

AGRICULTURAL RESEARCH AND EXTENSION IN ETHIOPIA: AN OVERVIEW

Goshu Mekonnen

I. HISTORICAL PERSPECTIVE

The formal beginnings of public agricultural research and extension services in Ethiopia can be traced to the initiation and establishment of agricultural service institutions in the late 1940s and early 1950s. Such service institutes include the Ambo Agricultural High School (1947), the Jimma Agricultural and Technical School (1952) and the Alemaya College of Agriculture (1956). The latter two institutions enjoyed substantial external support from USAID up to 1968 through bilateral agreement reached between the government of the United States of America and Ethiopia. The Alemaya College of agriculture (now Alemaya University of Agriculture) was modeled after the US land grant college system, where agricultural training, research and extension are fully integrated in one institution. In order to fully expedite its triple mandates, the Alemaya College of Agriculture, in addition to its research facilities at Jimma and Alemaya, opened a research station at Debre Zeit in 1955. The station was mainly intended to cater for the central highlands of Ethiopia and the staff located at the station were exclusively to focus on research. In 1963, under the scheme of Ethiopianization, the college became part of Haile Selassie I University (now Addis Ababa University), and its nation-wide mandate of agricultural extension was transferred to the Ministry of Agriculture (MOA).

The Alemaya College of Agriculture remained the major public institution conducting agricultural research until 1966 when the Institute of Agricultural Research (IAR) was established by proclamation under the MOA (ISNAR, 1993a). Major support to establish and build up IAR was provided by FAO and UNDP at its initial stage of development. Soon after its establishment, IAR rapidly took over from Alemaya college of Agriculture as the country's leading agricultural research institute. In the 1970s, IAR opened research centres for the major commodity crops (Maize, Sorghum, Wheat, etc) at Bako (1966), Awassa (1967), Alemaya (1973), Mieso (1973), Kobo (1973), Negale (1973) and Setit Humera (1973). The national coordination of the commodity crops research programme was also transferred from Alemaya to IAR during this period. The major support to establish the maize research programme at Awassa and Bako was provided by the Governments of the Federal Republic of Germany (FRG) and France, while IDRC supported the Sorghum programme at Alemaya and Melkassa.

Prior to 1975, the collection, characterization and preservation of indigenous crop resources was carried out by IAR and the Alemaya College of Agriculture. This important

task was done in a scattered and unorganized manner and, therefore, the need to create a separate plant genetic resource centre to cater for the collection and preservation of indigenous crop resources was felt. Hence through the support of the German Agency for Technical Cooperation (GTZ), the Ethiopian Plant Genetic Resource Centre (PGRC) was established in 1975, under the auspices of IAR administration. Two years later, the Soviet Phyto Pathological Laboratory (SPL) was established at Ambo in (1976/77) for the purpose of conducting research on crop protection, with major emphasis on cereal rusts, pests and weed control. The SPL was not absorbed by IAR, and its governance, accountability and its functional relationship with other national research institutes was unclear. It remained as the Soviet political symbol until recently, when it was renamed as the Plant Protection Research Centre (PPRC), under the auspices of the Ethiopian Science and Technology Commission.

In addition to the research work done by IAR and the academic institutions, some adaptive type of research was conducted by the MOA in the late 1960s and 1970s through comprehensive integrated package projects (Amare, 1977). These projects targeted towards the problems of the small farmers, were established in different regions of the country. But the Chilalo Agricultural Development Unit (CADU), established through the Swedish International Development Agency (SIDA), was the only project which developed a long-standing research programme. Over the years, it has tested and released many wheat and barely varieties. It has also undertaken research on forage crops, cross-breeding, farm implements, oil crops and horticulture. CADU was, renamed the Arssi Regional Development Unit (ARDU) in the early 1980s and SIDA's support was withdrawn in the late 1980s.

Through its Research Advisory Department, the Ministry of State Farms (MSF) also used to undertake field experiments on the research products developed by IAR and Alemaya University of Agriculture to test their suitability for large scale agricultural production.

The National Veterinary Institute (NVI) and the National Tse-tse and Trypanosomiasis Investigation Centre (NTTIC), both supported by the French Government under MOA, are responsible for the major part of the veterinary research. Research on Forestry and Fishery resources is largely non-existent, except the limited activities both in the IAR and the academic institutions. The Forestry Research Centre, which falls under the auspices of the Natural Resource Protection and Development Ministry has research programmes which are limited to silviculture, wood utilization and germplasm collection and evaluation. Limited research activities in agro-forestry also exist focusing mainly on the screening of multipurpose trees. The Fish Breeding and Research Centre established in 1974, under the Animal and Fisheries Resources Development Department of MOA, undertakes limited research and extension activities; but so far it has been unable to develop meaningful research programmes because of lack of resources (ISNAR, 1993a).

Agriculture-related research at Addis Ababa University (AAU) is conducted by the Awassa College of Agriculture, the Faculty of Veterinary Medicine (FDM) at Debre Zeit and the Institute of Development Research (IDR). IDR was established in 1972, with the main task of identifying and analyzing the socio-economic constraints to development. IDR has

made structural and organizational changes in recent years, including the establishment of a women's centre in 1990.

From the foregoing discussion, it can be noted that, the development of a national agricultural research system in Ethiopia is more of a recent phenomenon when compared with other African countries whose research activities date back to the colonial period. For example, agricultural research in Tanzania began in 1890 and that of Kenya dates back to 1903 (IAR-AUA joint committee report, 1990). Though the Ethiopian government showed its commitment to agricultural research and development as part of the national development plan through the establishment of IAR (1966) and the Ethiopian Science and Technology Commission in 1975, no clear research and extension policy directives were produced to guide and serve as a framework for the development, governance, and coordination of the national agricultural research and extension system. The research endeavour in the various public institutions were, therefore, uncoordinated and remained fragmented. In the absence of an apex body to oversee the smooth functioning of the national agricultural research system, duplication of effort and misuse of the available scarce resources is inevitable. The absence of a clear national research policy to guide the system of governance and coordination at a regional and national level, created conflict of interest and stress among the various national institutes (eg., IAR and AUA, IAR and ESTC). This gap has remained a major drawback of the Ethiopian NARS.

II. ORGANIZATION AND MANAGEMENT OF AGRICULTURAL KNOWLEDGE AND INFORMATION SYSTEMS

The organizational structure of agricultural knowledge and information system involves the institutional forms and the mechanism through which human, physical, financial and information resources are brought together for the operation of the research and extension process. It also includes how authorities and responsibilities are distributed and how the information flow system is defined. A successful organizational system must allow for mutually reinforcing interactions among the policy environment, the systems organizational structure, and a set of basic operational processes. The external actors like credit and marketing institutions and input supply establishments also play a key role in the successful technology generations and transfer system. A close collaboration and interaction with these institutions is, therefore, imperative if one wants to see the fruition of agricultural research and extension.

There is no single formula or model where the national agricultural knowledge and information system can be organized. Various countries have followed different models or mechanisms to organize and administer their national agricultural knowledge and information systems. These include:

- a) The integrated research, extension and education model, where agricultural education, research and extension are fully integrated (eg., US land-grant college system).

b) Autonomous or semi-autonomous publicly or privately supported research model which was pioneered by Great Britain.

c) The Ministry of Agriculture Model, which has been the most common pattern for research on domestic food crops in the less developed countries.

d) The agricultural research council model (eg., India). India has used this model to effectively organize and coordinate its agricultural knowledge and information system. The Indian Council of Agricultural Research, in principle serves not only as a national coordinating and supporting agency, but also provides considerable financial and technical support to the State agricultural universities in performing their tasks (Bredero, 1988).

The organizational setting and the management of the agricultural knowledge and information system in Ethiopia is a reflection of a mixture of the above models. The agricultural education, the research and the extension are the responsibilities of different government institutions and there exists little or no formal full-fledged inter-institutional collaboration or coordination. The choice of the right model appropriate to the Ethiopian condition for more effective planning and management of the Ethiopian agricultural knowledge and information system is also the other major concern. This concern has been felt by the Transitional Government of Ethiopia and to this effect, an Agricultural Research Council was established within the Ethiopian Science and Technology Commission (ESTC) in 1991. The Council is expected to serve as a clearing house for agricultural research projects for financing by ESTC and donor agencies.

The Council is also expected to do several other functions like coordinating the national agricultural research system, monitoring, follow-up and evaluation, standardization of the research operational processes (eg., what is a programme? project? experiment? trials, etc), and the issuance of guidelines on research priority setting, project planning, initiation and development, resource appropriation and reporting system. Currently, the research programmes of the various institutions vary considerably in their level of priority, scope, staffing and leadership. This is inevitable in the absence of comprehensive planning at national, regional and institutional levels. Therefore, the preparation of a long-term national agricultural research plan which takes account of all relevant research capability in the country is a necessary condition for making effective use of local resources and external cooperation and assistance.

The establishment of the Council is a step in the right direction and should be supported. But from the very beginning, it has a number of weaknesses that would perhaps impede its success. First, since the Council members were not popularly elected by the scientific community, their scientific competence and experience in national and international agricultural research systems may be doubtful. Second, the two important components of the system (agricultural education and extension) are not within the mandate of the Council and this may pose a problem to approach the system in its holistic manner. Third, the autonomy (power and authority) of the Council is uncertain. Fourth, the relationship it will have with the regional research establishments is so far unclear. Without redressing these weaknesses at this initial stage, the Council might not achieve its objective.

III. CURRENT NARS STRUCTURE

3.1 The Institute of Agricultural Research (IAR)

The current structure of the Ethiopian national agricultural research system is given in Table 1. IAR is the largest and most important agricultural research institute in Ethiopia. About three-quarters of the total number of Full Time Equivalent (FTE) researchers in the country are placed in IAR. The institute has 24 permanently staffed stations spread all over the country. It has 15 different research divisions ranging from socio-economics to natural resources. It has also the largest number of test sites located in various agro-ecological zones of the country (ISNAR, 1993a).

IAR is an autonomous publicly funded institute. Policy guidance to the institute is provided by a high level Board that represents the various interests in agricultural development. The institute is headed by a General Manager with full executive power, and is supported by two deputy General Managers; one for Research and one for Administration. The research centres are administrated by the Centre Managers who directly report to the Deputy General Manager for Research. Centre Managers are supported by research division heads and commodity programme leaders. Their say on the research programme is apparently limited. Though each research centre has its own separate centre cost, fund acquisition is through the headquarters from the Central Treasury.

3.2 The Alemaya University of Agriculture (AUA)

The academic sub-sector of the Ethiopian NARS consists of the Alemaya University of Agriculture (AUA), Faculty of the Veterinary Medicine, Awassa Agricultural College, and the Institute of Development Research (IDR) of the Addis Ababa University. AUA is by far the largest of the academic institutes.

When the Alemaya College of Agriculture was up-graded into free-standing University (the AUA) in may 1985, the structural set up of the AUA made provision for the offices of the Vice President for Research and Extension, Research Coordination (overall), Director of Research Centre and Manager of substations. The directors of research centres have full executive authority in administrating the affairs of the research centre. This is particularly true for the Research Centre located off-campus, (Debre-Zeit) but not for the Alemaya Research Centre which is located within the campus. There is a high competition between the academic and the research programmes for the limited resources. Since training is considered as a primary objective of the University, resources are usually diverted to the academic programme at the expense of the research. The research budget which is centrally administered by the university is not entirely used for research purposes. Other support services like transport, procurement, technical services and personnel administration are shared with the academic and administration division. Such arrangements have rather stifled the research programmes of the University.

Table 1: Overview of NARS Structure, 1991/92

Executing agency		Research Focus	No. of Research sites	Number of Researcher		
				Na.	Expat.	Total FTEs
1.	Institute of Agricultural Research (IAR)	Crops, livestock, vegetables socio-economics, soils.	24(24)	272	16	288
2.	Alemaya University of Agriculture (AUA)	Crops, Livestock Forestry, FSR, Agro-economies	7(2)	NA	-	19.1
3.	Research and Advisory Department-MSF	Crops and Livestock	NA	25	1	26
4.	Forestry Research Centre (FRC)	Forestry	NA	NA	-	8
5.	Wood Utilization Research Centre (WURC)	Forestry	1(1)	7	0	7
6.	Awassa Agricultural College AAU	Crops and livestock	NA	NA		
7.	National Veterinary Institute	Animal Health	1(1)	5	-	1.5
8.	IDR-AAU	Socio economics	1(1)	14	-	3.0
9.	Faculty of Vet. Medicine -AAU	animal Health	1(1)	-	-	4.1
	Total		35(30)	323	17	356.7

Source: ISNAR, 1993a

Key: NARS- National Agricultural Research System.

FTE- Full Time Equivalent.

Expat.- Expatriates.

Na.- Nationals.

() -Permanently Staffed Stations.

3.3 The Ministry of Agriculture (MOA)

The MOA has undergone several organizational changes since 1975. In fact the MOA has been one of the most unstable government institutions in the past 20 years. Perhaps the most significant organizational change was made in December 1984 with the aim of decentralizing the technical support and the decision making functions of the administrative regions which were grouped into eight developmental zones (Personal communication). At the headquarters, four main departments headed by vice ministries were created. These were Rural Infrastructure Development; Cooperative Promotion and Agricultural Development; Animal and Fishery Resources, and Natural Resources Conservation and Development. The MoA Zonal offices were directed by the General Managers, supported by four main technical departments reflecting the revised organizational set-up at the headquarters. The new arrangement, however, was not extended to Awraja levels.

The front line extension staff (DA_s) were redeployed to Service Cooperatives or Development centres, whereas the subject matter specialists (SMS) were located at Woreda and Awraja levels to provide technical backstopping for the DA_s. The DA_s were the last contact points in the extension network. Since one DA was assigned for 8,750 peasant holdings covering a geographic area of about 2,400 km², the DAs created their contact point known as the 'contact farmer'. Each contact farmer is expected to have his own 'follower farmers'. Currently, the zonal MOA offices are replaced either by the Regional Agricultural Bureaus or Regional zonal Agricultural Offices. The regional distribution of technical, supervisory and frontline staff is provided in Table 2. Since the data were taken before the major structural adjustment was made both at the headquarters and regional levels, it may not exactly reflect the current manpower structure at the regional level.

Table 2: Regional Distribution of Technical, Supervisory and Frontline Staff

Region	Supervisory staff	Frontline staff	DAs	Home agent
1	778	23	297	322
2	15	0	58	20
3	774	40	399	92
4	2461	30	489	273
5	50	0	0	0
6	12	2	40	2
12	12	0	31	8
14	68	2	16	21
Southern coalition	982	24	453	182
Total	5152	121	1783	920

Adapted from: Takele, 1984, page

IV. THE RESEARCH PROGRAMMES

Government desires that publicly funded agricultural research programmes concord with national agricultural development objectives and available resources. The clients of the research product, the farmers, extension services and development organizations require rapid solution to their problems. The research institutes and the researchers want to ensure that their programmes and experiments are relevant to the need of their clients, are of high scientific standards, and give good value for money. As resources are scarce to accommodate all the interests of the concerned parties, effective communication between all the parties involved is highly important for correct identification of research problems, balanced management of priority areas, programme planning, informed assessment of suitable technologies, formulation of implementing strategies, and the identification of non-technical constraints to the adoption of such research products (ISNAR, 1993b). In the Ethiopian context, there is no formal mechanism and procedure for research planning at national level. Each institute has its own research planning mechanism and procedure. There is little inter-institutional interaction in research problem identification, priority setting and in the identification of non-technical constraints for adoption of the emerging technologies.

4.1 Research Focus

An overview of the research focus of the Ethiopian NARS is provided in Table 3. According to ISNAR (1993a) 63 per cent of the research focused on crop production (food and raw materials), 18 per cent on livestock production, 4 per cent on forestry development, and a negligible 0.3 per cent on fisheries production in 1993. The rest, about 15 per cent was directed to socio economics and natural resources.

4.2 Program Formulation Procedures

The program formulation procedures bring both short and long-term national priorities and objectives down to operational terms. Research programmes are based on available resources. Implementation strategies and monitoring and evaluation of the operational processes are also laid down. In effect, several group of people should be involved in the planning and designing of research programmes and sub.research programmes. Usually, the final beneficiaries of the research product are not involved either in the planning or in the operational and evaluation stage.

The IAR, has two main types of research programmes: Zonal/regional and the commodity programmes. There are eight regional research programmes with one or more research centres in each zone. Each regional research Programme is grouped into three main themes: crop production, livestock production and natural resources. The commodity programmes are designed to tackle the production problems of selected crops at national level whereas the zonal programmes are intended to address the production constraints specific to that particular region.

Table 3: Research Focus NARS, 1991.

Research focus	Total FTE*	
	NARS	%
Crop	230.1	62.6
Livestock	64.8	17.6
Forestry	15.2	4.1
Fisheries	1.2	0.3
Natural Resources	27.5	7.5
Others	29.1	7.9
Total	367.8	100

Source: RSNAR, 1993a

* Awassa Agricultural College not included.

The initiation, review, planning, approval and the implementation process reflect, the two strategic approaches (regional versus national). Both the regional and commodity research programmes are reviewed at zonal and national research programme review meetings (NRPRM). At NRPRM, user organizations and representatives of different Government institutions including the Universities are expected to attend. Farmers do not take part in the process. They are represented by the extension wing of MoA. Similar procedure is more or less followed by the academic institution. The Farming System Research of IAR and AUA is intended to assist in the research initiation and planning process by reflecting the actual need of the farmer. It is also used as a tool for testing the appropriateness of the research results. Once research programmes are reviewed at national or institutional levels, they are submitted to the Government for financing. There is no independent body to serve as a clearing house.

In general, the system does not allow sufficient time for thorough interaction, evaluation and appraisal of research programmes. Most of the research projects are prepared and planned without sufficient information on the subject under consideration.

4.3 Human Resources

The number of professionals in NARS increased from 49 in the 1960s to 368 in 1991 (Table 4). In the 1960s and early 1970s a few of the agricultural researchers were expatriates (24 and 31, respectively). The relative importance of the expatriates declined in the mid-1970s and 1980s. Most of the researchers are first degree holders while Ph.D holders make up about 7 per cent of the total researchers on full time equivalent basis in 1991. Retaining senior and experienced research staff has been the most difficult problem encountered by all institutions. The majority of the researchers are employees of IAR (Table 5).

Table 4: Educational and Nationality status of Researchers (Full-time equivalents)

Institutional Category	status	1966-70	1971-75	1976-80	1981-85	1986-90	1991
	Ph.D	na	3.9	5.3	15.2	19.4	22.2
Government	M.Sc	na	8.1	18.5	55.9	85.0	87.9
	B.Sc	na	17.5	36.8	99.9	162.2	209.6
	subtotal	12.9	29.5	60.6	170.6	266.6	319.8
	Expat.	24.1	31.5	23.1	10.2	15.6	18.7
	Total	37.0	61.0	83.7	180.8	282.2	335.5
Academic	Ph.D	na	3.1	3.2	3.3	3.8	4.3
	M.Sc	na	3.8	3.0	6.0	12.4	13.6
	B.Sc	na	3.1	3.1	4.4	6.2	8.7
	Subtotal	na	10.0	9.3	13.7	22.5	26.6
	Expat.	na	2.6	0.9	2.7	2.3	2.7
	Total	11.8	12.7	9.9	16.5	24.5	29.3
NARS Total	Ph.D	na	7.0	8.5	18.5	23.2	26.5
	M.Sc	na	12.0	21.5	61.9	97.5	101.5
	B.Sc	na	20.5	39.9	104.0	165.5	218.4
	Subtotal	na	39.5	69.9	184.3	289.1	346.4
	Expat	na	34.1	24.0	12.9	17.9	21.4
	Total	48.9	73.7	93.6	197.3	307.0	367.8

Source: ISNAR, 1993a

Table 5: Staffing structure, IAR

Staff Category	1986	1991	1992
Research	184	272	271
Technical Staff	489	477	359
Technical/Research Ratio	2.6	1.6	1.3
Administrative	488	437	359
Adm./Research Ratio	2.6	1.6	1.3
Others	1470	1620	1709
Total	2636.2	2809.2	2700.6

Source: ISNAR, 1993a.

4.4 Agricultural Research Expenditure

In terms of agricultural research intensity ratio as measured by agricultural research expenditure as per cent of agricultural GDP, Ethiopia performed badly, as compared to other Sub-Saharan African countries, during the period 1981-85. The weighted average of the agricultural research intensity ratio for the Sub-Saharan countries in 1981-85 was 0.5 per cent while that of Ethiopia remained 0.36 per cent during the same period (ISNAR, 1992, 1993a). The jump in the agricultural research intensity ratio during the late 80s was due to the support of World Bank to Ethiopian agricultural research.

The breakdown of agricultural expenditure by institutional category is provided in Table 6. During the earlier stage of agricultural research development in Ethiopia, the academic sector spent 25 per cent of the research expenditure, but soon after the establishment of IAR, the share of the academic sector declined. Most of the expenditure (60-70 per cent) is provided by the Ethiopian Government. The World Bank and other donor agencies like SAREC, IDRC, FAD and UNDP provided support for agricultural research. The average annual growth rate of the Ethiopian NARS in terms of researchers, expenditure and number of researchers per million farmers is provided in Table 7. The ratio of expenditure per researchers declined by 0.6 per cent over time.

The average annual growth rate of researchers was 10.7 per cent compared to the average annual growth rate of 10.0 per cent for research expenditure. Between 1960 and early 1990, the number of researchers per million farmers increased from 2 to 24. The Ethiopian NARS is still too small when viewed in relation to the number of farmers it has to serve.

Table 6: Agricultural Expenditure (Millions 1985 PPP Dollars Per Year)
Institutional Category

Year	Government	Academic	Total
1961-65	2.888	0.658	2.946
1971-75	9.771	1.826	11.598
1981-85	19.832	2.291	22.123
1986*	27.890	2.456	30.347
1987*	44.033	3.098	47.131
1988*	47.307	3.747	51.054
1989*	41.728	4.035	45.763
1990*	42.423	4.268	46.691
1991*	33.058	4.747	37.805

Source: ISNAR, 1993a

* World Bank Support

Table 7: NARS Researcher and Expenditure Series, 1961 -1990

	1961-65	1966-70	1971-75	1976-80	1981-85	1986-90	1991	A.G.R. %
Researchers (FTEs)	21.5	48.9	73.7	93.6	197.3	307.0	367.8	10.7
Expenditure (Millions 1985 Barr per year)	2.119	5.803	8.342	12.281	15.914	31.792	27.194	10.0
Expenditures (Millions 1985 PPP dollars per year)	2.946	8.067	11.598	17.074	22.123	44.197	37.805	10.0
Expenditure per Researcher (1985 PPP dollars per year)	136,500	165,600	157,600	192,600	114,000	143,300	102,800	-0.6
N° of farmers (millions)	10.7	11.8	12.8	13.7	14.4	15.1	15.7	1.4
Researchers per million farmers	2.0	4.1	5.8	6.8	13.7	20.3	23.5	9.2
AgGDP (million 1985 PPP dollars)	5206	5811	6337	6508	6605	6666	7439	1.0
Expenditure As a % of AgGDP	0.07	0.16	0.21	0.28	0.36	0.73	0.54	8.6

Source: ISNAR, 1993a

V. LINKAGES WITH TECHNOLOGY USERS AND THE TRANSFER SYSTEM

The absence of formal linkage mechanisms between research and extension has been one of the major problems of Ethiopian NARS. The problem still persists.

5.1 Linkage to Extension

Extension is the responsibility of MoA while research (technology generation) is the responsibility of IAR and the academic sector. IAR and AUA have also extension unit, but are intended for micro popularization not for national/regional popularization of technologies. Under the pressure of the world bank, the National Research and Extension Liaison Committee (RELC) was created in 1986/87. The structure of RELC was extended down to the regional level following the structural organization of MoA. The national RELC was chaired by the minister of MoA while the regional is chaired by the MoA regional representative. Farmers and NGOs were not included in the membership. RELC was established to serve as a formal linking mechanism between research and extension. RELC was mandated to review and approve research proposals submitted by the research institutes. It was also to serve as a forum where the views of extension workers are taken into account in identifying research problems for the formulation of research topic that had the thrust of both researchers and development agents. RELC remained useful and functional until it was interrupted in 1991 because of the change in Government. Currently an attempt is being made to reactivate it. One of the limitations of RELC was the lack of budget to finance the operational process.

5.2 Linkage to Farmers

The Ethiopian farmer is not so far considered in the decision making process of technology generation and transfer. The farmer is expected to accept and adopt whatever technologies are recommended by the research on extension bodies. Being responsible for extension, MOA is the only institution that has direct link with the farmer. The front line extension agent serves as link between the MoA and the farmer. Over the years, MoA has followed different approaches to reach the farmer. In the 1960s and early 1970s intensive regional agricultural development projects were launched. These included the establishment of Chilalo Agricultural Development Unit (CADU) in 1967, through swedish international support (SIDA), the Walyaita Agriculture Development Unit (WADU) in 1971 through World Bank support and the Ada District Development project (ADDP) in 1971 through the USAID support. These projects focused on providing comprehensive support including infrastructure and technological input to the specific regions where the projects were located. Their coverage was, therefore, limited to the area where the projects were located. This of course produced regional economic inequalities and as a result the Minimum Package Programme (MPP) of the Extension and Programme Implementation Development (EPID) was created within MoA in 1971 (Amare, 1977). EPID was in charge of all small farmer-oriented rural development programmes of the country, and therefore all the intensive

regional agricultural development projects like CADU, WADU and ADDP were included under EPID's programme as part of national extension network. EPID's programmes were assisted by FAO's Freedom From Hunger Campaign (FFAC) fertilizer trials, and its major focus was on fertilizer followed by improved seeds and pesticides (Amare, 1977).

There is no doubt that the rich farmers benefitted from the regional intensive projects and the Minimum Package Programmes of EPID. These approaches also helped the development and expansion of commercial farms prior to the 1974 revolution (Amare, 1977). The majority of the farmers were not the beneficiaries of these projects, perhaps with the exception of model farmers and those along the road side in the case of MPP. As a follow-up of MPP, the Peasant Agricultural Development Project (PADEP) was launched in 1983. PADEP was intended to enhance the input distribution, promote the role of cooperatives in rural development, improve linkages between research and extension, and to improve the performance of extension based on the Training and Visits (T and V) concepts. An excellent review on the Ethiopian experience on the T and V extension system is provided by Alemneh Degene (1989). The three key elements in the T and V approach were: promote effective communication with farmers; strengthening linkages between research and extension; and improving extension based on training and visits. Under the Ethiopian context, the T and V system narrowed the communication gap between the farmer and the extension agent, but the linkage between research and extension remained unchanged. The training of extension agents on a bi-weekly bases was also boring and redundant (Alemneh, 1989). The system was not also supported by effective and strong technology-generating network. The central assumption in the T and V system is that each front line extension agent passes the extension message to the contact farmer and the contact farmer relays the message to the other farmers known as the follower farmers.

In the Ethiopian context, there are a number of issues to be raised with regard to agricultural research and extension system. On the issue of priority, what should be done first? Should resources be diverted to the creation and development of institutions and services like rural Banking, credit systems, infrastructures and education or continue to strengthen the research-extension-farmer linkages under the current rural setting. If one chooses the strengthening option of the current system, what institutions (farmers institution) are available as the linking organ?. On the issue of farmers' institutions, what kind of institution should be created? what should be its power and authority, political freedom?, etc. One of the major problems in the agricultural research and extension system is the absence of effective farmers institutions empowered to guide, question and evaluate the system. Until this problem is redressed, the Ethiopian agricultural and extension system will remain ineffective and unproductive.

VI. TECHNOLOGIES GENERATED IN NARS (1960-90)

Over the last three decades, the total number of technologies generated in NARS in the various fields and disciplines of Ethiopian agriculture is 340 (Table 8). The type of technologies generated are either biological (varieties, breeds, etc) or agronomical (cultural

practices). Chemical and mechanical technologies like pesticides, herbicides, farm tools and implements generated by NARS are so far non-existent or minimal, compared to the biological varieties developed (Table 8). The highest number of technologies are generated for field crops (wheat, maize, etc), followed by horticultural crops and livestock (Table 8), reflecting the research emphasis given to these commodities.

Table 8: Summary of technologies generated in NARS (1960 - 1990).

Commodities	Institution IAR	AUA	Total
Field crops	83	50	133
Industrial crops	17	-	17
Oil crops	32	-	32
Pulses	15	10	25
Root crops	10	7	17
Spices	5	-	5
Horticultural crops	39	-	39
Livestock	38	2	40
Farm implements	4	-	4
Forest trees	16	10	26
Soil & water conservation	-	2	2
Total	259	81	340

Source: Discussion paper presented to the National Research Council by IAR and AUA, 1991

Since the Ethiopian NARS has a recent history (30 - 40 years), the number of technologies generated so far could be viewed as reasonable. However, the number of technologies that have reached the final beneficiaries - the farmers - is not known with certainty. Both IAR and AUA claim that their technologies are either in the hands of the farmers or available to be used. If these technologies have reached the farmers, their impact could have been reflected in the total agricultural output of the country.

VII. CONSTRAINTS OF AGRICULTURAL RESEARCH AND EXTENSION

The constraints of agricultural research and extension in Ethiopia imposes substantial stress on research administration and research personnel. These constraints are either in the form of policy, institutional, technical or socio-economic.

7.1 Policy

The Ethiopian NARS lacked clear national research policy to guide it and provide a framework on its governance, coordination, follow-up and evaluation system. Research endeavour remained fragmented, uncoordinated and, therefore, unproductive. Inter-institutional research collaboration, functional and purposeful linkages between the technology generation and the delivery systems also remained poor and weak. Because of lack of evaluation systems, research resources (inputs) either remained wasted or unproductive. Since research programmes are initiated and developed by researchers to reflect either their own interest or institutional priority, the socio-economic need of the target groups (farmers) is not usually taken into account. Hence, the emerging research results either become less productive or are rejected by the target groups. Moreover, because of lack of central documentation and information services, even useful research results remain uncommunicated to the final users.

Recently, the Transitional Government of Ethiopia (TGE) issued a national agricultural research policy (TGE, 1993) which provides priority to peasant agriculture and privately owned commercial farms. Increased supply of agricultural raw materials to local industries, import substitution, the generation of appropriate technology, and protection and development of natural resources in sustainable way are also given priorities. According to the policy framework, emphasis is to be given to adaptive and applied types of research, input generation (chemical technology), institutional capability building, draught power and improvement in the incentive and reward system of NARS. The policy also indicates that the Government is committed to allocate up to 1.5 per cent of the GDP to research (TGE, 1993). This level of support is provided for all science and technology development in the country. Agriculture is expected to crunch a major share of it. The extension policy is under preparation and is expected to be issued in the immediate future.

7.2 Institutional

The Ethiopian agricultural research lacks an apex body to coordinate and support it. Because of overlapping responsibilities of certain institutions like ESTC and IAR, there is always conflict of interest on research administration and coordination. As a result, the functional linkages among the institutions are weak.

The existing research and extension institutes suffer from bureaucratic top-down administration, lack of senior research staff, awful shortage of resources and lack of motivation and incentives for the research personnel.

7.3 Technical

The technical problems are related to the research programmes. Most of the research programmes lack scientific depth and integrity. Most of them are misconceived and ill-designed. Most of the projects are terminated before completion, because of staff turn over.

Hence project continuity is a major problem. There is also lack of sufficient technical information to assist in the design of research projects and interpretation of research results. Perhaps the analytical and interpretation capability of the research staff is poor, and as a result most of the field data remain unprocessed.

The other technical problem is bias between formal and informal research. Most of the research programmes are too formal and too academic. They are not target oriented. The agricultural research system has failed to take advantage of the existing indigenous technical knowledge.

7.4 Socio-economics

The general attitude of Ethiopian policy makers towards agriculture has so far been negative and misconceived. Investment on science and technology with the aim to promote agricultural development was not considered as a priority, if not as a waste of resources. Perhaps this negative attitude is reflected by the lack of research and extension policies up to the present day. Fertilizer and seed policies were released only recently. The other major socio-economic problem is the lack of grass root level institutions. These include farmers organizations, credit and marketing institutions and input supply establishments.

VIII. FUTURE DEVELOPMENTS

The future development of Ethiopian agricultural research and extension system should be designed to serve and meet the need of its clients. The experiences of the past two to three decades have shown that top-down controlled technology generation and transfer system has failed, and an alternative bottom-up system should be sought. Separate research, extension and training institution models have also failed and a combined research extension and training institution model might be worth considering. The agricultural knowledge and information system in Ethiopia was laid down without addressing the primary issues of land rights, peasant organization, rural education, marketing, credit and rural banking at the grass root level. The absence of these basic service institutions and infrastructure in the Ethiopian rural setting has a serious constraint to establish meaningful linkage between research and extension, and between farmers and extension. Perhaps, it may be advisable, particularly for the newly established political regions, to start addressing these vital issues.

The public sector (with limited resources) has over stretched itself by focusing both on food and industrial crops, while the private sector plays little or no role at all. It is high time that the industry and the private sectors should be encouraged to participate in agricultural research, either in financing research projects on contractual basis (with the academic institutions), or in implementing their own research programmes in the area of industrial and plantation crops. This will provide the government a chance to concentrate on food crops with the ultimate objective of increasing food production.

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