

# THE CONTRIBUTION OF UYOLE AGRICULTURAL CENTRE TO AGRICULTURAL DEVELOPMENT IN THE SOUTHERN HIGHLANDS OF TANZANIA

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## ABSTRACT

*The Uyole Agricultural Research and Training Institute otherwise known as Uyole Agricultural Centre (UAC), was established in 1972. This paper describes the historical background to UAC's establishment and examines some of its achievements over the years since then.*

## HISTORICAL BACKGROUND OF UYOLE AGRICULTURAL CENTRE

The history of Uyole Agricultural Centre dates back to the year when the Governments of Denmark, Finland, Norway and Sweden (all Nordic countries) were invited by the Government of Tanzania to collaborate in drafting a proposal for establishing the centre. Once a plan had been drafted an agricultural project agreement was signed in 1972 and the Nordic Tanzania Consultative Committee was established to oversee the implementation of the project. Iceland became involved in 1975.

The Uyole Agricultural Centre was established in 1972 and named Uyole Agricultural Research and Training Institute (ARTI). The research institute started to operate at the end of 1973, while the training institute started officially in January 1975. From 1972 to 1975 both the research and training institutes were directly under the supervision of the Ministry of Agriculture.

In March 1976, the Uyole Agricultural Centre became a parastatal organisation established by the President Order No. 17 under the Public Corporation Act of 1969, thus enabling it to operate freely with regard to decision making and programme planning and implementation, within the guidelines set out by national research and training policies.

## THE SCOPE OF OPERATION AND MANDATE OF UAC

### Coverage

The mandate of the UAC covers the Southern Highlands zone of Tanzania. The Southern Highlands comprise four regions, namely Mbeya, Ruvuma, Rukwa and Iringa. These regions lie between latitude 6°30' S-10°75' S and longitude 30°30' E. More than 30% of the area lies at an elevation of between 1800 m and 2500 m or more above sea level. The rich volcanic highlands lie at an elevation of between 1500 m and over 2500 m above sea level. The whole zone experiences relatively cool weather, with temperatures ranging between a mean maximum of 23°C and a mean minimum of 14°C. The coolest months, May, June, July and August, have mean maximum temperatures ranging between 16 and 20°C while the extreme monthly minimum varies between 4 and 10°C. Frost is common during these months. The annual rainfall is more than 800 mm. The rainy season occurs between the months of November and April or May. The soils are generally moderately or very fertile.

The Southern Highlands region produces surplus food which feeds other parts of Tanzania. As a result, these four regions can support a population of 537 million if their potential is fully exploited. The Southern Highlands covers 25 million ha of the total area of 88 million ha in Tanzania. The generally fertile soils and moderate climate, with a dependable rainfall, allow a variety of crops to be grown.

The areas served by UAC, and their population, are shown in Table 1. In order to serve the more distant areas UAC has seven sub-stations, two in each region except Rukwa, where there is only one. The importance of UAC research to the Southern Highlands can be assessed from the area which is under crop production, which in 1988/89 was 23% of the Tanzanian total.

Table 1. Land area and population in the Southern Highlands by region

Region	Land area km <sup>2</sup> x10 <sup>3</sup>	Population ('000)		Population density (people km <sup>-2</sup> )	
		1978	1988	1978	1988
Mbeya	60.3	1 080	1 476	17.9	24.5
Iringa	57.0	923	1 209	16.2	21.3
Ruvuma	63.4	564	783	8.9	12.3
Rukwa	68.5	452	695	6.6	10.1
Southern Highlands total	249.2	3 019	4 163	12.1	16.7
Tanzania total	885.3	17 528	22 534	19.8	25.6
Southern Highlands as % of Tanzania	28	17	19	61	65

#### MANDATE OF UAC

The mandate of the UAC covers twelve objectives, which can be grouped under the following broad aims:

- to conduct agricultural, livestock and related applied and adaptive research with smallholder farmers as the target group;
- to training students at certificate and diploma level, to enable them to join in the implementation of Tanzania's national agricultural policy;
- to engage to some extent in production activities to demonstrate the results of research and generate revenue to supplement the Government's subvention.

This paper examines the extent to which the UAC has fulfilled the scope of its mandate and the impact UAC has had on the agricultural development of the Southern Highlands. The judgement of UAC's impact is to some extent subjective, but can be quantified in terms of the consumption of farm inputs and the output of crop and livestock products, the number of crop varieties developed and released by the UAC over the past fifteen years, and the recommended production packages that have significantly improved crop yields. The per capita consumption of farm inputs (such as seed and fertilizer) has increased; it is estimated that farmers in the Southern Highlands consume about 65% of the fertilizers imported into the country. The purchase of certified maize seed in the Southern Highlands has increased ten-fold since 1973/74. According to the available statistics, this region produces more than 30% of the country's maize. Furthermore, the area under cultivation of food crops has increased rapidly.

## ANALYSIS OF THE UAC's IMPACT

### Maize

The UAC's research recommendations reach its target group, the small farmers, through field days, demonstration plots, on-farm trials, and the extension services. According to Temu and Lyimo, mean average maize yields in ten villages in Rukwa (1989/90) on KILIMO-Sasakawa Global 2000 farmer-managed management training plots ranged from 3.5 to 5.6 t ha<sup>-1</sup> compared with 1.5 to 1.9 t ha<sup>-1</sup> from farmers' traditional plots. Maize grain yields from eight villages in Mbeya Region ranged from 2.9 to 6.2 t ha<sup>-1</sup> on management plots compared with 1.7 to 2.8 t ha<sup>-1</sup>, from traditional plots, and in 30 villages in Iringa Region maize grain yields ranged from 2.7 to 7.3 t ha<sup>-1</sup> on management training plots compared with 1.8 to 3 t ha<sup>-1</sup> from farmers traditional plots. This increase in grain yield can be attributed to UAC's research recommendations, to credit facilities offered to farmers by the KILIMO-Sasakawa Global 2000 Agricultural Project, and to the services of other extension agents.

UAC, through the International Liaison Committee for Food Crops (CILCA) project, has increased maize production in twelve villages in Mbozi District from 0.6 t ha<sup>-1</sup> in 1980 to between 1.8 and 3 t ha<sup>-1</sup> in 1990. With improved research-extension linkages, many more farmers are likely to benefit from such improved packages.

The surplus production of maize compared to the population's whole, in the Southern Highlands in the 1988/89 season was 45% (Table 2).

If the production constraints faced by smallholder farmers could be removed or reduced, the Southern Highlands zone alone could produce enough food not only to supply other regions in the country where there is a deficit but, also to supply the export market (Table 3).

UAC has not been the only stimulus to agricultural development in the Southern Highlands. Other agencies and projects that have contributed include the European Economic Community (EEC) through its agricultural sector support programme, International Fund for Agricultural Development (IFAD), the Food and Agricultural Organisation (FAO)-KILIMO Fertilizer Programme, Agricultural Development Programme (ADP), International Liaison Committee for Food Crops (CILCA), the Mbeya Oxenization Project (MOP), CONCERN, the Small Scale Dairy Development Project (SSDDP), other Non-Governmental Organisations and various large scale farm operations.

Table 2. Production and consumption of maize in the Southern Highlands of Tanzania in the 1988/89 season

Region	Estimated population	Maize equivalents (tx10 <sup>3</sup> )		
		Production	Consumption	Surplus
Mbeya	1 517 532	500.3	388.8	111.5
Iringa	1 242 763	52.5	318.4	209.1
Ruvuma	805 260	424.4	206.3	218.1
Rukwa	14 433	35.4	183.0	192.3
Total Southern Highlands	3 579 988	1 82.6	1 096.5	731.0
Southern Highlands as % of Tanzania	19	24	19	45

Source: National Food Security Unit, Kilimo, 1990.

### Coffee

UAC has been instrumental in the provision of coffee seedlings from Mbimba Experimental sub-station to coffee growers, not only in the Southern Highlands but as far away as Kigoma and Tarime. Coffee research as such does not fall under UAC's mandate, although UAC's plant protection section conducts research on coffee diseases and pests. The impact of UAC's recommendations on coffee can be clearly seen in the Southern Highlands.

Table 3. Crop Production Southern Highlands and Tanzania (1986)

	Mbeya	Iringa	Ruvuma	Rukwa	Tanzania	Southern Highlands as a % of Tanzania
Coffee area (ha)	47 014	925	-	-	256 422	18.7
Smallholder tea area (ha)	4 036	1666	-	-	9 177	62.1
Made tea production (t)	18 867	35655	-	-	71 472	76.3
Cashewnuts <sup>1</sup>	7	6	1 320	-	19 214	6.9
Pyrethrum <sup>2</sup>	491	848	-	-	1 351	99.1
Cotton <sup>3</sup>	4.3	-	-	-	106	4.1
Tobacco <sup>4</sup>	1 609	1323	1 034	8 121	23 160	52.2
Groundnuts <sup>5</sup>	-	-	43	32	507	14.8
Sesame <sup>5</sup>	-	-	1.3	5.6	1 858	0.4
Sunflower seed <sup>5</sup>	21	122	771	3	4 847	18.9
Castor seed <sup>5</sup>	-	-	7	-	502	1.4
Soyabeans <sup>5</sup>	-	-	-	26	465	5.6
Maize <sup>6</sup>	15 987	38006	29 116	29 338	178 494	63.0
Rice <sup>6</sup>	11 582	19	10	194	15 933	74.1
Wheat <sup>6</sup>	-	844	-	86	50 289	1.8
Sorghum <sup>6</sup>	285	684	-	110	14 744	7.3
Beans <sup>6</sup>	889	44	2	-	5 659	16.5
Cassava <sup>6</sup>	-	-	644	1 188	12 935	14.2
1985 fertilizer sales (t)	27 232	25233	22 655	4 393	117 969	67.4
1985 seed sales (t)						
1985 maize seed sale (t)	310	642	646	126	4 426	39.0
1985 sorghum seed sale (t)	-	29	-	-	356	8.1
1985 wheat seed sale (t)	-	229	-	24	1 014	25.0
1985 rice seed sale (t)	15	-	3	1	82	23.2

<sup>1</sup>Purchases (t); <sup>2</sup>Production of dried sunflowers (t); <sup>3</sup>Production (tx10<sup>3</sup>) of seed cotton (AR+BR); <sup>4</sup>Purchases of flue cured tobacco in metric tons (Ruvuma Fire cured); <sup>5</sup>Collection of Gapex (t); <sup>6</sup>Purchases by National Milling Corporation (t); <sup>7</sup>Quantities sold in 1985 (t).

### Irish Potatoes

The production of Irish potatoes in the Southern Highlands has increased considerably in recent years as a result the adoption by farmers of UAC's research recommendations on land preparation, time of planting, spacing and, above all, improved varieties and fertilizers. A joint Nordic-Tanzania evaluation of UAC in 1980, noted that the introduction of new potato variety Baraka, combined with the adoption of improved crop husbandry had increased production almost three times since 1976.

In the 1988/89 season farmers in the Southern Highlands produced about 90 % of Tanzania's total output of Irish potatoes. A comparison of the production of potatoes in the Southern Highlands in 1975/76 and 1988/89 is shown in Table 4.

**Table 4. Potato production (t) in the four regions of the Southern Highlands 1975/76 and 1988/89.**

	1975/76	1988/89
Iringa	83 300	247 500
Mbeya	25 000	79 454
Rukwa	367	500
Ruvuma	250	300
Total	108 917	327 754

Source: Mayona, (1991).

The improved potato varieties released by UAC since 1976 include Baraka, Sasamua, Subira, Tana, Kikondo and Bulongwa. The demand of seed potatoes of high yielding and disease-resistant varieties has increased to a level which exceeds supply. The UAC sub-station at Igeri in Njombe is currently producing improved varieties for sale to smallholder farmers. Efforts are being made to persuade other large scale farmers to produce seed potatoes for eventual distribution to farmers. Despite the release of these improved potato varieties, farm yields are still poor (5-7 t ha<sup>-1</sup>) compared with yields from research plots (20 t ha<sup>-1</sup>). According to the agricultural sector support programme's survey conducted by the Food Security unit at UAC in 1988/89, 1989/90 and 1990/91, most of farmers in the Southern Highlands are aware of modern agronomic practices (EEC-ASSP, 1988-1991). The yield gap between research plots and those of the small scale farmers is partly due to the limited use of inputs which results from insufficient cash and lack of availability of the inputs.

### Beans

Since the inception of the beans programme at UAC a number of improved varieties have been released to farmers in the Southern Highlands. These include Ilomba 90, Uyole 84, Uyole 90.

Most of the farmers have adopted the new bean varieties. However, the yields from farmers' plots are still only 0.4 t ha<sup>-1</sup>, compared with field trial yields of 1-2 t ha<sup>-1</sup>. More work is needed on the part of the extension workers to disseminate improved management practices to the small scale farmers.

### Land suitability

The Soil Science Unit at UAC is involved in the basic mapping of land systems and land regions in the Southern Highlands. Land suitability maps have been prepared for several crops, so that extension workers can now easily advice farmers about suitability of soils in their area for the production of those crops by looking at the quality of the soils. Important land qualities include such characteristics as the availability of soil nutrients, the soil moisture content, the rooting depth, the soil temperature and erodability.

UAC has helped to identify the agro-ecological zones in the Southern Highlands. Researchers at UAC have identified the problems that exist in the agro ecological zone by interviews, by observing the appearance of crops in the field, and by looking at yield data. They have conducted trials on representative sites to solve these problems.

### Horticultural development

UAC embarked on research into horticultural crops in 1973. Since then UAC has released a number of improved varieties of vegetables suitable for specific areas. Farmers can now grow tomatoes throughout the year as late blight disease, which once restricted the growing of tomatoes in the rainy season, has been controlled. Tomato growers now obtain an average yield of 50 t ha<sup>-1</sup>, which is comparable with the yield of 70-80 t ha<sup>-1</sup> from research plots.

## CROP PRODUCTION TRENDS AND PROSPECTS

Agricultural Sector Support Programme's survey conducted by the Food Security unit at UAC, indicated that farmers intend to increase their production of almost all crops, especially maize, which they grow both as a cash and a food crop. The impact of UAC research is evident in that many farmers use hybrid seeds.

## THE LIVESTOCK INDUSTRY

UAC has been instrumental in the adoption of modern animal husbandry practices by small scale farmers in the Southern Highlands. The training provided to farmers on the management of dairy cattle has increased milk production and improved nutritional standards. To provide an example of the impact that UAC has had, in 1978 UAC sold 22 Friesians to small scale farmers in Mwakaleli Division in Rungwe District. The size of the cattle herd had grown to 800 dairy cattle by 1991.

Livestock research has focused on animal health, animal breeding, pastures and forage, animal nutrition and animal husbandry. A number of studies have been carried out and appropriate recommendations to farmers and extension workers by means of field days, extension leaflets and seminars. The milk production from both exotic and indigenous cattle has increased; for example, the yield of Friesian cows in the early 1980s was 5 litres per cow per day and this had increased to 15 litres per cow per day in 1991.

## AGRICULTURAL TRAINING

Although there are a number of training institutes in Tanzania, UAC is unique in that it trains students at both diploma and certificate level in both livestock and crop production. The UAC Training Institute began in 1975/76 with only 12 students but now has a capacity of 500 students, with 480 undergoing training at present. A total of over 3,400 students have already graduated from UAC and are now scattered all over the country. UAC's contribution to the pool of trained agricultural staff is thus significant. UAC Training Institute is the largest agricultural institute in terms of the number of students. In the report of the Nordic-Tanzania evaluation mission it was noted that the training institute operated efficiently from 1975 to 1978 and was known to be the best school in the country. During their training, students usually go to nearby villages to advise and set up demonstration plots on better crop husbandry practices. Students also undertake an eight week yield practical, when they are posted to villages. This exercise has helped farmers in villages in the regions under UAC's mandate to understand modern agricultural practices better.

The UAC Training Institute has conducted a number of short courses for village extension workers and farmers. The aim of these courses is to improve the problem solving ability of village extension workers and farmers and improve farming skills so as to increase productivity and income.

About 20% of the students at the training institute are women. This is an advantage when it comes to offering extension services to women farmers, especially in the teaching of home economics and nutrition. Gender issues have been emphasized by FINNIDA in Phase II of its UAC Support programme.

## SUMMARY AND CONCLUSION

It is clear that the investment in research and training at UAC has benefited the target group, the small scale farmers, in terms of improving their output of crop and animal products by the adoption of the recommended modern practices. Farmers adoption of new technologies is to some extent constrained

by lack of capital for the timely purchase of inputs. The Government should look at the possibilities for providing credit facilities to credit-worthy farmers.

The research results available so far to extension workers and smallholder focus mainly on methods to produce maximum yield. In view of the financial constraints on small scale farmers it might be better to direct research efforts at practices that involve affordable levels of inputs rather than maximum yields. The adoption of adaptive research at UAC is a move in the right direction. Production packages developed by using this approach are likely to be more realistic and location-specific than those being recommended at present.

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