to 1½ ft. and it saved - what is important - one weeding.

6. Threshing, Winnowing, Grading

a) Thresh like other beans (e.g. put it in a bag or on a prepared place and beat with sticks.)

b) Winnow with wind.

c) Remove all soil and other particles as well as spoiled beans. The quality depends largely on grading. (Badly graded yield may not be accepted for marketing.)

d) If the beans are still too soft, they have to be dried further. (Beans are dry if you cannot press you nails in.)

e) Mix the thresh with dung and put it back into the shamba. This will improve soil fertility.

7. Storing

Store save from rats and mice, in a dry and airy place (never in closed plastic bags!)."

We would like to stress the point, that for the Pilot Project farmers did not use fertilizers or inoculants.

The Agricultural Research Stations' findings did not favour their use. But these findings seem to be questionable since they were based on trials primarily conducted in the fields of research stations which have - according to the soil analysis of the National Laboratories of samples from Kisii farmers and the Station - a very different soil structure compared with farmers' shambas (e.g. the Stations' fields had lots of fertilizer residuals nearly everywhere.)

FAO fertilizer trials could not be evaluated sufficiently. The results from Western Province were not very interesting since the yield levels were generally rather low (the reasons are not known to us; we guess that it had something to do with varieties, climatic conditions and may be germination).

13 Soya Bean Varieties

Basically two varieties are available and used in Kenya:

Hill and

Belgian Congo.

Hill is an American variety which has a short maturing time. It does well in certain areas. But rather slight deficiencies in P and CA seem to result in small bean size and rather low yields.

Hill seeds are available in larger quantities. In the Maize and Produce Board Headquarter files in Nairobi (19.1.1976) a stock of 375 (90 kg) bags (at least 360 of them being Hill variety and harvested after Novermber 1974)/, was kept The Kirchhoff Seed Company (Nairobi)[1] is also offering Hill seeds as the only variety.

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1) Kirchhoff's E. A. Ltd.

Belgian Congo available in Kenya is a Kisii bread which originally stems from the Belgian Congo. It is the only Kenyan bread to our knowledge. Belgian Congo yields considerably higher in Kisii and South Nyanza than Hill variety. But the maturing time is significantly longer than of / Hill. If not harvested in time, the pods burst easier than with Hill.

Belgian Congo seeds were extremely short. (The Pilot Project had originally only 40 kilos.) A first bulking effort failed, since the already bulked bags of Belgian Congo got mixed up with the Hill variety during marketing and could not be identified afterwards. At present the Soya Bean Food Processing Enterprise in Kisii has started to bulk Belgian Congo on a small scale.

It might be worth to mention that two farmers (out of about 12 who had planted Belgian Congo so far) had record yields of 25 - 30 bags per hectare, while the highest yields of Hill (planted by a few hundred farmers already) monitored so far are around 15 - 20 bags per hectare. As mentioned elsewhere no farmer used inoculants, fertilizers or irrigation.

Table: 3. Major differences between Hill and Belgian Congo varieties in Kisii and South Nyanza Districts.

	Advantages	Disadvantages
Hill	short maturing time (9-13)	strong yield declines if soil deficiencies
	pods do hardly burst if delays in harvesting	often small bean size
Belgian Congo	high yielding	long maturing time (15 - 20 weeks)
		pods do burst if delays in harvesting.

Source: Soya Bean Pilot Projects in Kisii and South Nyanza.

Finally there is an other agronomic difference between the two varieties: Belgian Congo grows taller and has a larger root system. Spacing recommendations therefore vary for the two varieties (see chapter on agronomy).

14 C Economic and other advantages/problem for smallholders to grow Soya Beans.

The farmers and the extension staff participating in the first phase of the Pilot Project were interviewed and asked about their experience with Soya Beans.

The most common statement was, that it is a very easy crop and that one can make money quickly. By "easy" the interviewees meant: not much work, no difficult work, no cash inputs (besides seeds).

A systematic analyses proves the viability of these arguments:

Table: 4. Labour input (in mandays) and cash input (in Kshs.) for average production levels of Hybrid Maize, Ground Nuts, Soya Beans per hectare.

	Hybrid Maize	Ground Nuts	Soya Beans
Cash input	310/=	200/=	85/=
Labour input (mandays)	108	215	83

Source: Ministry of Agriculture. Prices up-dated by I.D.S.

Further details for the crop economics can be seen in the appendix. The quick returns are due to the short maturing periods.

Table: 5. Average maturing periods for the two varieties of Soya Beans used for the Pilot Project in Kisii and South Nyanza

Variety	Kisii	South Nyanza
Hill	12-13 weeks	9 - 11 weeks
Belgian Congo	15-20 weeks	not used

Source: I.D.S. Survey.

The gross margin of Soya Beans as calculated by the Ministry of Agriculture is good compared with the low input and the short growing period.

Table: 6 Gross margin for average production level of Hybrid Maize Ground Nuts, Soya Beans.

Hybrid Maize	1,315/= KShs.
Ground Nuts	1,420/= "
Soya Beans	909/= "

Source: Ministry of Agriculture, up-dated by I.D.S.

The yield levels of the Pilot Project were on average a bit below that of the Ministry of Agriculture's general calculation in the first phase. One major reason was the variety used. Due to very limited seed resources, mostly "Hill" had to be planted, whereas Belgian Congo was recommonded by the Nyanza Agricultural Research Station as the highest yielding variety. Generally yields were a bit higher in South Nyanza and Trans Mara compared with Kisii.

Table:7. Average yield levels (most frequent) during the Soya Bean Pilot Projects in Kisii, South Nyanza and Narok (Trans Mars)

	Most frequent yield in 90 kg bags per hectare	
	Hill	Belgian Congo
Kisii	9 - 12	12 - 16
South Nyanza	10 - 13	-
Trans Mara	10 - 13	-

Source: monitored by I.D.S. researchers and complimented by agricultural field staff.

All yields were achieved without using inoculants and any sort of fertilizer.

The most crucial factor influencing yield levels could be clearly identified with the assistance of the National Laboratories. It is the fertility - especially the availability/lack of calcium and phosphates.

Besides this there are a few other advantages: Soya Beans provide protein very cheaply. If properly tought, farmers (especially their children) would have an excellent food crop.

Soya Beans are leguminous and therefore improve the nitrogen content of the soil. They therefore are a very good crop for rotation. (e.g. with Maize)

Soya Beans have a rather deep root system. During the drought in South Nyanza (short rains 1974) they survived whereas most other local beans dried up. They are therefore considered by farmers to be more drought resistant than many other local bean varieties.

Finally many farmers were surprised that Soya Beans were not attacked by bean flies and weavels (during storage). The two varieties used seem to be rather desease and pest resistant compared to other bean varieties.

The problems monitored were as follows:

1. Bad germination if planted shallow (1 inch) in dry soils (good germination was achieved throughout, if planted in moist soil 2-3 inches deep)

2. Pods shatter if not harvested in time.

3. Yield levels are low if planted on poor soils.

4. Interplanting with other crops seems to be uneconomical (contrary to many other local been varieties).

15 Soya Beans compared with other oil crops

At present there could be some competition between Ground Nuts, Sunflower and Soya Beans for the edible oil production.

We think that a diversification of oil crops is useful and we would like to support this by the following points:

(a) Certain areas are more suitable for only one of the crops. Prof. von Eijnatten, Department of Crop Science, Faculty of Agriculture, University of Nairobi suggests as feasible conditions for the three crops:
Ground Nuts: sandy-loamy (soft) soils in rather warm areas,
Sun Flower: drier areas (short maturing varieties with deep root systems),
Soya Beans: medium rainfall areas of not very high altitudes.

(b) The differences in crop economics for each crop suite to different farm management systems: e.g. high labour intensive Ground Nuts with a high gross margin for those household/s where labour is available sufficiently. The low labour intensive Soya Beans with the lower gross margin for households where labour is a constraint.

(c) Specific advantages for Soya Beans compared with Sunflower are:

1. They are a most valuable protein food for home consumption.

2. They are leguminous and therefore excellent for crop rotation.

(d) It is an excellent short rain crop in Maize growing areas where Maize is not /being grown during short rains.

16. The market for Soya Beans

Soya Beans are a scheduled crop and therefore marketing is monopolized by /the Maize and Produce Board.

In Kenya three major demand areas can be identified:

1. High protein content food for human consumption (especially for lactating mothers and children; feeding programmes, and rehabilitation of malnourished people).

2. Processing for edible oils.

3. Protein cakes as high quality feeds for cattle and poultry.

(a) The existing market for Soya Beans as food crop for human consumption.

Soya Beans are an extremely cheap supplier of protein (compared with meat, aggs, and fish). As a subsistence crop they could improve the nutrition of mothers and children very considerably. The articulated demand at present can roughly be quantified: A Soya Bean Food Processor who runs a Soya Bean Factory in Uganda already (African

Basic Foods) has started a new enterprise in Kisii. He intends to process Soya Beans to provide especially clinics and health centres with cheap protein products in Kenya. He plans to process around 400 - 600 t of Soya Beans per year (first stage).

The Ministry of Health and the Ministry of Education as well as some other Organizations and a number of Boarding Schools have shown strong interest in purchasing Soya Beans. One representative from the Ministry of Health mentioned informally the demand of at least 500 tons per year.

(b) The existing market for Soya Beans as oil crop and animal feed

Edible oils have to be imported to Kenya in large quantities. 1970 the foreign exchange spent for the import of edible oils was KShs. 39, 1 Millions and in 1973 it went up to KShs. 88, 6 Millions. This huge amount is astonishing since in Kenya quite a number of oil processing factories do exist (concentrated in Kisumu, Nakuru, Nairobi, Mombasa).

But there seems to be a policy or tendency to import mainly the cheaper palmoil and to export high quality oils. The later ones seem to have a good export market.

The edible oil processors in Kisumu and Nakuru were interviewed by I.D.S. researchers. In all four relevant factories the interviewed managers gave very similar answers:

(A) They do not get sufficient oil crops (some factories seem to run cinsiderably below capacity)

(B) They would be very ready to purchase any amount of Soya Beans up to their capacity immediately for a higher price than presently fixed by the Maize and Produce Board.

Table: 8, Articulated demand for Soya Beans by 4 edible oil processors (interviewed in September 1975)

Place	Firm	Demand in 90 kg bags
Nakuru	Rift Valley Products	20,000 (immediately)
	Elianto	250,000 (per annum)
	Nakuru Oil Mills	60,000 (per annum)
Kisumu	Kibos Industries	60,000 (per annum)
Nairobi [1])		

Source: I.D.S. Survey.

Elianto Kenya Ltd. was very keen to gather further information and requested the researchers to bring Soya Bean samples from the Pilot Areas for oil and protein content analysis. Elianto was provided with 4 samples

1. ACIF (Ltd) recently interviewed - 550,000 (per annum)

from Kisii and South Nyanza.

Table: 9, Oil and protein content analysis of 4 Soya Bean samples from Kisii and South Nyanza (Long Rains crop 1975)

Variety	Bean Size	Oil Content in %	Protein content (after deduction of oil content)[1] in %
Hill	small	16.8	37
	medium	17.5	39
	large	17.1	43
Belgian Congo	medium	18.5	39

Source: Elianto Kenya Ltd., Nakuru.

These factories, of course, sell the remaining staff as protein cakes for cattles and poultry feeds. Protein cakes from Soya Beans achieve the highest prices, since they contain important nutritional minerals not found in other vegetable protein (e.g. cakes from Ground Nuts or Sunflower).

The net price for Soya Beans offered to the farmers by Maize and Produce Board rose from 1972/73 when it was KShs. 56/35 per 90 kg/bag to KShs. 115/80 (Nyanza Province) in 1974/75. The price was fixed in an "arbitrary" manner according to Maize and Produce Board officials since in Kenya there was no production of the crop and therefore no market prices.

But interviews with edible oil manufactureres in Kenya show that some of them are ready to purchase Soya Beans at a higher price[2] per bag. 1974 one firm imported 400 tons of Soya Beans from Malaysia finally for a price of above 300/= KShs. per bag. It is worthwhile to mention that there is little/direct connection between the price of Soya Beans in international markets and in Kenya. First, the edible oil prices are fixed in Kenya and secondly, imports have rather high transport costs plus an import levy of 33.3% (on produce price Mombasa Harbour).[3]

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1. After oil extraction the remaining cake will be sold. One price factor is the protein content of the cake.

2. Firm committment given by:
Rift Valley Products per kg 1/70 (minimum)
Nakuru Oil Mills per bag 180/= - 250/=.
But Rift Valley Products offered seed inputs free of charge in addition.

3. According to recent information the levy is 50% for whole Soya Beans.

17 Extension infrastructure for Soya Bean promotion

The extension for the Pilot Projects in Kisii and South Nyanza (and later Trans Mara of Narok) were very carefully planned and implemented.

The agricultural field staff of the lower areas of Kisii and about 25 field staff members of South Nyanza were trained in two one week in-service courses. Later the relevant staff in Trans Mara was trained as well.

Farmers training was conducted in the form of field training courses (Kisii) and field days (South Nyanza). It cannot be exactely determined how many farmers finally had participated in the training, but the number is near 1,000 in Kisii and very considerably above 1,000 in South Nyanza.

There was (and is) astonishingly good enthusiasm (surveyed by I.D.S. researchers) among extension officers to promote the crop and of course frustration, when seed and credit provision after the second phase broke down due to reasons beyond the field staff's control.

For further reference see I.D.S. Discussion Paper No. 200, Working Paper No. 186 and Occasional Paper No. 12, Chapter 8.

18 Constraints for further Soya Bean extension

As mentioned already, the further expansion of Soya Bean growing is hampered by two factors:

(1) seed distribution

(2) credit provision for seeds.

Seeds can be used from the previous harvest. In the near future there is no danger of degeneration of seeds.

a) The situation in Kisii:

Soya Beans were marketed partly directly through the Maize and Produce Board and partly through the Soya Beans Food Processing Enterprise in Kisii, who in turn sold most of it to Maize and Produce Board as well. The enterprise was interested in the traders commission granted by Maize and Produce Board. The Maize and Produce Board had to transfer the crop due to storage limitations from the area, first to Kisumu and later to Nairobi.

For the short rains 1975 the Soya Bean Enterprise has started to offer to farmers Soya seeds (packed in 12½ kg. packages for the price of KShs. 30/=, which are supposed to be sufficient for ¼ acre). When interviewed in November 1975, the enterprise had sold 250 packages.

But these sales do not reflect the adoption readiness of the farmers from Lower Kisii. For the long rains 1975 farmers had received the message that Soya seeds will be available on credit. Field staff of four locations had organized well above 1,000 farmers who in turn had kept

½ acre plots for the crop.[1] Unfortunately the credit did not arrive in Kisii and farmers were told to purchase seeds. This created some unrest and farmers refused to purchase seeds. Very often the argument was heard that farmers felt that they were being cheated. Furthermore the arguement was raised that for all other new crops in Kisii the cash inputs are financed on credit.

b) The situation in South Nyanza:

The strongest growth area for Soya Beans was the Migori Division where during the short rains 1974 350 farmers grew Soya Beans (usually on plots of about ⅓ acre) which was even much below the farmers' demand and limited only due to seed shortage.

During an informal visit the Kisii Soya Bean Entrepreneur had indicated to the Agricultural Officer in charge that he will organise marketing and issuing of new seeds. But due to reasons not known there was no further contact and the farmers after waiting a long time to sell the harvested crop were advised by the agricultural staff to sell it to Maize and Produce Board. Many farmers sold the crop without keeping seeds , still expecting to get fresh seed supplies again. The crop then was transferred to Kisumu and Nairobi. Only those farmers who kept seeds on their own initiative replanted. There are no other seeds available whatsoever.

c) The situation in Trans Mara:

The extension has just reached the second stage and new growers receive seeds on credit through Ministry of Agriculture staff. But it can be foreseen that if more than a few hundred farmers are involved, the seed distribution can hardly be managed by the few agricultural officers in future.

d) A note on the experience with credits for Soya Bean seeds

In phase one of the Pilot Project in Kisii and South Nyanza all seeds were given on credit. Farmers were supposed to repay in kind during marketing.

Repayment in Kisii was organized without problems. The crop was brought to the Co-operative Societies by the individual farmers and the weight registered. The field staff than deducted the credit amount in kind (for further distribution).

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1) The Kisii Soya Bean Project Review of the Kisii District Agricultural Officer, 21st Feb., 1976 reports a total of 2,672 farmers were recruited in 7 locations before the long rains 1975.

2 Proposal for further expansion of Soya Bean production

21 Objectives:

(a) Short Term: 1) To strengthen infrastructural support for SoyaBean production in Kisii, South Nyanza and Narok (Trans Mara) Districts.

2) To increase the supply of Belgian Congo seed and promote wider use especially in South Nyanza.

3) To promote farm home consumption of soya-beans for nutrition improvement.

(b) Medium Term: 1) To introduce SoyaBean cultivation to other feasible areas of Kenya.

2) To improve yield levels in all suitable areas .

3) To begin increasing production of edible oils, animal feeds and human consumption products.

22 Components:

(a) Short Term Project:

1) Development of effective seed distribution through stockists, cooperative societies (or Agric. Village Committee Groups) KFA and private firms.

2) Seed provision for first adopters on loan financed by the SoyaBean manufacturing Firms.

3) Forward announcement of farmers' prices for SoyaBeans.

4) Involving SoyaBean manufacturing firms in the marketing of SoyaBeans.

5) To organize a Belgian Congo seed bulking project with farmers.

6) To teach farmers how to prepare Soya food for use in their homes (proposal of 1974 already with Home Economics Department, Ministry of Agriculture; another project is elaborated by FAO/PBFL).

(b) Medium term project:

1) Introduction of SoyaBeans to the following Districts:

District	Variety	Proposed Growing Season (Long or Short Rains)
Kisumu	B. Congo	L.R.
Siaya	B. Congo	L.R.
Busia (lower paerts)	B. Congo	L.R.
Baringo (middle parts)	Hill	L.R.
Embu (lower parts)	B. Congo	L.R.
	Hill	S.R.
Meru (lower parts)	Hill	L.R.
Machakos	Hill	L.R.
Muranga (lower parts)	B. Congo/Hill	L.R./S.R.
Kitui	Hill	L.R.
Taita (middle parts)	Hill	L.R.
Kwale Kilifi	no variety yet identified	?
Other potential areas not yet identified		?

2) Multi-disciplinary Research on Soyabeans

Selection of Varieties for various areas;

Response to Fertilizer for various areas;

Response to Inoculum;

Various cultural practices, intercropping, crop rotation, etc;

Breeding of appropriate varieties for various ecological zones

Disease and Pest Control;

Farm Management and other socio-economic aspects;

Nutritional and consume aspects.

APPENDIX

Source: Ministry of Agriculture 1972/3;
Prices updated by authors

Economics of Soya Beans

		Production level		
		low	average	high
1.	yield in 90 kg bags/hectare	5	9	17
2.	output @ 116/- per bag[1]	580/-	1,044/-	1,972/-
3.	seed @ 50 kg. per hectare[2]	65/-	65/-	65/-
4.	fertilizer	-	-	-
5.	sprays and dusts	-	-	-
6.	other costs	10	20	30
7.	total variable costs (3 to 6)	75/-	85/-	95/-
8.	gross margin per hectare - (2 minus 7)	515/-	969/-	1,887/-

9.	labour mondays/hectare (average)	
	seedbed preparation	35
	planting	8
	weeding	20
	harvesting	20
	total mandays	83

10. total labour cost @ 6/- per manday = 498/-

11. gross margin per manday (8:9) = 11/70

Remark: Two crops can be grown per year. Short rain crop has a tendency of yielding higher (probably due to more sunlight). Soya Bean is a light feeder and enriches the soil with nitrogen (leguminous).

1. Maize and Produce Board from 17th August, 1974.

2. Not certified (from farmers own crop).

Economics of Sunflower

		production level		
		low	average	high
1.	yield in 40 kg. bags/hectare	12	17	28
2.	output @ 50/- per bag[1]	600/-	850/-	1,400
3.	seed @ 10.kg. per hectare[2]	50/-	50/-	50/-
4.	fertilizer	-	-	-
5.	sprays and dusts	-	-	-
6.	other costs	10/-	20/-	30/-
7.	total variable costs (3 to 6)	60/-	70/-	280/-
8.	gross margin per hectare(2 minus 7)	540/-	780/-	1,120/-

9. labour mandays/hectare (average)

seedbed preparation	35
planting	8
weeding	30
harvesting	20
total mandays	93

10. total labour cost @ 6/- per mandays = 558/-

11. gross margin per manday (8:9) = 8/40

Remark: two crops can be grown per year.

1. variety white and black. Maize and Produce Board, 17th August, 1974.

2. certified.

Economics of Groundnuts

		Production level		
		low	average	high
1.	yield in 80 kg. bags/hectare	6	9	15
2.	output 180/- K.shs[1] per bag	1,080	1,620/-	2,700
3.	seed 80 kg./hectare[2]	180/-	180/-	180/-
4.	fertilizer	-	-	-
5.	sprays and dusts	-	-	-
6.	other costs (including transport)	10/-	20/-	30/-
7.	total variable costs (3 to 6)	190/-	200/-	210/-
8.	gross margin per. hectare (2 minus 7)	890/-	1,420/-	2,490/-

9. labour mandays/hectare (average production level)

seed bed preparation	35
planting	30
weeding	90
harvesting	60
total mandays	215

10. total labor cost @ 6/- per manday 1,290/-

11. gross margin per manday (average) = 6/60

1. produce price to the farmers (Maize & Produce Board price list 17th August, 1974).

2. Not certified seeds, taken from farmers own crop.

Remark: Can be grown during long and short rain seasons (without overlapping). Groundnuts are light feeders and leguminous.

Economics of Hybrid Maize

	Production level		
	low	average	high
1. yield in 90 kg bags/hectare	15	25	45
2. output @ 65/- per bag	975/-	1,025	2,925
3. seed	60/-	60/-	60/-
4. fertilizer	80/-	180/-	620/-
5. sprays and dusts	-	30/-	80/-
6. other cost (including transport)	20/-	40/-	50/-
7. total variable costs (3 to 6)	160/-	310/-	810/-
8. gross margin per hectare (2 minus 7.)	815/-	1,315/-	2,115/-

9. labour mandays/hectare (average)	
seed bed preparation	35
planting	8
weeding	30
harvesting	35
total mandays	108

10. total labour cost @ 6/- per manday = 648/-
11. gross margin per manday (average) = 12/20 (8:9)

Remark: can be grown during long and short rains with lower yields during short rains (and some overlapping between crops of the two seasons). Maize is a heavy feeder (if not fertilized and well treated the soils will be exhausted quickly).