Analysis of Farmers' Preferences for Development Intervention Programs: A Case Study of Subsistence Farmers from Eastern Ethiopian Highlands

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Abstract

The aim of this paper is to better understand farmers' perception of the relevance of different development intervention programs. Farmers' subjective ranking of agricultural problems and their preference for development intervention are elicited using a stated preference method. The factors influencing these preferences are determined using a random utility model. The study is based on a survey conducted in the Hunde-Lafto area of the Eastern Ethiopian Highlands. Individual interviews were conducted with 145 randomly selected farm households using semi-structured questionnaires. The study suggests that drought, soil erosion and, shortage of cultivable land are high priority agricultural production problems for farmers. Low market prices for farm products and high prices of purchased inputs also came out as major problems for the majority of farmers. Farmers' preferences for development intervention fall into four major categories, market, irrigation, resettlement, and soil and water conservation. Multinomial logit analysis of the factors influencing these preferences revealed that farmer's specific socio-economic circumstances, and subjective ranking of agricultural problems play a major role. It is also shown that preferences for some interventions are complimentary and need to be addressed simultaneously. Recognition and understanding of these factors, affecting the acceptability of development policies for micro level implementation, will have significant contribution to improve macro level policy formulation.

Key words: Ethiopia, policy, development intervention preference, and subsistence farmers.

1. Introduction

Most studies dealing with the impact of rural development programs and agricultural technology adoption by farmers in developing countries are based on *ex-post* analysis of intervention programs. Farmers are rarely consulted, a priori, about their specific circumstances, priority problems, and their preference for type of intervention. The adoption behavior study comes after the costs are incurred and the technologies have been diffused. Such technological interventions often resulted in a low level of acceptance by the target group and a lower success for development programs (Feder et al., 1981). A long list of explanatory variables, that requires different policy interventions to overcome, has been identified and suggested to explain adoption behavior of farmers. Farmers' preferences for the type of intervention rarely appear in the explanatory variables. Prior identification of farmers' preference can help to design more acceptable and cost effective development intervention programs. In addition, the likely extent of future adoption of research results has a strong influence on the efficiency of research and on the results of research priority setting exercises (Batz et al., 2003).

Prior knowledge of farmers' priority problems and predisposition with respect to the usefulness of a development interventions program can also help to gear development intervention programs to the needs of different regions and group of farmers. This is so because farmers, who are the ultimate users of the program, take decisions to participate and adopt any development intervention in line with their utility maximization objective. Alternative intervention programs are valued based on their contribution to the household welfare. Knowledge of farmers' preference for development intervention (PDI) gives an insight into the value farmers place on the different programs. These preferences can be elicited using a stated preference survey method and factors affecting these preferences can be determined econometrically.

Prior studies that systematically analyzed farmers' preferences include Napier and Napier (1991), Schnitkey (1992) Carter and Batte (1993) and Pompelli et al., (1997), Tucker and Napier (2000). All these studies are conducted in the context of USA and mostly focused on the analysis of farmers' preferences for information type, source, and method of communication. Drake et al. (1999) analysed farmers' attitude towards Countryside Stewardship Policies in Europe. In all these studies information on farmers preferences is elicited using stated preference survey method, and the econometric models used to determine factors affecting farmers' preferences are the logit model (Schnitkey, 1992; Carter and Batte, 1993; Pompelli et al., 1997;and Drake et al., 1999) and descriptive statistics and multivariate regression model (Napier and Napier, 1991; and Tucker and Napier, 2000). The findings reported from these studies indicated that farmers' preferences are influenced by the characteristics of the farm and the farmer and, the personal costs and benefits that farmers expect. Results studies on information type and method of communication, suggest that sources and methods of communication of information should not only be based on their capacity to reach larger number of farmers, but also according to their perceived credibility and relevance among target audience. The study by Batz et al., (2003) undertaken in Kenya is the only in Africa, and

probably in developing countries, to attempt a priori prediction of farmers' preferences for technological intervention. This study, aimed at predicting technology adoption to improve research priority, approached the issue from a different angle. Instead of directly eliciting farmers' preferences for technology, the study focused on past experiences and knowledge of the characteristics of the technology that have determined adoption. Empirical results from past experiences are used to predict the speed and ceiling of adoption of potential new dairy technologies to be developed. This study, though indirectly through the desired characteristics of the technology, revealed that farmers' preference is a function of their specific socio-economic circumstances.

Ethiopian agriculture, the dominant economic sector in the country, is characterized by subsistence nature of production. An important proportion of the rural population lives under the poverty line and is repeatedly hit by devastating famine and hunger. Under such situations, government interventions ranging from life saving emergency food aid to rehabilitation and rural development assistance are vital and necessary. Apparent market failures, as in many developing countries emanating from, lack of information, risk and uncertainty, ill-defined property right regimes and poorly developed capital market, resulting in inefficient allocation of resources also necessitates government interventions. Public policy and development intervention programs can play a positive role to reverse the scenario of poverty and steer the rural economy along a sustainable path of economic development. However, interventions need to be planned and implemented in a manner that it will bring the highest benefit to the target group in line with the intended development path. To this end, policy programs need to be congruent with farmers priority problems and felt needs and; fit the agro-ecological and socio-economic circumstances. Such development program interventions will have a greater chance of being accepted and practiced in a sustainable manner than programs based on temporary incentives and coercive pressure. Hence, the need to have an insight into the farmers' felt priority agricultural problems and determinants of farmers preferences for development intervention programs.

Based on their extensive knowledge of the farming environment and the outstanding agricultural problems, farmers can state their preference for development intervention in line with their utility maximization objective, given their constraints and resource endowments. Different types of development intervention programs can be different in their social efficiency and imply different levels of resources and involvement by government. Therefore, identified farmer's preferences would require to be evaluated for their social, economic and political feasibility both from the point of views of local and national government.

This paper attempts to provide an insight into this less studied dimension in rural development by eliciting farmers' felt priority problems and preferences for development intervention program. Having identified the preferences for intervention, the agricultural problems and socio-economic factors assumed to have potential to influence farmers' preferences are analyzed using stated preference model. The key research questions pursued in this study are: (a) what are the main agricultural problems as perceived by farmers? (b) what type of development assistance or policy interventions do farmers prefer to solve their problems? and (c) what are the factors that determine these preferences. This is important to guide micro level implementation of development policies to come up with more appropriate programs that are acceptable to farmers and are more likely to make differences in rural life.

2. The study area

This study is based on a survey conducted during July and August 2000, in the Hunde-Lafto area, which is part of the Western Hararghe Zone of the Oromiya Regional State. Hunde-Lafto is located at about 350 km east of the capital city of Ethiopia, Addis-Abeba, and 20 km north of the zonal (District) town Chiro, along the main road to Harar and Dire-Dawa. The area has an undulating topography with convex shaped interfluves, V-shaped valleys, and steep to very steep hills. It has a slope gradient ranging from nearly flat valley bottoms to more than 50 degree steep hillsides (Tolcha, 1991). The area has a bimodal rainfall distribution, with a light secondary rainy season from March to May and a heavy primary rainy season from July to September. Agriculture in the area is characterized by small-scale subsistence mixed farming-system, with livestock production as an integral part. Sorghum-Maize-Haricot beans (S-M-H) intercropping, typical in the Eastern Ethiopian Highlands, dominates the cropping system. Other crops like highland pulses, vegetables and a stimulant crop T'chat" (*Catha edulis forsk*) are also grown in small amounts.

Table 1: Socio-economic characteristics of sample farm households

Characteristic	Percent of total	Mean	Standard Deviation
Family size	-	6.43	2.41
Male household members	-	3.40	1.68
Female household members	-	3.03	1.44
EA household members	-	3.26	1.49
ED household Members	-	3.19	1.83
Land holding (hectares)	-	0.72	0.34
Total livestock holding (TLU)	-	0.83	0.79
Oxen (heads)	-	1.60	1.31
Other cattle (heads)	-	1.10	1.54
Goats & sheep (heads)	-	2.38	3.29
Chicken (heads)	-	0.21	0.5
Donkey (heads)	-	1.45	1.01
Formal Education	-	-	
None	44	-	
1 – 3 years	26	-	
4 – 6 years	17	-	
> 6 years	13	-	
Ethnic Group	-	-	
Oromo (Majority)	71	-	
Amhara (Minority)	29	-	

Source: Own survey, 2000

EA = Economically Active = Family member ≥ 15 and < 65 years old.

ED = Economically Dependent = Family member < 15 and ≥ 65 years old.

TLU = Tropical Livestock Unit = 250 kg life weight of animals (Ghirotti, 1988)

Cash income for household financial requirements is mainly generated from sale of livestock and crop products. Households facing seasonal food shortage and lacking access to credit to overcome the problem may, however, work as daily laborers for other farm households in exchange of food grains or cash. A limited number of households generate off-farm income. These include small trade activities like trading of vegetables and T'chat in nearby village centers, and sale of processed consumer goods in their village. Farmers in the area have different levels of resource endowment and socio-economic characteristics (Table 1) that shape their farming practices and potentially affect their agricultural technology adoption behavior.

3. Theoretical framework

Since the 1960's, several stated preference techniques have been developed in recognition of the importance of valuing non-market goods and services (Carson et al., 2001). These techniques are most commonly used to combine economic theory and survey research to estimate the economic value individuals or households place on various goods, services, or public programs. The welfare implications of utility resulting from a change in the public good are elicited through survey questionnaire. This welfare implication is often expressed in terms of a change in index expressed in monetary amounts which would need to be taken from or given to the agent to keep the agent's overall utility constant. Individuals are interviewed and asked about their maximum willingness to pay (WTP) for an increase in the provision of goods or services, and their minimum willingness to accept (WTA) in compensation for the decrease in the provision of the goods or services, depending on the relevant property right to the good or service (Carson et al., 2001). The framework of this method can also be used to assess farmers' willingness to participate in public development programs or their preference for development intervention (PDI) in subsistence agricultural economies.

In this study we assume that farmers, from experiences, know their major agricultural problems and can state their preference among alternative development programs. Underling this assumption is that the stated preference is based on farmers' implicit cost and benefit expectation from the alternative interventions, given their resource endowment. They are expected to rationally reveal their preference in line with the objective of improving their welfare. This preference can be represented by a utility function and the decision problem can, therefore, be modeled as a utility maximization problem.

Based on the assumption that the only information available is the ordering of alternative situations (preference map) by the household, the principle of welfare measurement of individual households can be derived (Boadway and Bruce, 1984). Observations of farmers' preference among different interventions can reveal the farmers' utility ranking of the alternatives. However, in the case where farmers are asked to state their preferences for alternative intervention programs, there is no natural ordering in the alternatives and it is not assumed that there is monotonic relationship between one underlying latent variable and the observed outcomes in ordering the interventions. In such cases, a common alternative framework to put some structure on the different probabilities is a random utility framework, in which the utility of each alternative is a linear function of observed individual characteristics plus an additive error term (Verbeek, 2000). With appropriate distributional assumptions on the error terms, this approach leads to a manageable expressions for probabilities implied by the model. Following the stated choice method (Adamowicz, 1998; Hanemann, 1984 and; Hanemann and Kanninen,

1996), the econometric model used to investigate the determinants of farmer's PDI in this study is a random utility model (RUM).

Suppose that the farmer drives utility from participating in public development intervention program and from his resource endowment. Let participation in development intervention be represented by *j*, where *j = 1* if the farmer is willing to participate in the development intervention program and *j = 0* otherwise. Resource endowment of the farm household is represented by w, and the vector x represents other observable attributes of the farm household that might potentially affect the desirability of the intervention program. If the farmer prefers the public development intervention program, his utility is given by $U_1 = U(1,w,x)$ and, if he dose not have preference for the intervention $U_0 = U(0,w,x)$. As in a standard economic theory, farmers should try to choose the policy intervention offering they like best, subject to their constraints. As it is most common in the specification of utility function, we assume additively separable utility function in the deterministic and stochastic components where the deterministic component is assumed to be linear in the explanatory variables. That is,

$$U_1 = U(1, w; x) = V(1, w; x) + e_1 \quad (1)$$

and

$$U_0 = U(0, w; x) = V(0, w; x) + e_0 \quad (2)$$

where $U_j(.)$ is the utility from the intervention program, $V_j(.)$ is the deterministic part of the utility, and e_j is the stochastic component representing the component of utility known to the farmers but unobservable to the economic investigator. Farmers are assumed to know their resource endowment, *w,* and implicit cost of participating in the program in terms of engagement of their resources and can make a decision whether to participate or not. Let the farmer's implicit cost of participation be represented by *A*. Therefore, the farmer will prefer a development program if,

$$\begin{aligned} &U_1(.) \geq U_0(.) \\ &V(1, w - A; x) + e_1 \geq V(0, w; x) + e_0 \end{aligned} \quad (3)$$

The presence of the random component permits to make probabilistic statements about decision maker's behavior. If the farmer prefers the intervention, the probability distribution is given by,

$$P_1 = \Pr(prefere) = \Pr(V(1, w - A; x) + e_1 \geq V(0, w; x) + e_0 \quad (4)$$

and if the farmer did not prefer the intervention,

$$P_0 = \Pr(notprefer) = \Pr(V(0, w; x) + e_0 \geq \Pr(V(1, w - A; x) + e_1 \quad (5)$$

With the assumption that the deterministic component of the utility function is linear in the explanatory variables, the utility functions in (1) an (2) can be expressed as $U_1 = b_1'X_i + e_1$, and $U_0 = b_0'X_i + e_0$ respectively, and the probabilities in equation 4 and 5 can be given as

$$\Pr(prefer) = \Pr(U_1(.) \geq U_0(.))$$

$$= \Pr(b_1' X_i + e_1 \geq b_0' X_i + e_0)$$

$$= \Pr(b_1' X_i - b_0' X_i \geq e_0 - e_1) \quad (6)$$

Extending the argument to multiple choices alternatives, suppose there is a choice between *M* different alternatives indexed by *j = 0 … M*, with the ordering being arbitrary. Assume that the utility that individual i attaches to each alternative is given by U_{ij}, *j = 1, 2 … M*. The farmer will prefer alternative *j* if it can be expected to give him the highest utility. That is,

$$U_{ij} = \max\{U_{i0},...,U_{iM}\} \quad (7)$$

The probability that farmer *i* prefers intervention *j* from among *M* alternatives is given by

$$P(C_i = j) = p\{U_{ij} = \max\{U_{i0},...,U_{iM}\}\} \quad (8)$$

where C_i denotes the preference of individual *i*..

Assuming that the error terms in the utility function are independently and identically distributed (IID) two widely used distributions are the normal and logistic that gives the probit and logit model respectively (Haab and McConnell, 2002). In this study we assume that the error term is logistically distributed and use the logit model. This model is more appropriate and makes it possible to study the determination of the factors influencing farmers' preference when the explanatory variables consist of individual specific characteristics and these characteristics are the determinants of the choice.

In its multivariate generalization it gives rise to the multinomial logit model (McFadden, 1974). In a multinomial logit framework, the probability that a farmer prefers alternative j is given by;

$$\Pr(C_i = j) = \frac{e^{b_j X_i}}{e^{b_0 X_i} + e^{b_1 X_i} + ... + e^{b_M X_i}} \quad (9)$$

Using identification normalization with an arbitrary restriction by setting $\beta_0 = 0$, the probabilities are given by,

$$\Pr(C_i = 0) = \frac{1}{1 + e^{b_1 X_i} + e^{b_2 X_i} + ... + e^{b_M X_i}} \quad (10)$$

$$\Pr(C_i = j) = \frac{e^{b_j X_i}}{1 + e^{b_1 X_i} + e^{b_2 X_i} + ... + e^{b_M X_i}} \quad (11)$$

By differentiating equation (11) with respect to the covariates we can find the marginal effect of the individual characteristics on the probabilities (Greene, 2003). This is given by:

$$d_j = \frac{\partial P_j}{\partial X_i} = \left[b_j - \sum_{k=0}^{J} P_j b_k \right] = P_j \left(b_j - \bar{b} \right) \qquad (12)$$

where δ_j denotes the marginal effect, the coefficient, of the explanatory variable on the probability that alternative j is preferred.

4. Empirical analysis

Data for this study is generated in parallel with the soil and water conservation adoption study survey conducted by the author in July – August 2000 in the study area. Within the survey area, 145 farm households were randomly selected and individually interviewed using a semi-structured questionnaire. Prior to the formal survey an informal survey was conducted using individual interviews and focus-group discussions with farmers and key informants. The information collected in the informal survey helped to guide the development of the formal questionnaire. The questionnaires were pre-tested in training enumerators who were to help the researcher conduct the interviews. Questions included in the final survey include household socioeconomic and farm characteristics, as well as institutional aspects. Some of the questions related to farm production and household income were found to be sensitive for respondents and generated inconsistent information. Therefore, these were not used in the analysis.

Farmers' subjective priority agricultural problems were elicited in two steps. First they were asked to enumerate their major agricultural production problems that causes frequent crop failure and food shortage. They were then asked to rank these problems in order of importance. Finally farmers were asked about the development intervention that they prefer and feel is the most appropriate to solve their agricultural problems based on their own experience and knowledge of their environment. In this survey, unlike the contingent valuation exercises where respondents are given a hypothetical scenario and offer (Whittington, 2002), farmers are asked to identify and rank their own priority agricultural production problems and state their preferences for development intervention that they are willing to accept and adopt. This line of eliciting farmers preference is used in the study of Tucker and Napier (2000), where farmers were asked to indicate frequency of use for source of conservation information identified from literature and then rank the perceived relevance of most common communication channels.

5. Results and discussions

5.1. Priority agricultural problems

The first step in the analysis is to determine farmers' perceived ranking of agricultural problems. Perception is a behavioral issue that cannot be observed by the investigator. What is observable is the response received from farmers on the specific questions raised. The assumption is that the reply to the question reflects the perception the individual possesses on the topic of interest. The survey result show that, among numerous agricultural problems enumerated five turned out to be

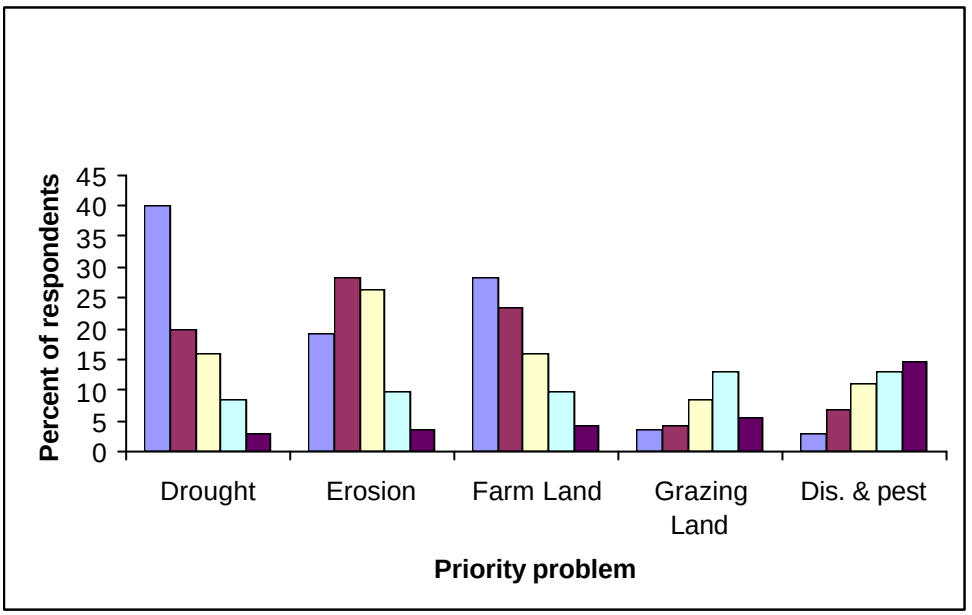
the most important for the majority of sample farmers. These include, frequent drought problem, soil erosion, shortage of farmland, lack of grazing land, and crop disease and pest occurrence (Table 2, and Figure 1).

Table 2: Summary of sample farmers' ranking of agricultural problems in Hund-Lafto area

Priority of the Problem	Drought		Erosion		Farm Land shortage		Grazing Land shortage		Disease & Pest		Total
	No.	%	No.	%	No.	%	No.	%	No.	%	%
1st	58	40.0	28	19.3	41	28.3	5	3.5	4	2.8	93.8
2nd	29	20.0	41	28.3	34	23.5	6	4.1	10	6.9	82.8
3ed	23	15.9	38	26.2	23	15.9	12	8.3	16	11.0	77.2
4th	12	8.3	14	9.7	14	9.7	19	13.1	19	13.1	53.8
5th	4	2.8	5	3.5	6	4.1	8	5.5	21	14.5	30.3
Not in 5	19	13.1	19	13.1	27	18.6	95	65.5	75	51.7	
Total	145	100	145	100	145	100	145	100	145	100	

The results suggest that frequent occurrence of drought resulting in crop failure is the first priority agricultural problem for about 40% of the sample farm households. About 20% and 16% of the households ranked drought as the second and third priority problem, respectively. Shortage of farmland is identified as first priority problem by about 28% of the respondents while land degradation due to erosion is ranked as first priority problem by about 19% of the respondents. Erosion is ranked as the second priority problem by about 28% of the respondents and the third priority problem by about 26% of them. Shortage of farmland is ranked as second and third priority agricultural problem by about 23% and 16% of respondents, respectively. Problems related to grazing land and occurrence of disease and pest received lower percentage (< 5%) of respondents ranking as the first priority problem and less than 10% as the second priority problem. The five priority agricultural problems identified, all together, represented the first, the second, and the third priority problems for about 94%, 83% and 77% of the sample farm households, respectively. In addition, farmers also identified problems related to output and input markets prices. About 83% of the sample farmers reported the price of chemical input, notably fertilizer, to be high while about 68% reported the prices for agricultural products on the market to be low.

Figure 1: Sample farmer's priority agricultural problems ranking in Hunde-Lafto area.



Note: *the bar graphs represent the rank of the problem. From left to right first, second, third, fourth, fifth.*

Major agricultural problems identified by the sample farmers are not considered as a reevaluation because most of these problems are well known and documented agricultural problems of the country as a whole. Drought incidence is not an unusual phenomenon in Ethiopia. The climate is characterized by high rainfall variability and drought situations took place throughout human history. Occurrence of drought in the country is characterized by a quasi-periodic fluctuation with an approximate period of 8 – 10 years and this oscillation period is lower in some part of the country (Haile, 1988). The history of soil erosion in Ethiopia is as old as the history of agriculture (Hurni, 1988) and the country is one of the most serious soil erosion areas in the world (Blaikie, 1985 and Blaikie and Brookfield, 1987). Recurrent famine and starvation engendered by drought and land degradation are well known images of the country. The results of the study, however, shows that farmers are not unaware of the farming problems and their priority ranking differ as a function of their resource endowments and socioeconomic circumstances. The interest of this study is to look into the priority ranking of these problems from farmers perspective and the effect of these rankings on farmers' preferences for different types of development intervention.

Farmers ranking of agricultural production problems are used as explanatory variables in the analysis of the determinants of their preference for development interventions. For the purpose of rank interpretation the ranks of each problem are given arbitrary weights as follows.

Rank	Weight
Not in five priority problems	0
Fifth priority problem	0.2
Fourth priority problem	0.4
Third priority problem	0.6
Second priority problem	0.8
First priority problem	1.0

5.2. Preferences for development intervention

Preferred development intervention programs suggested by farmers are classified into four major categories for analysis, input and output market, irrigation, soil and water conservation, and resettlement (Table 3). These stated preferences correspond to past and current rural development programs pursued by the national government and international donor organization, indicating farmers' awareness about possible intervention areas. The focus of this study is analysis of the differences in farmers' preferred intervention program as a function of their specific circumstances.

Table 3: Sample farmers preferred agricultural development interventions in Hunde-Lafto area.

Type of assistance preferred	Responses	
	Number	Percent
No opinion	19	13.1
Input and output market	46	31.7
Soil and water conservation	33	22.8
Development of irrigation	25	17.2
Resettlement in potential areas	22	15.2

The results show that about 32% of the respondents would prefer intervention in the area of improving input and output markets. This reflects the problems farmers face due to inability to pay for fertilizer and improved seed credits that sometimes cost them their important livestock asset. The inabilities arise because of crop failure due to unfavorable weather conditions and also low market prices for their grains in case of better production, in years of favorable climatic conditions. This is an indication of the absence or low level of development of rural financial market. Farmers do not have access to credit from formal governmental or private financial institutions because of lack of capital assets to be used as a collateral. Even the land they cultivate is a government property to which they have only the right to usufruct and could not be used as a mortgage. Insurances against crop failures due to adverse climatic conditions are simply inexistent for subsistence farmers. Further more, information about current and future market prices are not available. This conditions result in market failure and inefficient allocate resources that will impact on the country's effort to alleviate poverty and ensure food self-sufficiency, in the over all objective of attaining sustainable rural development. Hence, the concern of farmers is justifiable and the issue requires appropriate public intervention.

About 23% of the sample farmers stated their preference for intervention in the area of soil and water conservation and, about 17% for development of irrigation infrastructures. This reflects awareness and concern about land degradation due to erosion and frequent drought problems in the area, which result in crop failure. Ethiopian agriculture is predominantly rain fed and food production in the country is

at the mercy of nature. Currently only about 3% of the total food production in the country comes from irrigation agriculture while only about 5% of the potential irrigable land in the country is under irrigation (FDRE-MoFED, 2002). This dependence on nature made the vast majority of the rural population vulnerable to climatic changes. Increasing water resource utilization, development of water harvesting technologies and development of small-scale irrigation scheme to ensure reliable supply of water are among the objectives of the Ethiopian sustainable development and poverty reduction program (ibid). Irrigation structures often require high initial investment cost that is beyond the reach of subsistence farmers. Interventions in the design and implementation of appropriate small-scale irrigation technologies that are within the reach of farmers will be of paramount importance.

Soil erosion by water is the principal form of land degradation in Ethiopia threatening the nation's future food security and development prospects. Soil and water conservation projects were among the widely implemented programs in the country over the past decades. However, this program have not succeeded in triggering voluntary adoption of conservation practice among farmers outside the project area, nor preserving the structures constructed under the incentives of the project. The program, however, succeeded in razing awareness about the problem of soil erosion and importance of conservation. Among the reasons for the failure of the program in triggering voluntary adoption was lack of consideration for farmers' preference and, its huge reliance on temporary incentives and coercive actions. Carefully planned intervention, paying due attention to farmers needs and circumstances with consideration for their preferences, will still help in the effort to combat land degradation.

An important proportion of sample farmers (22%) have shown preference for resettlement program. Well planned resettlement programs can help to achieve ecological objective of reducing natural resource and population imbalance and economic objective of using productively underutilized human and natural resources. Intra-regional and inter-regional migration of people has been common in Ethiopian history. Prior to the 1974 Ethiopian revolution, such migrations have been taking place without central coordination based on individual initiatives and by local governors and aid agencies with a variety of motives and objectives (Pankhurst, 1990). The land reform proclamation of 1975 that nationalized all rural land has facilitated state intervention and resulted in an increase in resettlement programs in the country. Massive resettlement programs undertaken during the past regime (1974-1991) were characterized as being hasty without proper need and capacity assessment, costly, poorly planned, and based on coercive actions that resulted in excess mortality and family separation (Pankhurst, 1990). As a result the outcomes in terms improving productivity and the well being of the society as a whole was far below expectation. The sustainable development and poverty reduction program of current Ethiopian government (FDRE-MoFED, 2002) also considers resettlement as one possible alternative strategy for people from drought prone areas where there is land and rainfall shortage.

The issue of resettlement programs in Ethiopia is complicated due to ethnic based federal states boundary delimitation and, therefore, requires careful planning. Some federal states suffering from agricultural land degradation and inadequacy of rainfall may not have enough underutilized productive land to accommodate new settlers. Across boundary resettlement programs may prove difficult due to possible conflicts along ethnic lines that may force resettlement programs to be confined within the same federal state boundaries. Sometimes resentments within the same federal state boundaries may also prove difficult because differences across ethnic lines may get its way to differences among sub-regions and clans within the same ethnic

group because of economic interests involved. The economic interest involved is that the local community would like to preserve sufficient stock of land in its immediate area for future claimants from its community to ensure transgenerational rights in face of rapidly growing population. Ensuring basic services to create conducive living and working environment for new settlers also require careful consideration. Careful planning is also needed not to induce land degradation and environmental problems in new settlement areas.

5.3. Determinants of farmers preferences

Policy program interventions in Ethiopia are often planed without sufficient knowledge of farmers' resource endowment, priority problems and felt needs. Moreover, the same type of program is designed and implemented to work for all regions and farmers across the country. The cultural background of different peoples, ecological conditions, available technologies and manpower, and many other factors constitute a context within which rural development programs attempt to bring changes. Differences need to be noted. Environmental conditions vary from region to region and from site to site within the same region. Nor are rural people a uniform mass and their strategies all the same. Even in the same locality, there can be a big contrast between the strategies of those with different socioeconomic background, for example, for those with more land and those who are with less land or landless. Therefore, there is a need to understand factors that influence preference for one or other type of development intervention.

Past and present agricultural crisis and famine problems in Ethiopia could at least partly be attributed to the failure of government rural development policies. Evidences show that climatic variability and drought is not a new phenomenon in the country, it is as old as the history of agriculture itself. Designing and implementing appropriate development programs to cope with this foreseeable phenomena lies within the responsibilities of policy makers. Nature cannot be blamed forever. Farmers, with their extensive knowledge of local circumstances and their problems, can help in identifying their preferred development program. Knowledge of these preferences can help in the design and implementation of development programs that will be acceptable to farmers and will bring a lasting change.

Farming practices that would be optimal from the point of view of society as a whole may not be adopted as widely or as rapidly as society would prefer when the issue is left solely to the free market, due to apparent market failures in many developing countries. It is not in society's power either to directly select a particular type of farming practice to be adopted by individuals. Rather policy makers require understanding of factors influencing the acceptance and adoption of various interventions, and design appropriate policy and programs that will be acceptable. The agricultural practices and land use system that will come into existence will be that which results from farmers' reactions to the government policies. It is probable that some farmers will respond somewhat to perceived social pressure or community expectations, temporary incentives and, coercive actions. However, this will not be a sustainable solution to problems, and will be abandoned if it will not be beneficial to the fulfillment of self-interest. Ethiopia itself is a good example of failure of rural development programs based upon temporary incentives and coercive actions. The failure of the massive population resettlement programs (Pankhurst, 1990), and soil and water conservation projects under the incentives of Food-For-Work program during the late 1970s and 1980s (Hoben, 1996; Admassie, 1995; Shiferaw and Holden, 1998) could be cited as example. Therefore, there is a need

to genuinely understand and address factors influencing farmers' preferences for different types development intervention programs.

Table 4: Summary statistics and definition of explanatory variables for farmers' preference in Hunde-Lafto area.

Variable	Definition	Value	Mean values
Prefer	Preferred intervention (Dependent variable)	No opinion = 0 Market = 1 Conservation = 2 Irrigation = 3 Resettlement = 4	
Age	Age group interval of the household (HH) head *	1 … 5	2.53
Education	Years of formal education.	1, 2, 3…	2.32
Ethnic	Ethnic group of the HH head	1/0=majority/ minority	0.70
Family	Family size	-Number. 1, 2, 3…	6.43
Dependent	Economical dependent HH member	Number, 1, 2 3…	3.19
Food	Often produce enough food	1/0 = yes/ no	0.37
Total Land	Cultivable land holding in hectares	-0.1, 0.2, 0.3, …	0.73
Livestock	Livestock in tropical livestock unit	-0, 0.1, 0.2, 0.3, …	1.41
Per-Crop	Grow permanent crops	1/0 = yes/ no	0.67
Fertilizer	Used chemical fertilizer	1 /0 = yes/no	0.41
Output P.	Consider output price to be	1/0= High/reasonable	0.32
Input P.	Consider input price as	1/0= high/reasonable	0.84
Drought	Priority rank of drought problem**	1 … 5	0.69
Erosion	Priority rank of erosion problem	Same	0.62
Small Land	Priority rank of farmland shortage	Same	0.61
Disease	Priority rank of disease & pest problem	Same	0.23

*1 = < 30, 2 = ≥ 30 & <40, 3 =≥ 40 & <50, 4 = ≥ 50 & < 60, 5 = > 60 years old
**1 = 1st, 0.8 = 2nd, 0.6 = 3ed, 0.4 = 4th, 0.2 = 5th, 0 = not in 5 major priority problems

The preference determinant function, used in this study, incorporates a list of variables (Table 4) that reflects the socioeconomic circumstances of farm households, institutional aspects, and farmers perceived priority problems. These variables are assumed to potentially affect farmers, preferences for intervention. However no a priori assumption is made about the direction or magnitude of the influence of the variables due to lack of theoretical or empirical background relating personal and farm characteristics to preferences for different development intervention programs in developing countries.

The multinomial logit analysis results (Table 5) suggest that educational status and priority rank of farmland shortage positively and significantly (< 0.1) influence preference for resettlement. Total land holding and the number of economically dependent household members have a significant (< 0.05) negative influence on this preference. The influence of farmland shortage and total land holding is obvious straightforward that can be explained by simple logic. Those who have more land do not have incentive to be displaced and face uncertain new environment, they rather prefer interventions that help them improve productivity on their land. Farmers who do not have enough land holding to feed their family have stronger incentive to take risk of displacement with the hope of getting enough land resources to solve their

family problems. The positive correlation of educational status with resettlement can be explained by the higher-level awareness of educated farmers about the problems and opportunities provided by such an intervention. The influence of economically dependent household members provides an interesting insight in to the issues to be considered. It appears that families with higher number of economically dependent members are less willing to take the risk of displacement to an uncertain environment. This shows the concern that the economically dependent household members, children (≤ 14 years old) and elderly people (> 65 years old), may face hardships to cope with uncertainties that might be faced in a new environment. Families with less number of dependent members are showing willingness to take the risks and find productive lands on which they can use their labor force more productively.

Farmers' experiences in chemical fertilizer use positively and very significantly (< 0.01) influence preference for intervention in the areas of irrigation development. This could be explained by the fact that moisture availability for plant growth is crucial to get higher yields from the use of chemical fertilizers. In order to be able to pay for purchase of fertilizer and maximize the returns from its use, adequate water availability for plant growth is essential. Perception about input prices has shown significant (< 0.1) negative correlation with preference for irrigation. This is an indication of the complimentarily between chemical input use and irrigation investment. Investment in chemical fertilizer gives higher benefits when moisture availability in the soil is ensured; and returns from investment in irrigation could de maximized when nutrient availability for plant growth is ensured at reasonable costs.

Total land holding and priority rank of soil erosion problem show positive influence on preference for intervention in the area of soil and water conservation (SWC). The effect is significant at < 0.05 and < 0.1, respectively. Food production status and perception of input prices have shown negative correlation with preference for SWC. The influence is significant at < 0.1 and 0.01, respectively. The direction of influence of priority rank of soil erosion problem and total land holding is obvious.

Table 5: Marginal log probabilities of determinants of farmers preferences for development intervention in Hunde-Lafto area.

	Market				Soil &water conservation			
Variable	Coeff.	Std. Err.	T-ratio	P-value	Coeff.	Std. Err	T-ratio	P-Value
Age	-0.070	0.056	-1.249	0.212	-0.017	0.055	-0.304	0.761
Education	-0.020	0.023	-0.874	0.382	0.000	0.022	0.042	0.966
Ethnic	-0.157	0.123	-1.283	0.200	0.992	0.116	0.858	0.391
Family	0.134	0.040	0.336	0.737	0.007	0.041	0.163	0.871
Dependent	-0.041	0.048	-0.856	0.392	0.022	0.047	0.471	0.637
Food	0.328	0.139	2.351	0.019**	-0.230	0.134	-1.711	0.087*
Total Land	-0.037	0.199	-0.188	0.851	0.351	0.180	1.958	0.050**
Livestock	0.013	0.062	0.211	0.833	-0.024	0.056	-0.418	0.676
Per-Crop	0.007	0.115	0.061	0.952	0.047	0.113	0.414	0.679
Fertilizer	-0.109	0.129	-0.844	0.399	-0.778	0.116	-0.672	0.502
Output P.	0.004	0.117	0.035	0.972	-0.091	0.120	-0.757	0.449
Input P.	0.833	0.220	3.782	0.000***	-0.509	0.163	-3.115	0.002***
Drought	0.226	0.171	1.322	0.186	-0.108	0.150	-0.716	0.474
Erosion	-0.241	0.186	-1.294	0.196	0.327	0.185	1.764	0.078*
Small Land	-0.186	0.159	-1.170	0.242	0.111	0.144	0.773	0.440
Disease	0.394	0.200	1.972	0.049**	0.177	0.193	0.918	0.359

Variable	Irrigation Development				Resettlement			
	Coeff.	Std. Err.	T-ratio	P-value	Coeff.	Std. Err	T-ratio	P-Value
Age	0.019	0.038	0.495	0.621	0.011	0.026	0.406	0.685
Education	0.007	0.128	0.512	0.609	0.021	0.011	1.932	0.053*
Ethnic	0.093	0.083	1.123	0.261	-0.015	0.056	-0.267	0.789
Family	-0.014	0.028	-0.515	0.607	0.026	0.018	1.423	0.155
Dependent	0.025	0.032	0.787	0.431	-0.049	0.025	-1.959	0.050**
Food	0.106	0.083	1.271	0.204	0.015	0.068	0.212	0.832
Total Land	-0.085	0.109	-0.783	0.434	-0.305	0.127	-2.407	0.016**
Livestock	-0.026	0.346	-0.743	0.458	0.040	0.030	1.330	0.183
Per-Crop	0.060	0.076	0.793	0.428	-0.045	0.054	-0.831	0.406
Fertilizer	0.027	0.077	3.474	0.001***	-0.084	0.068	-1.233	0.218
Output P.	0.054	0.072	0.750	0.453	-0.019	0.053	-0.351	0.726
Input P.	-0.179	0.095	-1.880	0.060*	-0.054	0.077	-0.703	0.482
Drought	0.016	0.108	0.148	0.881	-0.068	0.068	-1.009	0.313
Erosion	-0.103	0.099	-1.040	0.298	0.060	0.089	0.666	0.505
Small Land	-0.145	0.096	-1.514	0.130	0.145	0.845	1.717	0.086*
Disease	-0.059	0.113	-0.523	0.601	0.129	0.093	1.390	0.165

Dependent variable	Preference
Number of observations	145
Log likelihood function	-163.263
Restricted log likelihood function	-225.7050
Chi-squared	124.883
Significance level	0.00000

*Significant at < 0.10, **Significant at < 0.05, ***Significant at < 0.01.

If soil erosion were perceived as a priority agricultural problem this would positively influence the preference for intervention in the area of SWC. Farmers with larger land holding would prefer to maintain the productive capacity of the land by reducing the process of land degradation due to erosion. The influence of food production status and perception of input prices is not so obvious. The negative effect of food production status may be explained by previous experiences where SWC programs have been considered to be synonymous with temporary incentives such as food-for-work program. Hence, those who produce enough food for their family do not show interest for such programs. The negative influence of perceived input prices on preference for intervention in the area of SWC is unexpected. It would seem reasonable to assume that when input prices are perceived to be high farmers would prefer to maintain land productivity by investing in SWC. The unexpected negative correlation might be explained by the existence of complimentarily between investment in SWC and input use. Investment in SWC may give higher return to investment when supplemented by the use of inputs, such as fertilizer, when provided at reasonable prices.

Contrary to their influence on preference for intervention in the area of soil and water conservation, food production status and perception of price of inputs have shown positive correlation with preference for intervention in the sphere of agricultural marketing. The correlation is significant (<0.05) for food production status and very significant (< 0.01) for farmers' perception of input prices, Rank of crop disease and pest problems has also shown significant (< 0.05) positive correlation with preference for intervention in the area of agricultural marketing. These results are straightforward because those farmers who consider input prices to be high to use and those farmers who give high rank to disease and pest problem

would prefer intervention in the area of input supply system. The positive correlation between food production status and preference for intervention in the sphere of marketing could be explained by the desire of farmers to have good prices for any amount of surplus they would be able to sell in order to procure themselves with consumer goods and farm inputs at reasonable prices.

6. Conclusions

Most often, problems with development policies and strategies arise not in the statements of the policy or crafting strategies at national or regional level. The problem arises at the grass root level implementation of the policies and strategies. A well stated and best articulated policy and strategy might fall short of achieving the intended target if micro level implementation programs are not well designed. The priority agricultural problems identified by sample farmers, in this study, are problems acknowledged by the government and are in the development plan to be addressed by the country's sustainable development and poverty reduction program (FDRE-MoFED, 2002). The findings of this study give insights into issues and variables to be considered at the micro level implementation of programs. This study suggests that farmers' specific socioeconomic circumstances and ranking of priority agricultural problems influence their preferences for development intervention and thereby affect the success of development programs. Though the analysis is made for a small area, the framework of the analysis could be used as an instrument for preference analysis in larger areas and, the specific results could be applicable for areas with similar settings.

On the top of the list of priority areas of action in the agricultural development program of the country is the design and introduction to farmers of menu based agricultural extension package that takes into account agro-ecological diversities (FDRE-MOFED, 2002). The results of this study suggest that, the menu for intervention also need to take in to consideration socioeconomic differences that might exist within the same agro-ecological settings for micro level implementation of development programs. Differences must be noted within the agro-ecological zones as well. Rural people are quite diverse both in the problems they face and their strategies to solve these problems. Even in the same locality, there can be a big contrast between the strategies of those with different socio-economic background and need to be addressed accordingly.

In planning interventions, attention also need to be drawn to the complimentarity of different interventions programs in order to ensure higher return from investments. As the results of this study show, for example, the preference for intervention in the area of irrigation is positively correlated with the experience in the use of chemical fertilizers and negatively correlated with the perception about input prices. The perception about input prices also affects preference for intervention in the area of soil and water conservation negatively. Programs that require the involvement of farmers' resources, such as in irrigation and soil conservation, therefore, need to be supported by appropriate intervention programs in the area of agricultural and financial market to ensure a higher return from investment by farmers.

The results of the study illustrate farmers' preferences for deferent potential intervention programs and the factors that affect preference for each program. Therefore, at grassroots level implementation of development programs, factors influencing the acceptance of each type of intervention have to be identified *a priori* and be properly addressed if development efforts are to bring about the desired outcome. From the policy makers' perspective, however, different types of

development intervention programs can be different in their social efficiency and imply commitment of different levels of resources and involvement by government. Therefore, identified farmers' preference for intervention could be evaluated and weighed for their social, economic and political feasibility both from the point of views of the national and regional governments.

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