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WEST AFRICAN SMALL GRANTS PROGRAM

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Increasing Vegetable Oil Seed Production and Processing in Northern Ghana

A Socioeconomic Impact Study

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OAU/STRC-SAFGRAD/CSIR Collaborative Program
Funded by USAID Africa Bureau for Sustainable Development

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1.0 Introduction

1.1 Background

In spite of the significant role the agricultural sector is expected to play in the economies of Sub-Saharan African (SSA) countries, the sector's contribution to overall economic growth and development has been below expectation. Indeed, public policy recognizes the need to increase agricultural productivity through research as a condition for improved producer and consumer welfare and overall economic growth. However, several factors, including constrained access to input (including seeds) and output markets, high post-harvest losses, and little or absence of post-harvest processing, retard growth in the agricultural sector.

As a result of technology transfer bottlenecks, farmers in SSA are yet to fully benefit from agricultural research results and available technological options in order to improve upon their income and well-being. Among the various efforts to alleviate some of the bottlenecks to the transfer of proven technologies to end-users, SAFGRAD under the TTG funded SARI to undertake a project entitled "Increasing vegetable oil seed production and processing in northern Ghana". SARI undertook the project in collaboration with the Ghana Grain Development Board (GDB), Agricultural extension agents and community farming groups. Other partners included individual farmers and oil processing mills. The objectives of the project were to: supply farmers with improved varieties of soybean seeds which have high oil content; transfer the technology for increasing on-farm yields; guarantee farmers a market for the produce by linking them to vegetable oil mills; and guarantee the Oil mills high quality raw materials in required quantities.

The project was organized at four levels including the production of breeder seed (SARI), foundation seed (GDB), certified seed (community farming groups) and grains (individual farmers/nucleus farmers) for sale to oil mills. The project assisted nucleus farmers and farmers' associations to produce soybean grains which were taken-up by Bosbel Co. Ltd, an edible oil processing firm.

1.2 Purpose of assignment

In addition to obtaining some missing agronomic data, the objectives of the present assignment are:

1. to examine the extent of soybean utilization and processing at household and community levels
2. to evaluate the impact of the project on household economy of the participating communities
3. to identify soybean marketing opportunities and constraints
4. to examine the nature of partnerships/linkages (both vertical and horizontal) that have been established among researchers, extensionists, farmers, oil processing firms, NGOs and other stake holders
5. to determine the potential for sustainability of the project.

1.3 Methodology

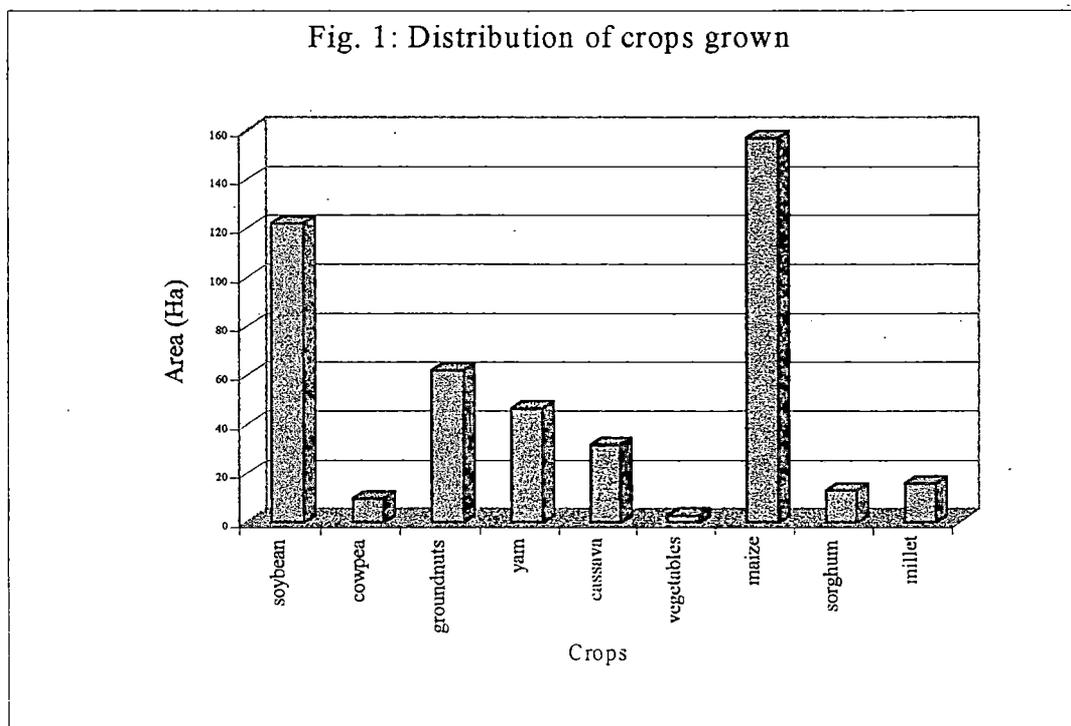
The information required to achieve the goals of the study will be obtained through formal and informal surveys. The formal survey, using structured questionnaire, was used to interview about ninety randomly selected farmers (sixty from the nucleus farmer groups, 20 members of farmer groups/associations and 10 nonparticipating farmers). Informal survey, through personal discussions/interactions using prepared checklists, will be used to elicit information from members of farmer-based organizations involved in the project, leadership of the nucleus farmers group, as well as owners and operators of soybean processing firms.

The survey was carried out in four districts in which the project was implemented. These included Gushegu/Karaga, Yendi, West and East Gonja Districts. Four communities were selected from each district and at least five farmers selected randomly for the interview. The questionnaire collected data on soybean production processing, and utilization, as well as marketing constraints and interventions. The survey focused on the Tiyumtaba nucleus farm and the Asheli-nye Beihagu farmers' association as well as some non-participating farmers. The data collected formed the basis of the results of this study

2.0 Findings

2.1 Importance of soybean in the cropping system

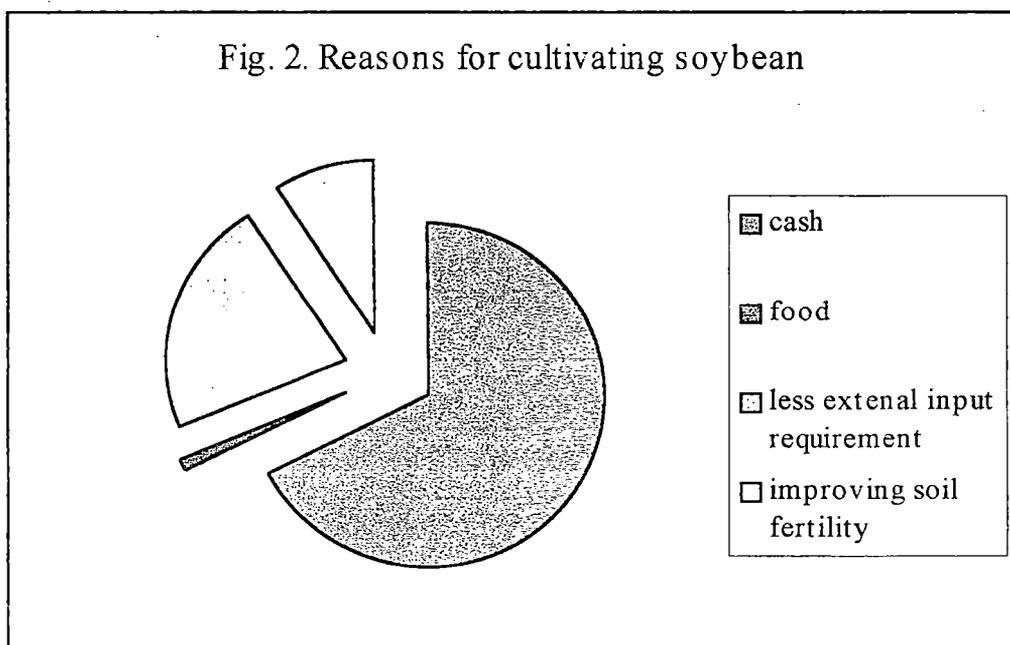
Cereals, legumes and root and tuber crops dominate the cropping system in the study area. The major crops cultivated by the farmers are maize, sorghum, millet, groundnuts, soybean, cowpea, yam and cassava. Rice, vegetables and cotton are also grown for cash. The study reveals that monocropping is most frequently practiced than mixcropping. About 98% of farmers' fields were monocropped. Figure 1 below shows the distribution of major crops in terms of land area under cultivation. The distribution shows that maize cultivation is the most common in the study area, followed by soybean groundnut and yam in order of importance. Incidentally, soybean groundnut and yam were identified to be the major cash crops in the study area.



Soybean is a relatively new crop in Ghana. Its importance as cash crop and its production has grown significantly over the past few years. The release of improved varieties of soybean by SARI and the vigorous promotion on utilization by the Women in Agriculture Department (WIAD) of the MoFA contributed immensely to the development of the crop in northern Ghana.

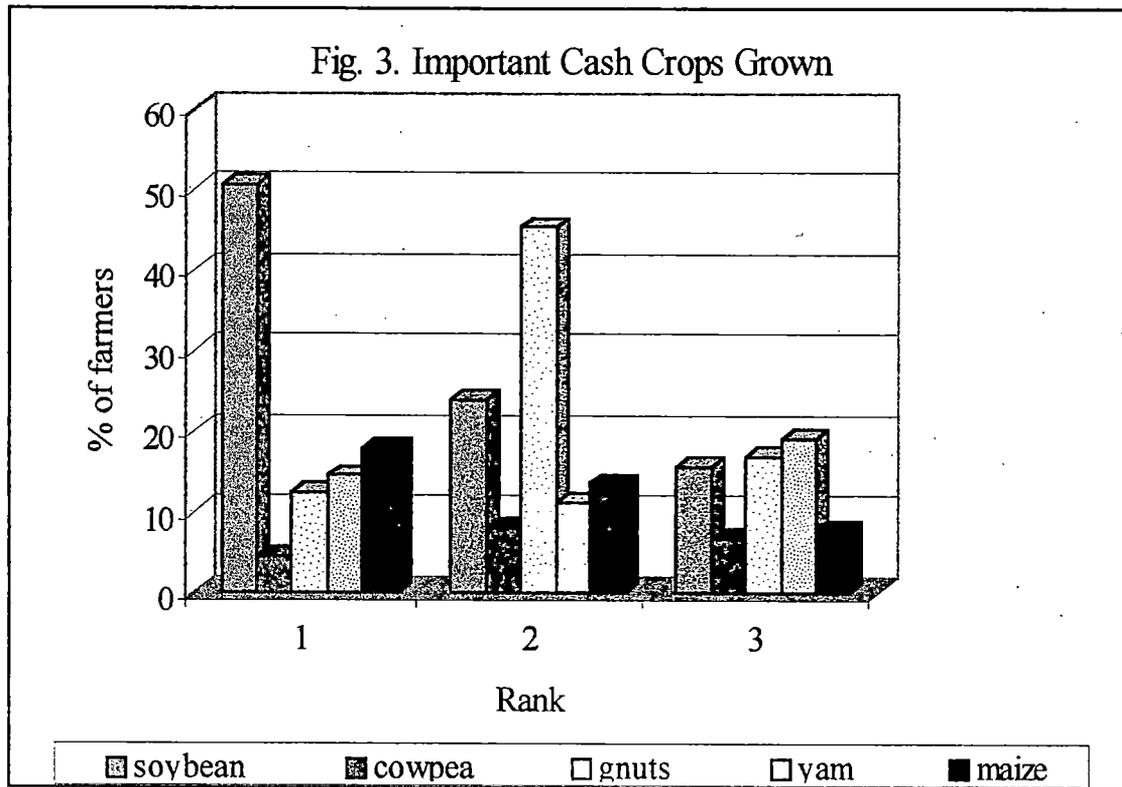
Almost all of the farmers interviewed knew about soybean, however 62% began to cultivate soybean over the last six years and for the majority whom through their participation in the SAFGRAD/SARI/MOFA community seed program. The main process of diffusion of improved soybean production practices has been through the MoFA extension education (49%), farmer - to - farmer diffusion (15.7%), farmer field schools organised by research and participation in on-farm trials - SARI effort (22.4%), while NGO extension accounts for 12.9% of soybean extension education in the project area.

The reasons why farmers cultivated soybean in the study area were identified to be four fold: 1) for its food value, 2) as a source of cash income, 3) its ability to improve fertility of the soil, and 4) its cultivation requiring fewer and less expensive external inputs. In the main majority of the farmers (67%) cultivate soybean as a main source of cash income. Only about 1% does so purely for its food value. The ability of the crop to do well without external inputs (such as fertilizer and insecticides) was cited by 22.2% of the respondent as the main motivation for its cultivation Fig 2. Gender analysis showed that nearly equal numbers of both men and women cultivate soybean for its commercial value. Only about one percent (mainly men) cultivates soybean for home consumption.



2.2 Major source of farm income

Agriculture remains the main source of household cash income. However, close to 65 percent obtain supplementary income from off-farm activities such as petty trading, crafting, food processing/shear butter extraction and wage/salary employment. The major cash crops cultivated by the respondents are soybean, cowpea, groundnut, yam, maize and rice. Fig. 3 below presents the ranking of the major cash crops as source of household income. The figure shows that soybean tops the first rank of important cash crops. The crop is second to groundnuts in the second rank and placed third in the ranks of the third most important cash crops.



Soybean is the major cash crops for 67% of the respondents, while yam remained the important cash crop for 18% of the farmers (Table 1). Gender analysis reveal that 23% more women (85%) than men (61.8%) consider soybean as their major source of cash income.

Table 1. Important Cash Crops Grown

Crop	Total sample (n=89)	Men (n=66)	Women (n=23)
Soybean	67.4	61.8	85.7
Cowpea	5.6	7.4	0
Groundnuts	3.4	4.4	0
Yam	13.8	18.3	4.8
Maize	6.7	7.	4.8
rice	3.3	3.0	4.8

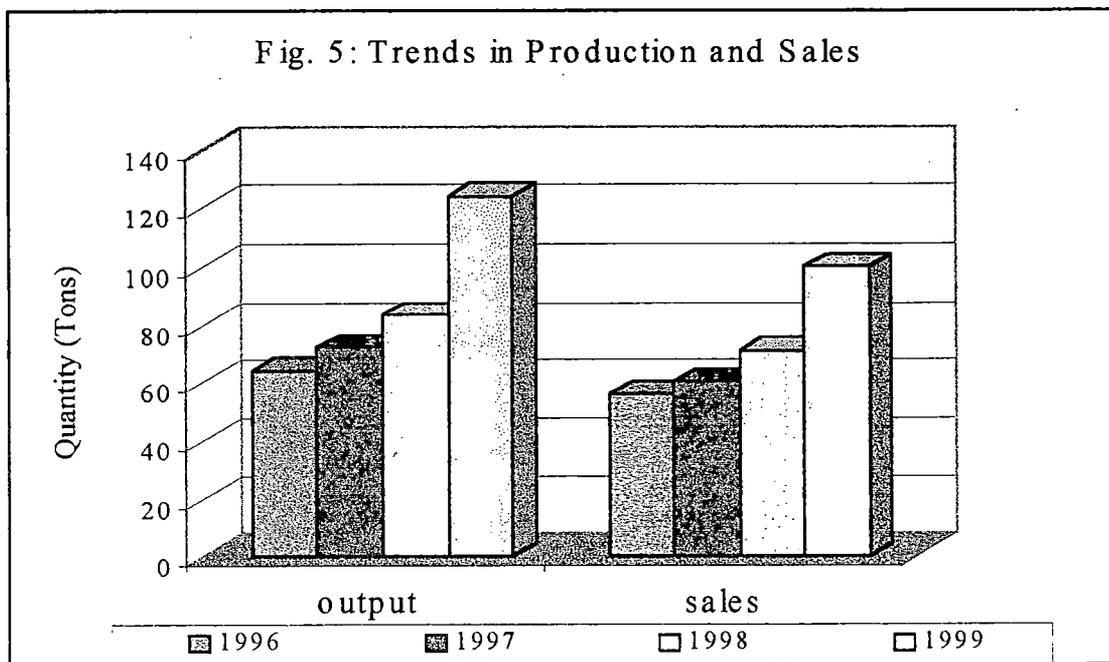
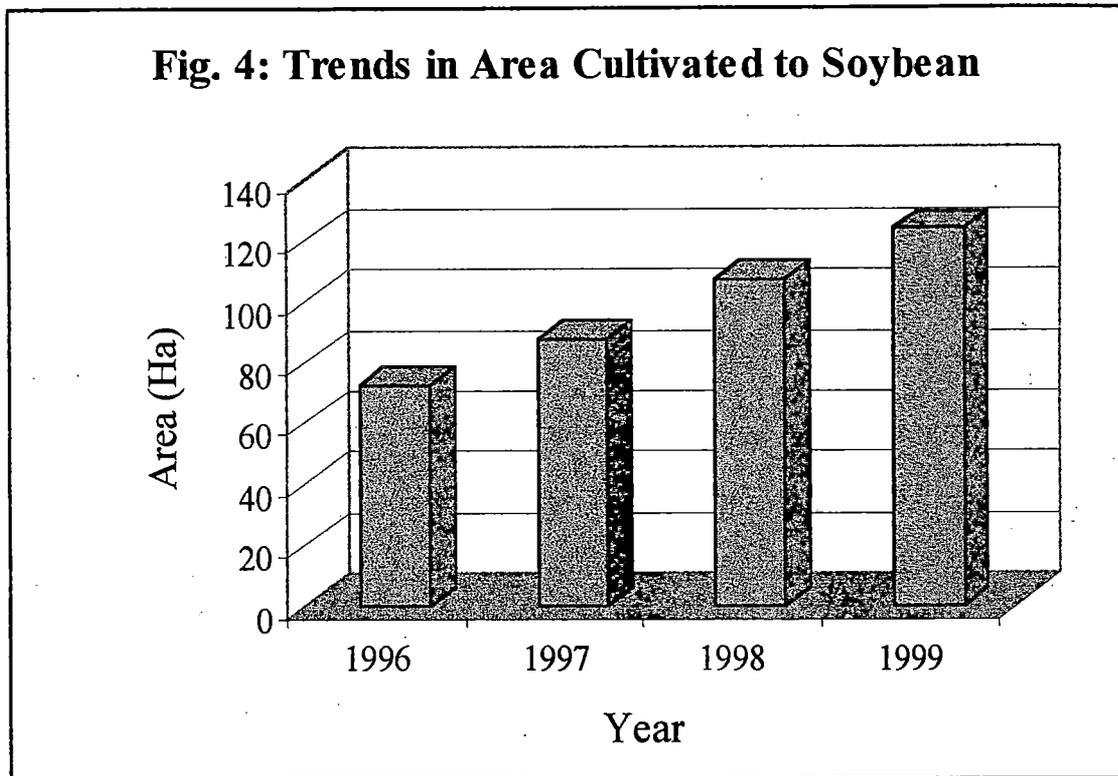
Source: SARI field data, 2000

2.3 Trends in soybean production

Figures 4 and 5 below depicts the impact of the vegetable seed oil production project on soybean cultivation by comparing the pre-project and project periods in terms of area under cultivation, total production as well as marketable surplus of soybean by the participating farmers in the study area. As depicted in Fig. 4 the results of the study indicate that total area cultivated to soybean rose from 72,4ha in 1996 to 123.8ha in 1999, about 71 percentage increase over the period. Broun and Kennedy (1994) have argued that the expansion in cash crops in small-scale agriculture have negative effect on the basic staple food crops as the there is the tendency to shift resources away from these crops. The expansion in the soybean area in the study area however has not been at the expense of any other crops. However, the introduction of the crop has helped to bring into cultivation marginal and infertile lands due to the ability of the crop to improve upon the fertility of soils.

The growing popularity of soybean is being manifested in the significant increases in production over the past few years. The total soybean production by the participating farmers rose from 63.9tons in 1996 to about 124tons in 1999, about 95% percentage increase over the period. Consequently, the marketed surplus of rose from 56.2tons to over 100tons in 1999 (Fig.), substantially raising household income. Fig. 5 shows the trend in soybean production and sales. Appendix 1 on the other hand provides the yield

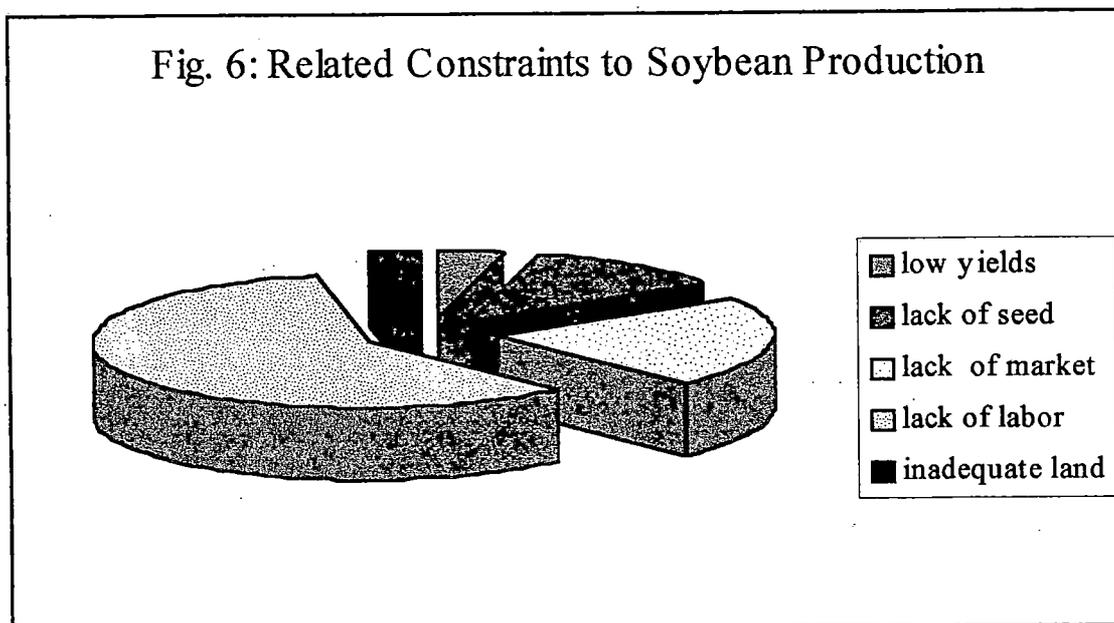
data for 1999 for the Tiyumtaba Nucleus farms and the Asheli-nye Beihagu farmers association, which were the focus of both the project and this study.



Indeed, as clearly indicated in the Fig. 5, the implementation of the project in 1998 and the promotion of soybean utilization at the household level coupled with linkages to market sources, especially to industrial concerns, have greatly contribute to the increase in production and utilization of soybean.

2.4 Soybean production constraints

Like a previous study on soybean production in northern Ghana (SARI, 1994), unavailability of ready market and lack of improved seeds remain the major constraints farmers face in the study area. Figure 6 below presents farmers' ranking of the soybean production constraints.



Unavailability of improved soybean seeds on the market frustrates the efforts by farmers to expand their production. Farmers have tended to solve their seed problems by relying on nucleus farmer, their participation in on-farm trials, SARI/MoFA through their associations, and sometimes on the benevolence of neighbouring farmers. Farmers lacked the financial resources to hire labour to complement the family labour. Most often the cash crop (in this case soybean) suffers in times of labour conflict.

2.5 Soybean utilization and consumption

Soybean is consumed in one form or another in most of the households in the study area. All but 12% of the respondents incorporate soybean in their household diet. The use of soybean in the preparation of "Tubani" and "Dawadawa" is well known by the farmers. Eighty-three percent of the respondents consume soybean in the form of Tubani (Table 2). Dawadawa made from soybean is consumed by 72% of the farmers. In fact nearly 78% of the respondent prefer dawadawa prepared from soybean to dawadawa from parkia due to the high nutritional value of the former. In contrast, soymilk was consumed by only about 3% of the respondents. Increase and continuous extension education is required to introduce more innovations in soybean utilization to enable the farmers benefit from the food value of the crop. Abeit, the above results is remarkably different from that of previous studies conducted in northern Ghana (see for instance, SARI, 1994).

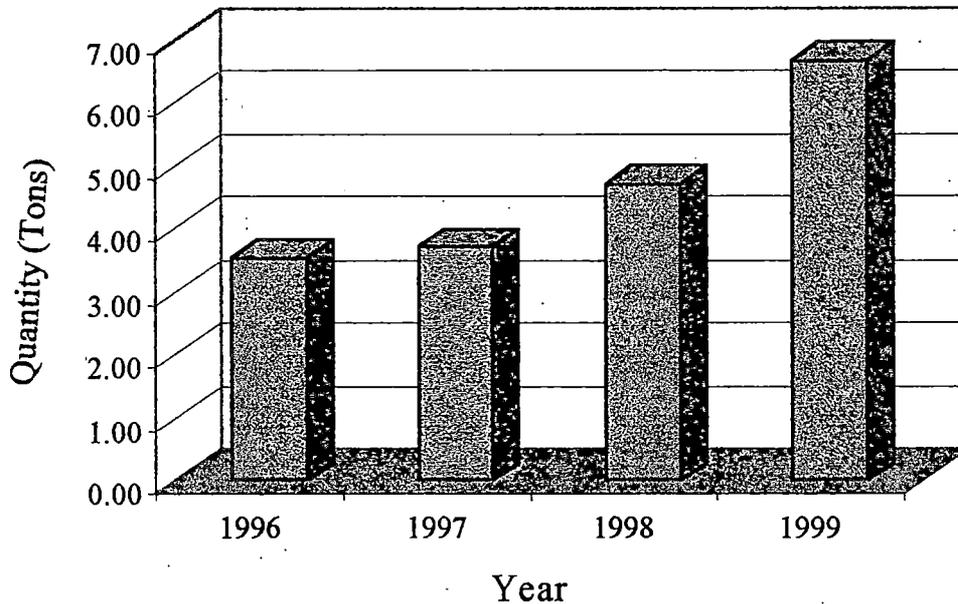
Table 2. Forms in which soybean is consumed at the household

Food type	Percent of farmer
Dawadawa	71.9
Koose	23.6
SoyMilk	3.4
Tubani	83.1
Porridge	47.2
Soup/grave	10.1
TZ	7.9

Source: SARI field data, 2000

It is significant to note that, the consumption of soybean at the household level rose from 3.6 tons in 1996 to 6.7 tons in 1999, nearly 100 percentage increase between 1996 to 1999 (Fig. 7). The implication of this revelation to household nutrition and food security in northern Ghana is phenomenal since the crop is not only cheap but more importantly rich in protein.

Fig. 7: Pattern in Soybean Consumption



2.6 Impact of soybean production on household income

In their ordinal ranking of the relative importance of major cash crops farmers ranked soybean first as the most important source of household income. Indeed, soybean provided the largest share of household income for majority of the respondents (61.8%). Increasing proportion of income accruing to women as a result of soybean production can have significant contribution to household food security status, health and welfare of children. Gender analysis reveal that 33.9% more women (85.7%) than men (61.8%) ranked soybean first as the important cash crop. The mean share of soybean in household income was 51.3% i.e., farmers earned more than half of their farm income from soybean. In particular, between 40-80% of farm income was derived from soybean

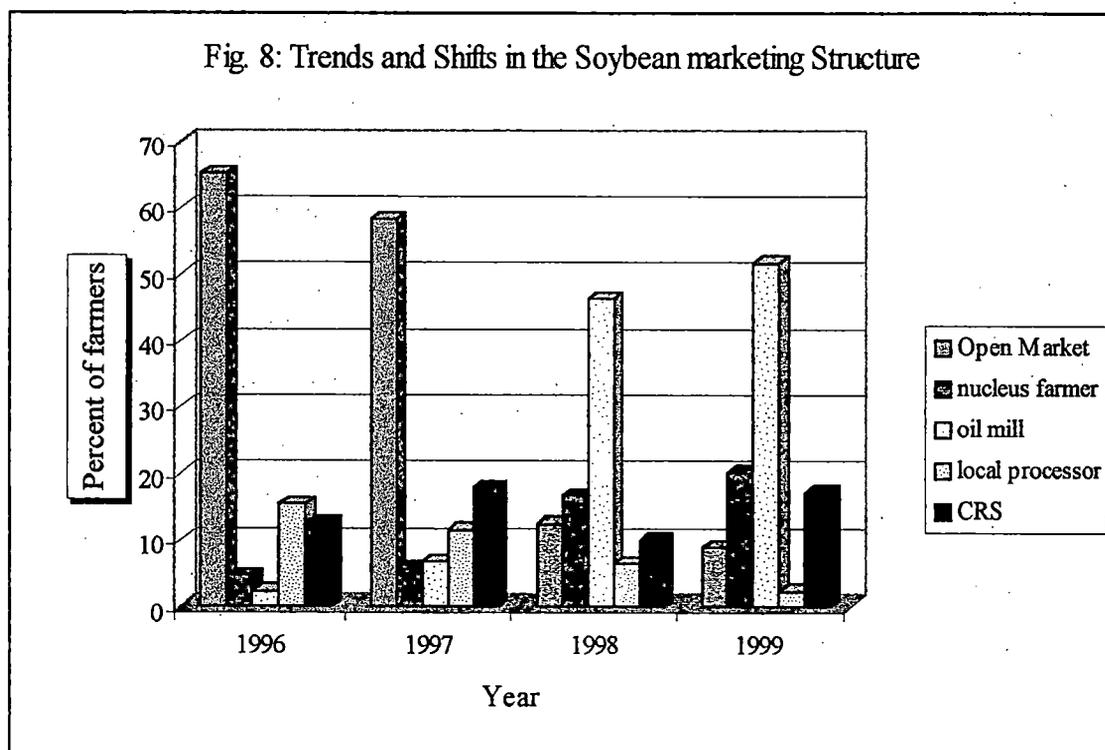
production. These revelations add to accumulated evidence in literature on the importance of soybean (see for instance, Kormawa, 1996; SARI, 1994). The study observes increasing empowerment of women through increased income generation from soybean production, which has enabled the women to improve upon their welfare and the welfare of their children.

2.7 Impact of soybean production on the welfare of farmers

Both Material Life Style (MLS) and Human Capital Investment (HCI) indices (Dewalt et al, 1990) were used to access the impact of the project on the welfare of the people. This analysis was based on the ownership of socially valued items that the households acquired using income from soybean since their participation in the project.

Table 3 below shows the proportion of household that acquired MLS and HCI items with soybean income. The study finds that household members were able to improve upon their material wellbeing and standards of living through the acquisition of items such as bicycles (24.7%) - a major means of transport in the study area, livestock (30%), and corrugated iron sheets for roofing houses (23.6%). It is clear from the results that women used most of their income to acquire HCI items for themselves and their children; paying school fees (38%) and purchasing clothing (57%), while 71% of women spend some of their income on social obligations such as contributions to funerals, wedding and child naming ceremonies and social development projects take up to . On the other hand 39.7% of men spend their soybean income on social obligations while 61% percent their soybean income on the paying school fees.

the study area. Figure 8 below presents the trends and shifts in the structure of the soybean marketing system over the period 1996 to 1999. The proportion of farmers who sell in the open market (to wholesalers/retailers in the local and urban markets) reduced from 65% in 1996 to just about 8.9% in 1999. On the other hand, the percent of farmers who sell to who sell directly or through associations to oil mills increased from merely 2 in 1996 to about 52 in 1999. The involvement of the nucleus farmer in marketing arrangement improved from 4.5% representation in 1996 to 20% in 1999. The involvement of the nucleus farmer in marketing arrangement improved from 4.5% representation in 1996 to 20% in 1999.



2.11. Institutional linkages

As observed earlier, the project aimed at establishing functional linkages between research, extension, farmers and industry that will help to promote the production and processing of soil been in northern Ghana. The study observed functional partnership (though not strong) between SARI and MoFA which has been facilitating transfer of technologies to farmers. Informal relationships between SARI and farmers exist mainly through farmer training programs (e.g., IPM field schools) and participation in on-farm trials.

cake for the poultry industry, although they are unable to meet the demand for the product. Even though the marketing channel and linkages in the soybean been market has not been properly identified, there are large, medium and small scale firms such as GAFCO, FAMINDUS, FATECO, TRINTO as well as multi-national companies like Lever Brothers and Nestle in southern Ghana which constitute a major industrial market for the crop in Ghana.

2.9. Marketing constraints

Soybean marketing has been one of the major production constraints inspite of the growing industrial demand for the crop. Limited utilization of the crop at the household level coupled with fact that farmers are poorly organized and for that matter lack functional linkages with industrial users of the crop have been identified as some of the limitations. Liquidity problems (especially with BOSBEL) limit the quantity of raw materials the company can hold at a time, therefore putting much pressure on farmers as they struggle to get market for their produce.

2.10. Interventions

One of the objectives of the project was to establish linkages among Research (SARI) - Extension (MoFA) - Farmers - Processors (Oil Mills, in particular, Bosbel). The intent was not only to extend improved soybean production technologies to the farmer but also to link the farmer to market sources. The project organized farmers into groups and associations and supported a nucleus farmer as means of fostering functional linkages with industry, especially BOSBEL vegetable oil mill.

In spite of occasional frustrations the linkages farmers had with BOSBEL and CRS for bulk purchasing of most of the grain has helped to improve upon soybean marketing in

Table 3. Contribution of Soybean income in the acquisition of welfare items in northern Ghana (percent of farmers)

	Men (n=66)	Women (n=23)	Total (n=89)	Sample
Material style of life items				
Bicycle	27.9	14.3	24.7	
Furniture	13.2	14.3	13.5	
Matresses	7.4	14.3	9.0	
Motor bike	4.4	0	2.2	
Cooking pot	1.5	14.3	4.5	
Radio	16.2	4.8	13.5	
Sewing machine	1.5	0	1.1	
Corrugated iron sheet	25.0	19.0	23.6	
Tractor	2.9	0	3.3	
Fencing wire	1.5	0	1.1	
Human Capital investment items				
School fees	61.8	38.1	56.2	
Medical expnses	17.6	0	16.9	
Clothes	38.2	57.1	42.7	
Marriage	17.6	16.9	0	
Purchased food	5.9	4.8	5.6	
Social obligations	39.7	71.4	47.2	

Source: SARI field data, 2000

2.8 Market potential

One of the major constraints of soybean production has been the lack of immediate market for the produce. Public effort to create domestic demand for the crop led to vigorous promotion on the utilization and incorporation of soybean in local diets. The stimulation of domestic consumption to some extent created market for domestic products such as dawadawa. Soybean purchasing by Non Governmental organizations for relief services and food aid has also expanded the market for the crop.

There is growing industrial use of soybean in Ghana because of the growing importance of soybean vegetable oil as well as soybean cake in the poultry industry. BOSBEL the largest vegetable oil mill in northern Ghana, has been the main industrial market for soybean in the study area. RAKTIA HOLDINGS Ltd also purchase soybean from northern Ghana to feed its vegetable oil mill in Kumasi. Both firms also produce soybean

Linkages between farmers, industry and NGOs (though not extensive and strong) were identified by the study. Table 4 presents a matrix of linkages and partnerships observed.

Table 4. Partnerships between farmers and stakeholders in soybean production

Partner	Role of played	Institutional arrangements
Farmer Associations	Organise farmers into groups to source production support and access markets	Have leadership roles and management controls
Nucleus farmer	<ul style="list-style-type: none"> • provision of certified seed • tractor services as well as extension services to outgrower farmers • assist in accessing market 	<ul style="list-style-type: none"> • Agreement contract with farmers on the mode of payment for services • sign supply agreement with BOSBEL and CRS
SARI	<ul style="list-style-type: none"> • Provision of breeder seeds • extension on improved soybean production practices • link farmers to marketing sources 	<ul style="list-style-type: none"> • Informal working relation with farmers • formal working relation with MoFA and NGOs
MoFA	<ul style="list-style-type: none"> • Production of foundation seed • extension on improved soybean production practices • link farmers to marketing sources 	<ul style="list-style-type: none"> • formal working relation with SARI and NGOs • Informal working relation with farmers
BOSBEL	<ul style="list-style-type: none"> • Facilitate production and processing of soybean • provide market of soybean grain 	<ul style="list-style-type: none"> • MOU with farmer associations and nucleus farmer for the purchase of grains • informal working relation with SARI and MoFA
CRS (NGO)	<ul style="list-style-type: none"> • inventory credit and financial assistance to farmers • purchase soybean grain 	<ul style="list-style-type: none"> • Agreement on modalities for repayment of credit • working relations with SARI and MoFA
MAID (NGO)	<ul style="list-style-type: none"> • Inventory credit • training in farm management practices 	<ul style="list-style-type: none"> • Informal working relation with farmers • formal working relation with sister NGOs, MoFA and SARI

Source: SARI field data, 2000

2.12. Potential for sustainability

The potential for sustainability of the project largely depends on the ability of the farmers to overcome major constraints to soybean production, namely; lack of labour, seed and unavailability of ready market. The study observed that already some farmers are making efforts towards becoming self-reliant in accessing inputs and becoming less dependent on the nucleus farmer for tractor services. Bullock ploughing for preparing soybean fields is becoming prominent. NGO involvement in the soybean industry is growing and assuring farmers of continuous assistance. Indeed, farmer associations are producing seeds for their members whilst collectively they rely on the linkages established with BOSBEL to market their grain. It must however be emphasized that the marketing linkage established so far is very weak and for that matter creates a lot of problems to farmers in times BOSBEL fails to honour its parts of the agreement. More functional and extensive linkages with other market source are required to ensure the sustainability of the project.

2.13. Conclusion

This report assessed the impact of the vegetable oil production and processing project on the household economy in northern Ghana. The study examined the importance of soybean in the cropping systems of the study area. The analysis showed that soybean is ranked as a major cash crop cultivated by both men and women. This is manifested in the expansion in area cultivated over the past few years. Indeed, the study showed increasing production, utilization and marketing of soybean over the project period. The observed expansion in soybean production gives credence to the fact that resource-poor farmers are constantly in search of new opportunities to diversify their income sources and to improve their wellbeing (Inaizumi et al, 1999).

The study provides evidence that soybean production has had positive impact on the income of farmers, accounting for over 50% of household income, in particular, over the project period. The major constraints to soybean production that were identified were lack of improved seeds, lack of labour and unavailability of ready market. The intervention of the project through its linkages with BOSBEL drastically improved

soybean marketing in northern Ghana. This was manifested in rapid increase in industrial purchasing of the grain. However, linkages so far established were found to be weak and not extensive enough to ensure the sustainability of the project.

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Appendix

Farmer Group/Assoc	No	Total acreage	Total Production (100kg/bag)
Tiyumtaba soybean project (Nucleus farmer)			
1. Tuyim	16	6.4	4.8 ton
2. Nyingali	46	18.4	15.2 ton
3. Shellouyili	20	8	10.0 ton
4. Kpatinga	26	10.4	7.2 ton
5. Bulugu	21	8.4	5.0ton
6. Katung	28	11.2	9.3 ton
7. Nagagu	40	16	9.6 ton
8. Suglokonbo	13	5.2	6.5 ton
9. Yapalsifong	15	6	7.5 ton
10. Nyebbiyoda	23	9.2	11.5 ton
11. Kpangmang	21	8.4	3.5 ton
12. Pishigu	32	12.8	2.95 ton
TOTAL	301	120.4	93.05ton
	10	6	4.55 ton
GRAND TOTAL	311	126.4	97.6 ton

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