AGRICULTURAL TECHNOLOGY ECONOMIC VIABILITY AND POVERTY ALLEVIATION IN TANZANIA

Context:

- Agriculture in Tanzania is still the most important sector for the country's overall development.

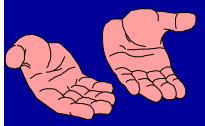
- The enigma to both researchers and policy makers alike is:

Context:

- **"Despite availability of a backlog of improved agricultural technologies developed or made available to farmers by the National Agricultural Research System (NARS), production is still being undertaken using rudimentary technologies"**

These technologies include

- **hand hoe**
- **traditional seeds**
- **little or no manure**
- **little or no chemical fertilizers**
- **poor husbandry practices and**
- **dependence on unreliable rains.**



Productivity in farm and non-farm activities has remained very low and, as a result, poverty in the country has continued to be a rural phenomenon.

The Problem

- **An assumption is often made that there are adequate profitable technologies on the shelf in Tanzania which farmers can use to increase productivity and incomes and hence reduce the level of poverty.**

The Problem

- **The economic benefit of agricultural technologies is one factor that influences adoption of the technologies developed. But it is known, from the way in which agricultural research has been organized for decades, that economic assessment of these technologies has not been sufficiently integrated with the process of agricultural technology development.**

The Problem

- **Most technologies have been released based on attributes like high yield, early maturity and taste rather than on being based on economic benefit.**

The Problem

- **In numerous occasions, the adoption of these technologies may have been difficult, either because the technologies proposed, were not sufficiently adapted or because they presented economic risks, contradicted local culture, or were constrained by inadequate accompanying economic policies.**

Objectives of the Study

- This study is one of four similar studies undertaken concurrently in three other countries of Ethiopia, Kenya and Uganda.

- It aimed at providing insights into the extent to which agricultural technologies recommended by the National Agricultural Research Systems in the respective countries are profitable.

Objectives of the Study

- It looked into the issue of adoption of agricultural technology. It sought to answer the following questions:
  - if the technologies are profitable and yet adoption is low, what are the policy areas that may be hindering the process of adoption and what should be done to mitigate them?
  - if they are not profitable, what are the implications for policies related to agricultural research agenda as well as for the programme leaders and research administrators within NARIs and to the Ministries of Agriculture?

Significance of the Study

This study is important because:

- **Agricultural technology, its development, transfer and adoption are fundamental in increasing productivity, rural incomes, growth and subsequently in contributing to poverty reduction.**
- **NARIs should be helped to focus their research programmes on those issues where improved technologies create measurable economic impact at the farm level.**

Significance of the Study

- **The objective should be to promote economic growth by developing, introducing and disseminating agricultural technologies which both create markets and respond to future economic opportunities for new technologies as well as maintaining the long term sustainability of the natural resource base.**
- **Findings from this study will develop better understanding by various stakeholders and especially the Tanzania policy makers about how to make reform programs more effective in fostering broad-based development.**

Significance of the Study

- **The study is expected to contribute to the debate on revolutionizing agricultural research in Tanzania to better respond to the real challenges of poverty alleviation.**

Hypothesis

"Agricultural technology adoption and use by farmers will be improved by paying more explicit attention to the underlying market factors that determine economic viability and by greater consideration of the technology transfer systems".

Methodology

- **Analytical review of literature**
- **Interviews with research administrators, scientists, planners and policy makers**
- **Technique used to determine the financial profitability of the selected technologies is Gross Margins Analysis (GMA)**

Aspects of Poverty in Tanzania

- **Poverty** is a state of not being able to obtain the goods or services necessary to meet some minimum standard of living.
- **Its manifestations include:**
  - Lack of income and productive resources sufficient to ensure sustainable livelihood;
  - Hunger, malnutrition and Ill health;
  - Limited or lack of access to education and other basic services;
  - High morbidity and mortality from illness;
  - Homelessness and inadequate housing;
  - Unsafe environment; and
  - Social discrimination and exclusion.
  - Lack of participation in decision making in civil, social, and cultural life.

The Poverty Situation in Tanzania:

- The majority of the poor in Tanzania mainly live in rural areas. The depth and severity of poverty are greatest in rural than in urban areas.

- Based on the 1 $ per capita poverty line, the proportion of the rural population living below the poverty line was estimated at 65 percent in 1983 and 59 percent in 1995.

The Poverty Situation in Tanzania:

- At present about 60 percent of the Tanzanian rural population lives below the poverty line. Rural households accounted for 85 percent of the poor in 1991. This ratio rose to 92 percent in 1993

- Poverty is associated, among others, with less education, size of the household, whether households grow cash crops or not, lack of credit, availability of implements.

Policies and Initiatives to Eradicate Poverty

Recent effort to deal with the old problem of poverty eradication in Tanzania is reflected by a number of initiatives.

- Establishment of a Network for Research on Poverty Alleviation (REPOA) in 1994 to deepen understanding of the causes, extent, nature, rate of change and means to combating poverty in the country.

- The recently endorsed Tanzania Development Vision 2025 which envisages to reduce extreme poverty by half by the year 2010 and to eradicate it by the year 2025.

Policies and Initiatives to Eradicate Poverty

- In 1998, the government, through the Vice Presidents' Office, issued a policy statement, namely the National Poverty Eradication Strategy which was followed up in 1999 with a Poverty and Welfare Monitoring Indicators exercise, which spells out areas in poverty eradication and mechanisms for monitoring implementation of poverty eradication programmes.

All these initiatives attest to the significance and commitment the government attaches to the objective of poverty alleviation.

Agricultural Technology Development in Tanzania

- Technology is a major factor in combating economic backwardness or poverty. It is broadly defined as a mix of knowledge, organizations, procedures, machinery, equipment and human skills to produce desirable appropriate products.

- It is unrealistic to assume that poverty in Tanzania can be alleviated by improved agricultural technologies alone. But since poverty in Tanzania is a rural phenomenon then, *ceteris paribus*, improving the income, food security and nutrition situation of the majority poor through agricultural technology will significantly contribute to the alleviation of overall poverty in the country.

Agricultural Technology Development in Tanzania

On Organization of Research in Tanzania

- The structure and organization of the research system in the country has changed several times since 1980s when research was carried out mainly by four parastatals, namely TARO, TALIRO, TPRI and the Uyole Agricultural Center (UAC). In 1989, the government re-organized the system by merging the two research parastatals: TARO and TALIRO with the Directorate of Research and Training (DRT) to form the present Department of Research and Development (DRD).

On Organization of Research in Tanzania

The restructuring and right sizing of the activities and services of the MAC have led to reduction of research institutes, stations and substations by half.

- Most have been reduced to trial sites and others have been closed outright.
- The TPRI continues to be a semi-autonomous parastatal while the UAC is now within the network of the DRD stations.

On Organization of Research in Tanzania

- The Sokoine University of Agriculture (SUA) has now been accorded a zonal status which brings the total number of zones to eight.
- In each zone there is a lead-research centre which has the responsibility for both applied and adaptive research and training.
- In addition to government controlled research (institutes), crop authorities, estates and private agri-firms also undertake agricultural research.

On Organization of Research in Tanzania

- It is the policy of the MAC that all new crop varieties developed must pass through the national testing system whereby the National Varieties Release Committee appraises resistance to diseases, acceptability and adaptability of the various varieties that are produced or distributed.

- Multinational firms are also actively involved in seed distribution. These are Monsanto (which has replaced Cargil Hybrid Seed Company Ltd), Pioneer Hybrid International, and Pannar.

Approaches to Agricultural Research and Development

- After realizing the weaknesses of the conventional systems in agricultural R&D, the MAC is currently using the Participatory Rural Appraisal (PRA) approach where farmer research groups have replaced the best model or contact farmer approach. Researchers involve the various stakeholders right from the problem identification stage to the stage of developing the technologies.

- Research in Tanzania is also doing away with the old tradition whereby researchers behaved like doctors (not like flying doctors) who waited for patients. The Farming Systems Approach, which the MAC is now using, ensures a two-way operation system.

Approaches to Agricultural Research and Development

- Most technologies developed up till now could not be commercialized. The MAC is currently emphasizing on the commercialization of the technologies being developed.

On Agricultural Extension and Training

- Extension and training are among the core functions of the MAC. The main objectives of the extension and training services is to transfer recommended agricultural technologies from breeders to farmers, livestock keepers and other stakeholders.

- The MAC has now evolved a National Agricultural Extension Programme (NAEP) where services are now demand driven and will address the needs of the farmers. The focus is to merge crop and livestock extension services into a multidisciplinary system where management and organization will be strengthened.

On Agricultural Extension and Training

- Currently the MAC operates twelve training institutes whose total capacity are 2,100 students. This capacity has been rarely reached due to a number of reasons including the cost-sharing requirement and availability of specialized training within projects. The institutes are now changing their curricula and programmes and operating self-help accounts in order to cope with the existing realities of a market economy.

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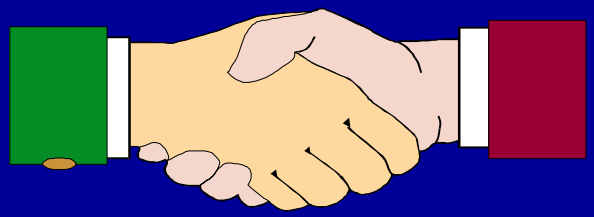


Profitability of Selected Agricultural Technologies and the Link with Poverty

Profitability of Agricultural Technologies and the Link with Poverty

Technology 1: Improved Maize Variety: KILIMA

- **Maize is the most important food grain in Tanzania:**
  - It is grown on about 45 % of total arable land
  - The bulk of the maize produced (75 %) is consumed on the farm
  - Per capita maize utilization is about 114 kilograms per year
  - Per capita maize feed use is about one kilogram per year, and
  - Maize provides about 25 % of the total calories required in diets

Profitability of Agricultural Technologies and the Link with Poverty

Technology 1: Improved Maize Variety: KILIMA

- **Maize research in Tanzania started way back in 1940s. A national programme for research, the National Maize Research Programme (NMRP), was initiated only in 1974.**

- The NMRP has released fifteen maize varieties, the most preferred ones being mainly eight, namely:
  - *Staha*, *Staha-St*, *Kilima*, *Kilima-St*, *Katumai*, TMV-1, ICW, and UCA.

These are high yielding, resistant to pests and diseases, tolerant to drought, early maturing and low risk technologies.

Technology 1: Improved Maize Variety: KILIMA

- In view of the various climatic conditions different parts of Tanzania experience, agricultural research institutes recommend that early maturing maize varieties be grown in areas with short rain seasons while late maturing varieties in areas with long rainy seasons in order to maximize yields.

- Recent studies show that maize farmers in all zones grow both local and improved varieties. Identification of pure varieties is difficult due to recycling. Available data shows that the zones that have high adoption rates also have high shares of total maize production.

Table 1: Recommended Improved Maize Varieties per Zone and Adoption Rates

Zone	Varieties Recommended	% of Total Production	Adoption Rates
Western	Staha, Kilima and TMV-1	11	36
Central	Staha, Kilima and TMV-1	3	28
Eastern	Staha, Katumani and TMV-1	9	66
Lake	Kilima, Katumani and imported varieties	17	44
Northern	Kilima, CG 4141, H 632 and H 622	11	66
Southern	Staha, Katumani and ICW	2	24
Southern Highlands	H 632, H 614 and UAC	46	81

Source: Moshi et al (1997) and Nkonya and others (1998)

Profitability of the KILIMA Maize Variety and its Potential to Alleviate Poverty

- The area selected for analyzing profitability of the variety is the northern and Lake Zones comprising the regions of Mwanza, Mara, Kagera, Arusha, Kilimanjaro and Tanga where the *Kilima* is a recommended variety.

- Figures from on-station trials for the variety (Table 2) indicate that if farmers grow maize as per recommendations, the gross margin per ha is Tshs 397,500 and return per labour is Tshs 2,923 per man-day. This profitability is impressive.

Profitability of the KILIMA Maize Variety and its Potential to Alleviate Poverty

- **Net revenues in lake Zone vary from Tshs 615 to 1,358 per labour day and range between Tshs 40,000 and Tshs 111,000 per ha. On-farm data shows that the net return per ha for three types of soils viz., *mbuga, luseni* and *kikungu* are respectively Tshs 91,000; 72,500 and 40,000 and the corresponding returns per man-day are Tshs 1,358; 806 and 615. Returns are higher when maize is inter-cropped with groundnuts on *kikungu* soil. When not inter cropped, returns to labour is highest when the soil type is *mbuga*.**

Profitability of the KILIMA Maize Variety and its Potential to Alleviate Poverty

- **Comparison of profitability of this variety across space shows that the market plays a big role in determining profitability of a technology.**

  The gross margin in Mpwapwa is Tshs 28,520 per ha and return to labour is Tshs 344 per labour day while the respective profitability in Tabora is Tshs 44,360 and Tshs 534. Price in Tabora is higher (Tshs 80) while it is lower (Tshs 67) in Dodoma. This could be so because Dodoma is normally a maize surplus region. Data further shows that returns to labour are much higher to producers of the variety in the lake zone.

Profitability of the KILIMA Maize Variety and its Potential to Alleviate Poverty

- According to the 1996/97 Expanded Agricultural Sample Survey, the average area planted maize was 0.6 ha per agricultural holding, i.e. an economic unit of agricultural production under single management having or operating at least 25 square meters of arable land

  - This means that a holding can get only 60 percent of the returns, i.e. Tshs 54,600; 43,500 and 24,000 per ha for maize grown in *mbuga, luseni,* and *kikungu* soils respectively and realize as return to labour only Tshs 815; 483; and Tshs 369 per man day for the respective soil types.

Profitability of the KILIMA Maize Variety and its Potential to Alleviate Poverty

- These figures show that because these realizations are per holding, whose average is 5.3, the per capita realizations per ha are Tshs 10,300; 8,207; and 4,530, adult equivalents not taken into consideration. These are, by all standards, too low levels of income realization from maize farming.

- The lesson one learns here is that however profitable technologies may be, they can not alleviate poverty if the scale of production is so low.

Technology 2: Improved Bean Variety Lyamungu 90

- **Bean is an important source of vegetable protein and cash for smallholders in Tanzania.**
- **It accounts for about 80 percent of the total amount of pulses produced in the country thus being strategic crop in ensuring food security and alleviating malnutrition in the country.**
- **There are a large number of varieties of dry beans (both local and improved) grown in Tanzania but the most important ones are red, yellow medium sized, and gray spotted types.**

Technology 2: Improved Bean Variety Lyamungu 90

- Most of the beans are grown by subsistence farmers (predominantly women) and they are normally inter-cropped with maize, bananas, coffee and tree and root crops. Yields realized on these farms are low ranging from 200 to 750 kg/ha.

- Smallholder bean farms range between 1-5 ha while large-scale commercial farms average 20 hectares.

- The National Agricultural Research System has released about fifteen bean varieties since 1980s. Uyole has released seven of these while Selian released six. One of the popular varieties includes the Lyamungus.

Selected Characteristics of Improved Bean Varieties

Cultivar	**Maturing** (days)	**Potential Yield** (kg/ha)	**Cooking time** (minutes)
Lyamungu 85	80 - 85	2,000-3,500	40 - 49
Lyamungu 90	80 - 85	2,000-3,500	40 - 49
Selian 94	85	2,000-3,000	40 - 45
Selian 97	80 - 85	2,000-3,400	40 - 48
JESCA	80 -85	2,000-3,000	40 - 48
ROJO[1]	67 - 74	2,151	38 - 43

Technology 2: Improved Bean Variety Lyamungu 90

- The attractive characteristics of these varieties both to producers and consumers as sown in the table above makes these varieties be accepted in Tanzania markets and are now cultivated in many parts of the country. The varieties were also traded in Uganda when the country experienced drought in 1996.

- On-farm yield for Lyamungu 85 and 90 are 915 kg/ha and 704 kg/ha respectively.

Profitability of Lyamungu 90

- The bean varieties compared are the improved variety Lyamungu 90 and the traditional variety Maasai Red.

- Data shows that the gross margin per ha for Lyamungu 90 is Tshs 654,000 (about US$ 920) and 170,500 (about US$ 240) for the Maasai Red variety. The respective returns to labour are Tshs 4,247 ($ 6) and Tshs 1,107 ($ 1.5) per man-day. Even if yields fall by 50 percent, the gross margin per ha for the HYV will be Tshs 204,000 ($287) and the return to labour per man-day will be Tshs 1,325 ($1.9). This is about two times the estimated 1$ per capita/day poverty line for rural Tanzania.

Profitability of Lyamungu 90

- **The impact of a 50 % fall in yield on the gross margin and return to labour for the traditional variety farmers is considerably big. The gross margin falls from Tshs 170,000 to Tshs 10,500 per ha while return to labour falls from Tshs 1107 to Tshs 68 (or $ 0.1) per man-day. This shows that farmers growing traditional bean varieties face high risks in case of crop failure.**

Profitability of Lyamungu 90

- As noted earlier, the poverty line or expenditure level in Tanzania is about Tshs 74,000. The analysis of the profitability of high yielding bean varieties technology has revealed that at the current low levels of yield of 1200 and 1000 kgs/ha in Mbeya and Arusha regions respectively (see Table below) the gross margins are respectively Tshs 197,800 and 144,500 per ha.

- The average area under maize per holding in 1996/97 in Mbeya and Arusha regions were respectively 0.14 and 0.3. This area is too small to alleviate poverty. Increase in area under beans will definitely benefit farmers because the technologies are profitable.

Comparison of Profitability of Improved Bean Varieties in Mbeya and Arusha Regions

Item	MBEYA	ARUSHA
REVENUE:		
Yield (Kg/ha)	1,200	1,000
Producer Price (Tshs/Kg)	220	200
Realization (Tshs/ha)	264,000	200,000
Labour input	154	154
COSTS OF INPUTS		
Seeds Cost (Tshs/ha)	6,600	6,000
Bags total cost	6,000	5500
Hoes total cost + depreciation	8,800	8,000
Total cost of Inputs	14,800	13,500
Other total costs	51,400	42,000
Total Costs	66,200	55,500
Gross Margin (Tshs/ha)	197,800	144,500
Returns to labour (Tshs/Manday)	**1,284**	**938**

Technology 3:Animal Draught-power Technology and Weed Management

- Animal Draught-power Technology (ADT) can be used in four main agricultural activities: land ploughing, planting, weeding, and transportation.

- The contribution of draught oxen traction to agricultural GDP of Sub Saharan Africa is estimated at US$ 500-1000 million. It is used for primary tillage on about 10 -15 percent of total cultivated land .

- The advantages of using ADT in agriculture include increasing the productivity of labour, expanding the area under cultivation as well as increasing the intensity of land use, improving the quality and timeliness of performing key farming operations, reducing manual labour and drudgery and monetary savings.

Technology 3:Animal Draught-power Technology and Weed Management

- In Tanzania (for most crops), 20 to 50 % of labour costs are in weeding and land preparation. Technology which reduces these requirements, or which enhance labour capacity to deal with these demands is likely to be attractive

- Tanzania has made little use of the rich livestock resources available to increase productivity and alleviate poverty. The country, whose population of draught oxen was 5.3 percent that of total cattle population of 162.5 million in Africa, uses animals for land tillage on only about 20 percent of total cultivated land, to an even lesser extent in transportation and rarely in weeding.

Technology 3:Animal Draught-power Technology and Weed Management

- Weeds constitute one of the most serious barriers to increased agricultural production. In the vertisols of the Ethiopian Highlands, losses due to weeds ranged from 30 to 88 % and in Zambia, from 43 to 63 %of yield potential. In the Southern Highlands of Tanzania, yield reduction in un-weeded plots ranges from 50 to 100 % . Studies undertaken have demonstrated that timing and frequency of weeding increases yield by 138 percent (see Table below).

- Since weeding is a labour intensive activity, and following from the alarming losses demonstrated above, it is extremely important to avail farmers with economically viable weeding technologies that are labour and time saving. One solution to this problem is to make use of ADT.

Effects of Different Times of Weeding on Maize Grain Yields in Southern Highlands

	Yield (t / ha^{-1})	**% increase**
No weeding	2.28	0
One weeding at 10 cm stage	4.17	83
One weeding at 30 cm stage	3.88	70
One weeding at 50 cm stage	4.09	79
Two weedings at 10 and 50 cm stages	5.32	133
Two weedings at 30 and 70 cm stages	5.41	137
Three weedings at 10, 50 and 70 cm stages	5.42	138

Technology 3:Animal Draught-power Technology and Weed Management

- Efforts to develop ADT in Tanzania at the institutional level started in mid 1980s. An oxenization project was established in Mbeya in 1987 and institutions such as SUA, CARMATEC and SEAS have been involved in designing and producing ADT.

- In 1988, the CARMATEC developed an animal draught weeder with capacity of weeding 2 ha per day. It is drawn by only two oxen, is made from locally available materials, and is easy to operate and maintain. Its price was Tshs 13,700 in 1990. Comparing the big losses that weeds can cause when not properly managed, the profitability of using this technology is obviously high, even after taking into account the costs of acquiring the two oxen needed which can simultaneously be used for land ploughing and transportation.

Profitability of Animal Draught Technology and its Potential to Alleviate Poverty

Assumptions:

- **The farmer invests in ADT after obtaining a loan from a credit institution.**
- **Two rates are used: 12 percent for donor funds and 30 percent for commercial bank loans.**
- **The farmer makes a constant repayment, amortized over six years.**
- **Oxen graze all year round and feed on concentrates for the two months prior to the on set of the rainy season. Costs for these are included.**

Findings show that:

- **Ox-weeding is more profitable than manual weeding (if more than two hectares of land are cultivated each year)**
- **The use of herbicides for weeding is more expensive than ox-weeding (if more than three hectares are cultivated each year).**
- **It is always cheaper to use herbicides than to weed by hand even when farmers take loans at interest.**

Findings show that:

- **If family labour is not costed, the return to capital in the hand labour farming system is almost three times higher than in the animal draft system.**

- **Many farmers are reluctant to invest in labour saving technology like ADT, preferring to increase the family labour force through marriage or increase in the number of dependents. This is mainly because labour in rural areas has a low opportunity cost. There is lack of extension and training to farmers to make them recognize the potential of ADT in alleviating their poverty.**

Findings show that:

- **With the use of animal draft labour productivity increases and if hired labour is used, the return to capital invested favours oxenization.**

- **Analysis based on the higher interest rate reduces the return to both capital and to labour but still returns on oxenization are above 200 percent those of hand labour**

Constraints to Wide-scale Adoption of ADT in Tanzania

- Inadequate promotion, extension and training
- Low purchasing power of farmers
- Lack of animals for traction,
- Competing demands for livestock products,
- Lack of implements,
- Lack of agricultural mechanization policy and political/donor commitment and seriousness,
- Poor image of ADT

Constraints to Wide-scale Adoption of ADT in Tanzania

- **Environmental factors,**
- **Threat of animal diseases,**
- **Low power capacities of animals due to type of breed or poor nutrition**
- **Inadequate distribution and dealership (after-sale services) for implements, caused partly by poor rural infrastructure,**
- **Social tradition, gender issues and taboos biased against ADT.**

Technology 4: DAIRY FARMING

- **Dairy production in Tanzania is classified into systems that reflect the genotype, the major product or objective s of production and the physical (climate), biological (flora and fauna), and social-economic environments.**

- **The production systems are either:**
  - **large scale (intensive or extensive) or**
  - **small scale (intensive-rural, intensive-urban).**

- **Marketed dairy is concentrated near consumers and in the highlands with a suitable agro-climate and high population density such as Arusha and Kilimanjaro regions (MAC, SUA and ILRI, 1998).**

Technology 4: DAIRY FARMING

- **90 percent of the total cattle is of indigenous breed, namely the Tanzanian short-horn Zebus. Total number of improved dairy cattle is about 346,000 or 2.5% of total cattle. Over 90% of the improved dairy cattle are mainly found in six regions of Kilimanjaro, Arusha, Kagera, Dodoma, Tanga, and Mbeya.**

- **Despite its large cattle and successive government efforts to promote dairying, Tanzania is a net importer (15 million liters annually) of milk.**

Technology 4: DAIRY FARMING

- **The national per capita milk consumption is between 20 and 28 liters per annum compared to 35 liters for Africa, 44 liters in Kenya and 105 liters world wide.**
- **About 70 percent of the milk is produced by traditional small producers in rural areas.**
- **Keeping improved cattle can significantly contribute to alleviating poverty in the country:**
  - **It can create both income and employment**
  - **Provide food to households involved in dairying**
  - **Improvement of soil fertility**
  - **Biogas production. Wide usage of biogas can highly contribute to halt deforestation.**

Technology 4: DAIRY FARMING

- **Where a market for dairy products exists, dairy farming has high prospects. Recent experience shows that the integration of dairying on 2-5 ha smallholdings has proved to be very profitable in Zanzibar, and many farmers are striving to enter this business. The rate of dissemination of the technology is high**

- **Average milk yield in the zero-grazing system is 8 kg/cow per day, with a maximum of 22 kg/cow per day. In the semi-intensive system, average milk yield is 6 kg/cow per day with a maximum of 15 kg/cow per day. In both situations income is adequate to sustain a farm family (Biwi, Kategile, and Mubi, 1993).**

Profitability of Dairy Farming and its Potential to Alleviate Poverty

This study has used two types of data sets to assess the profitability of dairy farming in the country.

- **The first set is information for three most important production systems:**

1. **Small scale intensive (Arusha/Kilimanjaro and Southern Highlands),**
2. **Small scale intensive urban dairy (represented by Dar es Salaam)**
3. **.Small scale semi-intensive dairy with zebu cattle (Chalinze area).**

Dairy cattle keepers under this category operate without formal support. Data on this was collected during a rapid appraisal carried out in 1997, April-July.

Profitability of Dairy Farming and its Potential to Alleviate Poverty

- **The second data set is from dairy farmers under the Tanga Dairy Development Programme (TDDP) which is under supported of the government of Netherlands.**

- **The TDDP started in 1985 with 5 farmers and seven cows. In 1998 a total of 2471 farmers with a total of 7768 cows were registered members of and enjoyed support provided by the TDDP. The overall aim of the TDDP is to improve the living condition of the population in Tanga region through strengthening the dairy sub-sector. Farmers are supported with extension services, market development etc.**

Profitability of Dairy Farming and its Potential to Alleviate Poverty

- Data shows that gross margins of the three production systems are influenced mainly by the type of cattle being kept. Variable costs are higher in the intensive rural dairying with exotic crosses system and are highest in the intensive urban dairying with exotic crosses system. Although variable costs are higher in these two systems, the value of milk and the increase in herd value more than compensate for the costs, leaving behind a relatively much higher profit margin.

Profitability of Dairy Farming and its Potential to Alleviate Poverty

- Data for TDDP farms shows that for both types of farms, that milk income was generally falling and costs increasing. Medium-scale farms incurred much higher costs but also earned much higher income. Gross margins for both small and medium-scale farms increased by between 19 percent to 29 percent during the 1995-1996 period. In 1997 gross margins per cow per year for smaller and medium-scale smallholder farms were Tshs 176,548 and Tshs 1,140,623 respectively.

Profitability of Dairy Farming and its Potential to Alleviate Poverty

- The respective margins in 1998 were Tshs 113,500 and Tshs 838.800. During the year the gross margins decreased by 35 percent at small and by 26 percent at medium-scale farms. The fall in the gross margin was attributed to by both a difficult milk market and increased price of inputs as Table 19 demonstrates.

- This suggests that a reliable milk price is very important for dairy farmers to continue doing profitable business.

Profitability of Dairy Farming and its Potential to Alleviate Poverty

- Although dairy farming was less profitable in 1998 compared to the previous years, dairying is still very popular in the region as many farmers still opt to start a dairy unit. The lower gross margins might have made farmers economize on feeds thus causing the slight drop in milk production per cow. Reality suggests that if farmers are to get a high gross margin, they must in future learn on how to produce more efficiently with lower input costs.

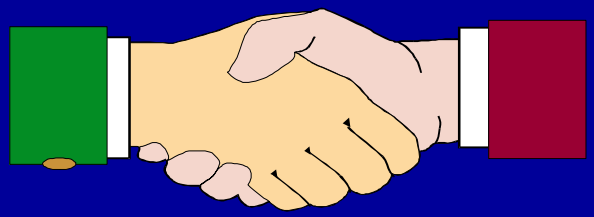
Profitability of Dairy Farming and its Potential to Alleviate Poverty

- **Profits in dairy farming appear to be positive for all types of dairy systems. Data (Table 5) shows that the gross margin per cow per year is Tshs 456,000 in intensive rural dairy systems in a rural set-up using exotic crosses and Tshs 603,000 in intensive urban dairy farming. This is six times higher than the national poverty line of Tshs 74,000. Even dairying using the traditional cattle is profitable as possession of only one dairy zebus brings the farmer close to the poverty line.**

Profitability of Dairy Farming and its Potential to Alleviate Poverty

- **The current low levels of milk consumption appear to be constrained mainly by low income levels on the part of consumers. Improvement of peoples incomes in general and enhancement of milk production, processing and marketing will most likely lead to poverty alleviation in both fronts: enhancing incomes as well as improving food intake and thus the nutrition status.**

Thank You



Key Messages and issues

Key Messages and Issues

General Messages:

- One of the major factors constraining development of Agriculture in Tanzania is failure of the farming community to adopt existing improved agricultural technologies.

- There is abundant evidence showing that the National Agricultural Research System has made available a wide range of improved agricultural technologies that have a high potential of alleviating poverty, enhancing food security and improving nutrition status of the majority.

Key Messages and Issues

- Failure in utilizing these improved agricultural technologies contributes to perpetuation of intensification of poverty in the country
- Existing improved agricultural technologies are much more profitable than traditional ones, and can highly contribute to increasing agricultural productivity and to improving nutrition. Even if farmers do not get a market for their products they themselves can get assured of availability of adequate food to eat if they adopt these technologies. This itself is poverty alleviation. Adoption of these technologies is, therefore, crucial and strategic for poverty alleviation and enhancement of food security in the country .

Key Messages and Issues

Specific Messages:

1. **However profitable technologies may be, they can not contribute to poverty alleviation if the scale of production is so low.** If poverty is measured by income, which is a function of quantity produced and price of the produce, then a smaller quantity produced per household will mean little income and thus nothing will happen to poverty situation.

Key Messages and Issues

- ***Specific Messages:***

2. **Farmers growing traditional varieties face high risks of reduced returns to land and labour in case of crop failure.** Usually improved varieties are more resistant to pests and diseases, more tolerant to drought, high yielding, and are low risk technologies. These characteristics at least assure farmers that they can harvest some crops or earn some income in the event that there is a problem or a risk.

Key Messages and Issues

Specific Messages:

3. **Adoption of improved agricultural technologies is severely hindered by lack of markets for the products produced.** The demand for improved technologies depends on profitability of using that technology. If farmers fail to sell the product emanating from such technologies at a price that covers the costs of using that technology, then they will dis-adopt it.

Key Messages and Issues

Specific Messages:

- **4. Low levels of on-farm gross margins relative to on-station margins are reflective of existence of institutional constraints that hinder farmers from widely adopting the recommended technologies.** On-farm margins may be high or low depending on the ratio between costs and revenue. Costs may be high and prices low due to poor functioning of input and output markets which in turn could be due to lack of informed policies and regulations. Poor infrastructure such as credit, roads, communication etc. could be another factor.

Key Messages and Issues

Specific Messages:

5. **It is highly profitable to use animal drawn technology (ADT) in weed management even when bank credit is utilized.** Tanzania is endowed with abundant cattle that can be used in agricultural activities including land ploughing, weed management, and transportation. Use of ADT can release labour to other farm activities, especially when labour power is demanded for several activities simultaneously. Wide use of ADT could be a vital step towards mechanization and commercialization of agriculture in the country. Continued use of the hand hoe and carrying agricultural produce on head reflects ignorance and poverty of the Tanzanian farmer and backwardness of Tanzanian agriculture.

Key Messages and Issues

Specific Messages:

6. **Dairying using exotic cattle can highly contribute towards poverty alleviation if promoted. Profits are potentially very high even under a rural-area set up.**
   Dairy framing has generally never been a commercial activity in Tanzania except in pockets of rural and urban areas. Some of the bottlenecks include: non- availability of exotic crosses in rural areas, seasonality in availability of cheap animal feed, poor veterinary services, lack of milk processing and storage technologies, most people do not value milk more than they value other drinks such as beer, and availability of cheap imported milk products.

Key Areas for Policy Intervention

Improving adoption of improved agricultural technologies in Tanzania can never be a task of one or selected institutions. BUT the government has to take the leading role in motivating and giving other actors a sense of direction.

- The key areas for intervention include:

Key Areas for Policy Intervention

1. **The government should increase budgetary support for agriculture research, extension and policy analysis.** Research should be directed towards developing more appropriate technologies, adapting existing ones into respective agro-ecological zones. Extension should be effective, demand driven and customer oriented. Research and extension staff should be motivated in terms of adequate remuneration and working environment. Analysis of various policies that influence agricultural technology adoption should be prioritized. This can highly contribute towards designing corrective intervention measures.

Key Areas for Policy Intervention

2. **Improve access by farmers to improved technologies.** Extension services have to improve so that research messages reach stakeholders at the time and in the form required. Measures should be sought to make prices of the technological packages be affordable. Information flow systems should be more efficient. Farmers have to be availed with sustainable agricultural credit.

Key Areas for Policy Intervention

3. **Improve efficiency of product market systems to enable farmers realize better (competitive) prices for their products** through: liberalizing cross-border trade; informed regulation of inputs and crop markets; encouraging diversification in use of agro-products and adding more value onto the products; promote formation of strong farmer associations and community based organizations; promotion of private sector involvement in agribusiness; improved rural infrastructure: markets, roads, communication, electricity, information, water, etc.

Key Areas for Policy Intervention

4. **Promote increased demand for local agricultural products.** Deliberate and aggressive advertisement of local products should be promoted. Imported products are currently more advertised than local ones. People should, for example, be sensitized and encouraged to drink more (locally produced) milk, than say beer. Manufacturers of animal feeds and millers should be motivated to use locally produced grains rather than using imported ones.

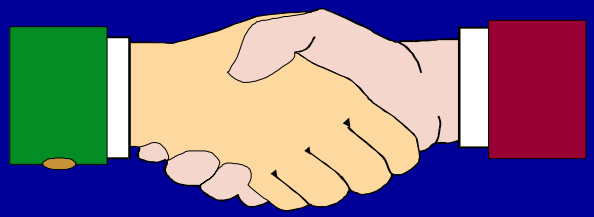
Key Areas for Policy Intervention

- **5. The government should implement policies that will bring about a movement from the current subsistence smallholder farming to commercial medium and large scale farming.** Commercial farming is inevitably expected to lead towards reaping of economies of scale. Costs of production go down when the farming industry starts seeking improved technologies and improved and more efficient ways of producing agricultural inputs and products. Commercial farmers will wish to look for and have secure markets for their products, etc.

Key Areas for Policy Intervention

- **6. Promote, with much more vigor, use of animal draught technology.** This will involve increasing political seriousness and commitment. Putting a mechanization policy in place, provision of proper and adequate training, and improving distribution and dealership in ADT implements are some of the key measure that need to be taken.

Thank You



AGRICULTURAL TECHNOLOGY ECONOMIC VIABILITY AND POVERTY ALLEVIATION IN TANZANIA

ISSUE/ PROBLEM	**WHAT** should be done ? *(Actions Required)*	**HOW ?**	**by WHO ?** *(Stakeholders)*	**WHEN ?** *(Duration)*	**Targets to be Achieved**	**Pre-conditions**

AGRICULTURAL TECHNOLOGY ECONOMIC VIABILITY AND POVERTY ALLEVIATION IN TANZANIA

ISSUE/ PROBLEM	**WHAT** should be done ? *(Actions Required)*	**HOW ?**	**by WHO ?** *(Stakeholders)*	**WHEN ?** *(Duration)*	**Targets to be Achieved**	**Pre-conditions**
Low adoption of technologies - Lack of accessibility	-Develop coherent and effective policy		**The Farming Community** (farmers, cooperatives etc)	Immediate Short-term Long-term		
- Lack of markets for agricultural products			**Business Community** (firms and associations)			
- Low Scale of Production			**Policy Makers**			
-Lack of coherent and effective agricultural policy w.r.t. agricultural technology development			**Government:** MAC, Local, Central etc.			
	-Promote milk consumption -Create awareness -encourage more milk processing		**Donors**			
			NGOs			
LIVESTOCK SECTOR:			**Financial Institutions**			
- Low consumption of Milk			**The Academia**		Increased per capita milk consumption from 23 litres to 40 litres within 5 years	
RESOURCE ALLOCATION TO AGRICULTURE:			**Policy Dialogue Institutions**			
RESOURCE ALLOCATION TO AGRICULTURE:			**The Media**			