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# Past Present and Future Perspective of Rice Production in Tanzania

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## Abstract

Cultivated rice is divided into two distinct types namely *Oryza sativa* L. and *Oryza glaberrima* which are commonly known as Asia rice and Africa rice respectively. Between the two subspecies *Oryza sativa* which originated from Asia continent around 8000BC is the most widely distributed and grown almost globally while *Oryza glaberrima* which originated in West Africa around 1200BC is restricted only in Africa. Nevertheless, both of the rice have unique domestication histories and plays most important components of human diet that energize and nourish mankind for thousands of years. Rice is the staple food and principal food crop for more than 50% of the world's population. Because of its potential of feeding more people in the world the Food and Agriculture Organization (FAO) regard it as a strategic crop for food security in the world.

**Keywords:** *Oryza glaberrima*; *Oryza sativa*; Domestication; Population

## Introduction

Rice is the second most important food crop after maize in Tanzania, It is being grown by 18% of the farming households and more marketed than maize. The quantity of marketed rice is approximately 42% of the total production while that of maize is 28%, thus being more commercialized than maize. Tanzania is among the top three countries in Africa in terms of rice production. This indicates how important this crop has been to this country. The rapidly increasing trend in rice production is partly due to increase of population, urbanization and rice preference [1].

Increasing rice production/productivity and value addition in Tanzania will have the greatest impact among resource poor farmers in Tanzania. Rice value addition will not only introduce new cuisine with rich taste but also spurs small and large scale industries such as wine, vinegar, flour blending, furniture, and animal feedstuff making [2].

## History of rice introduction in Tanzania

The overall physical environment of the East African coast historically made it an important supplier of spices, jewels, timber, laborer, and other goods to Arabia and the rest of the Asia. It is probable that the Indian ocean was mostly used for commercial navigation after the discovery of the monsoon winds by hippalus in the third century BCE from information presented in the Periplus and in Ptolemy's geography, it seems clear that a basic east west nexus between the red sea and India was already in place by the second century. By the ninth century, and probably earlier, a fully articulated commercial system existed that extended from East Africa and the red sea to China [3].

Carpenter narrated that *Oryza sativa* was first introduced on the coast of East Africa by asian traders from Sri Lanka and India around 2000 years ago. Some of these Asian traders settled in Zanzibar, Kilwa, Somalia, Mafia, Mombasa and other East Africa coastal towns. They soon started cultivating rice this new crop in lowlands and valleys. Rice cultivation did not spread quickly to East Africa countryside for centuries until during slave trade [4]. Slave trade opened up the East Africa countryside. The spread of rice as well as other new crops such as maize (*Zea mays*), cassava (*Manihot esculentum*) country side followed along the slave trading routes from Zanzibar, Bagamoyo, Morogoro, Iringa, Dodoma, Singida, Sumbawanga, Tabora, Shinyanga, Mwanza and Kigoma and beyond lake Victoria and lake Tanganyika. At first cultivation of rice was done mostly by arab traders who settled in these areas. The local farmers were not interested in this new crop because they did not know how to cultivate, cook and its production turned out to be less reliable in comparison with pearl millet (*Pennisetum glaucum*), banana (Musa spp), finger millet (*Eleusine coracana*) and sorghum (*Sorghum bicolor*) [5].

## Materials and Methods

During colonial period, the emphasis was on cash crops as raw materials for their industries in Europe. In Tanganyika (Tanzania) the German introduced cotton in western Tanzania, sisal in Eastern coastal areas, coffee and tea in northern and southern highlands of Tanzania. After taking over from german in 1920's there are evidences which show British colonial agricultural officers sighting of the cultivation of indica rice [6]. However, just like germans, british colonialist emphasized on cash crops rather than food crops therefore cultivation of rice did not increase during the colonial period. During colonial period only cash crops research centres were established such as ukiriguru research centre for cotton in western Tanzania, Ilonga research institute, mlingano agriculture research institute for sisal research and improvement (Table 1).

| Year | Cultivated area (ha) | Production (tonnes) | Year | Cultivated area (ha) | Production (tonnes) |
|---|---|---|---|---|---|
| 1961 | 82000 | 94000 | 1992 | 306570 | 392220 |
| 1962 | 83000 | 104000 | 1993 | 353700 | 641000 |
| 1963 | 115000 | 183000 | 1994 | 352600 | 614300 |
| 1964 | 110000 | 147322 | 1995 | 394000 | 622600 |
| 1965 | 56000 | 72954 | 1996 | 513400 | 806800 |
| 1966 | 127000 | 133082 | 1997 | 439300 | 549700 |
| 1967 | 110000 | 109687 | 1998 | 654500 | 849100 |
| 1968 | 128000 | 104000 | 1999 | 379100 | 728600 |
| 1969 | 129000 | 126000 | 2000 | 415600 | 781538 |
| 1970 | 151000 | 132000 | 2001 | 405860 | 867692 |
| 1971 | 153000 | 171000 | 2002 | 565600 | 984615 |
| 1972 | 155000 | 187000 | 2003 | 620800 | 1096923 |
| 1973 | 130824 | 301000 | 2004 | 613130 | 1058462 |
| 1974 | 163000 | 223000 | 2005 | 701990 | 1167692 |
| 1975 | 204000 | 265000 | 2006 | 633770 | 1206154 |
| 1976 | 267000 | 346000 | 2007 | 557981 | 1341846 |
| 1977 | 243000 | 314000 | 2008 | 887660 | 1420570 |
| 1978 | 258000 | 387000 | 2009 | 805630 | 1334800 |
| 1979 | 260000 | 262000 | 2010 | 1136290 | 2650120 |
| 1980 | 245000 | 291000 | 2011 | 1119324 | 2248320 |
| 1981 | 280000 | 200000 | 2012 | 799361 | 1800551 |
| 1982 | 300000 | 320000 | 2013 | 928273 | 2194750 |
| 1983 | 224110 | 349231 | 2014 | 957218 | 1681000 |
| 1984 | 271210 | 355385 | 2015 | 1154467 | 1937000 |
| 1985 | 236540 | 427692 | 2016 | 1039205 | 2229000 |
| 1986 | 273760 | 547692 | 2017 | 1097283 | 2451707 |
| 1987 | 351190 | 644615 | 2018 | 1032902 | 3414815 |
| 1988 | 345000 | 615385 | 2019 | 1052547 | 3474766 |
| 1989 | 385310 | 718461 | 2020 | 1586952 | 4528000 |
| 1990 | 384500 | 740000 | 2021 | 955729 | 2688000 |
| 1991 | 368700 | 624615 | - | - | - |

**Table 1:** Post independence rice production statistics in Tanzania.

## Rice production after independence and current status

After independence, farmers were not forced to cultivate cash crops and there was a shift in focus by Tanzania government to rather research and improve food crops as well as and livestock under smallholder farmers. The year after Tanzania got independence rice production was 94,000 tonnes from 82000 (ha) cultivated area. The years after independence rice production (tonnes) as well as area under rice cultivation (ha) steadily increased [7]. After green revolution in 1970's, the Tanzania government introduced many high yielding varieties from India and Philippines. The varieties introduced included IR54, IR56, IR64, IR68, Supa8, kihogo red basmati pishori, ran captain, calyaman, supa India. The growing interest for rice by the

farmers encouraged the government to establish rice research centre Katrin (Ifakara) in 1975. Since 1975, therefore katrin has operated as the major institute dealing with rice research in the country. A number of traditional varieties including Faya of the Theresa, Afaa mwanza, Kihigo selection No. 1/159, 0/746, Kihogo selection No. 7, 22 and 23, gamti, tunduru dunduli, salama have been developed through pure line selection, testing and evaluation at different locations in the country. In 1980's, sokoine university of agriculture was established as well as uyole and Ukiriguru research centre started doing rice research and improvement as well. International research institute such as WARDA, Africa rice, IRRI and IITA they all opened office in Tanzania. New rice varieties and rice production technologies introduced to farmers by these research institutes including sowing, fertilizer application: Weeding control, pest and disease control, harvesting and rice value additions. In 2019 and 2020, Tanzania produced 3474766 and 4528000 tons of rice respectively. This makes Tanzania, The leading producer of rice in east and central african countries. It ranks 4$^{th}$ in Africa and 22$^{nd}$ in the world in rice production. Rice has emerged as a vital crop as staple food, for livelihoods and source of income in Tanzania. It has also potential for powering small industries and development in Tanzania [8,9].

## Rice production ecology in Tanzania

In Tanzania, rice is cultivated under three major ecosystems namely rain fed lowland, upland rice and irrigated. Since large scale rice farmers are less than 10% and subsistence farmers about 90% of rice producers in Tanzania. It is estimated that only 5% of rice is produced under irrigation system, about 85% produced under rainfed lowland and around 10% produced under upland ecosystem [10].

## Upland rice ecosystem

Upland rice is cultivated under a monocropping system and sometimes under a mixed cropping system with other food crops. In upland rice ecosystems there is little use of inputs such as machines, inorganic fertilizers and pesticides. Soils are relatively poor and water is inadequate. Landraces commonly supa, mlimani are commonly grown. In these systems, NERICA varieties are being introduced in order to increase productivity. The productivity in this ecosystem is low and it ranges from 0.8 t/ha to 1.2 t/ha and there is only one season for rice cultivation per year [11].

## Rainfed rice ecosystem

In rainfed rice ecosystem, farmers rely on rainfall for water needed to grow the rice. Water is not reliable and problems of flooding and drought or rainfall are persistent since rainfall is unpredictable. Soils are relatively fertile compared to upland soils. It is characterized by the use of hand hoe or ox plough, little use of tractor, transplantation by hand, farmers generally apply little fertilizers, farmers usually use farm saved seeds and minimal use of other inputs. The productivity in this ecosystem is low and it ranges from 1.41 t/ha to 2.1 t/ha and there is only one season for rice cultivation per year. Common cultivars cultivated in this system includes all landraces such as afaa, afaa mwanza, kalamata, kilombero, mabu etc, some improved varieties such as mwangaza, komboka, TXD85 and TXD88 are cultivated in the rain fed ecosystem [12].

# Results and Discussion

## Irrigated rice ecosystem

Irrigated ecosystem is the system or rice cultivation where by the rice fields have assured water supply throughout the growing season. In Tanzania only few farmers (around 5%) use this rice ecosystem. It is characterized by use of mod ern mechanization technology such as tractors, rice planters, agrochemicals and good agricultural practices [13]. Rice productivity ranges from 3.2 t/ha to 4.5 t/ha with great scope for further yield improvement through improved crop management and further intensification. In this system some farmers in Tanzania they have 2-3 season for rice cultivation per year. Improved rice varieties commonly used in this system includes dakawa line 85, dakawa line 88, TXD306, TXD307, SATO1, SATO9 (Tables 2 and 3).

| S/N | Source | Cultivars | Rice ecosystem | S/N | Source | Cultivars | Rice ecosystem |
|---|---|---|---|---|---|---|---|
| 1 | Landrance | Afaa | Rainfed | 48 | Landrance | Supa jyela | Rainfed |
| 2 | | Afaa mwanza | Rainfed | 49 | | Supa utafiti | Rainfed |
| 3 | | Chamota | Rainfed | 50 | | Tondogoso | Rainfed |
| 4 | | Chaka | Rainfed | 51 | | Tunduru | Rainfed |
| 5 | | Cherehani | Rainfed | 52 | | Turiani | Rainfed |
| 6 | | Dunduli ya mlimani | Rainfed | 53 | | Usiniguse | Rainfed |
| 7 | | Faya manana | Rainfed | 54 | | Wahiwahi | Rainfed |
| 8 | | Faya mzinga | Rainfed | 55 | TARI | Dakawa line 85 | Irrigated |
| 9 | | Faya theresa | Rainfed | 56 | | Dakawa line 88 | Irrigated |
| 10 | | Gomba | Rainfed | 57 | | IR 9101-124-1 | Irrigated |
| 11 | | Jaribu | Rainfed | 58 | | ITA 283 | Rainfed |
| 12 | | Kahogo | Rainfed | 59 | | ITA 303 | Rainfed |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 13 | | Kalamata | Rainfed | 60 | | KATRIN | Irrigated |
| 14 | | Kalubangala | Rainfed | 61 | | Komboka | Rainfed |
| 15 | | Kalundi | Rainfed | 62 | | SATO1 | Irrigated |
| 16 | | Katani | Rainfed | 63 | | SATO61 | Rainfed |
| 17 | | Kilombero | Rainfed | 64 | | SATO9 | Rainfed |
| 18 | | Kisegese | Rainfed | 65 | | TAI (IR 0334262) | Rainfed |
| 19 | | Kikweta | Rainfed | 66 | | TARI-RICI | Rainfed |
| 20 | | Tule na bwana | Rainfed | 67 | | TAR-RIC2 | Rainfed |
| 21 | | Kyela | Rainfed | 68 | | TXD 306 (SAR05) | Irrigated |
| 22 | | Limota | Rainfed | 69 | | TXD 307 (SAR07) | Irrigated |
| 23 | | Lugata | Rainfed | 70 | | TXD 85 | Rainfed |
| 24 | | Mabu | Rainfed | 71 | | TXD 88 | Rainfed |
| 25 | | Malamata | Rainfed | 72 | SUA | Kalalu | Rainfed |
| 26 | | Malomogambiki | Rainfed | 73 | | Mwanagaza | Rainfed |
| 27 | | Masantula | Rainfed | 74 | | Sslama M-19 | Upland |
| 28 | | Mbawa ya njiwa | Rainfed | 75 | | Salama M-57 | Upland |
| 29 | | Mbawambili nyekundu | Rainfed | 76 | | SSD 1 | Rainfed |
| 30 | | Mbega | Rainfed | 77 | IRIR | IR8 | Upland |
| 31 | | Mwananwala | Rainfed | 78 | | IR 22 | Rainfed |
| 32 | | Mwenda mbio | Rainfed | 79 | | IR 56 | Rainfed |
| 33 | | Moshi | Rainfed | 80 | | IR 68 | Irrigated |
| 34 | | Mpaka wa bibi | Rainfed | 81 | | IR 54 | Irrigated |
| 35 | | Msongo | Rainfed | 82 | | IR 64 | Irrigated |
| 36 | | Nondo | Rainfed | 83 | | IR 72 | Rainfed |
| 37 | | Rangi mbili nyekundu | Rainfed | 84 | AfricaRIce | IRAT 256 | Irrigated |
| 38 | | Ringa | Rainfed | 85 | | NERICA 1 | Upland |
| 39 | | Serena | Rainfed | 86 | | NERICA 2 | Upland |
| 40 | | Shingo ya mwali | Rainfed | 87 | | NERICA 4 | Upland |
| 41 | | Sindano | Rainfed | 88 | | NERICA 7 | Upland |
| 42 | | Sina Bibi | Rainfed | 89 | | WAB450 | Irrigated |
| 43 | | Sumbawanaga | Rainfed | 90 | India | Super India | Rainfed |
| 44 | | Supa | Rainfed | 91 | | Basmati | Rainfed |
| 45 | | Supa 8 | Rainfed | 92 | | Pishori | Rainfed |
| 46 | | Spua kinyope | Rainfed | 93 | | Ran capyain | Rainfed |
| 47 | | Supa kitere | Rainfed | 94 | | Calyaman | Rainfed |

**Table 2:** Common pests of rice in Tanzania

| S. No | Type of pests | Pest name | Causative agent | Effects |
|---|---|---|---|---|
| 1 | Bacterial disease | Bacterial blight | *Xanthomonas Orzae pv oryzae* | Yield lows 20%-30% |
| 2 | | Bacterial blast | *Magnaporthe oryzae* | Yield lows 11.9%-37.8 % |
| 3 | Virus disease | Rice yellow mottle disease | Rice yellow mottle virus | Yield Imps 20%-30% |
| 4 | | Brown leaf spot | *Helminthosporium* spp | Significance losess |
| 5 | | Sheath rot | *Acrocylindrium oryzae* | Yield lows 20%-30% |
| 6 | Insects | African armyworm | *Spodoptera exempta* | Significance losess |
| 7 | | White stem borer | Maliarpha seperatella ragonot ragonot | Significance losess |
| 3 | | Stalk eyed fly | Diopsis thoracica Westwood | Significance losess |
| 9 | | Spotted stem borer | *Chilo partellus* swinhoe | Significance losess |
| 10 | | African pink borer | *Sesania calamistis* Hamson | Significance losess |
| 11 | | African rice gall midge | *Orseolia oryzivora* | Significance losess |
| 12 | | Flea beetles | *Chaetocnema varicornis* | Significance losess |
| 13 | Rodents | African soft furred mouses | *Mastonys natalensis* | Pre harvest bss 10%-12% |
| 14 | | African grass rat | *Arvicanthis niloticus* | Pre harvest bss 10%-12% |
| 15 | | The house mouse | *Mus musculus* | Stored rice significant bsess) |
| 16 | | The black rat | *Rattus rattus* L | Stored rke significant bsses) |
| 17 | Birds | Red billed quelea | *Quelea quelea* | Yiekl lows 15.2% |
| 18 | | African golden weaver | *Ploceus subaureus* | Yield lows 15% |
| 19 | | Black headed weaver | *Ploceus melanocephalus* | Yield lows 15% |
| 20 | Neimtode Weeds | Root-knot nematodes | *Meloidegyne graminicola* | Significance losess |
| 21 | | Nutgrass | *Cyperus rotundus* | Yield lows 28%-89% |
| 22 | | Common barnyard grass | *Echinochloa crus-galli* | Yield lows 28%-89% |
| 23 | | Yellow nutsedg | *Cperus esculentus* | Yield losses 23%-89% |
| 24 | | Red rice | *Oryza longistaminata* | Yield losses 23%-89% |
| 25 | | Chicken spike | *Sphenoclea zeylanica* | Yield losses 23%-89% |
| 26 | | Saramolla grass | *Ischaenwmrugosum* | Yield losses 23%-89% |
| 27 | | African wild rice | *Oryza barthii* | Yield lows 23%-89% |
| 28 | | Nees | *Asteracantha longifolia* | Yield losses 23%-89% |

**Table 3:** Common pests of rice in Tanzania.

## Major pests and diseases

Rice production in Tanzania has been loaded by many pests and diseases which have significantly reduced yield. The incidence, severity and distribution of these pests and diseases depend on stage of infestation/infection, rice ecosystem, location, season, variety, farming system, and weather condition [14]. Other important diseases are leaf blast caused by magnaporthe oryzae and bacterial leaf blight caused by *Xanthomonas orzae pv oryzae*. Also pests can cause total rice yield loss. Common pests include stem borers (chillo spp), African rice gall midge (*Orseolia oryzivora*), rodents and birds. Integrated Disease and Pest Management (IDPM) options are being used includes good agricultural practices, mechanical, botanical, chemical and biological control of pests and disease in the country. Despite the use of IDPM methods in controlling pests still the problem continue to exist. There is a need to renew IDPM by involving all stakeholders such as researchers, extension officers and farmers with the help of updated technologies ICT tools to disseminate information about different IDPM strategies [15].

## Climate change, price fluctuation, sustainability and resilience in rice production

**Climate change and globalization:** Global warming and climate changes are anticipated to cause a wide range effects to world food production systems and food security. The climate change is predicted to impact more developing tropical countries than temperate countries. Rice is among of crops likely to be affected severely due to its photoperiod sensitivity and susceptibility to altered environmental effects such as salinity, drought and new pest and diseases. Among the several strategies to tackle the effect of global warming and climate is creation of variation in rice using mutation induction to create wide genetic base and introgression of useful genes from exotic cultivars and wild relatives of rice (wild rice) with aid of DNA markers. Other technologies include genetic engineering, digital early warning systems, biotechnologies and the use of artificial intelligence.

Globalization refer to the growing interdependence of the world's economies, cultures and populations, brought about by cross border trade in goods and services, technology and flows of investment, people and information. While, it has it has helped to raise global trade, economy, human rights and civilization, it is blamed for the spread of plant diseases, invasive species of pests and weeds in the world. Evolutionally plants, Animals and pathogens have coevolved with their host and environment. In a way they balance each other but when barriers are broken as in case of globalization in which exotic pathogenic organisms are introduced into new environments, potentially finding suitable hosts lacking resistance genes and environments favouring pathogenic behaviour; this increases spread and emergence of new disease, pests and epidemics. Countries especially developing countries which less phytosanitary measures and personnel has great chance of being affected. This can be demonstrated by the case of fall army worm (*Spodoptera frugiperda*) and Greater grain borer (*Prostephanus truncates*) in Tanzania and East Africa. Tanzania should be prepare itself with technology, capabilities and personnel to intercept invasive species of disease, pests and weed from being introduced or ability to thwart them before they bring any effects in rice production as well as other crops.

## Rice price fluctuations in Tanzania

Price fluctuation is the irregular up and down movement of price of rice in the market. In Tanzania rice price cultivation is either seasonal or yearly. Generally the dry season (May, October) coincides with harvesting season with rice the price is low while the rain season (November, April) rice price is high). Table two indicates the variations in rice production as well are cultivated. The rainfall availability forces farmer to cultivate or not to cultivate rice. In 2020 we had highest production and area cultivated because Tanzania received abundant rainfall in 2019/2020 season and in 2021 the harvest were low because Tanzania received very low rain fall in 2020/2021 rain season. It is a serious problem to farmers and often make farmers vulnerable to losses from their investment and sometimes lose their investment altogether. Although farmers benefits when the prices rises many farmers prefer stable price which can give clear information and can use it as benchmark in long term investment plans. According to Wilson and iewis rice prices are irregular as it varies seasonally as supplies of rice depend on production. The season that rainfall is abundant or less abundant then rice supply is high and vice versa. In most cases prices are low just after harvest and shoot up afterwards. Since most of farmers are small scale and resource poor they don't have storage facility and they are force to sell the rice just after harvest and low price. In order to have a stable price of rice the demand of rice should be always there. Most rice in Tanzania is just for household consumption usually cooking as white rice, spice rice (pilau) or as by product in the form of vitumbua. There is significance reduction in rice demanded as well as price when the supply of rice high because only little rice is needed for household consumption. Establishment of rice processing industries (both small and large) such as industries related to wine, vinegar, animal feedstuffs, furniture, brown rice and flour blending will help increase the demand of rice throughout hence positive effect on rice price stability.

## Resilience and sustainability of rice cultivation in Tanzania

Building or making communities resilient in development arena in the face of climate change and globalization is among of top agenda in UN sustainable development goals. A resilient community is the community which is capable to stand firm, soak up, contain, and recuperate from adverse environment brought up by number of issues such as changing climate, price fluctuation, diseases, and globalization to sustain its livelihoods in a sustainable manner against all adversity. In our case in Tanzania we need resilience and sustainability of rice producing communities. Farmers have a habit of changing crop cultivated in the face of adversity such as disease, price change, and low profit. This may results into lack of continuation and hence specialization in production of such crops. Specializations are touted to increase trade off, increase efficiency and lead to development of famer's economies of scale.

## Perspectives

Intervention by government and agricultural stakeholders to undertake researches which will lead into new varieties, new method of farming and crop protections. Utilization of technologies such as mutation breeding, polyploidy breeding, biotechnologies and climate smart farming systems will be key in obtaining sustainable solutions to future rice production. This technologies have successful utilize in rice and other crops in many countries so it has potentials to be fully utilized in Tanzania and became effective as well.

Enhancing extension services using ICT, lead farmers and field demonstration centres will help making sure research outputs and solutions are put in use by farmers. Studies shows most of research output or solutions that are published in journals and books are rarely used by farmers in rural areas. Despite having some high yielding varieties such as SARO5, NERICA etc. most farmers continues using farm saved seeds from landraces which are mostly of low quality. Training rice farmers on community seed production under the umbrella of Agricultural Marketing Cooperative Society (AMCOS) will likely help the diffusion of improved seed. The improved seed they can be introduced to farmers through AMCOS and Quality Declared Seed (QDS) can be produces in subsequent years under the supervision of Zonal Tanzania Seed Certification Institute (TOSCI) and agricultural officers in their villages or wards. Similarly, implementation of Good Agricultural Practices (GAP) from land selection and preparation to harvesting are key in sustaining high and increased rice production. The use of System of Rice Intensification (SRI) and enhancement of irrigation schemes *via* diversion of rivers, use of lake, underground water and harvesting of rainwater will increase productivity, reduce dependence on rain and increase resilience of farmers. Also, will make it possible to produce rice at least twice or thrice a year in some areas increasing out a, revenue and profit margin to rice farmers. With the rice production of 4,528,000

tonnes in 2020, rice production can jump up to close or more than 10,000,000 tonnes a year which will make Tanzania the leading country in rice production in Africa. Other countries like Egypt and south Asia they produce twice a year so it can be done in Tanzania as well.

The increase of rice production will bring in food security and well rice surplus. The Surplus rice will spur industrialization through rice; farmers will be able to sell rice, rice husks and rice straws. Small and large industries will be established for rice grading and packaging of white and brown rice, Industries for rice flour blending as well as starch for both home and industrial purposes. Flour can be locally used for making porridge, ugali or rice cake (vitumbua). Other industries will be established use rice and rice product in the manufacturing of different products such as pasta, noodles, vinegar, rice wine, animal feedstuffs and furniture's.

Markets (both local and international) will be created for rice products. Many people will be able to self employ or be employed in businesses related to rice. The value of rice and profit margin will increase hence many farmers will enter and specialize intensive rice production and the rice cultivation will finally become resilient and sustainable because farmers will be more professional, have good profit margins, assured profits and markets for their produce.

## Conclusion

Rice production in Tanzania happen by chance through the asian early settlers. It passed centuries unnoticed. Slave trade helped its spread. After independence, the production increased dramatically despite many setbacks and challenges. Currently rice productivity is low partly due to dependence in rainfall, little use of improved variety and poor use of good agricultural practices. Consumption and demand of rice is ever increasing because of high preference of rice as a staple food by Tanzanian and people in neighbouring countries in Africa. In order to sustain rice production and resilience for rice cultivating farmers climate change adapted varieties, rain less depended cropping system and value addition of rice should be sought. As long as farmer's will continue getting good harvest and good profit from rice cultivation despite all other challenges will continue or perhaps intensity rice cultivation. Rice has potential of becoming a main food, source of income, livelihood and re ignite industrialization and economic development in Tanzania.

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