THE ROLE OF SASAKAWA GLOBAL 2000 PROJECT CREDIT SYSTEM IN THE ADOPTION OF IMPROVED WHEAT TECHNOLOGIES BY SMALLHOLDER FARMERS IN ETHIOPIA: THE CASE OF HETOSA DISTRICT

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ABSTRACT

The general objective of this study was to examine the role of SG-2000 project credit system in the adoption of improved wheat technologies by smallholder farmers in Hetosa District. The specific objectives of the study were: (i) to identify wheat technologies that have been adopted as a result of the credit system, (ii) to assess the effect of credit system on the adoption of wheat technologies, and (iii) to assess farmers' and extension agents' perceptions on the SG-2000 credit system.

The design of this study was a cross-sectional survey, which involved collecting data at one point in time from a selected sample of respondents. Data were collected using an interview schedule and a questionnaire supported by personal observation, informal discussion and informal interviews with key informants. A simple random sample of 50 and 60 respondents was picked from SG-2000 and non-SG-2000 farmers respectively (using a table of random numbers) to form a sample size of 110 respondents.

The results (of this study) show that wheat technologies such as wheat varieties kubsa and wabe; proper land preparation; DAP and urea fertilizers; and 2,4-D (U-46) herbicide were adopted by the majority of farmers. Out of these adopted wheat technologies, urea fertilizer and 2,4-D (U-46) herbicide were adopted by smallholder farmers as a result of SG-2000 credit system.

The analysis of the data revealed that the SG-2000 credit system had a significant effect on the adherence to recommended rates of wheat technologies (DAP and urea fertilizers and 2,4-D or U-46 herbicide), on the use (expansion) of urea fertilizer and 2,4-D

herbicide and on the wheat yields per hectare. The results of Chi-square statistical test for relationship between the involvement in SG-2000 credit system and the following: (a) the adoption of the recommended rates of fertilizers (DAP and UREA), and herbicide (2,4-D or U-46); (b) percentage of wheat area in which urea fertilizer and 2,4-D herbicide were applied in relation to farmers total wheat land; and (c) wheat yield per hectare were found to be statistically significant.

Farmers perceptions on SG-2000 credit system were that: SG 2000 credit system is effective in making of credit inputs (like improved seeds, fertilizers and herbicides) available on time, provides regular supervision, has less bureaucratic procedures for credit provision, and helpful in adoption of wheat technologies. However, farmers were not happy with the inflexibility of SG-2000 in some of the conditions (such as amount of down payment, size of EMTP) for obtaining credit. It was found out that the down payment conditions put forward by SG-2000 only favoured well-to-do farmers and not poor ones. Hence this enhances the equity gap.

The extension workers' perception on SG-2000 credit system indicated that the credit system assisted farmers in the adoption of wheat technologies. However, the following were found to be the weaknesses of the SG-2000 credit system: involvement of extension workers in input distribution and credit repayment collection, lack of regular training for extension workers, low involvement of relatively poor farmers and lack of specific recommendations for wheat technologies (eg urea fertilizer) for various locations.

Recommendations pertaining to this study are provided in chapter five.

DECLARATION

I, Kedir Bati Jibba, do hereby declare to the Senate of Sokoine University of Agriculture that the work presented here is my own creation, and has not been submitted for a degree award in any other University.

Signature 

Date 09-10-99

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To my parents, Bati Jibba and Subbo Kalu, who laid the foundation for my education.

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ADLI	=	Agricultural Development-Led Industrialization
AIDB	=	Agricultural and Industrial Development Bank
AISCO	=	Agricultural Input Supply Corporation
CADU	=	Chilalo Agricultural Development Unit
CBE	=	Commercial Bank of Ethiopia
CIMMYT	=	International Maize and Wheat Improvement Centre-Mexico
CSA	=	Central Statistics Authority
DA	=	Development Agent
DAP	=	Di-Ammonium Phosphate
DBE	=	Development Bank of Ethiopia
D&T	=	Digalu and Tijo
EIC	=	Ethiopian Investment Corporation
EMTP	=	Extension Management Training Plot
EPID	=	Extension Project Implementation Department
FAO	=	Food and Agricultural Organization
FDRE	=	Federal Democratic Republic of Ethiopia
GDP	=	Gross Domestic Product
IAR	=	Institute of Agricultural Research
IBE	=	Investment Bank of Ethiopia
L&M	=	Lemu and Bilbilo
masl	=	meter(s) above sea level
MOA	=	Ministry of Agriculture
MPP	=	Minimum Package Project

NBE	=	National Bank of Ethiopia
NEPP	=	National Extension Package Programme
PA	=	Peasant Association
PC	=	Producer Cooperative
RDC	=	Rural Development Centre
SAA	=	Sasakawa African Association
SAFE	=	Sasakawa African Fellowship for Extension Education
SBE	=	State Bank of Ethiopia
SC	=	Service Cooperative
SG-2000	=	Sasakawa Global 2000
SMS	=	Subject Matter Specialist
SUA	=	Sokoine University of Agriculture
T&V	=	Training and Visit
WADU	=	Wolaita Agricultural Development Unit
VEW	=	Village Extension Worker
ZAO	=	Zonal Agricultural Office

CHAPTER ONE

INTRODUCTION

1.1 Background Information

Agriculture is the mainstay of the Ethiopian national economy, accounting for 51% of Gross Domestic Product (GDP) and employs about 85% of the population (SG-2000, 1995; DBE, 1996). From the country's land area of 1.115 million square kilometers, 66% is considered potentially suitable for agricultural production, while the current cultivated land accounts for only 14.8% of the total area (Taketel, 1996). The agricultural sector is mainly dominated by smallholder farmers who occupy 96% of the total land, producing about 95% of all cereals, pulses, and oilseeds (Taketel, 1996; CSA, 1997).

Cereal production's share is about 84% of the total cultivated land and 70% of the caloric intake of the Ethiopian population (Quinones and Takele, 1996; CSA, 1997). The most important cereal crops are tef, maize, barley, sorghum, and wheat.

Wheat is an important crop to Ethiopia. In sub-Saharan Africa, Ethiopia is second to South Africa in terms of wheat area and production. In Ethiopia, wheat ranks fourth in total crop area and production covering around 882,000 hectares each year (Sarah and Gemechu, 1996; CSA, 1997). Wheat is grown on about 11% of total cropped area at national level and it extends to as much as 45% in such zones as Arsi, some parts of East Shewa and Bale which are most conducive to wheat production.

In Ethiopia, the smallholder sector contributes 76% of total wheat production. Currently, wheat area and production are increasing because of its significance as a cash crop and its role in supplying the dietary requirements of smallholder farmers in wheat zones like Arsi, shewa and Bale (Asefa, et al. 1996; CSA, 1997). In Arsi zone, wheat occupies up to 45% of the crop land and serves both as staple food and cash crop. Arsi zone alone accounts for 25% of the total wheat area and 36% of total wheat production of the country (CSA, 1997; ZAO, 1997).

Although Ethiopia is one of the largest wheat producing countries in Africa, productivity of wheat in Ethiopia is low compared to other wheat producing countries. For instance, on average the national wheat yields stand at 1.2 tones per hectare. These yields are 24% below average African yields and 48% below average world yields. When compared with other countries in Sub-saharan Africa, Ethiopia is ranked 15th in terms of crop yields (FAO, 1994; Sarah and Gemechu, 1996; CSA, 1997).

Wheat production in Ethiopia is faced with many constraints which have contributed to its low productivity. Some of these constraints include unfavourable climate, poor husbandry practices, lack and high costs of inputs, and credit mechanisms are yet to be put in place on a formal and sustainable manner (Quinones and Takele, 1996). Farmers continue to use very low fertilizer rates which are estimated to be an average of seven kilograms of nutrients per hectare, and this is well below the African average use of nutrients, which is about 22 kilograms of nutrients per hectare. In addition, only two percent of Ethiopian farmers use improved seeds of cereals crop. This is due to unavailability of improved seeds in types and quantity demanded by farmers. In

addition, improved seeds are too expensive to be afforded by smallholder farmers (Mulugeta, 1994).

On the other hand, population growth has resulted in widening the gap between production and consumption. While the growth of the agricultural sector is, on average, estimated to be 1.2% per year, the population growth rate stands at 2.7% (FAO, 1995). This shows that food production in general is not keeping pace with population growth.

Prior to the 1950s Ethiopia used to be a net exporter of grains, most of which was wheat. Since 1957 it became a net importer of grains (FAO, 1987). At present, the country's domestic production has failed to meet food requirements to the extent that it has to rely on imports and food aid. For instance, the Newsletter of the Sasakawa African Association (SAA) of April, 1998 reported that Ethiopia's 1997/98 main harvest of cereals and pulses was 25% below previous year estimate figures. The country's total grain import requirements for 1998 was about 530 000 tonnes. The grain import includes 420 000 tonnes of food aid relief to 5.3 million rural people who were affected by poor harvests and structural poverty. According to the Newsletter, the rest of the shortfall is expected to be covered by commercial imports (SAA,1998). However, reliance on food aid from donors is not sustainable, as commercial food imports require large sums of foreign exchange, which the country cannot afford. In that regard, there appears to be a need for increasing production through productivity improvements.

The productivity improvement of wheat demands the application of modern production

technologies. However, the new technology requires resources which the smallholder farmers cannot afford (Perez, 1988). Recognizing the need for making farmers get access to resources which are essential for the adoption of improved agricultural technologies, the Sasakawa Global-2000 (SG-2000) agricultural project was started in Ethiopia in 1993.

1.1.1 An overview of the Sasakawa Global 2000 Project

SG-2000 agricultural projects in Africa, is a joint venture of two international, non-profit, private organizations committed to promote agricultural and rural development in food deficit countries south of the Sahara. The two organizations are the Sasakawa Africa Association (SAA) and the Global 2000 programme (SG-2000, 1996). SAA, whose President is Nobel Peace Prize Laureate Dr. Norman E. Borlaug, was registered as a non profit, tax-exempt organization in Geneva in 1986. SAA serves as the lead management organization for agricultural projects in Africa. Global 2000, whose chairman is former U.S. President Jimmy Carter, was also established in 1986. Global-2000 works alongside African leaders in identifying and shaping government policies that are critical for promoting and sustaining economic development, health, education, and particularly, agricultural development. The SG-2000 programme established its first food crop technology transfer projects in Ghana, Sudan, and Zambia in 1986. Currently, projects operate in Benin, Burkina Faso, Ghana, Guinea, Mali, Mozambique, Nigeria, Tanzania, Togo, Uganda, Eritrea and Ethiopia (SG-2000, 1996; Breth, 1998).

SG-2000 project in Ethiopia started its operation in April, 1993 with a similar mission

and objectives like those SG-2000 projects found elsewhere in Africa (Quinones and Takele, 1996). Specifically, one of major areas of the work undertaken by SG-2000 in Ethiopia in discharging its mandate has been in sponsoring the establishment of large size (usually one half of a hectare) food crop production plots on farmers' fields. These plots are known as Extension Management Training Plots (EMTPs) and are used for the purpose of disseminating improved production technologies on food grain crops amongst smallholder farmers. These demonstration plots are managed by participating farmers themselves with the back stopping from MOA field level extension workers. The project supplies each EMTP participant with the necessary inputs, mainly fertilizers, improved seeds, and herbicides to cover one half a hectare. Participants are supposed to pay back at the end of the farming season after harvesting.

1.1.2 The Sasakawa Global 2000 credit system

In Ethiopia, a project-based credit programme for the introduction of agricultural technological packages, through the extension workers, was started for the first time in 1968 by Chilalo Agricultural Development Unit (CADU) (Cohen, 1987). However, an assessment that was made indicated that management of such credit was found difficult by extension workers (Cohen, 1987). The extension workers were spending up to 50% of their time facilitating the provision and collection of credit and this limited their time for formal extension activities. The credit system also brought a negative impact on the nature of trust that must exist between the extension workers and farmers (Cohen, 1987). Recognizing the effects of this credit, CADU, in 1973 transferred the credit provision function to the marketing and cooperative unit (Cohen, 1987). In that case,

extension workers were responsible for only dissemination of technologies, while marketing agents were responsible for input distribution and credit activities. Credit activities include: issuing of the loan application forms to farmers, collection of the completed loan application forms, distribution of inputs, and repayment collection of loan. Later on, it was found that there was a poor coordination and collaboration between extension workers and marketing agents (Waktola, 1980). In addition, it was unaffordable for the Ethiopian government in terms of manpower requirement. In view of this, credit advancement and collection was made under farmers service cooperatives. The extension workers continued to be involved in input distribution, and this process has continued to-date alongside with SG-2000 credit system for technology transfer although the extension workers were not interested in these tasks.

Under SG-2000 credit system, the credit facility that is extended to farmers is supervised jointly by the extension experts (at the district and zonal levels) and the field extension workers. For effective supervision of the farmers, the project provides extension workers in the project area with transport (that is, motor cycles for each supervisor and bicycles for each field extension worker).

The selection of participating farmers is done by field extension workers in collaboration with their supervisors. The participation of farmers in the EMTPs is on a voluntary basis. Farmers discuss and agree on the conditions of participation which usually involve agreement on the part of farmers to follow application of the recommended type and amount of production inputs followed by proper cultural practices. In addition, farmers are requested to make a down payment of 25 to 50

percent of the total input costs at the time of receiving the inputs. The philosophy behind partial cash down payments is that in addition to enhancing self-reliance, it induces farmers to pay more attention to the implementation of the technological packages in order to reduce risks (Quinones and Takele, 1996).

1.1.3 The SG-2000 achievements

The field programme of SG-2000 project started its activities in Ethiopia in 1993 in two regional states namely, Oromiya and Southern Nations Nationalities and peoples' (SNNPR) Regional states, with 161 farmers. In 1995 it extended to four regions with 3185 farmers. Thereafter, the number of participating farmers was reduced (Table 1-a) because: (i) the SG-2000 adopted a strict policy that limits the number of EMTPs per a given project village to a number that will trigger a rapid adoption rate within that community, thereby, avoiding the establishment of unnecessarily high number of demonstration plots (SG-2000, 1996); and (ii) the government of Ethiopia took the initiative to run the programme on its own by launching the National Extension Package Programme (NEPP). In view of this, SG-2000 project decided to focus on supporting the government in training the government extension workers for the implementation of NEPP. NEPP is operating in the same way like that of SG-2000 credit system (Habtemariam, 1997). The crops that were given attention under the SG-2000 Project, at the beginning were maize and wheat with the number of participating farmers being 98 and 63 respectively. In 1995 the programme grew nearly twenty fold in 77 districts of the country. In addition to maize and wheat, tef and sorghum were included.

The SG-2000 yield assessment over the past project life indicated that the average yield of crops from EMTPs were much better than those from traditional farmers' plots. According to the report on EMTPs grain yields at the national level, an average of 5.7 tonnes maize and 2.15 tonnes wheat yields per hectare were obtained from EMTPs and those were 189% and 145% higher than those from traditional farmers' plots respectively (SG-2000, 1996). Average yields of maize and wheat from traditional farmers' plots are 1.8 and 0.8 tonnes/ha respectively.

Table 1(a) Number of SG-2000 and NEPP sponsored EMTPs (credit participants) by year (1993-97).

Participants	Year				
	1993	1994	1995	1996	1997
Total farmers involved					
SG-2000	161	1 482	3 185	2 048	1 538
NEPP	-	-	35 000	350 000	756 608

Source: SG-2000 annual reports (1994-97) and MOA annual reports (1995-97).

Table 1 (b) Distribution of farmers involved in NEPP according to types of package programmes for 1997 crop season.

Activities	Food crops							Cash crop	Livestock	Other	Grand total
	tef	wheat	maize	barley	Sorghum	Other	Total				
Total numbers of farmers involved	212452	172164	118805	33544	25548	21830	584343	22503	21511	128251	756608
Percentage Share of food crop	36.4	29.5	20.3	5.7	4.4	3.7	100	-	-	-	-
Percentage share of total NEPP	28	22.8	15.7	4.4	3.4	2.9	77.2		2.8	17	100

Source: MOA annual NEPP performance report of 1997.

The successful results of SG-2000 project made the government of Ethiopia to launch a national programme with the aim of reaching as many farmers as possible in a relatively short period of time (Habtemariam, 1997). In 1995, the government launched a National Extension Package Programme (NEPP) in seven regions, made up of 38 zones and 229 districts (Teketel, 1996). The Government modified the programme content to suit its interests. Besides putting emphasis on cereal package, it also focused on post harvest, livestock and high economic value crops (Table 1-b). In 1997, the number of farmers reached by NEPP was doubled (from 350 000 farmers in 1996 to 756 000 farmers in 1997). Currently, Ethiopian government has publicly declared that it is aiming at reaching at least two million farmers by the year 1998 through the national extension programme (SAA, 1998).

1.2 Problem statement

In spite of the efforts made by national and international development organizations, the problem of technology adoption by smallholder farmers in developing countries is still a major concern. Among reasons pointed out for low adoption of agricultural technologies are: (a) farmers are conservative (Adams, 1990); (b) lack of understanding of farmers' problems and conditions (Wambura, 1988; Mulugetta et al. 1992); (c) economic constraints such as high cash and labour demand of new agricultural technologies and inadequate returns to investment (Perez, 1988; Wambura, 1988); and (d) Lack of formal and sustainable credit systems to facilitate the adoption agricultural technologies by resource poor smallholder farmers (Quinones and Takele, 1996). As a result, the agricultural sector of sub-Saharan African countries, including Ethiopia, has performed poorly due the failure of smallholder farmers to use improved agricultural

technologies and practices.

In Ethiopia, the post-1974 efforts to bring about development by concentrating on large-scale state farms and cooperatives, totally neglecting and often harassing smallholder farmers proved to be a failure. This is because the improved agricultural technologies were often not used by smallholder farmers, who own the large proportion of cultivated land of the country, due to high cash requirements. Adoption of improved agricultural technologies imply greater operating expenses which in turn puts additional strain on the smallholder farmers' financial or labour budget (Anderson, 1994). Income for Ethiopian smallholder farmers is very low, hence savings are almost negligible. Credit is thus a key requirement in the development of agriculture. Agricultural Credit not only remove the financial bottleneck but also provide an incentive to farmers to adopt improved agricultural technology packages that would otherwise be more slowly adopted (Gebrehiwot, 1992).

In view of the above, the SG-2000 agricultural project and the government of Ethiopia are promoting the SG-2000 credit system to facilitate the adoption of improved agricultural technology packages by smallholder farmers. Although the government has decided to abide with SG-2000 credit system, there is no study which has investigated its performance in relation to adoption of wheat technologies by smallholder farmers in Ethiopia. Therefore, the study envisaged is an initial effort to examine the role of SG-2000 credit system in facilitating the adoption of wheat technologies by smallholder farmers in Hetosa district.

1.4 Objectives of the Study

1.4.1 General Objective

The general objective of this study was to examine the role of SG- 2000 project credit system in the adoption of improved wheat technologies by smallholder farmers in Hetosa District.

1.4.2 Specific objectives

The specific objectives for this study were to

(i) identify wheat technologies that have been adopted as a result of the credit system.

(ii) assess the effect of credit system on the adoption of wheat technologies.

(iii) assess farmers and extension workers' perception on the SG-2000 credit system.

1.5 Definition of Terms

The following terms which are used frequently in the text are defined here to provide a common basis of understanding.

1.5.1 Smallholder farmer

Any adult who is involved in small scale farming or agricultural production. He/she usually cultivates an area of land that varies consistently from 0.5 to 5 hectares and the predominant production resources consist mainly of land and family labour.

1.5.2 Peasant Associations (PAs)

PAs are defined as farmer organizations which cover an area of 800 and more hectares. It is the first stage in the local government administration structure. It caters the functions of giving credit services to members in terms of inputs distribution and repayment collection in places where there are no farmer service cooperatives.

1.5.3 Rural Development Center (RDC)

RDC is the first level of organizational structure of the Ministry of Agriculture. It is in most cases located in rural areas, where one or more village extension workers is or are assigned. It covers three to five PAs.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section reviews the literature pertinent to this study and covers such sections as adoption of wheat technologies by small holder farmers, the history of the agricultural credit and credit policy/strategy in Ethiopia and concludes by examining the role of agricultural credit in the adoption of agricultural technologies.

2.2 Adoption of Wheat Technologies in Ethiopia

2.2.1 Wheat research

For about two million years, people have sustained themselves by collecting food from the wild, such as fruits and roots, and by hunting and fishing (Briggle, 1980). Perhaps ten thousand years ago, during the Neolithic period, the Neolithic women deliberately preserved seed from the previous crop generation and sowed it to produce the following crop. According to Briggle (1980), wheat was the first crop to be domesticated somewhere in the Mesopotamia on what is now called Iraq.

In Ethiopia, wheat has been grown since ancient times (Choudhri, 1987). The highlands occupying the center of the country have favourable temperatures and adequate rainfall, as well as fertile soils suitable for wheat production. The two major wheat species grown in Ethiopia are duram wheat (*Triticum durum L.*) and bread wheat (*Triticum aestivum L.*). While bread wheat is regarded as an exotic crop, durum is indigenous. Ethiopia is considered one of the centres of genetic diversity (Tesfaye and Jamal, 1982; Hailu and Bekele, 1985; Hailu, 1991; Solomon et al. 1995). Bread wheat was probably

introduced by the Portuguese and Italians although the exact period of introduction is unknown (Hailu, 1991). Wheat research in Ethiopia can be categorized as follows:

(a) Prior to 1930, wheat research dealt mainly with scientific expeditions, germplasm collection, identification and characterization

(b) The period between 1930 and 1952 focused on the collection and evaluation of indigenous wheat and the introduction of exotic germplasm for testing under local conditions. During this period, several wheat varieties which were introduced from Europe yielded satisfactorily until they succumbed to diseases (Hailu, 1991). A formal wheat improvement programme started in 1949 at the Paradiso government station near Asmara with the testing of large numbers of indigenous and exotic varieties

(c) During the period between 1953 and 1966 wheat research was extended to such areas as DebreZeit, Alemaya and Kulumsa

(d) During the Period between 1967 and 1998 the Institute of Agricultural Research established in 1966 was followed by the creation of several other research and development institutions, resulting in an effectively organized national wheat research programme. The priorities given by IAR for wheat research emphasized increased wheat production by concentrating on improved varieties with a package of cultural practices (Hailu, 1991).

Achievements in wheat research are numerous. In this review, only major research outputs and those currently in use are addressed. The total number of bread wheat varieties released so far in Ethiopia are 42 (IAR, 1997). Some wheat varieties currently under production, with year of release in brackets are as follows: Dereselign (1974);

K6290 Bulk (1977); K6295-4A (1977); ET-13 A2 (1980); Pavon 76 (1982); Enkoy (1974); Dashen (1984); Batu (1984); Mitikie (1993); Wabe (1994); Kubsa (1994); Galama (1995); Abola (1997); Magal (1997); and Tusie (1997) (IAR, 1996 and IAR, 1997).

2.2.2 Technology transfer for wheat production

The term "*technology transfer*" generally refers to the process by which technology produced or generated in one place becomes directly implemented in another (Anderson, 1994). This form can be considered to be a direct transfer. For agriculture, it is well documented that this direct transfer is impaired by differences in edaphic, climatic, economic and policy-regime conditions (Anderson, 1994).

The adoption of improved technologies is strongly influenced by the policy environment like input supply, markets, credit and price policies. Likewise, the use of improved technology information is influenced by the effectiveness of extension services and other communications media, as well as farmers' educational level (Anderson, 1994; Rogers, 1995; Van den Ban and Hawkins, 1996).

The history of agricultural extension in Ethiopia can be traced back to 1908, when Emperor Menelik II issued a decree to establish the Ministry of Agriculture (Hiruy, 1986). However, up to the 1950s, there was no formal national extension programme in the country. With the revision of the country's constitution in 1951 and with the establishment of the Alemaya College of Agriculture in 1953 (Tennasie, 1985; MOA, 1989), a formal extension service was started as one of the functions of the college.

In 1963, extension responsibility was transferred from Alemaya to the MOA (MOA, 1989); during this period, on farm fertilizer trials and wheat varieties (Kenya 1 and Kenya 2) demonstrations were conducted throughout the country with the assistance of FAO (MOA, 1989). However, lack of new technologies and weak linkages between research and extension hampered technology transfer activities (Adugna, *et al.* 1991).

In 1967, comprehensive integrated package projects like the Chilalo Agricultural Development Unit (CADU) and the Wolaita Agricultural Development Unit (WADU) were launched in Arsi and Sidamo zones (Adugna, *et al.* 1991). Later, the projects were found to be too expensive in terms of finance and manpower and could not be duplicated in other areas of the country (Waktola, 1980; Tennasie, 1985; Solomon, 1988; MOA, 1989). In addition, donors were not willing to assist such development approaches as recurrent costs were markedly higher than in other regions and the size of the country was big (Axin, 1985; Adams, 1990; Gizaw, 1992).

After reviewing the comprehensive packages, the Minimum Package Project I (MPP I) was launched in 1976, under the Extension Project Implementation Department (EPID) in 14 highland provinces (Cohen, 1987). The package comprised limited extension components like inputs, credit and extension advice. The then existing land tenure system was, however, not friendly to farmers and hence, could not benefit from the project. This was because the monarchy government tenure system had concentrated land in the hands of a powerful provincial elite and a local government system supportive of elite interests. The central government was unwilling to commit itself to economic policies and agrarian reforms supportive of smallholder agriculture (Cohen,

1987). The project was found to widen the equity gap between farmers near the road and those far from it (Tennasie, 1985; Solomon, 1988; Adam, 1990).

The MPP I was replaced by the MPP II in 1980 and was to serve farmers by making Peasant Associations the local link with the extension project, and by distributing inputs and credit (Adugna, *et al.* 1991). The MPP II extension message included recommendations on the use of improved ox-drawn equipment and cultivation practices, as well as the use of high-yielding wheat varieties and fertilizer (Gizaw and Amare, 1992). However, the narrow basis of the programme involved a high degree of risk, especially when the price of fertilizers increased. After two or three years of operation, it was found that the recommendations on fertilizer were unsuitable in some MPP II areas. Further, the immense diversity of the rural environments could not be ordered for the purpose of delivering a uniform package (Adam, 1990). An appropriate technology, competent extension personnel, farm inputs from commercial suppliers and favourable prices for produce were not so easy to be assembled and coordinated in a package for smallholder farmers in MPP II (Adam, 1990 and Gizaw and Amare, 1992). Thus, MPP II was officially terminated in 1985 and this led to the introduction of Training and Visit (T& V) extension approach.

The training and visit approach of agricultural extension was developed for the World Bank by Daniel Benor (Benor and Baxter, 1984), the former director of the Israel extension service (Roberts, 1989). The methodology was first tested in Turkey and later adopted widely in India and Southeast Asia, where it proved to enhance the effectiveness of the agricultural extension (Van den Ban and Hawkins, 1996; Roberts,

1989). In essence, the T&V approach involves an application of classic management principles to the field of agricultural extension to improve the performance of extension service. These principles include: (a) clear reporting lines; (b) allocation of work by functions; (c) attention to spans of control; (d) regularized training sessions; and (e) a scheduled cycle of field visits by supervisors (Moris, 1987).

The T&V extension approach was initiated as a pilot project in 1983, with the assistance of the World Bank, aiming at improving the existing extension service. The approach emphasized regular visits by the development agents (DAs) to contact farmers, monthly training of DAs by subject-matter specialists (SMSs), and every three months contact of SMSs with researchers for seasonal training (Adugna, et al. 1991). The extension workers were expected to teach a package of recommendations to contact farmers who would, in turn, pass on this information to non-contact farmers. Inputs and credit were to be provided to farmers by non-extension agencies to make them to adopt the recommendations. However, the T&V approach could not be implemented under the Ethiopian conditions and thus failed to achieve the objectives it had set. This is because the assumptions underlying the T&V approach (such as strong linkage among the research, extension, input supply and farmers) were, under Ethiopian conditions, found to be weak (SG-2000, 1995). As a result an attempt was made to modify some of the principles of the approach to suit the Ethiopian conditions. Some of the modifications include: the number of farmers to be served by one extension worker was increased from 800 (original T&V system) to 1300, the extension workers continued to handle non-extension activities, and training of extension workers by SMS was made once per month instead of two times a month. This modified T&V approach

also failed to bring changes in as far as the effectiveness of extension system is concerned, because most of the principles under which the approach is expected to be effective were not fully implemented. Hence the T&V approach was terminated in 1994. In short, the T&V was found to be inefficient in facilitating the adoption of technologies by farmers under Ethiopian conditions (SG-2000, 1995).

In 1993, SG-2000 project extension approach was initiated to strengthen the capacity of the extension services for effective dissemination of proven, research-led technologies to smallholder farmers. Also, it wanted to invigorate the linkages between research and extension in order to streamline the process of technology generation and dissemination (Quinones and Takele, 1996). Since 1995 the government of Ethiopia took the initiative to run the SG-2000 approach on its own and launched the National Extension Package programme (NEPP) (Habtemariam, 1997). The element of NEPP include:

(a) Technical package;

(b) Credit;

(c) Communication methods; and

(d) Availability of technologies.

In summary, this section has reviewed the process of technology generation and dissemination to farmers in Ethiopia. From the review it is clear that Ethiopia has implemented various extension approaches to enhance the dissemination and adoption of wheat technologies since the establishment of formal agricultural extension programme in 1953. Some of these approaches include: the comprehensive integrated package; the minimum package (MPP-I&II); the T&V approach; and the SG-2000

approaches. According to the review it can be concluded that past approaches have failed to bring the expected improvements in the utilization of wheat technologies. Some of the reasons are: lack of understanding of the farmers and country's conditions, incompatibility of the approaches, unaffordability of the proposed packages, focus on the well-to-do farmers, and neglect of the resource poor farmers who are the majority.

2.2.3 Adoption of wheat technologies by small holder

Van den Ban and Hawkins (1996) define adoption of technologies as "decisions to apply an innovation and to continue to use it." Adoption is not a sudden event, but a process (Adam, 1990). The adoption process refers to changes that take place within an individual with regard to an innovation from the moment that he/she first becomes aware of the innovation to the final decision to use it or not (Van den Ban and Hawkins, 1996).

The continued slow pace of technical change in African food production, is a concern of donors as well as international and African research institutions (Anderson, 1994). In many areas of Africa appropriate technologies are becoming available, but adoption has been slow or has not been sustained (Byerlee and Heisey, 1993). There is a growing evidence that a major factor explaining low adoption of improved crop management technology in Africa is the lack of appropriate institutional and policy support (Eicher, 1985; Sanders, 1989; World Bank, 1990).

Wheat technology demonstrations have been conducted in Ethiopia since 1958

(Adugna, *et al.* 1991). In the earlier period (1958-60), the Debre-Zeit research centre demonstrated improved wheat varieties Kenya 1 and Kenya 5 to farmers in Ada and Akaki. Later demonstrations were conducted by CADU in Arsi Region (Gentry, 1963). In 1968, the bread wheat cultivar *Laketch* was recommended for demonstration in many wheat growing regions of the country. During the early 1970s, several improved wheat varieties such as Romany BC, Momba, Arendato, Marou and Dereselign were demonstrated to farmers in Arsi, Shewa, Gojam and Gonder regions (Adugna, *et al.* 1991). However, the results of these demonstrations and the rate of varietal dissemination and adoption were not compiled in report form and hence, they cannot be traced.

Adoption studies in selected wheat producing regions indicated that the pace of varietal adoption is faster than that for chemical and mechanical technologies (IAR, 1997). For example, an early study of adoption and diffusion of agricultural technologies in Chilalo, part of Arsi, in the 1980s showed that wheat varieties called *Laketch, Supremo* and *Romany* were adopted by 69, 45 and 40% of the respondents, respectively (Waktola, 1980). Ten years later, another adoption study of bread wheat technologies in Wolmera and Addis Alem areas, central part of Ethiopia, indicated that more than 90% of host and 55% of non-host farmers planted the improved varieties. More than 80 and 40% of both groups applied fertilizer (DAP) and Herbicide respectively although no farmer applied the recommended rate (Hailu and Chilot, 1992). The major reasons pointed out for not applying the recommended rates of DAP fertilizer and herbicides were unavailability, high costs of inputs and failure to make them available to farmers on time. Similarly, recent studies (Mulugeta, 1994) have indicated that all sampled

farmers planted improved wheat varieties, while 87% and 20% of the respondents reported using fertilizer and herbicides respectively.

The results of different adoption studies (Gentry, 1963; Waktola, 1980; Hailu and Chilot, 1992; Mulugeta, 1994) indicated that farmers were adopting portions of the improved wheat packages. The main reasons for not adopting the entire package were unavailability and high costs of inputs (seed, fertilizer and herbicide) and poor extension services, especially follow-ups (Hailu and Chilot, 1992). In addition, despite the fact that most of the bread wheat varieties currently under production have been released from research stations after several years of testing, most of varieties are susceptible to one or more diseases. Wheat diseases have been a major concern throughout the history of wheat production. Many of the disease-producing micro-organisms are as old as the wheat plant and have evolved parallel to the evolution of wheat genus (Quinones and Takele, 1996). The most important diseases of wheat are rusts, smut and mildews.

In short, one can say that wheat technology demonstrations have been conducted in Ethiopia since 1958. The trends of the rate of adoption of wheat technologies indicated that pace of varietal adoption is faster than that for chemical and mechanical technologies. Currently the demand for improved wheat varieties is high although the supply is very low due to lack of sufficient facilities for multiplication and distribution of improved wheat seed. The majority of farmers in wheat producing zones of the country adopted the use of fertilizer and herbicides. However, almost all of the farmers were applying the fertilizer and herbicides below the recommended levels due to high

cost of these inputs. Hence, this necessitates farmers to look for ways of getting access to credit in order to facilitate adoption of technologies and increase productivity.

2.3 Institutional Agricultural credit: Historical Perspective and Policy Strategies

2.3.1 Historical Perspective

In Ethiopia, the history of institutional agricultural financial market is over 86 years. The first Development Bank of Ethiopia (DBE) was established in 1908. This was followed by the establishment of the agricultural bank of Ethiopia in 1945 (Gizaw, 1992). Ethiopian's agricultural credit institutions have undergone numerous changes in their structure, organizations and lending policies, regulations and strategies since the war of liberation in 1942 when the State Bank of Ethiopia (SBE) was established (FAO, 1982). The chronology of these changes can be summarized as follows (Gizaw, 1992):

In 1945 the Agricultural Bank of Ethiopia was formed under the Ministry of Agriculture to assist the agricultural production and marketing of agricultural produce. Due to its dual activity in agriculture as well as in commercial transactions its name was changed to the Agricultural and Commercial Bank of Ethiopia in 1949. In 1951 the Development Bank of Ethiopia (DBE) was established by renaming the Agricultural and Commercial Bank of Ethiopia with its roles redefined to accommodate the acceleration of the development of the agricultural and industrial sectors of the economy. Most agricultural credit during 1951-60 was for financing agricultural production and coffee processing for commercial farmers. Since 1960 financing of agricultural production and coffee processing was meant for large commercial farmers.

From 1960 to 1963 DBE made relatively few small agricultural loans to commercial farmers because of faulty loan appraisal, political interference, and use of funds for unauthorized purposes (FAO, 1982).

In 1963 a new banking law was passed laying foundation for modern banking in Ethiopia. Under this law, the State Bank of Ethiopia (SBE) was replaced by two new institutions namely the National Bank of Ethiopia (NBE) assuming the Central banking function, and the Commercial Bank of Ethiopia (CBE) which assumed commercial banking functions. Since December, 1970 CBE had approved a loan of Birr 274 million of which agricultural loans represented only Birr 24 million or 9% of CBE's loan. In 1963, the Investment Bank of Ethiopia (IBE) was created as a fully government owned share company to undertake investment banking including granting of loans, and acted as government investment agency in agriculture, industry, and commerce. The IBE was different from the rest of the banks in that it was not involved in mobilization of savings. IBE since it did not provide general banking, its name was changed to Ethiopian Investment Corporation (EIC) in 1965. About 55% of the loans advanced by EIC were for agriculture, of which about 60% was utilized by large plantations (FAO, 1982).

In 1970, the Agricultural and Industrial Development Bank (AIDB) was formed by merging DBE and EIC. Like its predecessors, AIDB's resources consisted mainly of funds provided by the government and through foreign borrowing. By July, 1971 AIDB had approved 154 loans amounting to Birr 16 Million of which 136 loans (Birr 13.2 Million) were for agriculture and these mostly went to commercial farmers. The

remaining 18 loans (Birr 3 million) were for the industrial and commercial sector and investments (FAO, 1982). These data suggest that credit available for small farmers was negligible.

The political and economic changes of 1974 made AIDB come under the direct control of the NBE and precluded from engaging in equity financing. However, the proclamation of public financing agency No.58 of March, 1979 that re-established the AIDB made it to continue to perform as an autonomous institution. AIDB's functions cover a wide range of activities such as:

(a) to extend long term loans, issue guarantee for viable development projects in the agricultural and industrial sectors; extend short-term agricultural production credit.

(b) to ensure a balanced regional distribution of projects consistent with national objectives;

(c) under exceptional cases and on a selective basis, to manage funds of other government institutions (risks of failure and non-repayment borne by the entrusting agency) and international agencies to be used for special lending purposes;

(d) to attract financial resources from other countries and international agencies;

(e) to attract funds through direct mobilization of savings from the private and public sectors and indirectly through borrowing from institutions which mobilize savings;

(f) to cooperate with development agencies in project identification and promotion; and

(g) to participate in the dissemination of technical, managerial and financial knowledge and innovation (FAO, 1982; Gizaw, 1992).

Regarding the bank's performance, the summary of post 1986 AIDB's income and expenditure indicated that income accrued from interest was sufficient to meet interest costs and administrative expenses. However, actual recovery rate was poor. The actual recovery rate for the period 1988 to 1995 was between 56% and 85% respectively. The major unrecovered loans (arrears) were from the state farms and farmers' co-operatives.

Overall, the performance of the AIDB was seriously affected by several factors (Gizaw, 1992; DBE, 1995; DBE, 1996):

(i) Although credit is normally provided to applicants after a thorough study, the AIDB, in most cases, extended credit to projects under state farms and farmer co-operatives and these never met the requirements. Consequently, the repayment rate of such projects has been unsatisfactory.

(ii) Frequent changes in bank's names, roles and credit policies: Government departments supervising development financial institutions did not consider the problems that might be encountered by the intermediaries prior to the issuance of policies and changes in bank's name and roles aimed at improving credit delivery and recovery. These changes contributed to the weakening of the financial position of the bank. For instance, the long term loan advanced for the acquisition and use of machineries and equipment (such as oil mill machines, tractors and combine harvesters) requires occasional maintenance and repair

with sufficient support in spare parts. Due to frequent changes of bank names, roles and policies most of the local suppliers who offer the machinery and equipment for sale were not provided the after sale services. Lack of the after sale services led to the under utilization or abandonment of valuable equipment before giving its intended service. As a result this situation contributed in eroding the bank's credibility as well as its financial position (Gizaw, 1992).

(iii) Low level of infrastructural development: The delivery of credit without provision of extension education, marketing and management services along with transport and storage facilities is not sufficient by itself to achieve desired economic development. The bank was extending loans to farmers and other business activities under poorly developed infrastructures, and lack of coordination (among organizations providing services to farmers) contributed to bank's high rate of credit defaulters.

In addition to the AIDB, the commercial Bank of Ethiopia (CBE) also retained small loans that were advanced as working capital for agricultural sector since 1975. In 1986 a new rural Credit Policy (NBEICR 16/86) redefined the roles of CBE and AIDB, and gave both institutions equal responsibility for seasonal loans and working capital. However, the policy contained some contradictions concerning the provision of long term credit (Gizaw, 1992) and it was, therefore, superseded by a revised policy, No.NBE/CR/7/88 in 1988. The revised policy requires AIDB to provide:

(a) long term credit;

(b) a package of short and medium (1 to 5 years), or short and long term (more than 5 years) credit, where a project requires such package;

(c) short term credit for the purchase of fertilizers, insecticide and seeds;

(d) all medium term credit except those for rural enterprises specified for CBE; and

(e) forcign lines of credit in general (Gizaw, 1992).

Whereas CBE is required to give short term credit for seasonal agricultural inputs to farmers, AIDB's mission is to provide medium term credit for rural enterprises something which is regarded as inadequate. However, since 1990s, the credit policy has been revised to allow CBE to provide all short term credits to all rural sectors including short term credit for the purchase of fertilizers, insecticides and seeds (Gizaw, 1992).

In the context of the economic reform programme and agriculture-led-industrialization strategy pursued by the Federal Democratic Republic of Ethiopia (FDRE), the AIDB was renamed as the Development Bank of Ethiopia (DBE) in 1994 by Council of Ministers' Regulations No. 200/1994, following the issuance of the new economic policy (DBE, 1995).

The former AIDB's credit system operated in the context of the previous socialist system of economic policy when its paramount mission was to extend development loans to state-owned enterprises and cooperatives focusing more on lending rather than loan collection. Its services to the private sector were limited. Consequently, the former AIDB was not in a position to operate well and to give efficient services in line with the new economic policy of the country (DBE, 1995). At the same time, it was also expected to remain a financially sustainable institution. Considering the strategic role of the bank, the government realized that restructuring and reorganization of former AIDB into DBE was essential in order to enable the bank to accomplish its business mission

and ensure its financial sustainability (DBE, 1995; 1996).

2.3.2 Agricultural credit policies/programmes

An area in which profound changes have taken place in many countries is the agricultural credit policies and programmes (Yaron, 1993). These changes include several policy statements on simplification of lending procedures, interest rates, refinance measures, expansion of the banking network, introduction of supervised credit and in some cases, the doing away with a collateral-based credit system for smallholder farmers. For example, Philippines and Indonesia have adopted a supervised form of credit to smallholder farmers for commodity-specific production programmes which are supervised by production technicians (Randhawa and Sundaram, 1990; Bautista, 1992). According to Randhawa and Sundaram (1990) the system had increased accessibility of formal credit to smallholder farmers than two decades ago.

On the other hand, India adjusted the lending policies and procedures to facilitate credit access through the practices of earmarking credit to the smallholder farmers. Experience from India (Gadgil, 1992) has shown that smallholder farmers can be better served if collateral requirements are reasonably relaxed and that easy access, quick transaction and timely delivery of credit are more important than interest rate subsidies.

From sub-Saharan Africa, Nigeria and Tanzania have used a similar strategy and credit programme to promote activities such as fertilizer application and use of new technologies by setting up a guarantee scheme fund to minimize the losses banks may

incur in case of loan default by smallholder farmers. In the case of Ghana, the special needs of the smallholder farmers with respect to credit were realized through the Ghanaian participatory rural banking scheme (Imoudu and Onosakponome, 1992; Lyatuu, 1994; Obben, 1993). However, studies which were conducted in the three countries mentioned above, revealed that the overall effect of those arrangements has been low in terms of availing credit to smallholder farmers as compared to their requirements.

In Ethiopia, from the 1950s to 1974 during the feudalistic monarchy government, the agricultural credit policy focused on commercial farms as the key to agricultural development (Cohen, 1987). It was considered that commercial farms could feed a growing urban labour force and promote exports. Nevertheless, the large scale farms failed to promote adequate production because of sector's low absorptive capacity relative to capital. From 1975 to 1991 under the economic policy of socialism, again focus was on state farms, Service Cooperatives (SCs) and Producer Cooperatives (PCs). Individual smallholder farmers were discouraged and institutional credit priority was given to the state farms (nationalized large-scale farms) and collective producer cooperatives (Franzel and Houten, 1992). Focus on smallholder farmers, whether on collective basis or as an individual, started in 1991 after producer cooperatives were abolished and market-oriented economic policy was introduced. Since 1995 the provision of institutional credit to smallholder farmers is being implemented through peasant associations (PAs) on behalf of the banks and the SG-2000 credit system.

Although frequent changes have taken place in institutional agricultural credit (in terms

of its structure, organization and policy statements), the institutional financial market supply share for agriculture in general, and smallholder in particular, has remained very low. This is because the agricultural policy, among other things, favoured large scale commercial farmers (1950-74), state farms and peasant producer cooperatives (1975-91) in terms of access to resources, including credit. That is, the masses of private smallholder farmers who actually operate about 89.6% of the total farmland under cultivation and produce 89.9% of agricultural production (NBE, 1988/89; Gebrehiwot, 1989,1992) were completely neglected. For instance, for the period between 1975 and 1987, the share of private and individual farmers was 0.1 percent of the total agricultural loan from the AIDB (Haimanot, 1990). According to Gebrehiwot (1992) even this negligible amount was used to finance dairy and fattening projects which, in the Ethiopian context, are not poor farmers' undertakings. Not only has institutional agricultural credit been insufficient compared to the need, but has also failed to reach those who need it most. The main reasons are that institutional credit sources by their very nature are not well-suited to cater the needs of smallholder farmers in that they are highly bureaucratized in terms of operation, timely availability, high overall cost of borrowing, discrimination and collateral requirements (Asefa, 1987; Franzel and Houten, 1992).

The recognition of private smallholder farmers' role in the development of Ethiopian agriculture, became apparent in 1991 after farmers producer cooperatives were abolished and some of state farms privatized following the changes in the political and economic situation of the country. The current economic policy of the Ethiopian government is known as Agricultural Development-led Industrialization (ADLI). The

strategy of ADLI focuses primarily on agricultural development, which is to be attained through improvement of productivity of both small holdings and expansion of large-scale private farms, particularly in the lowlands (Teketel, 1996).

The strategy of ADLI also resulted in the changes of institutional agricultural credit provision policies, regulations and guidelines (DBE, 1995; DBE, 1996). Besides the provision of rural credit through banks, the government has currently adopted a new approach, namely the SG2000 credit system, for reaching the smallholder farmers through extension workers for the introduction of new technologies. This new approach has not been covered by previous studies. Therefore, this study intends to examine the SG2000 credit system's contribution to the adoption of wheat technologies by smallholder farmers.

2.4 Role of credit in adoption of technologies

The word *credit* comes from the Latin word meaning *credo*"I believe" (Lee, *et al.* 1988). Hence, credit is based upon confidence. The term credit means the capacity to borrow. The word *borrow* means to receive something with the understanding that it or its equivalent will be returned as agreed upon (Lee, *et al.* 1988). Hence, credit constitutes the method farmers use to acquire funds and the ability to command capital or services for a promise to repay at some future time as specified in the promissory note.

Credit is important and necessary in nearly all smallholder farmers farm activities.

According to Padmanabham (1982), the smallholder farmers are being caught in poverty because their saving capacity is very limited. He asserted that the smallholder farmers are in a vicious cycle of low income, low saving, low capital, low productivity and consequently low income. The low income realized by the smallholder farmers is not sufficient to try out and use the improved agricultural technologies. The smallholder farmers require resources for the adoption of improved agricultural technologies in order to realize higher productivity and thus higher income (Freshwater, 1989). Access to credit is one way to improve farmers' access to new production technology and increase productivity. Lee, *et al.* (1988) contended that credit is a unique resource, since it provides the opportunity to use additional inputs and capital items at the present and to pay the cost from future earnings. Moreover, according to Jugale (1993) credit facilitates the adoption process of improved agricultural technologies for it enables smallholder farmers to satisfy the cash needs that can be caused by the use of improved inputs and production techniques. In addition, credit can contribute to the improvement of net income of smallholder farmers through improvement of productivity.

The concepts which now dominate the debate surrounding the role of credit in agricultural development and adoption of technologies are effectiveness, efficiency and accountability (Carney, 1998). The way in which each concept is used in this review is according to Carney's (1998) definitions. *Effectiveness* refers to the ability to meet goals, objectives or needs of farmers. On the other hand, *Efficiency* refers to the way in which goals are met - it implies that this is done at a low cost as possible without having a negative impact on farmers. Finally, *accountability* is defined as institutionalized responsiveness to those who are affected by one's actions. Thus accountability

contributes to effectiveness and only institutions which are effective can be classified as truly efficient.

Therefore, effectiveness and efficiency in agricultural development requires a "mix" of conditions such as good infrastructure, water, land, markets, attractive prices of farm products, relevant technologies and access to credit (Kauzeni, 1988). The basic assumption behind provision of credit to rural farmers is that they are poor and have low level of personal income which inhibit their ability to make effective investments in agriculture. Credit has been regarded by Kashuliza (1992) as an effective means through which the rural farmers could be influenced to adopt the use of improved agricultural technology for effective agricultural modernization. In most developing countries lack of capital is far more important than lack of technical "know-how" (Kauzeni, 1989). Most farmers need finance for subsistence before adopting some farming technologies which require extra financing. Under such conditions credit facilities must be tied to the adoption of farming technologies (Kauzeni, 1989). For example, in the Sudano-Guinean zone of Mali and Burkina Faso, the input-tied credit system and the delivery of inputs has led to a wide diffusion of animal traction and the use of high yielding cultivars of cotton and maize (Coulibaly, 1995). However, when credit was withdrawn from such input-tied credit system, the area planted with high yielding varieties of maize decreased considerably. The average area planted with maize per farm household dropped from three to one hectare in 1985 and 1987 respectively (Coulibaly, 1996).

Despite the importance of credit to adoption of technologies, majority of smallholder

farmers are not accessible to institutional credit. The reasons for this include: bureaucratic procedures of the institutions, untimely release of funds, high interest rates and absence of banking facilities in the rural areas (Sharma, 1985; Kauzeni, 1989; Gebrehiwot, 1992; Mbata, 1992). According to Sharma (1985) the kinds of institutional credit's bureaucratic procedures and borrowing costs that have contributed to the limited access of smallholder farmers to formal credit include: (a) borrowing costs (such as application fees, service charges, stamp duties, legal fees, cost of preparation of loan application); (b) borrower's time lost in following up the loan application particularly during critical farming time; and (c) travelling expenses when following up the loan application. For instance, studies by Mbata (1992) and Yaron (1993) revealed that different governments and donors have promoted and continued to support supply-led rural finance institutions as devices to neutralize or mitigate distorted urban biased macro economic policies that adversely affected the rural sector. However, those programmes have failed to achieve their objectives due to the fact that only a small part of the rural population was reached.

In Ethiopia, agricultural policies emphasize the need for the promotion of agricultural credit for development. In view of this, the government also offers a variety of incentives and support measures which often include subsidized credit to the agricultural sector. As it was pointed out in the previous section, the AIDB assisted the introduction and adoption of agricultural technologies by providing credit to individual farmers and also by financing the package programmes, although it failed to reach the majority of the poor farmers. Some of the reasons that made poor farmers not have easy access to credit services provided by AIDB include: (a) failure to meet some of the

conditions put forward by the banks (such as collaterals) and (b) narrow policy strategies which were focussing on large farmers, farmer producer cooperatives and state farms. The majority of the smallholder farmers were given very little attention by the previous government. It is very recent that the government is targeting the smallholder farmers for making them get access to credit something which has been enhanced by SG-2000 credit system.

There are two possible approaches for studying the role of SG-2000 credit system in the adoption of wheat technology by smallholder farmers. One approach is to use the time of the start of the system and divide the data into "before" and "after" periods and to examine the differences between the two periods. Another approach is to compare credit beneficiaries and non-beneficiaries (Gittinger, 1982). The "before" and "after" comparison fails to account for changes that would occur without the project credit and thus leads to an erroneous statement of the benefit attributable to the credit (Osuntogun, et al. 1992). Therefore, the present study adopted the second approach which compares SG-2000 credit beneficiaries and non-beneficiaries.

This chapter has summarized the background information about adoption of wheat technologies in Ethiopia (wheat research, technology transfer for wheat production and adoption of wheat technologies by smallholder farmers); history of agricultural credit and agricultural credit policies (strategies) in Ethiopia; and the role of credit in the adoption of agricultural technologies. The literature indicated that Ethiopia had tried to devise and implement various agricultural extension approaches and various agricultural credit policies (strategies) with a view to increase production and

productivity of the agricultural sector. However, these agricultural extension approaches and agricultural credit policies (strategies) implemented in the past failed to bring expected improvement in the agricultural sector. Some of the reasons for lack of success in the development of agricultural sector by MOA and IAR institutions include: unaffordability of the programmes or strategies in terms of finance and manpower and paid special attention to large scale farmers, farmers' co-operatives, state farms and better-off farmers (even among smallholder farmers in terms of socio-economic strata). The majority of smallholder farmers who occupy 96% of the total land and are resource poor were totally neglected. The following chapter describes the methodology used for obtaining and analysing data relevant to this study.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter describes the location of the study area, research design, study population, sampling procedures, instrumentation for data collection, pre-testing and data collection methods. Statistical procedures used in the analysis of the data also described.

3.2 Location of the Study

The study was conducted in Hetosa district, located in Arsi zone. Hetosa district is 25 Kilometers away from Asella, the capital of Arsi zone, in the north and 150 kilometers away from Addis Ababa in the south east. The district is among the first two districts to join the SG-2000 project in 1993. Administratively, the district is one of the 20 districts of Arsi (Fig. 1) and is divided into 37 Peasant Associations (PAs) (Fig 2) with total land area of 114,101 hectares and population of 175,288 (CSA, 1996). According to the Ministry of Agriculture, the district is divided into 23 Rural Development Centers (RDCs) for the purpose of promotion of extension services to farmers. One RDC consists of one or more PAs. The ecology of the district varies considerably with respect to climate, soils, natural vegetation and agricultural potential. It is estimated that 53% of the total land area of the district is cultivable and 43% of the total land is under cultivation. According to the Ethiopian agro-ecological classification, Hetosa district is agro-ecologically composed of:

(a) 32% highland (2301-4200 meters above sea level);

(b) 48% medium highland (1500-2300 masl); and

(c) 20% lowland (500-1500 masl)

Generally, the altitude of the district ranges from 1500 meters in lowlands to 4200 meters above sea level at the highest peak (Mountain Chilalo). The rainfall of the area is characterized by a bi-modal pattern with short rains starting from February to May and long rains (Main season) from June to September. The district, on average, receives 400-800 mm of rainfall annually (CSA, 1997; ZAO, 1997).

In Hetosa, a predominant mixed farming system consists of crop and livestock production. Crop production is mainly practiced under rainfed conditions. Most important crops are cereals, pulses, oil seeds and vegetables. Wheat alone accounts for 48 and 56% of cultivated land and area under cereal crops respectively. Average farm size per household is 1.7 hectares. The major ethnic composition of the district consists of Oromo and Amhara tribes.

The study covered five RDCs and one PA from each of these five RDCs in Hetosa district. The five PAs referred to are Boru Hantuta, Daya'a Dabbaso, Gonde Finchama, Shaki Sharara, and Wachu Lencha. The three PAs (Gonde Finchama, Shaki Sharara and Daya'a Dabbuso) are along Asella-Nazereth road through Iteya town, capital of Hetosa. The other two PAs are Wachu Lencha along Iteya-Huruta town road and Boru Hantuta which is five kilometers off the main Asela-Nazereth road to the right (Figs. 2). The selection of the PAs was based on their participation in SG-2000 project and accessibility.

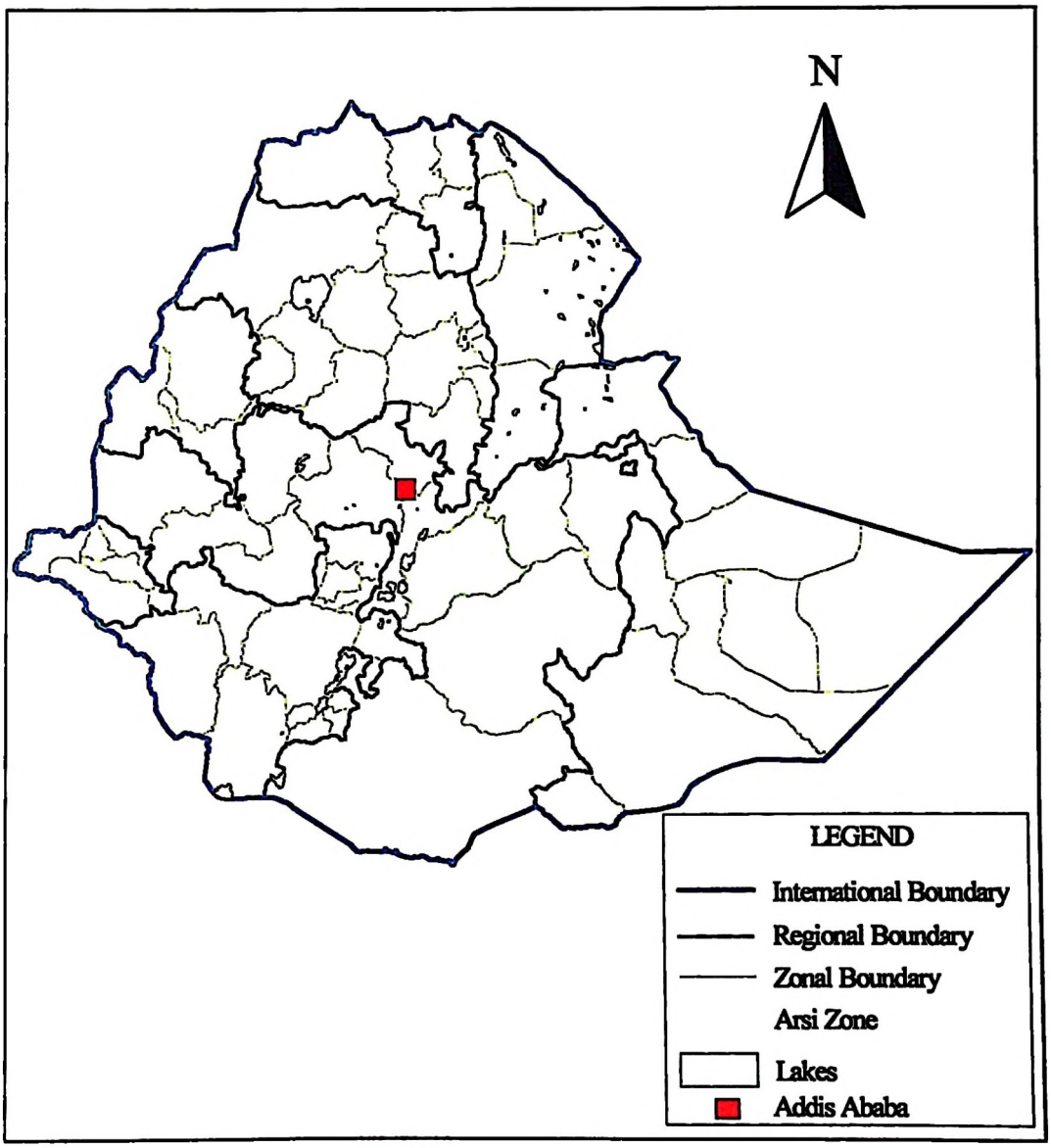

Figure 1. Ethiopia: Location of Arsi Zone

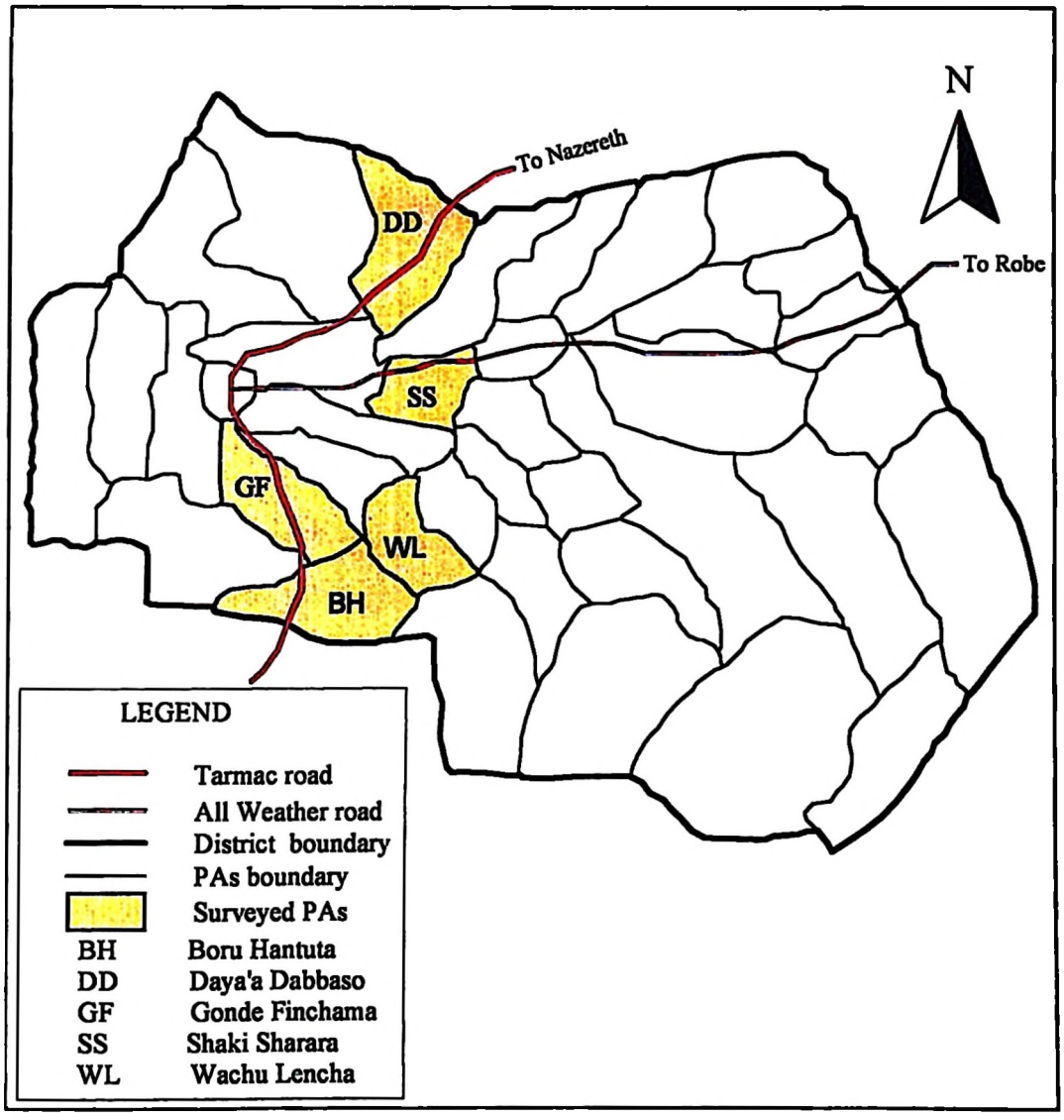

Figure 2. Hetosa district: Locations of surveyed peasant association.

3.3 Research design

The design of this study is a cross-sectional survey, which involves collecting data at one point in time from a selected sample of respondents. In line with the purpose and duration of this study, this design is said to be most appropriate for simple descriptive interpretations as well as determination of relationship between and among variables (Babbie, 1990).

3.4 The study population

The target population of this study consists of all smallholder farmers (SG-2000 farmers and non-SG-2000 farmers) in purposively selected RDCs and PAs in Hetosa district. RDCs and PAs of which smallholder farmers belong were selected using the following criteria: (a) RDCs in which farmers grow more wheat than other crops and have similar natural environment; (b) the number of years smallholder farmers in RDCs have participated in SG-2000. In this case, two years were regarded as a minimum. A period of two years is considered to be long enough to enable SG-2000 farmers to evaluate the SG-2000 credit system's contribution toward the adoption of wheat technologies; and (c) accessibility to the RDCs.

3.5 Sampling Procedures

A multi-stage sampling procedure was employed. There are 23 RDCs and 37 PAs in Hetosa district. Out of 23 and 37 of the district's RDCs and PAs respectively, 9 RDCs and 15 PAs are supported by SG-2000 project. It is in this 9 RDCs and 15 PAs that SG-

2000 is implementing its credit system for the demonstration of wheat technologies. Out of 9 RDCs and 15 PAs under SG-2000 project, 6 RDCs and 11 PAs in these RDCs fulfilled the criteria specified above. From 6 RDCs under SG-2000 project which met the criteria specified above, five RDCs and one PA from each RDCs were selected by random sampling method. The selection of RDCs and PAs was done with the aid of zonal and district extension workers. From these selected five PAs, a list of farmers was obtained from PA leaders. From that list, with the help of PA leaders and field extension workers, a sampling frame of 1133 farmers was prepared. The researcher stratified the household farmers into SG-2000 farmers and non-SG-2000 farmers based on their involvement in SG-2000 credit system. From the sampling frame of 1133 farmers 510 were SG-2000 and 623 were non-SG-2000 farmers.

Given the nature of the study and the time available to carry out the interviews, a random sample of 50 and 60 respondents was picked proportionately from 510 SG-2000 and 623 non-SG-2000 farmers respectively with the aid of a table of random numbers. That is, a random sample was taken from each stratum, and the two sub-samples were then joined to form the total sample size of 110 respondents for the purpose of this study. The unit of analysis was the individual smallholder farmer. In addition, 18 extension workers in the district who are involved in SG-2000 credit system services were interviewed.

3.6 Instrumentation

Primary data were collected using interview schedules (for farmers) and questionnaires

(for extension workers) supported by personal observation, informal discussion and informal interviews with key informants aimed at gathering both demographic information and data pertaining to the measurement of the following: (a) extent of adoption of wheat technologies as a result of the SG-2000 credit system; (b) the effect of SG-2000 credit system on the adoption of wheat technologies; and (c) determination of the farmers and extension workers' perceptions on SG-2000 credit system.

The two instruments, namely the interview schedule (for farmers) and self administered questionnaire (for extension workers), were constructed using closed and open ended questions deemed relevant for this study.

3.7 Pre-testing

Before preparing an interview schedule and questionnaire, ideas from Sokoine University of Agriculture professionals and from those who were working in the field of agricultural extension, particularly those facilitating the SG-2000 credit system in Arsi zone, were sought, screened and incorporated into the research instruments. Thereafter, pre-testing of the research instruments (especially interview schedules) was done using a sample of 10 farmers who were not part of the final sample. On the other hand, the pre-testing of extension workers' questionnaire was conducted using a sample of five extension workers in Tiyo district, one of neighboring districts of Hetosa in which SG-2000 project is operating. The initial drafts of the interview schedules and questionnaires were revised based on the pre-test results. Thereafter, the final drafts of the interview schedules and questionnaires were prepared and used for data collection.

3.8 Data Collection

3.8.1 Primary data

The primary data were collected by the researcher in the following manner: (i), Personal interviews with the selected smallholder farmers and (ii) through self administered questionnaires for village extension workers. The household data that were collected include: farmers' socioeconomic characteristics, information concerning farmers' opinions and views on SG-2000 credit mechanisms, kinds of wheat technologies demonstrated and adopted, and opinions on the provision of extension services. Extension workers' perceptions were determined by soliciting their opinions on the significance of SG-2000 credit system in as far as it facilitated their job performance and adoption of wheat technologies by farmers were concerned. Researcher's personal observation, informal discussion and informal interviews with key informants were also conducted for purposes of enriching and/or corroborating the findings.

3.8.2 Secondary data

Primary data were complemented by secondary data which were obtained from the following sources: AIDB, CBE, Agricultural Input Supply Corporation (AISCO), Central Statistics Authority (CSA), Institute of Agricultural Research (IAR), SG-2000 and MOA offices at different levels. The information collected include demographic data, SG-2000 project field performance and agricultural production figures.

3.9 Data Analysis

The record of each interview was inspected for its accuracy immediately after it was

completed, that is, before proceeding to another respondent. Data were verified by the researcher himself immediately after the field data collection in order to make sure that interview schedules had been filled in accurately and completed. The data from interview schedules and questionnaires were coded and analysed using the Statistical procedures from the Statistical Package for Social Sciences (SPSS) programme. Descriptive statistics such as frequencies, percentages and means were used to obtain the variability and central tendencies of variables. Chi-square tests were used to determine whether there was a significant difference between farmers with and without SG-2000 credit in terms of adoption of wheat technologies (such as fertilizer, herbicides, improved seed and cultural practices).

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 INTRODUCTION

The chapter presents and describes the findings from the analysis of the data. The chapter covers the following sections: (i) characteristics of the respondents; (ii) wheat technologies adopted by farmers as a result of SG-2000 credit system; (iii) the effect of SG-2000 credit system on the adoption of wheat technologies; and (iv) perception of farmers and extension workers on SG-2000 credit system.

4.2 Characteristics of the respondents

This section describes the general characteristics of the respondents. Characteristics that were examined include age, family size, farm size, main crops grown, main livestock types kept, and estimated annual income of the respondents.

4.2.1 Age

Table 2, presents the age distribution of SG-2000 and non-SG-2000 farmers. Most SG-2000 (64%) and non-SG-2000 (58%) farmers were found in the age category of 30-50 years. Only 8% of SG-2000 and 18% of non-SG-2000 farmers were below 30 years old. The respondents indicated that the proportion of youths was low because of: (a) returns from agriculture and especially rainfed agriculture was unreliable due to weather fluctuations and diseases; and (b) youths do not have easy access to land due to scarcity. As a result, most of youths look for wage labour. According to Mtama (1997)

participation of youth in agriculture is low because they cannot afford the costs of production (eg inputs) and hence have abandoned agricultural activities and opted for wage labour.

4.2.2 Level of education

Generally, majority (92.7%) of the respondents are able to read and write Only 14% of SG-2000 and 20% of non-SG-2000 farmers have no formal education. The results are summarized in Table 2.

4.2.3 Family size

The results (Table 2) show that 54% of SG-2000 and 53% of non-SG-2000 farmers have a family size of between six and nine members. Table 2 also reveals that while 36% of SG-2000 farmers had a family size of above 10 members, 33.3% of non-SG-2000 farmers had a family size of below six. Since family size is one of the main criteria in farm land distribution among members in PAs, the number of farmers with larger families were found to be higher in households participating in SG-2000.

4.2.4 Farm size

From Table 2, it can be noted that the majority (74%) of SG-2000 farmers had farm sizes of between three and four hectares, while majority (73.3%) of non-SG-2000 farmers have farm sizes ranging from one to three hectares. The results show that 78%

of SG-2000 farmers had farm sizes of more than two hectares, while only 48.3% of non-SG-2000 farmers owned farm sizes of above two hectares.

CIMMYT (1993) and Wambura (1988) pointed out that farmers with more resources in the form of either land, labour, or capital are better positioned to take the advantage of a new technology.

Table 2 Distribution of respondents according to age, level of education, family size and farm size (N=110)

Categories	SG (n=50)		NSG (n=60)	
	n	%	n	%
Age (year)				
<30	4	8	11	18.3
30-40	14	28	17	28.4
41-50	18	36	18	30.0
>50	14	28	14	23.3
Level of education				
No education	7	14	12	20.0
Adult literacy	8	16	10	16.7
Primary education	22	44	18	30.0
Junior Secondary	8	16	7	11.6
Secondary	5	10	13	21.7
Family size(number)				
< 3	2	4	3	5.0
3 – 5	3	6	17	28.3
6 – 9	27	54	32	53.4
10 – 15	14	28	8	13.3
>15	4	8	-	-
Farm size(ha)				
< 1	2	4	11	18.3
1 – 2	9	18	20	33.4
2.1 – 3	29	58	24	40.0
3.1 – 4	8	16	5	8.3
>4	2	4	-	-

Note: SG= SG-2000 farmers NSG= Non-SG-2000 farmers

4.2.5 Type of crops grow

The most commonly grown crop by respondents was wheat (100%) followed by maize(67.3%), barley(60%), and horse beans(59.1%) (Table 3). Wheat is both a staple and cash crop. On the other hand, horse beans is grown for multiple purposes like restoration of soils fertility (provision of green manure) and as a food crop. The type of crops grown by respondents are summarized in Table 3.

4.2.6 Type of Livestock kept

Types of livestock kept by respondents are presented in Table 3. From Table 3, it can be noted that cattle (90.9%) and donkeys (79.1%) were kept by majority of the respondents. Cattle were kept for a variety of reasons. Some of these reasons include draught power, milk, meat and manure. In addition, cattle are also kept as a symbol of wealth which can be translated into cash during times of financial constraints or privation.

Table 3 Distribution of type of crops grown and livestock kept by respondents (N=110)

Type of Enterprise	n	%
Main crop		
Wheat	110	100.0
Barley	66	60.0
Maize	74	67.3
Sorghum	28	25.5
Tef	26	23.6
Horse bean	65	59.1
Pea	22	20.0
Livestock		
Cattle	100	90.9
Horses	18	16.4
Donkeys	87	79.1
Mules	3	2.7
Sheep	54	49.1
Goats	20	18.2

4.2.7 Estimated annual income

Majority (76%) of the SG-2000 farmers' annual income is above Birr 7500, while 75% of the non-SG-2000 farmers earn below Birr 7500 per annum. The findings show that relatively wealthier farmers were involved in SG-2000 credit system. Reasons for a higher proportion of relatively wealthier farmers in SG-2000 credit system were

because of the SG-2000's credit requirements. That is, SG-2000 credit system requires a 50% down payment for one to qualify for a credit and this cannot be afforded by poor farmers. The selection of SG-2000 farmers focussed on the repayment capacity of farmers than representativeness of the farming community. These results are in line with the findings by CIMMYT (1993), Machumu (1995) and Rogers (1995) that richer farmers have more access to credit and extension information because they can afford to pay down payment for the credit and are more likely to take risks and to try out innovations.

Table 4 Distribution of respondents according to annual estimated income (N=110)

Income group (Birr*)	SG (n=50)		NSG (n=60)	
	n	%	n	%
< 3750	3	6	13	21.7
3750 – 7500	9	18	32	53.3
7501 – 11250	14	28	10	16.7
11251 – 15000	14	28	3	5.0
> 15000	10	20	2	3.3
Total	50	100	60	100.0

* Note: exchange rate: 1 Dollar = 7 Birr

4.3 Wheat technologies adopted as a result of the SG-2000 credit system

Since 1993, various types of wheat technologies were tested at farmers' field known as EMTPs by SG-2000 project. The types of wheat technologies disseminated to Hetosa

District by SG-2000 project are presented in Table 5.

Table 5 Type of wheat technologies and their recommended rate of application promoted by SG-2000 project credit system to farmers in Hetosa district

Type wheat technologies	Recommended rate of application per ha	Time of application
Improved wheat varieties		
Mitikie	150 Kg	na*
Wabe	150 Kg	na
Kubsa	150 Kg	na
Galama	150 Kg	na
Fertilizer		
DAP	100 Kg	during planting
UREA	100 Kg	during planting
Herbicides		
2,4-D (U-46)	1 liter	35-45 days after planting
Britox	2.5 liter	30-50 days after planting
Granstar	16 gms	Before 21 day after planting
Starine M	1 liter	30-50 days after planting
Grasp	1 liter	Before 21 day after planting
Puma	1 liter	30-50 days after planting
Fungicides		
Tilt-250	0.5 liter	depends on occurrence
Cultural practices		
Row wheat planting	na	na
Cultivation	3-4 times	Before planting

Note: * na = not applicable

The adoption rate of wheat technologies was determined by requesting the respondents to indicate whether they adopted or not adopted each of the wheat technologies that was promoted by SG-2000 project. In addition, each respondent was requested to indicate the size of wheat plot on which he/she adopted these improved wheat technologies and the rate he/she applied. This study adopted the concept of partial adoption emphasized by Murphy and Merchant (1988) and CYMMT (1993) in determining farmers' adoption rate of wheat technologies, since it clearly shows the trend that follow the progression from non-adoption through partial adoption to full adoption.

Murphy and Merchant (1988) defined partial adoption as a circumstance where the technology has been adopted, but not necessarily at the right level. The cut-off point of two third of the recommended quantity is taken as a measure or yard stick for partial adoption. In this case, while farmers who applied below one third of the recommendation level were considered as non-adopters, those who applied quantity between one third and two third of the recommended quantity were regarded as partial adopters. As per Murphy and Merchant (1988) farmers who applied above two third of the recommended quantity or amount were considered as full adopters. Likewise, in this study the cut-off point of below 33% of the recommended level (quantity) of improved practices was considered as non-adoption, while the application level between 33% and 66% of the recommended quantity was considered as partial adoption, and application above 66% of the recommended level (quantity) of the improved practices were regarded as full adoption. The adoption of this approach in determining the farmers' adoption rates of wheat technologies was decided based on the method of evaluation of agricultural extension used in the study area (Arsi zone). The partial adoption rates

approach in evaluating the adoption rates of agricultural technologies was first introduced in Arsi by World Bank in 1988 (Gizaw and Amare, 1992) with the introduction of T&V extension approach and since then it is in use.

The wheat technologies that were examined include improved wheat varieties, proper land preparation, seeding rate, wheat row planting, the use of fertilizer, fertilizer rates, use of herbicide, herbicide rates, and the use of fungicide. The farmers' responses were compared to the recommended application rates of wheat technologies by SG-2000 project (Table 5). The following section provides a comparison between SG-2000 and non-SG-2000 farmers in terms of the rate of adoption of these technologies.

4.3.1 Improved wheat varieties

Concerning improved wheat varieties, all respondents both SG-2000 and non-SG-2000 farmers fully adopted the use of Kubsa and Wabe wheat varieties (Table 6). The reason for wide adoption of this improved wheat variety was that farmers were well aware of the importance of new released wheat varieties from the research center. According to IAR (1997) old wheat varieties (both indigenous and improved) are frequently attacked by diseases which require extensive use of fungicides which the majority of farmers cannot afford. Hence, high adoption rate of these improved wheat varieties were not only associated with the role of SG-2000 credit system.

4.3.2 Proper land preparation

Table 6 reveals that proper land preparation was fully adopted by all (100%) respondents. In general, farmers were familiar with the practice of cultivating their wheat farm plots more than four times prior to planting before the introduction of SG-2000 project (while SG-2000 recommendation is 3-4 times before planting). That is SG-2000 credit system only helped farmers in reinforcing the practice and the practice was not adopted as a result of the credit system.

4.3.3 Wheat planting in row

The aim of planting wheat in rows is to control grass weed by hand weeding as grass weed herbicides are too expensive. However, as it can be seen from Table 6, wheat planting in row was not adopted at all by farmers. Row planting of wheat was completely new to farmers as well as extension workers. Farmers pointed out that the practice is very demanding in terms of labour during planting and weeding compared to their traditional practices. Besides, sowing is a bit difficult to adults as it requires them to bend their backs while sowing. Machumu (1996) indicated that in Tanzania some of the technologies, (such as planting in line in the case of sorghum) with high labour requirements were not fully adopted despite the recognition of their usefulness.

4.3.4 Fertilizer

(a) DAP

A comparison between SG-2000 and non-SG-2000 farmers in terms of adoption rate of

DAP fertilizer was done to determine if there was any relationship with SG-2000 credit system. The results in Table 6 show that DAP fertilizer has been adopted at a very high rate by both SG-2000 and non-SG-2000 farmers. Almost all (94%) of SG-2000 and 92% of non-SG-2000 farmers adopted DAP fertilizer. The results show that there were no significant differences between SG-2000 and non-SG-2000 farmers in terms of the adoption of DAP fertilizer. This implies that the high rate of adoption of DAP fertilizer is not attributable to the SG-2000 credit system. That means there were other factors that contributed to this. Some of the factors that contributed to high adoption rate of DAP fertilizer by farmers include: (a) DAP fertilizer was introduced long time ago (1967 by CADU) and it appears that farmers are already used to it; (b) DAP fertilizer is one of the main component of conventional institutional agricultural credit provided to farmers in kind; and (c) due to continuous decline of soil fertility farmers were obliged to use DAP fertilizer. Continuous cultivation on the same plot without other land management practices requires farmers to use DAP fertilizers.

(b) UREA

Similarly, the comparison between SG-2000 and non-SG-2000 farmers in terms of the adoption rate of urea fertilizer was also made. From Table 6, it can be observed that the majority (64%) of the SG-2000 farmers fully adopted urea fertilizer while only 28% of the non-SG-2000 farmers used urea. Most of the non-SG-2000 farmers (72%) never adopted urea fertilizer. The adoption of urea fertilizer is significantly associated with the involvement of farmers in SG-2000 credit system. The respondents indicated that SG-2000 credit system assisted them in the adoption of urea in many aspects. First, although the provision of agricultural credit for DAP fertilizer has long history in the

study area, there was no credit provided for urea fertilizer before the introduction of SG-2000 credit system. Almost all respondents said that although they well aware of the existence of urea fertilizer none of them tried it on their own farm. SG-2000 credit system gave them a chance to try urea fertilizer on their farm plots. In addition, SG-2000 provided them with credit for all required inputs and technical knowledge on how to apply the urea fertilizer together with other inputs. Hence, respondents with the assistance of SG-2000 realized the role of urea fertilizer in as far as increase in wheat yields was concerned.

According to Lyatuu (1994) the credit facility assists farmers in the adoption of agricultural technologies by increasing farmers' capability to purchase inputs such as fertilizers and seeds that would otherwise not be affordable.

4.3.5 Herbicide

(a) 2,4-D (U-46)

While Table 6 shows that majority (90%) of SG-2000 farmers had fully adopted 2,4-D or U-46 herbicide, 58% of the non-SG-2000 farmers used 2,4-D. The results show that there is a significant relationship between the rate of adoption of 2,4-D or U-46 herbicide by farmers and their involvement in SG-2000 credit system. In the past, the agricultural credit that was provided didn't include herbicides. In addition, farmers could not afford to purchase such herbicides, to the extent that herbicides were never made available in sufficient quantities at the local market. This situation resulted in non-use of herbicides.

(b) Granstar and Grasp

On the other hand, Granstar and Grasp herbicides were not adopted by farmers because such herbicides were not consistent with farmers' management practices. These herbicides are effective only if they are applied before 21 days after planting. Generally, farmers are not willing to apply them before 21 days after planting because they find it too early and the application of these herbicides after 21 days was found to be ineffective in controlling weeds. Moreover, farmers realized that these herbicides were not superior over the existing herbicides (2,4-D or U-46) in terms of effectiveness and costs (2,4-D is effective even after 45 days after planting with less cost per hectare). As a result farmers abandoned them after one year of trial. According to CIMMYT (1988) for farmers to adopt new technologies the returns to the recommended package must not only be more than those of their current practices, but must be substantially more.

(c) Starine M., Britox and Puma

Similarly, herbicides such as Starine M., Britox, and Puma were rejected by all respondents although they were appreciated by farmers in terms of their effectiveness in controlling weeds. These herbicides were able to control wheat weeds at every stage of growth. Reasons for the rejection of these herbicides were different from the ones which made farmers reject Granstar and Grasp herbicides. The reason behind non-adoption of these herbicides is that they could not be afforded by farmers. Farmers found that the use of these herbicides is not profitable. In addition, traders never purchased these herbicides on the grounds that farmers could not afford them. Hence, herbicides were not available at the local market even for those few able farmers. According to Machumu (1996) high prices of both fertilizers and chemicals impair

farmers from adopting new or improved technologies and especially when returns to investments are not worthwhile.

The problem is complicated by government's continuous removal of subsidies on these items. Further, Sarah and Gemmechu (1996) reported that high yielding wheat technologies are less profitable due to high cost of herbicides. Wheat technologies that are highly priced are less attractive to farmers because of the magnitude of investments that farmers have to make at the planting time when farmers have no money.

4.3.6 Fungicides

From Table 6, it can be observed that none of SG-2000 and non-SG-2000 farmers adopted the Tilt-250 fungicide demonstrated to farmers by the SG-2000 project. The fungicide was effective in controlling wheat diseases such as stem rust, leaf rust and other fungal diseases. The main reasons for non-adoption of this fungicide was that it is very expensive. Besides its high cost per one application, several applications have to be made depending on the number of occurrence of wheat diseases.

Table 6 Adoption rate of wheat technologies by involvement in SG-2000 credit system (N=110)

Wheat technologies	SG-2000 farmers (n=50)						Non-SG-2000 farmers (n=60)					
	Full adoption		Partial adoption		Non-adoption		Full adoption		Partial adoption		Non-adoption	
	n	%	n	%	n	%	n	%	n	%	n	%
Improved variety												
Mitike	3	6	-	-	47	94	-	-	-	-	60	100
Kubsa	50	100	-	-	-	-	60	100	-	-	-	-
Wabe	50	100	-	-	-	-	60	100	-	-	-	-
Land preparation	50	100	-	-	-	-	60	100	-	-	-	
Seeding rate	11	22	10	20	29	58	9	15	4	6 7	47	78 3
wheat row planting	-	-	-	-	50	100	-	-	-	-	60	100
Fertilizer type												
DAP	50	100	-	-	-	-	59	98 3	-	-	1	1 7
Urea	32	64	4	8	14	28	17	28 3	-	-	43	71 7
Fertilizer rate												
DAP	47	94	3	6	-	-	55	91 7	5	8 3	-	-
Urea	13	26	18	36	19	38	4	6 6	7	11 7	49	81 7
Herbicide type												
2,4-D or U-46	45	90	-	-	5	10	35	58 3	3	5	22	36 7
Granstar	-	-	-	-	50	100	-	-	-	-	60	100
Starane M	-	-	-	-	50	100	-	-	-	-	60	100
Brittox	-	-		-	50	100	-	-	-	-	60	100
Grasp	-	-		-	50	100	-	-	-	-	60	100
Puma	1	2	-	-	49	98	-	-	-	-	60	100
Herbicide rate												
2,4-D or U-46	16	32	16	32	18	36	12	20	13	21 7	35	58 3
Fungicide												
Tilt-250	-	-	-	-	50	100	-	-	-	-	60	100

This section described the types of wheat technologies that were adopted by Hetosa farmers as a result of SG-2000 project. The findings indicate that wheat technologies such as wheat variety kubsa and wabe, DAP and urea fertilizers, and 2,4-D (U-46) herbicide were adopted by majority of farmers. However, the adoption rate of urea fertilizer and 2,4-D (U-46) herbicide were higher for SG-2000 farmers than non-SG-2000. That is, urea fertilizer and 2,4-D (U-46) herbicide were adopted by majority of farmers as a result of SG-2000 credit system. On the other hand, herbicides (such as Granstar, Grasp, Starine M., Britox, and Puma), fungicides (Tilt-250) and wheat row planting were not adopted by almost all of the respondents. The reasons for non-adoption are that wheat technologies are: very expensive (eg Starine M., Britox, Puma, and Tilt-250); not better than previous technologies in terms of effectiveness and costs (eg Granstar and Grasp); and are labour intensive (eg wheat row planting).

4.4 The effect of credit system on the adoption of wheat technologies

Unlike the previous section which has emphasized on the identification of the type of wheat technologies adopted, this section focuses on the effect of the SG-2000 credit system on: (i) the extent of adherence to the recommended rates of wheat technologies by farmers, (ii) the extent of the use (expansion) of improved wheat technologies by farmers in relation to the farmers' total area of wheat land (plots), and (iii) farmers wheat yields per hectare.

4.4.1 Effect of SG-2000 credit system on the extent of adherence to the recommended rates of wheat technologies by farmers

The effect of SG-2000 credit system on the extent of adherence to the recommended rates of wheat technologies by farmers was tested by using chi-square statistic. Chi-square statistic was used to test if there was a relationship between the use of recommended rates of wheat technologies and involvement in SG-2000 credit system. The wheat technologies' recommendation rates examined include: DAP and urea fertilizers; 2,4-D (U-46) herbicides; and seeding rate.

(a) DAP

The comparison between SG-2000 and non-SG-2000 farmers in terms of the adoption of recommended rates of DAP fertilizer was done in order to see the effect of SG-2000 credit system. The results are presented in Table 7. The results show that there is a significant relationship between the rate of DAP fertilizer application and involvement in SG-2000 credit system ($p=0.04753$). This implies that SG-2000 credit system assisted farmers to adopt the recommended rate of application of DAP fertilizer. The application rate recommended by SG-2000 for DAP fertilizers is 100kg per hectare. Table 7 reveals that majority (70%) of the SG-2000 farmers applied fertilizer at a rate of 100 and above kilograms per hectare compared to the corresponding 58% for non-SG-2000 farmers.

(b) UREA

Similarly, the results of the relationship between the rate of urea application per hectare and involvement of farmers in the SG-2000 project credit system are

presented in Table 7. The results show that there was a significant relationship between the rate of application of urea and involvement in SG-2000 credit system ($p=0.00001$). This implies that SG-2000 credit system assisted farmers to apply higher quantity of urea per hectare than that of non-SG-2000 farmers. From Table 7, it can be noted that 62% of SG-2000 farmers applied urea fertilizer above 34 kg per hectare, while only 27.3% of non-SG-2000 farmers applied more than 34 kg of urea per hectare. Majority (72%) of non-SG-2000 farmers and only 22% of the SG-2000 farmers never applied urea.

However, the adoption of SG-2000 recommended rate of application of urea fertilizer (100kg per hectare) was very low. The main reason was that the recommended rate of application was too general and has some negative side effects. The recommendation was uniform regardless of soil types and the nature of moisture availability. Due to lack of flexibility of SG-2000 recommended rate of application for urea according to soil type and level of moisture availability, farmers observed the following problems: (a) lodging problem on long straw wheat varieties; (b) poor wheat seed germination rate during moisture stress; and (c) enhances weed growth than wheat plant in old wheat plot (that is wheat plot repeatedly planted by wheat crop for many years without fallowing or shifting with leguminous crop) if not controlled by effective herbicides at early stage something which cannot be afforded by farmers.

Urio (1996) indicated that the SG-2000 project was delivering sorghum, maize and wheat technology recommendations to farmers that were not sufficiently tested on

farmers' field for their compatibility with farmers' circumstances. That is SG-2000 did not give due consideration on the variation of climate, soil types and socioeconomic differences of farmers. For instance, in Tanzania farmers failed to sell the *Tegemo* variety of sorghum (promoted by SG-2000) produced on EMTP, because the society did not like its taste (Urio, 1996). On the other hand, Mohammed *et al.* (1996) reported that the application of urea fertilizer significantly increased grain yield of wheat but its application without controlling weeds reduced grain yield considerably.

Table 7 Relationship between the level of fertilizer applied per hectare by respondents and involvement in SG-2000 credit system (N=110)

Level of fertilizer (Kg/ha)	DAP fertilizer				Urea fertilizer			
	SG (n=50)		NSG (n=60)		SG (n=50)		NSG (n=60)	
	n	%	n	%	n	%	n	%
0	-	-	-	-	11	22	43	71.7
1 - 33	-	-	-	-	8	16	6	10.0
34 - 66	8	16	5	8.3	18	36	7	11.7
67 - 99	7	14	20	33.3	3	6	2	3.3
>100	35	70	35	58.4	20	20	2	3.3
Total	50	100	60	100	100	100	60	100
X2 =	6.09283				28.95219			
df =	2				4			
Significance =	0.04753*				0.0001*****			

Level of significance: 0.05* and 0.0001*****

Note: SG= SG-2000 farmers, NSG=Non-SG-2000 farmers

(c) 2,4-D (U-46) herbicide

The comparison between SG-2000 and non-SG-2000 farmers in terms of the

adoption of 2,4-D (U-46) herbicide was done in order to see the effect of SG-2000 credit system. The results of Chi-square test are presented in Table 8. The results show that there was a significant relationship between the rate of application of herbicide and involvement in SG-2000 credit system (p=0.01994). This shows that SG-2000 credit system assisted farmers to apply higher quantity of herbicide per hectare than that of non-SG-2000 farmers thereby motivating the adoption process. In Tanzania, Machumu (1996) indicated that one of the most important component of the success of SG-2000 project was credit since it enabled farmers to adopt most technologies that led to tremendous increase in production per area.

Table 8 Relationship between the level of herbicide applied per hectare by respondents' and involvement in SG2000 credit system (N=110)

Level of herbicide (Litre/ha)	SG (n=50)		NSG (n=50)		Total	
	n	%	N	%	n	%
0	6	12	24	40	30	27.3
0.10 - 0.33	12	24	11	18.3	23	20.9
0.34 - 0.66	16	32	13	21.7	29	26.4
0.67 - 0.99	8	16	8	13.3	16	14.5
>1.00	8	16	4	6.7	12	10.9
Total	50	100	60	110	110	100
X^2 =		11.67455				
df =		4				
Significance =		0.01994*				

Level of significance: 0.05*

Note: SG=SG-2000 farmers, NSG=Non-SG-2000 farmers

Table 9 Relationship between involvement in SG2000 credit system and seeding rate (N=110)

Seeding rate (kg/ha)	SG (n=50)		NSG (n=60)		Total (N=110)	
	n	%	n	%	n	%
Below 150	2	4	2	3.3	4	3.6
150 – 175	11	22	9	15.0	20	18.2
176 – 199	8	16	2	3.3	10	9.1
200 and above	29	58	47	78.4	76	69.1
Total	50	100	60	100	110	100.0

X^2 = 7.21369 Significance = 0.06539 df = 3

Note: SG=SG-2000 farmers, NSG=Non-SG-2000 farmers

4.4.2 Effect of SG-2000 credit system on the extent of the use (expansion) of improved wheat technologies by farmers in relation to the farmers' total area

The comparison between SG-2000 and non-SG-2000 farmers in terms of proportion of farmers' wheat plot(s) on which improved wheat technologies were applied was done in order to see the effect of SG-2000 credit system on adoption of these wheat technologies on the rest of farmers' wheat plots other than EMTPs. Farmers were requested to indicate the number and the size of their total wheat plots. In addition, they were asked to indicate for each wheat plot they had, the type and amount of wheat technologies (eg fertilizers, herbicides) applied for 1997/98 crop season. From this information the proportion or percentage (that is dividing respondents' area of

wheat plots on which improved wheat technologies applied by their total area of wheat plots for 1997/98 crop season) was calculated.

(a) UREA

The results (Table 11) of chi-square test for relationship between proportion of respondents' wheat plot(s) on which urea fertilizer was applied and their involvement in SG-2000 credit system were significant (p=0.00002). It means that SG-2000 credit system contributed to the adoption of urea on a larger proportion of total wheat area belonging to SG-2000 farmers compared to non-SG-2000 farmers. From Table 11 it can be noted that majority (64%) of SG-2000 farmers had applied urea on above 66% of their total area of wheat plot(s), while only 28% of non-SG-2000 farmers' had applied urea on above 66% of their total wheat area.

(b) 2,4-D (U-46) herbicide

Similarly, the results (Table 11) of Chi-square test for relationship between proportion of respondents' wheat plot(s) on which 2,4-D (U-46) herbicide was applied and their involvement in SG-2000 credit system were significant (0.00223). This indicates that SG-2000 credit system assisted farmers to adopt the use of herbicide on the larger proportion of their wheat plots compared to non-SG-2000 farmers. Table 11 reveals that most (90%) of the SG-2000 farmers had used herbicide on above 66% of their total wheat plots as compared to 58% by non-SG-2000 farmers.

Table 11 Relationship between proportion of wheat area of the respondents under improved wheat technologies and involvement in SG2000 credit system

Proportion of total wheat area (in %)	Urea fertilizer applied				Herbicides applied			
	SG (n=50)		NSG (n=60)		SG (n=50)		NSG (n=60)	
	n	%	n	%	n	%	n	%
0	12	24	43	71.7	4	8	21	35
< 33	2	4	-	-	1	2	1	1.7
33 -66	4	8	-	-	-	-	3	5
67 -75	3	6	1	1.7	1	2	3	5
> 75	29	58	16	26.7	44	88	32	53.3
Total	50	100	60	100	50	100	60	100
X^2	27.54685				16.68352			
df	4				4			
Significance	0.00002*****				0.00223			

4.4.3 Effect of SG-2000 credit system on wheat yield

The effect of SG-2000 credit system on yield per hectare was examined. The results are presented in Table 12. The results of Chi-square test for relationship between respondents' wheat yield per hectare and their involvement in SG-2000 credit system were significant (p=0.00862). From Table 12, it can be observed that majority (70%) of the SG-2000 farmers' crop yield per hectare was between 21 and 40 quintals, while majority (70%) of the non-SG-2000 farmers' crop yield per hectare was between 11 and 30 quintals. The results show that SG-2000 credit system has contributed to the improvement of the productivity of wheat production in the study area.

The SG-2000 project assumed that by making farmers access to improved wheat technologies and information, the average farmers' wheat yields could be doubled or even tripled. According to SG-2000 (1996), the efforts of the SG-2000 project in Ethiopia have been very rewarding. Its initiatives to show that Ethiopian farmers are able to increase the production of food crops have been proven to be right (SG-2000, 1996). Similarly, Urio (1996) pointed out that the SG-2000 approach helped farmers of Dodoma region (Tanzania) to increase production than T&V approach. In addition, Machumu (1996) contended that SG-2000 credit influenced farmers to adopt technologies such as fertilizers, insecticides and improved seeds that led to increased yields.

Table 12 Relationship between involvement in SG-2000 credit system and wheat yields per hectare

Yield/ha (Quintals)	SG (n=50)		NSG (n=60)		Total	
	n	%	n	%	N	%
Below 11	1	2	-	-	1	0.9
11 - 20	4	8	20	33.3	24	21.8
21 - 30	23	46	22	36.7	45	40.9
31 - 40	12	24	14	23.3	26	23.6
> 41	10	20	4	6.7	14	12.7
Total	50	100	60	100	110	100

Chi-square=13.61761 Significance=0.00862** DF=4

Level of significance: 0.01* Note: 1 Quintal = 0.1 Tonnes

4.4.4 Some of the factors that prohibited farmers from adopting full SG-2000 wheat technological packages

In general, the results of this study (Table 7 through 12) show that farmers did not adopt all packages of the wheat technologies as recommended by the SG-2000 project. There were many factors that prohibited farmers from adopting full wheat technological packages. From Table 13 it can be seen that 90% of the respondents said that they did not adopt full SG-2000 wheat technological packages because inputs are very expensive.

Table 13 Reasons that prohibited farmers from adopting full wheat technological packages (N=110)

Reasons	n	%
Inputs are expensive	99	90.0
Unavailability of improved seed	77	70.0
Lack of credit	74	67.3
Lack of technical knowledge	72	65.5
Unreliability of weather	63	57.3
Low price for wheat grain market	48	43.6
Wheat diseases	38	34.6
Unavailability of herbicides	35	31.8

4.5 Farmers' and village extension workers' perception of SG-2000 credit system

4.5.1 Farmers' perceptions

Farmers were requested to give their opinions pertaining to the contributions of SG-2000 credit system on the adoption of wheat technologies by the smallholder farmers. This aspect focused on the conditions for qualifying for credit, effectiveness of the programme, extent of satisfaction by the target group and effect of SG-2000 credit system programme on adoption. The results are presented in Tables 14 and 15.

Table 14 reveals that the SG-2000 farmers' perceptions on SG-2000 credit system are that: (i) it is effective in making timely availability of inputs (82%); (ii) the time of repayment collection set is right (86%); and (iii) they (farmers) are satisfied with the procedures (98%) for providing credit by SG-2000. The summary of SG-2000 farmers' opinions on the SG-2000 is presented in Table 14.

Overall, respondents are of the opinion that the SG-2000 credit system has assisted in the adoption of improved wheat technologies and practices. The main features of the SG-2000 credit system that assist in adoption of wheat technologies include: (a) the provision of credit in kind for the highly demanded (scarce) wheat technologies (like wheat varieties kubsa and wabe and 2,4-D herbicide), (b) type of on farm training on the application of wheat technologies and active involvement (letting farmers themselves to perform the EMTPs demonstration plot activities) of the farmers (c) carrying out farmers' field days where ideas are shared with extension workers, researchers and farmers themselves at different levels, and (d) regular follow up by extension workers at successive stages from planting to harvest to ensure that farmers practice what is recommended by extension workers.

However, both SG-2000 and non-SG-2000 farmers have some negative feelings or reservations about the conditions that were put forward by SG-2000 for one to obtain credit. The summary of farmers' perceptions on SG-2000 credit system's conditions for qualifying for credit are presented in Table 14. The results in Table 14 reveals that the majority (75.5%) of the respondents responded that the SG-2000 credit criteria were affordable by only few farmers in their areas. This implies that farmers who are involved in SG-2000 credit system are not representative of the majority of farmers in the study area.

Table 14 Perceptions of farmers on the performance of SG-2000 credit system (N=110)

Responses	n	%
Extent of affordability of conditions for qualifying for SG-2000 credit (n=110)		
Affordable by all farmers	1	0.9
Affordable by majority	26	23.6
Affordable by few	83	75.5
Perception on the amount of down payment		
Low	-	-
Right	45	40.9
Too much	65	59.1
Effectiveness in delivery of inputs (n=50)		
Very effective	36	72.0
Effective	5	10.0
Not effective	9	18.0
Satisfaction with the procedures for providing credit.		
Satisfied very well		
Satisfied	32	64.0
Not satisfied	17	34.0
Timeliness of repayment collection (n=50)	1	2.0
Early		
Right time	3	6.0
Late	43	86.0
	4	8.0
Assistance of credit system in adoption of technologies		
Assisted	50	100
Not assisted	-	-
Effect of credit system on the relationship between farmers and extension workers		
Improved	33	66.0
Reduced	3	6.0
No effect	15	28.0

In order to gain further insights on the perception of farmers on the SG-2000 credit system in terms of its contribution to the adoption of wheat technologies, the non-SG-2000 farmers' opinions were also solicited. The results are presented in Tables 15 and 16.

Generally, the respondents were aware about the SG-2000 credit services in their peasant associations. According to Table 15, 80% of the respondents were aware

and only 20% were not aware at all. The SG-2000 credit system was widely known to farmers because the credit system is advocated by both the SG-2000 project and the government through all available mass media and public meetings. However, only 22% of the non-SG-2000 farmers had attended the SG-2000 EMTP farmer field days (Table 15). The results indicate that during farmers' (EMTP) field days, little attention was paid to non-SG-2000 farmers and besides only a few were invited to participate in field days. In addition, it was found that the level of discussion between the SG-2000 and non-SG-2000 farmers of neighboring farmers was low. From Table 15, it can be noted that when non-SG-2000 farmers requested to indicate the level of discussion with their neighboring SG-2000 farmers about SG-2000 wheat technologies, most (60%) of non-SG-2000 farmers replied never and 38.3% rarely discussed with SG-2000 farmers. This was due to the fact that non-SG-2000 farmers regarded the SG-2000 farmers as better farmers in terms of economic status and hence could not copy from them. According to Van den Ban and Hawkins (1996), smallholder farmers copy technologies from farmers who are similar to them in terms of socio-economic status. However, Adams (1990) indicated that smallholder farmers could also copy from large-scale farmers if the types of technologies disseminated to farmers are economically divisible and affordable.

Table 15 Distribution of non-SG-2000 farmers respondents according to level of awareness and perception of SG-2000 credit system (n=60)

Responses	Frequency	%
Awareness about SG-2000 credit system		
Aware	48	80.0
Not	12	20.0
Awareness about location of EMTPs		
Aware	37	61.7
Not	23	38.3
Attendance of SG 2000 Field days		
Yes	13	21.7
No	47	78.3
Reasons for not attending EMTPs Field day		
Not aware of such things	45	75.0
Not concerned me	10	16.7
Too far	1	1.7
I was away	3	5.0
Discussion with SG-2000 farmers		
Regularly	1	1.7
Rarely	23	38.3
Never	36	60.0
Do you believe SG-2000 farmers get more yield than you do?		
Yes	53	88.3
No	7	11.7

In general, as can be seen from the Table 15, 88.3% of the non-SG-2000 farmers are of the opinion that SG-2000 farmers get better wheat yields than they do. Given this observation, farmers were requested to indicate reasons why they were not involved in SG-2000 credit system. The reasons are summarized in Table 16.

From the results (Table 16) it can be noted that 30% and 28.3% of the respondents did not participate in SG-2000 credit system because of lack of money for down payment and due to fear of debt respectively. Twenty five percent of non-SG-2000 farmers didn't have confidence in some of the SG-2000 wheat technologies or recommended levels. Lack of confidence on SG-2000 credit system's wheat

technologies by non-SG-2000 farmers was due to the fact that farmers were being forced to apply the full wheat technological packages that were not sufficiently tested on their local environment and hence farmers were not ready to take risks.

According to Nag *et al.* (1988), Anderson (1991; 1994) non adoption of agricultural technologies is most likely if new technology is more riskier and also requires significantly greater amount of working capital to be invested in seed, fertilizers and so forth. Smallholder farmers may be unwilling to borrow or unable to find lenders to take the risk (Boussard, 1981; Hazell *et al.* 1986, Foster and Rausser, 1991) if there is a risk of capital loss.

Table 16 Distribution of non-SG-2000 farmers according to reasons inhibited them to participate in SG-2000 credit system (n = 60)

Reasons for not participated	n	%
Fear of debt	17	28.3
Lack of awareness	5	8.3
Lack of money for down payment	18	30.0
Shortage of farm land	9	15.0
Lack of oxen	3	5.0
Lack of confidence in technologies	15	25.0

4.5.2 Perceptions of village Extension workers (VEWs) on SG-2000 credit system

In this section, an attempt is made to briefly describe the opinions of village extension workers on the SG-2000 wheat technologies they disseminated to farmers, the effect of SG-2000 credit system and utilization of improved wheat technologies. The village extension workers are the front line staff of the SG-2000 project in general.

The extension workers were well familiar with proper land preparation, fertilizers, and herbicides (2,4-D and U-46) before the introduction of SG-2000 project in their working areas. However, they were not familiar with some wheat technologies and their recommended application rates that were introduced by the SG-2000 project. Among the related wheat technologies which were completely new to them include: herbicides (like Grasp, Grasnstar, Starine M, Britox, Puma); fungicide (tilt-250) and wheat row planting. In addition, the extension workers indicated that the SG-2000 application of wheat seeding rates and amount of urea per hectare were different from what they used to apply. Extension workers indicated some reservations with regard to the application of recommended rates of urea for different type of soils and wheat varieties. They observed that the application of the SG-2000 recommended rates of urea fertilizer for long straw wheat varieties caused lodging and resulted in lower wheat yields than without its application.

Regarding the adoption of wheat technologies as a result of SG-2000 credit system, the extension workers indicated that improved wheat varieties (such as Kubsa, Wabe

and Galama), fertilizer recommended rates (especially DAP), and type of herbicides (2,4-D and U-46) were adopted by majority of farmers in their working areas. Reasons for adoption are such as: (1) wheat varieties were high yielding, resistant to wheat diseases, preference of white color, and no lodging problems (2) timely supply of inputs and (3) closer follow up by extension workers (both village, district and zonal extension workers).

On the other hand, extension workers pointed out that they do not prefer distribution and repayment collection of inputs advanced on credit basis due to the following reasons:

(1) extra work load: the extension workers said "*We spend abut two to three and four to five months in collecting credit down payment and loan repayment respectively per one cropping season. In addition, the distribution of credit inputs require two to three weeks of additional time.*

(2) *It is risky to stay with the collected money for a certain period before it is deposited in the bank; and*

(3) *repayment collection has made farmers perceive us negatively. Some of our farmers run away from us during repayment collection. Those type of events affected the relationship we had with farmers. Hence, we prefer the down payment and repayment of credit to be handled by somebody else possibly the farmers themselves by being organized in groups or by a separate body different from us*" .

Urio (1996) pointed out that involvement of extension workers in non-extension activities such as inputs distribution or credit arrangement interfere with the

professionalism of extension services. According to Urio (1996) the involvement of extension workers in non-extension activities affects the performance of extension workers more negatively than positively. Ryoba (1996) further noted that village extension workers with additional tasks, contrary to the advisory job description, resulted in dilution of efforts, incompetence and unwarranted interruptions in the extension workers' programme.

With respect to the strengths of the SG-2000 credit system, the extension workers indicated that timely availability of inputs, effective supervision, transport facilities, low bureaucracy, and incentive payments to extension workers were found to be the strengths of SG-2000 credit system. Effective supervision ensures regular contacts between farmers and extension workers thereby enhancing quick feedback from both parties.

Despite the above strengths of SG-2000 credit system extension workers claimed that SG-2000 has some weaknesses: (1) involvement of extension workers in input distribution and repayment of credit collection; (2) lack of regular training. Training of extension workers is usually done once a year before the operation of the following crop season compared to the T&V which is every two weeks or every month; (3) the credit system did not involve relatively very poor farmers because of its requirement of the amount of down payment (50%) and the size of demonstration plots (one half of a hectare) which were not affordable by majority of poor farmers; and (4) lack of project flexibility in some recommendations (such as uniform recommendation of the rates of application of urea fertilizer).

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

The overall aim of this study was to determine the role of SG-2000 credit system in the adoption of wheat technologies by smallholder farmers in Hetosa District. This chapter summarizes the conclusions and recommendations derived from the study. For the purpose of convenience, the major conclusions are organised around the study objectives as laid down in the first chapter, which is also in line with the way the results were presented.

5.1 CONCLUSIONS

Based on the findings of the study the following conclusions are provided.

1. The study identified that improved wheat varieties (such as Mitikie, Wabe, Kubsa and Galama); fertilizers (such as DAP and urea); herbicides (such as 2,4-D or U-46, Britox, Granstar, Starine M, Grasp and Puma); fungicides (Tilt-250) and cultural practices (such as row wheat planting and 3-4 times of wheat land cultivation) were the type of wheat technologies that were transferred and demonstrated to Hetosa farmers by SG-2000 project.

2. Wheat technologies such as wheat varieties kubsa (100%) and wabe (100%); proper land preparation (100%); DAP (94%) and urea (64%) fertilizers; and 2,4-D (U-46) (90%) herbicide were adopted by the majority of farmers. The reasons for the adoption of these wheat technologies include:

(a) wheat technologies such as DAP fertilizer and proper land preparation were introduced long time ago and farmers are already familiar with them

(b) provision of credit for DAP fertilizer by banks (DBE and CBE)

(c) Kubsa and wabe wheat varieties were resistance to wheat diseases, yielded better than local wheat varieties and their white color was preferred by local markets.

3. The findings reveal that urea fertilizer and 2,4-D (U-46) herbicides were adopted by majority of farmers as a result of SG-2000 credit system. It was found out that although the provision of agricultural credit for DAP fertilizer has long history in the study area, no credit was provided by banks (DBE and CBE) for urea fertilizer and herbicides before the introduction of SG-2000 credit system. SG-2000 credit system has given farmers a chance to try out the use of the right amount of urea fertilizer and 2,4-D (U-46) herbicide on their farm plots. In addition, SG-2000 provided farmers with credit for all required inputs.

4. Wheat technologies like herbicides (such as Granstar, Grasp, Starine M., Britox, and Puma), fungicides (Tilt-250) and wheat row planting were not adopted by almost all of the respondents. The reasons for non-adoption were that wheat technologies:

(i) are very expensive (eg Starine M., Britox, Puma, and Tilt-250)

(ii) are not better than previous technologies in terms of effectiveness and costs (eg Granstar and Grasp)

(iii) are too labour demanding (eg wheat row planting)

(iv) require use of high rates of inputs such as herbicides and fertilizers something which cannot be afforded by most farmers (eg SG-2000 recommended wheat seeding rate)

5. The findings of this study show that the recommended rates for some of the wheat technologies like DAP and urea fertilizers and 2,4-D (U-46) herbicide were adopted by SG-2000 farmers than non-SG-2000 because of SG-2000 credit system. The results of Chi-square statistical test for relationship between the adoption of the recommended rates of fertilizers (DAP and UREA) and herbicides (2,4-D or U-46) by respondents and involvement in SG-2000 credit system were found to be statistically significant.

6. The study shows that the SG-2000 credit system had a significant effect on the improvement of wheat productivity. The results of Chi-square statistical test for the relationship between wheat yields per hectare and involvement in SG-2000 credit system were statistically significant. Majority (70%) of the SG-2000 farmers' wheat yields per hectare was between 21 and 40 quintals, while wheat yield per hectare for the majority (70%) of the non-SG-2000 farmers were between 11 and 30 quintals.

7. When assessing farmers' perceptions on the SG-2000 credit system, the following were found to be the strengths of SG-2000 credit system:

(a) effectiveness in provision of credit for inputs,

(b) active involvement of farmers in the operation and management of EMTP demonstration plots

(c) involvement of stakeholders (farmers, extension workers, policy makers and researchers) on farmers' field days

(d) follow up by extension workers and higher officials in MOA and SG-2000 project coordination office for right implementation of improved wheat technologies by farmers.

8. It was found out that both SG-2000 and non-SG-2000 farmers have some negative feelings or reservations about the conditions for credit that were put forward by SG-2000. The majority of the respondents indicated that the SG-2000 credit system's selection criteria for one to qualify for credit (eg 50% down payment and the size of EMTP) were not in favour of the majority of farmers in their area. The analysis of the characteristics of respondents revealed that the majority of SG-2000 farmers were relatively better off in terms of income and size of farm land (i.e had larger areas) than non-SG-2000 farmers.

9. The extension workers' perception on the SG-2000 credit system reveals that the credit system assisted farmers in the adoption of wheat technologies. However, the following were found to be the weaknesses of SG-2000 credit system:

(1) involvement of extension workers in input distribution and credit repayment collection

(2) lack of regular training for extension workers

(3) the credit system did not involve relatively poor farmers because of 50%

down payment of the total credit during the time of planting something which could not be afforded by the majority of poor farmers

(4) lack of specific recommendations for wheat technologies (eg urea fertilizer) for various locations.

10. The extension workers were not comfortable by being involved in credit down payment and repayment collection tasks because of:

(1) extra work load: the extension workers said that they spend about two to three and four to five months in collecting credit down payment and loan repayment respectively per one cropping season. In addition, the distribution of credit inputs require two to three weeks of additional time.

(2) the risks involved in staying with the collected money until it is deposited in the bank

(3) repayment collection has negatively affected the relationship that exist between the extension workers and farmers. The extension workers visit to farmers' home place during repayment collection have made some of farmers to run away from them.

5.3 RECOMMENDATIONS

Based on the conclusions drawn from the findings, the following recommendations are made.

1. It is recommended that the SG-2000 project should revise some of the wheat technological packages or recommendations (eg urea) which did not perform well in some locations. The recommendations should vary for various locations, soil types and type of wheat varieties (long or short straw).

2. Given the fact that there are differences among the smallholder farmers themselves in terms of socio-economic status, it is recommended that the SG-2000 project should revise mechanisms for assisting farmers who cannot afford or able to meet the conditions put forward by SG-2000.

3. The handling of credit advancement and repayment collection by extension workers should not be continued as it is. According to extension workers the credit advancement and repayment collection should be handled by PA leaders or farmer credit groups.

4. It is also recommended that regular training for extension workers should be given at least every three months rather than once a year. The extension workers are of the opinion that refresher training workshops or distant education programmes provided after every three months could help in keeping them up-to-date and improve their job performance.

5. While this study indicated that wheat technologies such as DAP, and improved kubsa and wabe seed varieties provided by banks (DBE and CBE) were adopted by majority of farmers than other wheat technologies (herbicides, fungicides)

which were not provided by conventional credit, it is recommended that the financial institutions (such as DBE and CBE) should also support other related wheat technologies such as herbicides and fungicides in order to facilitate adoption of full packages of wheat technologies.

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APPENDIX I FARMERS' QUESTIONNAIRE

SOKOINE UNIVERSITY OF AGRICULTURE

DEPARTMENT OF AGRICULTURAL EDUCATION AND EXTENSION

TITLE: THE ROLE OF SASAKAWA GLOBAL 2000 PROJECT CREDIT SYSTEM IN THE ADOPTION OF IMPROVED WHEAT TECHNOLOGIES BY SMALLHOLDER FARMERS IN ETHIOPIA: THE CASE OF HETOSA DISTRICT

Dear Farmer,

The objective of this study is to examine the role of SG-2000 credit system and how this system in turn is related to ability OF farmers to adopt technologies of wheat production. It is our hope that the findings of this study will assist the government and the respective financial institutions to formulate a realistic credit policy for smallholder farmers in Ethiopia.

The success of the study rests on your cooperation in this exercise. I would like to assure you that this interview is completely voluntary and confidential.

SECTION A: RESPONDENT'S SOCIO-ECONOMIC CHARACTERISTICS

A1. Gender: 1 male 2 female

A2. How old are you? ..... (years).

A3. Ethnicity: 1. Oromo 2. Amhara 3.Others

A4. Religion: 1. Christian 2. Islam 3.Other

A5. What is your marital status?

(1) Married

(2) Separated

(3) Divorced

(4) Widowed

(5) Never married

(6) Other (Specify)

A6. What is the size of your family? Indicate the number and sex of your members of household in the following age groups?

Age Group	**Sex**	
	Male (number)	Female (number)
Below 10 years	.....	.....
10 - 18 years	.....	.....
19 - 50 years	.....	.....
Over 50 years	.....	.....

Total members (including head of household) .....

A7. What is your highest level of formal education attained?

1) No formal education

2) Grade 1-6 (Primary education)

3) Grade 7-8 (Junior secondary education)

4) Grade 9-12 (Secondary education)

5) Other (specify)

A8. What is the total hectarage of land which you use for farming for the last 1997/98 crop season?

1) Owned land _____

2) Rented land _____

3) Other (specify) _____

4) Total _____

A9. What portion of the total hectarage is allocated to the following for the last cropping season (ie 1997/98)?

Activities	**Hectarage**
For house and its compound	.....
Grazing land	.....
For crop production	.....
others (specify)	.....

A10. What types of crop do you grow?.....

A11. What is your total crop harvest from your total crop land for the last cropping season(1997/98)? Types of crop hectarage Total amount harvested (in quintal)

_____ _____ _____

A12. What types of livestock do you keep? Indicate the types of livestock and the number of heads you have?

Types of livestock Number of heads

_____ _____

A13. Besides farming what other sources of income do you have (non-farming)? How much did you get in September 1996 - September 1997?

Sources of Income	**Amount of income (in Et Birr)**
_____	_____

SECTION B: TYPES OF WHEAT TECHNOLOGIES AND PRACTICES PROMOTED BY SG-2000 AGRICULTURAL PROJECT TO SMALLHOLDER FARMERS

B1. What is the total area and number of plots/parcels of wheat crop did you cultivate during 1997/98 crop season?

1. Total area of wheat crop cultivated in 1997/98 is _____ hectare_____.
2. Total number of wheat crop parcels/plots in 1997/98 are _____.

B2. We are interested in the total area of wheat crop production performance for the last 1997/98 crop season. Please, indicate for each of your wheat plots in you have cultivated for the last 1997/98 crop season: the size of plots in hectare, number of times cultivated before planting, the type and amount of inputs used and wheat yields obtained in the following table.

Local farmer plot	Size of plot (ha)	Wheat seed				Fertilizer Use		Herbicide use				Fungicide Use		Seed dressing chemicals		Yield
		Local		Improved				Broad leaf herbicide		Narrow leaf (grass) herbicide						
		Name of variety	Amount (kg)	Name of variety	Amount (kg)	DAP (kg)	Urea (Kg)	Name	Amount Lt/Kg	Name	Amount Lt/Kg	Name	Amount Lt/Kg	Name	Amount Lt/Kg	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17

B3. The following are some of improved wheat technologies or practices with their recommended amount and time of application promoted by SG-2000 to farmers. Please, indicate your level of knowledge of wheat technologies as recommended before SG-2000, your opinion on the usefulness of the technologies or recommendations, type of technologies or practices you have decided to adopt or react and the reasons for deciding to adopt or reject each of G-2000 wheat technologies and practices described below.

G-2000 wheat technologies /practices	Recommended rate per hectare	Recommended time of application	Were you aware of it before SG-2000? 1. yes 2. No	Were you aware of its rate of application before SG-2000? 1.yes 2.No	Were you aware of this time of application before SG-2000? 1. yes 2. No	Do you think it is useful to increase wheat yields? 1. Yes 2. No	Do you think its rate of application is useful? 1.Yes 2. No	Do you think its time of application is useful? 1. yes 2. No	Did you apply it, fully as recommended by SG-2000, before SG-2000? 1.Yes 2.No	Have you applied it on your EMTP? 1.Yes 2.No	Have you applied it, as recommended by SG-2000, on non-EMTP wheat plot? 1.yes 2.No	If no, why not?
Mitike wheat variety	150 kg	na										
Kubsa wheat variety	150 kg	na										
Wabe wheat variety	150 kg	na										
DAP fertilizer	100 kg	during planting										
UREA fertilizer	100 kg	during planting										
U-46 (2,4-D) herbicide	1litre	35-45 days after planting										
Granstare herbicide	16grams	< 21 days after planting										
Starine M. herbicide	1 litre	30-50 days after planting										
Grasp herbicide	1litre	< 21 days after planting										
Puma herbicide	1litre	30-50 days after planting										
Tilt-250 fungicide	0.5 litre	depends on occurrence										
Row wheat planting	na	na										
Proper land preparation	3-4 times before planting	na										

B4 For each of the technologies you have regarded as useful and not useful in item B5 column 7 above, indicate reasons which made you regard them as useful or not useful.

Types of SG-2000 technologies regarded useful by respondents	Reasons

Types of SG-2000 technologies regarded not useful by the respondents	Reasons

B5 For each of SG-2000 wheat technologies/practices you have applied (adopted) or not applied (not adopted), as recommended by SG-2000, on non-EMTP wheat plots in item B5 column 12, please indicate what factors facilitated for your adoption or reasons for your non-adoption of the technologies.

(a)

Types of SG-2000 wheat technologies adopted	Size of plots	reasons for adoption

(b)

Types of SG-2000 wheat technologies not adopted on non-EMTP wheat plots, as recommended by SG-2000, by respondent	Reasons

(c) For the SG-2000 wheat technologies/practices you have applied on non-EMTP wheat plots, as recommended by SG-2000, will you continue to apply them even after the SG-2000 services are discontinued?

1. Yes 2. No.

In either case explain.

SECTION C: WHEAT TECHNOLOGY DISSEMINATION METHODS TO SMALLHOLDER FARMERS BY SG-2000 AGRICULTURAL PROJECT IN HETOSA DISTRICT

C1. Have you been a contact farmer for SG-2000?

1 Yes 2. No.

Questions C2 to C10 are meant for SG-2000 farmers

C2. If yes, when did you first become a contact farmer.

C3. How many times did the extension agent visit you for the last 1997/98 crop season during the following farming activities?

(a) Land preparation .....times

(b)Planting ..... times

(c)Weeding ..... times

(d)Harvesting ..... times

C4. Have you told non-SG-2000 farmers about the extension agent's visits and advice you received on SG-2000 wheat technologies that was/were demonstrated to you?

1. Yes 2. No.

Questions C5 to C14 ask only non-SG-2000 farmers.

C5. Do you know any extension agent who serves or provides advice to this peasant association?

1. Yes 2. No

C6. If yes, have you come in to contact with the extension agent?

1 Yes 2. No

C7. If yes, how many times and where did you get into contact during the last cropping season?

	Frequency	**Place**
(a) Land preparation	.....	.....
(b) Planting	.....	.....
(c) Weeding	.....	.....

C8. Are you aware that SG-2000 project is promoting wheat technologies/practices to smallholder farmers in your PA?

1. Yes 2. No.

C9. If yes, do you know where the extension agent conducts SG-2000 EMTP demonstration plots? 1. Yes 2. No.

C10. Do SG-2000 farmers discuss with you about SG-2000 wheat technological packages?

1. On a regular basis 2. Rarely 3. Never

C11. Have you or a member of your household attended a SG-2000 wheat technologies/practices demonstration in the last cropping season? 1. Yes 2. No.

C12. If: (a) Yes, who? 1. Respondent 2. Spouse 3. Both 4. Other

(b) No, Why not? ----------

C13. Do you think that SG-2000 farmers are getting better wheat yields than you do?

1. Yes 2. No.

C14. If yes, why didn't you participate in SG-2000 credit system?

Explain.....

SECTION D: HE ROLE OF SG-2000 CREDIT SYSTEM IN THE ADOPTION OF IMPROVED WHEAT PRODUCTION TECHNOLOGIES AND PRACTICES BY SMALLHOLDER FARMERS.

D1. Are you aware of the purposes of SG-2000 credit system? 1. Yes 2. No.

D2. If: (a) Yes, indicate the purposes of SG-2000 credit system.

D3. Are you aware of the conditions for getting or qualifying for SG-2000 credit?

1. Yes 2. No.

D4. If yes, what are they? Indicate the conditions for getting SG-2000 credit.

D5. Have you ever sought credit from SG-2000? 1. Yes 2. No.

D6. If: (a) No, why not? Explain.

.....

(b) Yes, did you get loan from SG-2000? (Explain if you were not succeed).

.....

D7. Do you think that SG-2000 credit system assisted you for the adoption of wheat technologies? 1. Yes 2. No.

D8. If: (a) Yes, how? explain ----------

(b) No, why not? Explain ----------

D9. What types of wheat technologies/practices have you adopted as a result of SG-2000 credit system? Indicate the types of wheat technologies/practices adopted and what factors facilitated you the adoption of each type of technology or practices of wheat production.

Types of wheat technologies/practices adopted as a result of SG-2000 credit system	Factors facilitated the adoption
---	---

D10. For the wheat technologies/practices you have adopted as a result of SG-2000 credit system, will you continue to apply even after the SG-2000 credit services are discontinued? Indicate the types of wheat technologies/practices you have decided to continue or not after SG-2000 credit is discontinued and reasons for making such a decision.

(a) Types wheat technologies/ practices decided to continue with even after after SG-2000 credit service are discontinued. Reasons

---

(b) Types wheat technologies/ practices adopted as a result of SG-2000 credit system but decided not to continue with them after SG-2000 credit services discontinued Reasons

---

SECTION E: FARMERS' PERCEPTION ON SG-2000 CREDIT SYSTEM

E1. What is your opinion about the performance of SG-2000 credit system in:

(a) The extent of your satisfaction with the procedures for providing credit?

1. Very satisfied 3. Not satisfied
2. Satisfied 4. Disappointed

(b) The beginning of down payment collection time?

1. Too early 2. Erly 3. Right time 4. Late 5. Too late

(c) Delivery of inputs?

1. Too early 3. On time 5. Too late

2. Early 4. Late

(d) Repayment collection time?

1. Too early 3. Right time 5. Too late

2. Early 4. Late

E2. What is the overall perception of SG-2000 credit system in your PA?

E3. Do you prefer to remain as a SG-2000 credit system contact farmer? 1. Yes 2. No.

If: (a) Yes, Why? Explain.

.....

(b) No, Why not? Explain.....

E4. How would you like the SG-2000 credit system to be operated in order for you to benefit more?

.....

E5. Do you have any other comments to make pertaining to provision of SG-2000 credit system to smallholder farmers?

.....

Thank you

APPENDIX II EXTENSION WORKERS' QUESTIONNAIRE

TITLE: THE ROLE OF SASAKAWA GLOBAL 2000 PROJECT CREDIT SYSTEM IN THE ADOPTION OF IMPROVED WHEAT TECHNOLOGIES BY SMALLHOLDER FARMERS IN ETHIOPIA: THE CASE OF HETOSA DISTRICT

Dear extension agent,

I am conducting a study pertaining to SG-2000 credit system. It is my hope that the findings of the study will assist in improving the existing credit services and/or in formulating ideal credit system for smallholder farmers. Thus, I am asking for your co-operation in the study by being agreeing to be interviewed. We assure you that your responses will be kept in strict confidence.

SECTION A: RESPONDENT'S SOCIO-ECONOMIC CHARACTERISTICS

A1: Sex: 1. Male 2. Female

A2: How old are you? --------

A3. What is your marital status?

1. Married 2. Single

A4. What is your highest level of education?

(1) below grade 9 (3) Grade 12 complete (5) Other (specify).....

(2) Grade 9-11 (4) Diploma.

A5. How many years have you been working as an extension agent? _____

SECTION B: EXTENSION AGENTS' PERCEPTION ON WHEAT TECHNOLOGIES/PRACTICES PROMOTED TO SMALLHOLDER FARMERS BY SG-2000 PROJECT.

B1. The followings are types of wheat technologies/practices promoted by SG-2000 agricultural project to smallholder farmers in Hetosa district. Indicate your level of awareness of each wheat technologies/practices and their recommended application prior to the introduction by SG-2000, the types of technologies/practices you have demonstrated to your RDC farmers and the number of adopter farmers by the types of wheat technologies/practices in the table given below.

SG-2000 wheat technologies /practices	Recommended rate per hectare	Recommended time of application	Were you aware of it before SG-2000? 1 yes 2 No	Were you aware of its rate of application before SG-2000? 1 yes 2.No	Were you aware of this time of application before SG-2000? 1 yes 2. No	Have you demonstrated to SG-2000 farmers in your RDC? 1 Yes 2 No	How many SG-2000 farmers applied it on EMTPs in your RDC? 1 Yes 2. No	How many SG-2000 farmers adopt it on non-EMTP wheat plots?	How many non-SG-2000 farmers of your RDC adopt it?
Mitike wheat variety	150 kg	na							
Kubsa wheat variety	150 kg	na							
Wabe wheat variety	150 kg	na							
DAP fertilizer	100 kg	during planting							
UREA fertilizer	100 kg	during planting							
U-46 (2,4-D) herbicide	1litre	35-45 days after planting							
Granstare herbicide	16grams	< 21 days after planting							
Starine M. herbicide	1 litre	30-50 days after planting							
Grasp herbicide	1litre	< 21 days after planting							
Puma herbicide	1litre	30-50 days after planting							
Tilt-250 fungicide	0.5 litre	depends on occurrence							
Row wheat planting	na	na							
Proper land preparation	3-4 times before planting	na							

B2. For each wheat technologies/practices in item B1 table column 9:

(a) adopted by SG-2000 farmers, indicate what factors facilitated the adoption.

(b) Not adopted by SG-2000 farmers, indicate seasons for why not adopted.

B3. For each wheat technologies/practices in item B1 of table column 10:

(a) Adopted by non-SG-2000 farmers, indicate what factors (reasons) facilitated the adoption.

(b) Not adopted by non-SG-2000 farmers, indicate reasons for none adoption.

B4. What is your opinion on wheat technological packages' or practices' characteristics promoted to smallholder farmers, as recommended by SG-2000 project, in terms of: their relative advantage; compatibility, trialability; observability and complexity from point of view of your RDC farmers' circumstances which affect their rate of adoption? For each of the following SG-2000 wheat technologies or practices and their recommendations, indicate your perception of the characteristics of the technologies or practices by circling the number from the response categories of each 9 questions below.

SG-2000 wheat technologies /practices	Recommended rate per hectare	Is it profitable over existing method? 1 yes 2 No	Is it consistent with farmers values or beliefs or attitudes? 1 yes 2.No	Is it consistent with farmers management practices? 1 yes 2 No	Is it within the ability of the farmers to manage? 1 Yes 2 No	Is it affordable? 1.Yes 2. No	Can it be tried out on a small scale basis? 1 yes 2 No	Is it trialable without committing farmers too much money? 1 Yes 2 No	Is it's superiority over existing methods clearly visible to farmers? 1 Yes 2 No
Mitike wheat variety	150 kg								
Kubsa wheat variety	150 kg								
Wabe wheat variety	150 kg								
DAP fertilizer	100 kg								
UREA fertilizer	100 kg								
U-46 (2,4-D) herbicide	1litre								
Granstare herbicide	16grams								
Starine M herbicide	1 litre								
Grasp herbicide	1litre								
Puma herbicide	1litre								
Tilt-250 fungicide	0.5 litre								
Row wheat planting	na								
Proper land preparation	3-4 times before planting								

B5. Were the any attempt being done in your RDC by SG-2000 to adjust wheat technological packages or their recommendations to a given farmers' local environment and socio-economic conditions?

1. Yes 2. No

B6. If yes, indicate the types of technologies or recommendations changed and factors for change.

_____

SECTION C. EXTENSION WORKERS' PERCEPTION ON SG-2000 CREDIT SYSTEM

C1. When did you start working with SG-2000?_____

C2. What were your major day to day agricultural extension activities before joining SG-2000?

_____

C3. What specific activities do you usually do or carry out under SG-2000?

_____

C4. Are they any selection criteria for SG-2000 farmers set by SG-2000?

1. Yes 2. No

C5. If yes, indicate the selection criteria as set by SG-2000 for the selection of SG-2000 farmers.

_____

C6. What do you think about appropriateness of SG-2000 selection criteria from point of view of farmers' circumstances of your area and extension service provision principles? Indicate the types of selection criteria regarded as

inappropriate and reason for in appropriateness to your area.

_____

C7. Beside your regular agricultural extension education activities, what types of credit are you providing to farmers under SG-2000?

_____

C8. How are you managing your extension activities with the additional work load of credit provision under SG-2000?

_____

C9. On average, how many days in a week do you spend in distributing credit inputs during planting under SG-2000?_____days.

C10. On average, how many days/weeks/months did it took you during the last season to distribute credit inputs? _____ days/weeks/months (Specify)

C11. On average, how many days a week do you spend in collecting credit down payments and repayments?

1. Down payments ------- days a week
2. Repayments ---------- days a weeks

C12. On average, how long (in weeks/months) does it take you to collect credit down payment and repayment per cropping season?

1. Down payment collection lasts-------weeks/months per season.
2. Repayment collection lasts -------- weeks/months per season.

C13. Do you find any difficulties in credit inputs distributions and repayment collection? Explain.

_____

C14. Is your relationship with farmers affected by being involved in credit provision and loan collection under SG-2000? 1. Yes 2. No

C15. If: (a) Yes, Explain.

_____

(b) No, Explain.

_____

C16. In your opinion, should the provision of credit continue to be handled by extension workers? Yes/No (In either case explain).

_____

C17. Do you think the number of household farmers reached or served are reduced by being involved in credit provision under SG-2000? 1. Yes 2. No (In either case explain).

_____

C18. Do you think SG-2000 credit system is useful in the adoption of wheat technologies/practices by smallholder farmers? 1. Yes 2. No

C19. If yes, indicate the types wheat technologies/practices that have been adopted by farmers as a result of SG-2000 credit system and specify particular nature of he SG-2000 credit system facilitated the adoption.

Types of wheat technologies adopted as result of SG-2000 credit system	Feature of the credit system that facilitated the adoption
_____	_____

C20. What strengths do you find in SG-2000 credit system?

_____

C21. What appears to be the weaknesses of SG-2000 credit system?

_____

C22. In your opinion do you think SG-2000 credit system in your RDC has been a success or a failure? Explain.

1. Success, explain

_____

2. Failure, explain

_____

C23. In your own opinion what do you think can improve the SG-2000 credit system? _____

Thank You