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Agricultural Transformation Centres in Africa

*Practical guidance
to promote inclusive
agro-industrial
development*





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A worker grinding hot pepper for the preparation of a chili pepper sauce in the Eswatini Kitchen factory.

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Contents

| | |
|---|-----------|
| Foreword | ix |
| Acknowledgements | xi |
| Executive summary | xiii |
| Abstract..... | xxiv |
| Acronyms | xxv |
| INTRODUCTION..... | 1 |
| The Feed Africa Strategy, Staple Crops Processing Zones and the Agricultural Transformation Centre Concept..... | 2 |
| FAO Collaboration with the Bank, Methodological Approach and Scope of the Study..... | 6 |
| Preliminary findings on existing models (Phase 1)..... | 8 |
| Limitations of the study | 11 |
| Structure of the report..... | 12 |
| PART ONE. DESIGN AND FEASIBILITY OF ATCs IN ZAMBIA..... | 15 |
| SECTION 1 | |
| ATC for maize and soybean in Zambia, Northern Province | 16 |
| 1. Overview of maize value chain | 16 |
| 2. SCPZ initiatives in the area | 19 |
| 3. Implications for ATC feasibility and design for maize | 19 |
| 4. Overview of the soybean value chain..... | 22 |
| 5. Implications for ATC feasibility and design for soybean | 24 |
| 6. Model proposed | 25 |
| Location and size..... | 30 |
| Service mix..... | 31 |
| Ownership, management and institutional set-up | 35 |
| Operating costs | 39 |
| Cost and revenue analysis | 42 |
| Investment needs | 45 |
| Impact..... | 50 |
| Risks | 51 |
| SECTION 2 | |
| ATC for cassava in Zambia, Northern Province | 54 |
| 1. Overview of cassava value chain | 54 |
| 2. Implications for ATC feasibility and design for cassava..... | 57 |

PART TWO. DESIGN AND FEASIBILITY OF ATCs IN CÔTE D'IVOIRE 61

SECTION 1

ATC for horticulture in Côte d'Ivoire, Bélier Region 62

1. Overview of horticulture value chain 62
2. SCPZ initiatives in the area 65
3. Implications for ATC feasibility and design for horticulture 65
4. Model proposed 67
 - Location and size..... 68
 - Service mix..... 70
 - Ownership, management and institutional set-up 73
 - Operating costs 75
 - Revenue and income analysis 76
 - Investment needs 78
 - Impact..... 82
 - Risks 83

SECTION 2

ATC for rice in Côte d'Ivoire, Poro Region 85

1. Overview of rice value chain 85
2. SCPZ initiatives in the area 88
3. Implications for ATC feasibility and design for rice 88
4. Model proposed 89
 - Location and size..... 92
 - Service mix..... 92
 - Ownership, management and institutional set-up 93
 - Operating costs 95
 - Revenue and income analysis 96
 - Investment needs 97
 - Impact..... 99
 - Risks 99

PART THREE. DESIGN AND FEASIBILITY OF ATCs IN THE UNITED REPUBLIC OF TANZANIA..... 101

SECTION 1

ATC for rice in the United Republic of Tanzania, Morogoro region 102

1. Overview of rice value chain 102
2. SCPZ initiatives in the area 106
3. Implications for ATC feasibility and design for rice 106
4. Model proposed 107
 - Location and size..... 107

| | |
|--|-----|
| Service mix | 109 |
| Ownership, management and institutional set-up | 111 |
| Operating costs | 112 |
| Revenue and income analysis | 114 |
| Investment needs | 115 |
| Impact | 116 |
| Risks | 117 |

SECTION 2

ATC for maize in the United Republic of Tanzania, Manyara region 119

| | |
|--|-----|
| 1. Overview of maize value chain | 119 |
| 2. SCPZ initiatives in the area | 125 |
| 3. Implications for ATC feasibility and design for maize | 125 |
| 4. Model proposed | 126 |
| Location and size | 128 |
| Service mix | 128 |
| Ownership management and institutional set-up | 130 |
| Operating costs | 130 |
| Revenue and income analysis | 132 |
| Investment needs | 132 |
| Impact | 133 |
| Risks | 133 |

CONCLUSIONS 137

| | |
|-----------------------------|-----|
| Findings of the study | 138 |
|-----------------------------|-----|

Where to from here?

| | |
|---|-----|
| Integration of ATC feasibility findings with planned SCPZ Initiatives and other Agriculture Development programmes for Africa of the Bank | 151 |
|---|-----|

ANNEXES 153

| | |
|--|------------|
| ANNEX 1. Establishing ATCs: From conception to implementation | 154 |
| ANNEX 2. Specific infrastructure requirements for maize | 159 |
| ANNEX 3. Specific infrastructure requirements for soybean | 161 |
| ANNEX 4. Specific infrastructure requirements for cassava..... | 163 |
| ANNEX 5. Specific infrastructure requirements for horticulture..... | 164 |
| ANNEX 6. Specific infrastructure requirements for rice | 166 |

Figures

| | |
|---|-----|
| 1. The processing hub and the ATC network..... | 3 |
| 2. The ATC..... | 4 |
| 3. Countries, regions and VCs selected..... | 6 |
| 4. Visual representation of the Zambia ATC for maize and soybean..... | 27 |
| 5. The value creation process over the course of the phased approach in the Zambia ATC | 29 |
| 6. Location of the Zambia ATC..... | 30 |
| 7. Lomana role, rice ATC, Côte d'Ivoire | 90 |
| 8. Location of the rice ATCs, United Republic of Tanzania..... | 108 |
| 9. Visual representation of the rice ATCs, United Republic of Tanzania | 111 |
| 10. Location of the maize ATCs, United Republic of Tanzania..... | 128 |

Tables

| | |
|---|----|
| 1. Zambia ATC for maize: services and farmers' constraints that will be addressed | 20 |
| 2. ATC service upgrading process..... | 28 |
| 3. Capacity building activities and providers, Zambia ATC | 34 |
| 4. Musika roles vis-à-vis other stakeholders, Zambia ATC..... | 36 |
| 5. Estimated operating costs for grain warehouse in Zambia..... | 40 |
| 6. Estimated operating costs, Model 1 maize ATC, Zambia..... | 42 |
| 7. Estimated operating costs, Model 2 maize ATC, Zambia..... | 42 |
| 8. Estimated revenues, Model 2 maize ATC, Zambia..... | 43 |
| 9. Comparison of farmers' earnings with or without ATC storage services, maize ATC, Zambia | 43 |
| 10. Estimated operating costs, Model 1 soybean ATC, Zambia | 44 |
| 11. Estimated operating costs, Model 2 soybean ATC, Zambia | 44 |
| 12. Estimated revenues, Model 2 soybean ATC, Zambia..... | 45 |
| 13. Costs for equipment and maintenance, Zambia ATC..... | 46 |
| 14. Costs of mechanization, Zambia ATC | 47 |
| 15. Costs of Musika extra staff, Zambia ATC..... | 48 |
| 16. Capacity building costs, Zambia ATC..... | 49 |
| 17. Total funding needs, Zambia ATC..... | 50 |
| 18. Potential increase in production, horticulture ATC, Côte d'Ivoire | 67 |
| 19. Selected areas for horticulture ATCs and irrigation system status, Côte d'Ivoire | 68 |
| 20. ATCs distribution across areas selected, horticulture ATC, Côte d'Ivoire | 69 |
| 21. Service mix, horticulture ATC, Côte d'Ivoire | 70 |
| 22. Distribution of space, horticulture ATC, Côte d'Ivoire | 72 |

| | |
|--|-----|
| 23. Management costs, horticulture ATC, Côte d'Ivoire | 75 |
| 24. Annual costs for one horticulture ATC, Côte d'Ivoire | 75 |
| 25. Tomato processing costs, horticulture ATC, Côte d'Ivoire..... | 77 |
| 26. List of equipment, horticulture ATC, Côte d'Ivoire | 78 |
| 27. Total investment costs for one facility, horticulture ATC, Côte d'Ivoire..... | 77 |
| 28. Capacity building costs, horticulture ATC, Côte d'Ivoire..... | 78 |
| 29. Path to full capacity, horticulture ATC, Côte d'Ivoire..... | 79 |
| 30. Operational costs, revenue and profit over the first three years, horticulture ATC, Côte d'Ivoire | 79 |
| 31. Total investment costs for 6 horticulture ATCs, Côte d'Ivoire | 80 |
| 32. Number of needed operators, rice ATC, Côte d'Ivoire..... | 91 |
| 33. Stakeholders' partnership areas, rice ATC, Côte d'Ivoire | 94 |
| 34. Total costs for fuel, rice ATC, Côte d'Ivoire..... | 95 |
| 35. Total operating costs, rice ATC, Côte d'Ivoire | 96 |
| 36. Investment for equipment, rice ATC, Côte d'Ivoire | 97 |
| 37. Total investment costs, rice ATC, Côte d'Ivoire | 98 |
| 38. Storage, production and post-harvest losses in ATCs location, rice ATC, United Republic of Tanzania | 108 |
| 39. Rice ATC services, United Republic of Tanzania..... | 110 |
| 40. Expected costs and expenses for the first 3 years, rice ATC, United Republic of Tanzania | 113 |
| 41. Expected revenues for the first year, rice ATC, United Republic of Tanzania..... | 115 |
| 42. Investment costs, rice ATC, United Republic of Tanzania | 116 |
| 43. Warehouse need in Manyara, United Republic of Tanzania | 122 |
| 44. Storage need in Manyara, United Republic of Tanzania | 124 |
| 45. Constraints in maize value chain and cause to be addressed by the ATC, United Republic of Tanzania | 126 |
| 46. Main maize ATC activities, United Republic of Tanzania..... | 127 |
| 47. Total operating costs, maize ATC, United Republic of Tanzania..... | 131 |
| 48. Total revenues, maize ATC, United Republic of Tanzania..... | 132 |
| 49. Estimated investment, maize ATC, United Republic of Tanzania..... | 133 |
| 50. Investment costs and payback in the five ATC models proposed | 143 |
| 51. Potential of ATC models proposed to achieve Feed Africa strategy objectives | 146 |
| 52. Equipment for maize ATC | 159 |
| 53. Equipment for soybean ATC | 161 |
| 54. Equipment for cassava ATC | 163 |
| 55. Equipment for horticulture ATC | 164 |
| 56. Equipment for rice ATC | 166 |
| 57. Rice milling equipment, rice ATC..... | 167 |

Foreword

With 65 percent of the world's most arable, uncultivated land, abundance of fresh water and more than 60 percent of the economically active population engaged in agriculture, Africa presents invaluable agricultural potential. Nonetheless, the continent's dependence on food imports continues to increase. Low agricultural productivity, which derives from the limited application of modern technology, the impacts of climate change, coupled with a lack of access to financial resources, are some of the obstacles impeding the transformation of Africa's agriculture sector.

To make this transformation happen, the African Development Bank launched the *Feed Africa* strategy to transform African agriculture into a globally competitive, inclusive and business-oriented sector – one that creates wealth, generates gainful employment, and improves the quality of life. The strategy aims to achieve these objectives through the implementation of a number of flagship programmes. One major flagship is aimed at developing Staple Crops Processing Zones (SCPZs), which are spatial development initiatives designed to concentrate agroprocessing activities within areas of high agricultural potential, to boost productivity and integrate production, and the processing and marketing of selected commodities. These zones include agroprocessing hubs made up of tracts of land dedicated to agroprocessing firms, as well as agricultural transformation centres (ATCs). The ATCs are intended to be community-based rural institutions providing a mix of hard and soft infrastructure and services to smallholders and agripreneurs. They aim to reduce on-farm and post-harvest losses, improve quality, aggregate production and create efficiency in transportation by linking them to the agroprocessing hubs within the SCPZs for further value addition.

This report is the result of a feasibility study undertaken by the African Development Bank and the Food and Agriculture Organization of the United Nations on the ATC concept in three countries: Côte d'Ivoire, United Republic of Tanzania and Zambia. The objectives of the study were to assess the feasibility of establishing ATCs in the countries and regions selected; identify the possible mix of services and infrastructures needed based on the specific context and needs of the selected value chains and the communities; and provide relevant information to develop a general methodology to be applied within feasibility assessments for a range of potential ATC interventions in other countries.

The study findings were validated during a workshop held at the African Development Bank Headquarters in Abidjan, Côte d'Ivoire in June 2018, and represent a preliminary attempt to better understand the practical and nuanced implications of promoting the establishment of ATCs in Africa as part of the broader SCPZ concept under the Feed Africa strategy. In addition, the report includes concrete and context-specific information and practical methodologies that can serve as the basis for those practitioners interested in assessing and promoting the establishment of ATCs, or similar initiatives.



Dr Jennifer Blanke

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Human and Social Development*

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Executive summary

Introduction: Background, scope and methodology

This study examines the feasibility of designing and implementing Agricultural Transformation Centres (ATCs) in the African context, with specific reference to Zambia, Côte D'Ivoire and the United Republic of Tanzania. The ATC is a concept of the African Development Bank (hereinafter referred to as “the Bank”), included in the framework of the Staple Crops Processing Zones (SCPZs), launched as part of the *Feed Africa* strategy. SCPZs are agro-based, spatial development initiatives designed to concentrate agro-processing activities within areas of high agricultural potential, to boost productivity and integrate the production, processing and marketing of selected commodities. The SCPZ concept includes purpose-built shared facilities to enable agricultural producers, processors, aggregators and distributors to operate in the same vicinity to reduce transaction costs and share business development services for increased productivity and competitiveness. As essential components, SCPZs include an agro-processing hub, a number of ATCs, and agricultural production areas. The ATCs are strategically located in high production areas, with the scope of serving as aggregation points to accumulate products from the community to supply an agro-processing hub for further value addition, or send to centres of great demand for distribution and retailing to consumers. Where the SCPZ is operational, ATCs are purposefully designed to link smallholder farmers to the agro-processing hub both for the supply of farm produce to the hub, and for facilitating access of smallholder farmers to agricultural technology, financial and other relevant services.

Under the technical supervision of the Food and Agriculture Organization of the United Nations (FAO), in partnership with the African Development Bank, consultants were recruited to conduct field work in five regions within three countries for the purpose of this study: Côte D'Ivoire (Belier and Poro regions), the United Republic of Tanzania (Morogoro and Manyara regions) and Zambia (Northern Province). Four priority commodity chains were targeted for maize (United Republic of Tanzania and Zambia), rice (Côte D'Ivoire and United Republic of Tanzania), horticulture (Côte D'Ivoire), and cassava (Zambia).

The purpose of this study was to:

- 1] assess the feasibility of establishing ATCs in specific countries and contexts for the predetermined commodity chains identified in Zambia, Côte d'Ivoire and the United Republic of Tanzania;
- 2] propose preliminary models for ATCs by identifying the mix of services and infrastructure needed, as well as the ownership and governance structure, investment costs and risks;
- 3] provide relevant information to develop a general methodology for future feasibility assessment of ATCs; and
- 4] assess the potential for ATCs to support the achievement of the overarching Feed Africa objectives associated with the rural infrastructure programme.

An additional purpose (5), that emerged during the course of this research, was the need to create clarity regarding the definition of the ATC concept and its link to the overall SCPZ framework.

Findings from the countries selected

Zambia. Field work was conducted in the Northern Province for three selected commodity chains: maize, soybean and cassava. Value chain (VC) analysis as well as stakeholders' analysis and community consultations were undertaken to assess the need for and feasibility of establishing ATCs, followed by the identification of the ideal mix of infrastructure and services. Results from the analysis showed the existence of market potential for both the **maize and soybean** chains which would justify the establishment of ATCs. Several relevant stakeholders interested in the ATC approach have also been identified who could potentially own/manage the centres.

While the establishment of an SCPZ is not yet planned for the Northern Province, the ATC model proposed could serve as an initial step in the preparation for an SCPZ to assist smallholders to increase productivity and reduce post-harvest losses in readiness for the SCPZ intervention. The ATC would help to facilitate coordination between agro-dealers and producers, and between producers and buyers, by increasing the quantity produced, improving quality and in so doing, helping to achieve the critical mass of supply needed to attract private processors to the area either under the SCPZ framework or independently.

Given the similar opportunities and challenges presented by the maize and soybean VCs in the Northern Province, a unique ATC system is proposed to jointly support the upgrading of both commodity chains. Emphasis will be on increasing production output by improving farmers' access to inputs and extension services and acting as an aggregation point for produce to reduce transaction costs. The ATC network proposed will also promote the linkage

between market actors, with the idea of creating a conducive ecosystem that encourages further commitment to upgrading the value chains.

In order to reduce the initial investment risk associated with establishing ATCs, and to promote a sense of ownership within the local communities, the ATC model will build on existing infrastructures and link to ongoing initiatives involving local actors. It will draw from, and further develop the network of agro-dealers already in operation in two districts close to Kasama town. This network will become the cornerstone of the ATC system to effectively reach farming communities.

In terms of services provided, the ATCs will work as:

- » Distribution points for inputs;
- » Aggregation and storage centre;
- » Service centre offering several types of on-farm and off-farm services, including tractor hire for ploughing fields, shelling and threshing machines, transport services, and savings services;
- » Training centre providing courses on financial literacy, business development and management, extension services to improve productivity and market information to support trading, negotiation and investment planning.

Two models of management are proposed for consideration: model 1, where the ATC leases existing cooperative-owned warehouses for a fee, and model 2, where the cooperative is a minor shareholder in the ATC and the warehouses are used for free, but the cooperative will earn dividends. The total investment needed for a system made up of **52 ATCs** would be of **USD 1 089 401**.

Different conclusions were reached for the **cassava VC**, where findings from field work suggested that there are currently too many constraints to justify investment in an ATC at this stage. Although national demand for cassava is increasing, the Northern Province is constrained by a lack of production capacity and challenges associated with the aggregation, storage and transport of a commodity with a very short shelf-life, given that no processing capacity currently exists within the province. Investments in the cassava value chain are in their infancy. The scale of related activities remains small for a crop still viewed as a food reserve and not yet as a commercial commodity. Infrastructure and resources are missing to take cassava one step further towards the commercial horizon and to encourage farmers to commit. Market demand is concentrated in the neighbouring province of Luapula, which has a competitive advantage due to its proximity to processors in Lusaka and the Copperbelt. Investing today in ATCs for cassava would make more sense in the Luapula province, especially when linked to the promotion of an SCPZ (e.g. Luswishi Farm Block) in the Copperbelt province. A possible intervention model for Luapula is proposed in the annex to this report, together with a checklist of the equipment that would be needed to establish an ATC for the cassava VC.

For now, in the Northern Province, for the cassava VC it is recommended that efforts should be concentrated on increasing the coordination with existing initiatives to address productivity issues (e.g. access to improved planting materials), aggregation and storage infrastructure. These are the first necessary steps that must be taken before further investments are sought to link farmers to markets outside of the Northern Province, or to encourage agro-processing investors to locate within the province.

Côte D'Ivoire. Field work was conducted in two regions, Bélier and Poro, for horticulture and rice value chains respectively. Analysis of the **horticulture** VC showed potential to link a network of ATCs to the planned national SCPZ initiative (2PAI). However, given the early stages of planning and development of this SCPZ, the option of establishing ATCs as a first step in preparation for the implementation of this initiative has been considered. Market analysis showed that there is indeed a growing urban demand for semi-processed vegetables and processed tomato products that could provide an opportunity for the establishment of an SCPZ. However, the chain presents a number of upstream (production) and midstream (post-harvest handling and primary processing) issues that need to be overcome so that production volumes can be increased to required levels. An ATC model focusing initially on improving production and post-harvest handling issues could help to achieve this objective.

Under the model proposed, the horticulture ATC will take the form of physical centres in the vicinity of the growing areas. Producers will deliver their output to the centre to be conditioned and packaged, before being properly stored and finally loaded into a truck for delivery to markets. Main services provided by the ATC would include: transport, weighing and recording of the produce, cleaning, drying, trimming, sorting and grading, packaging, and cold storage. In addition, a small processing facility to produce tomato puree for the local market will be added to the ATCs with the idea of processing the low-grade fruits and the fully mature fruit before it perishes.

The ATCs will be managed by a platform of stakeholders from the horticulture sector already operational. Total investment cost for an initial **6 ATCs** is estimated at **USD 594 430**.

The first expected impact is a dramatic reduction of the post-harvest losses through a proper process of cleaning, grading and packaging. Also, the cold storage facility will extend shelf life and give producers enough time to manage harvests and negotiate better terms with buyers. Finally, the ATCs should evolve towards becoming collective aggregation and marketing centres for farmers on behalf of the platform, with the ability to collect output on a larger scale and fulfil buyers' requirements in terms of quality and timeliness.

The analysis conducted in Poro region for the **rice** VC, showed the existence of rising demand that would justify an investment in ATCs. The demand for white

rice is increasing at a rate of 6 percent per year, and the government has expressed its commitment to supporting the rice value chain towards self-sufficiency. In line with the SCPZ and ATC approach, the government is promoting public-private partnerships under the framework of its national rice strategy, to stimulate the investment needed to expand milling capacities and improve efficiency in the management of publicly-owned mills. As in the case of the horticulture VC in Béliér, an SCPZ initiative for the area is planned but is still in its initial stages. Therefore, the scope of the ATC model proposed would be to primarily focus on improving farmers' access to agro-equipment, as findings show strong potential to increase productivity and efficiency of producers through the adoption of improved services. These services would include the provision of rototillers and tractors for faster and easier land preparation, and threshing machines for easier harvesting. In addition, trainings on farm management will also be provided to farmers. The ATC will also work on the supply side of these services, acting as an incubator for SMEs who will ultimately provide mechanization services to farmers. The overall objective is to drive farmers towards the use of more fee-based services with resultant increases in production and efficiency. A key challenge is changing the mindset of farmers to gradually do away with the subsidy system and shift towards paying fees for quality services.

The ATC could also play a role in the delivery of cleaner, higher quality paddy to the rice processing mills or agro-processing hub once established. Debris in paddy is a major problem due to poor post-harvest handling which lowers the quality and reduces market opportunities. This can be improved by introducing suitable grain handling equipment to be operated by the ATC service providers, such as blowers and cleaners.

The ATCs will be registered with the status of economic interest group (EIG), under the management of the regional rice platform. Two buildings will be used: one will be the ATC, used as a mechanization service centre where the machinery will be stored and maintained. The second building will be the training centre for entrepreneurs. **Total investment costs**, including the renting of two physical centres, of which one will constitute the ATC, is estimated at **USD 298 140**.

United Republic of Tanzania. Field work was conducted in Morogoro and Manyara regions for rice and maize respectively. Results from the analysis in Morogoro showed that there is strong market potential for Tanzanian **rice**, both domestically and in the region. National demand is increasing by 4 percent per year and the country currently produces 92 percent of consumption needs. However, access to market remains a challenge for smallholder farmers, who lack incentives to increase productivity. Rice prices fluctuate and farmers have little access to market information, which reduces their willingness to invest in production; thus yields remain low. The lack of strong farmers' organizations also makes farmers more vulnerable as price-takers since they lack collective bargaining power. Moreover, lack of efficiency in the chain affects profitability

for all chain actors. The rice sector in general lacks governance. No single player controls or drives the development of the chain, although the millers and wholesalers exert the greatest influence. The chain is characterized mostly by spot market transactions between rice value chain actors instead of a coordinated approach to sharing value amongst actors within the chain to deliver quality product required by end consumers.

Feasibility studies for the establishment of SCPZ initiatives are in progress in the country. In Morogoro, there is potential for the establishment of an SCPZ; however, to date, nothing concrete is planned. For this reason, the ATC model proposed focuses on creating the pre-conditions for the successful establishment of an SCPZ by addressing the main constraints faced by the VC through the introduction of ATCs.

The proposed model aims to rehabilitate existing infrastructures with the scope to create a network of ATCs to be linked to a mega-warehouse (to be built) which will provide storage services to farmers' organizations. The ATC will seek to make agreements with owners of the existing warehouses to play the role of satellites to the mega-warehouse by supplying the same quality of rice and providing some services to farmers (extension services, demo plots, professionalization of farmers' organizations). Reliable input suppliers will also use the ATC facilities. As an additional service, mechanization equipment/tools will be rented to farmers or will be sold to farmers via leasing agreements. It is expected that the ATC will serve as the interface between a large-scale processor in the region and producers who will benefit from this mix of services and be able to supply consistent quantities and quality of paddy rice. The resources needed to achieve these objectives will be secured by the ATC. The major aim is to ensure the availability and sustainability of farmers' access to services.

During the first year, the focus will be on increasing production through access to finance and inputs, use of mechanized equipment and reduction of post-harvest losses. The second step will be to bring on board the processor who will sign contract farming agreements with farmers' organizations.

The ATC will be created via a public-private-partnership ownership model whereby farmers' organizations, the local government, and private companies (processors, agro-dealers, etc.) will act as shareholders. The ATC will be governed by a board of directors representing all shareholders, but the daily activities will be run by a professional manager who has extensive experience in agribusiness. Moreover, a production and post-harvest specialist will be hired to facilitate smooth operations of all the post-harvest technologies provided at the centre.

The ATC will run as an autonomous institution and is expected to become self-sustainable after the second year. **Total investment costs**, including the **rehabilitation of 15 warehouses and the construction of a mega-warehouse** is estimated at **USD 2 103 000**.

Analysis of the **maize** VC was conducted in Manyara. The region presents good characteristics in terms of weather conditions, market potential and public interest in promoting the development of the chain. As in Morogoro, SCPZ initiatives are not planned in the immediate future; however, analysis showed the potential of ATCs to work on creating the preconditions for the establishment of an SCPZ. The domestic market growth for maize is estimated at 3 percent per year, and there is a high potential for maize and as an input for livestock production and for export to neighbouring countries.

Manyara is part of the Northern highlands zone which produces 14 percent of the total maize in the United Republic of Tanzania, and the government sees high potential for maize to be promoted in the Agricultural Sector Development Plan II. About 80 percent of the production in Manyara comes from smallholder farmers with 0.5 -5 acres and the rest from commercial farmers. Production trends in the region show a steady increase in recent years with potential to further increase production due to the availability of land and the favourable climate with two rainy seasons (short-rains minor cropping season and a long-rains season).

However, productivity remains low as farmers are reluctant to invest in production-enhancing inputs until they are assured of a rewarding market. Besides the lower yield, about 20 percent post-harvest loss occurs due to lack of skills and appropriate technology for harvesting, drying, shelling, transporting and storing.

The ATC model proposed is expected to become a sustainable solution to address main VC constraints, including low levels of productivity, lack of adequate storage capacities, and significant post-harvest losses. Similarly to the rice model, the ATC will draw from existing warehouses, under-utilized at present, with the plan to rehabilitate these structures to serve as ATC satellites given their close proximity to farmers.

The first activity to be conducted is the negotiation with the owners of existing warehouses, to transform them into service centres for farmers providing input supply, access to information and knowledge, production and post-harvest technologies as well as storage. The second activity is negotiating with private sector actors in the maize value chain to use the satellite warehouses as a base from which they can offer service provision to farmers.

The ATC is expected to provide the following services:

- » Input distribution
- » Production and post-harvest equipment
- » Primary processing: Shelling, cleaning, drying, grading and proper packaging
- » Storage
- » Access to finance

- » Market information
- » Linking to buyers/processors through contract farming agreements

The success of the ATC will depend heavily on the partnerships and synergies with various stakeholders. The ATC will generate revenue by charging rental fees to private operators based in the mega-warehouse and service fees to farmer organizations who will be using the infrastructure and services of the ATC.

The ownership structure for the maize ATC is the same as that proposed for the rice ATC model through the formation of a public-private-partnership ownership structure, governed by a board of directors with daily activities run by a professional manager. The ATC will employ a full-time manager and three other support staff including a post-harvest expert, as well as part time staff to operate the mechanization equipment (tractor, harvester and power tiller) and truck conductors. To set a good example, the ATC will initially equip four centres with mechanization and post-harvest equipment.

The total investment cost for the rehabilitation of **15 warehouses and the creation of an innovation centre** is estimated at **USD 768 000**. The ATC will be able to make profits starting from the second year. However, costs for capacity building for farmers' organizations will need to be covered by donors and are not counted in the model.

Conclusions and recommendations

Reflecting back on the study objectives, the main findings achieved can be summarized as follows:

- 1] The different models presented in the report for Zambia (maize and soybean), Côte d'Ivoire (horticulture and rice) and the United Republic of Tanzania (rice and maize) show how, and under what circumstances ATCs can be considered as a feasible option to stimulate inclusive rural transformation based on existing market potential, readiness of relevant stakeholders, infrastructure availability, and possibility to achieve financial sustainability over time. The models presented clearly highlight that no one-size-fits-all model exists for ATCs, but when country, regional and commodity-specific context are taken into account, innovative models can be proposed that demonstrate real potential for stimulating agro-industrial development at community level targeting the involvement of farmers and SMEs. However, the models show that this must be done in a way that is market-driven and commercially sustainable, that targets not only on-farm production issues but also tackles off-farm, post-harvest losses, in order to pre-empt the needs of actors further down the chain, whether this be through linkages to the agro-processing hub as part of the Bank SCPZ initiatives, or to existing customers in markets identified as having strong potential for growth.

- 2] All of the ATC models proposed provide a tailored mix of both hard and soft services targeting on-farm production issues and off-farm, post-harvest handling and storage. However, the focus or core business of each ATC varies depending on the specificities of the commodity and local context. In terms of ownership and management, findings from the country studies show how the institutional arrangements for ATCs may differ depending on the level of interest, capacity and commitment of the stakeholders involved, as well as the infrastructure needs (new versus existing). While formalised public-private-partnership ownership structures may be one potential model to ensure representation by all stakeholders, other, potentially less complex forms of governance exist such as the formation of economic interest groups (EIG), governed by a commodity chain platform as seen in Côte d'Ivoire. Each of the models proposed present their own risks and implementation challenges.
- 3] The information gathered throughout this study has helped, however, to identify a number of generic steps to be taken when evaluating the potential to establish an ATC. The generic checklist provided in Annex 1 of this study outlines eleven important steps that must be taken into consideration when conducting any future feasibility studies related to the design and implementation of an ATC under the Bank Feed Africa Strategy and the SCPZ framework. These steps include:
- Step 1:** Selecting the agro-processing hub potential locations
 - Step 2:** Identifying the target commodities
 - Step 3:** Identifying the ATC locations
 - Step 4:** Identifying VCs constraints
 - Step 5:** Assessing the infrastructure and service needs of ATCs
 - Step 6:** Designing ownership and management structure
 - Step 7:** Assessing the interest of the community and the stakeholders' buy-in
 - Step 8:** Calculating the ATC costs
 - Step 9:** Assessing financial sustainability
 - Step 10:** Excluding any other impediment to the establishment of an ATC
 - Step 11:** Elaborating an implementation plan
- 4] In terms of the potential for ATCs to achieve the related objectives outlined under the Feed Africa Strategy, findings show that the specific ATC design, including the types of services to be provided and management structure proposed, will influence the potential for achieving these objectives. With varying levels, the models proposed should contribute towards the achievement of the following impacts:
- » Enhanced competitiveness – **moderate/high** – depending on the linkage to SCPZ or other private buyers and extent of productivity and quality increases achieved;

- » Increased VC organization – **high** – all models proposed will improve VC coordination, particularly at midstream level with strong linkages created between production and primary processing in the short term, and with secondary processors (e.g. agro-processing hub) and other downstream customers over the longer term once the SCPZ is operational;
- » Improved resource efficiency – **high** – all ATC models rely on farmers’ payment for services and aim to encourage a shift away from dependency on subsidies and handouts;
- » Greater social inclusion and poverty reduction – **moderate/high** – ATCs will initially target those farmers (or SMEs) with some level of production skill and assets, but once established, the ATC model could be expanded to specifically target less resourced farmers and provide more intensive capacity building training. Some of the models proposed (e.g. rice ATC Côte d’Ivoire) specifically focus on the involvement of women and youth in an attempt to address the issue of inclusion in a sustainable manner;
- » Productive partnerships – **high** – all ATC models rely on building linkages with existing public and private stakeholders operating in the VC with the aim to build a common vision for developing national productive capacity in agro-industries;
- » Increased food production – **high** – addressing productivity constraints is a key focus of all ATC models proposed;
- » Improved quality and reduced losses – **high** – as above;
- » Required technologies for value addition identified – **high** – all ATC models proposed have identified necessary equipment for value addition to occur both on- and off-farm (e.g. mechanization services for land preparation, primary processing to improve storage, etc.)
- » Facilitate investment in profitable commodity chains – **moderate/high** – depending on the success of the service provision model proposed by each ATC and the uptake by farmers and other VC actors of its services.
- » Stimulate private sector development – **moderate/high** – several of the ATC models proposed involve local SMEs with the objective to help further build and expand their businesses over time. The increased availability of improved quality and quantity of production also has the potential to crowd-in private investment over time. However, the extent to which the ATCs can help stimulate larger-scale, private sector investment is dependent on the strength of the downstream linkages to the agro-processing hub and its ability to attract investors in the SCPZ.
- » Improved VC governance – **moderate** – several of the ATC models proposed rely on the involvement of existing commodity platforms or newly developed management boards – the success of these governance structures will depend on the level of commitment of the actors in these structures and their willingness to work towards a long-term vision for driving agro-industrial development within the country.

- 5] Another important and unexpected finding is related to the usefulness of conducting ATC feasibility studies prior to the development of SCPZ studies. The ATCs are not conceptualized as a stand-alone initiative. However, when the study was conducted, there was limited information available about the planned SCPZs in each country selected. Instead of being seen as a major limitation, this gave the consultants a chance to examine in more detail existing market opportunities for the commodities selected, and the potential to begin addressing issues of on-farm productivity and post-harvest losses at a community level in a way that could create the pre-conditions for the successful introduction of the SCPZ.

Where to from here? The practical implications from this study are as follows:

- » The study has helped to develop a generic checklist that can be considered and used as a guide for the establishment of ATCs;
- » The study has helped to identify the specific infrastructure requirements that an ATC should include based on the findings from the selected VCs. These checklists can be used as a reference guide for the establishment of ATCs serving these VCs, several of which are likely to be selected for inclusion in the SCPZ initiatives given their impact on food security;
- » The VC analysis, as well as the analysis of stakeholders and investment costs can be used to inform more in-depth analysis related to the selection of agro-processing hub locations, priority commodities, key stakeholders, available services and infrastructure at the community-level in the countries and regions investigated. Several advanced feasibility studies are now in progress for the SCPZs, where information gathered from this study can help to enrich the findings of the ongoing studies. For example:
 - » Feasibility studies for the establishment of an SCPZ in the United Republic of Tanzania are in progress and will be available soon.
 - » A relatively advanced feasibility study has been conducted in Zambia, Copperbelt Province, where the Bank is helping the government to conceptualize an SCPZ initiative in the framework of the Luswishi Farm Block.
- » A further practical recommendation would be to link the SCPZ and ATC approaches to existing agriculture projects and programmes of the Bank to ensure better coordination and avoid costly duplication of activities. In particular, strong linkages should be made to the two flagship programmes TAAT-S - Transformation of African Savannah initiative, and TAAT - Technologies for African Agricultural Transformation. These initiatives share with the SCPZ approach the overall objective to address Africa's growing dependence on food imports, through the promotion of increased productivity and value addition of key agriculture commodities.

Abstract

Over the next ten years, the African rural space will be the theatre of profound changes as the activities envisaged for agricultural transformation are drastically scaled up. Increased food demand and changing consumption habits driven by demographic factors, such as population growth and urbanization, are already leading to a rapid increase of net food imports, opening a huge opportunity for the agribusiness sector of many African countries. Against this backdrop and in line with its mission to spur sustainable economic development and social progress, the African Development Bank in 2016 launched *Feed Africa*, a strategy that is intended to contribute substantially to the transformation of African agriculture by 2025, and to reverse Africa's dependence on imported foods.

As part of this strategy, the Bank is promoting the concept of staple crops processing zones (SCPZs), which are agrobased spatial development initiatives, designed to concentrate agro-processing activities within areas of high agricultural potential to boost productivity and integrate the production, processing and marketing of selected commodities. As essential components, SCPZs include an agro-processing hub, a number of agricultural transformation centres (ATCs) and agricultural production areas. The ATCs are designed to link smallholder farmers to the agro-processing hub and are centres strategically located in high production areas, with the aim of serving as aggregation points to accumulate products from the community to supply the agro-processing hub for further value addition, or to send them to centres of great demand for distribution and retail to consumers.

Under the technical support of the Food and Agriculture Organization of the United Nations (FAO), this study has attempted to assess the feasibility and applicability of the ATC concept to selected regions in Zambia, Côte d'Ivoire and the United Republic of Tanzania. Findings from the field have demonstrated the potential of ATCs to address community needs and constraints for a range of selected value chains, and have helped to identify different ATCs models that could possibly work in each specific context.

Acronyms

| | |
|----------|---|
| 2PAI | Projet de pôle agro-industriel |
| 2PAIB | Projet de pôle agro-industriel dans la Région du Bélier |
| AfD | Agence Française de Développement |
| AfDB | African Development Bank |
| ABC | Agriculture business centre |
| ADC | Agricultural development centre |
| AMCOS | Agricultural and marketing co-operatives societies |
| AMDT | Agriculture Markets Development Trust |
| ASDP II | Agricultural Sector Development Programme, Phase II |
| ATC | Agricultural transformation centre |
| BDS | Business development service |
| BRITEN | Building Rural Incomes Through Enterprise |
| CEEC | Citizens Economic Empowerment Commission |
| CGER | Centre de gestion et d'économie rurale |
| CNRA | Centre National de Recherche Agronomique |
| COOPEC | Coopérative d'épargne et de crédit |
| COWABAMA | Collective Warehouse Based Marketing system |
| CRDB | Cooperative Rural Development Bank |
| EAC | East African Community |
| E-SAPP | Enhanced Smallholder Agriculture Productivity Project (IFAD project) |
| ETG | Export Trading Group |
| FADCI | Filières Agricoles Durables de Côte d'Ivoire |
| FAO | Food and Agriculture Organization of the United Nations |
| FATMA | Farm to Market Project (WFP) |
| FBO | Farmer-based organizations |

| | |
|----------|---|
| FCFA | Franc Communauté Financière Africaine/Central African Franc |
| FIRCA | Fonds interprofessionnels pour la recherche et le conseil agricole |
| FISP | Farmer Input Support Programme |
| FRA | Food Reserve Agency |
| FO | Farmer organization |
| IFAD | International Fund for Agricultural Development |
| KPL | Kilomero Plantation Limited |
| MoA | Ministry of Agriculture |
| MVIWATA | Mtandao wa Vikundi Vya Wakulima Tanzania |
| NBC | National Bank of Commerce |
| NFRA | National Food Reserve Agency |
| NGO | Non-governmental organization |
| NMB | National microfinance bank |
| NPCMU | Northern Province Cooperative and Marketing Union |
| ONDR | Office National de Development de la Riziculture |
| PADFA | Commodity Value Chain Support Project (IFAD project) |
| PARFACI | Programme d'Appui à la Relance des Filières Agricoles en Côte d'Ivoire |
| PASST | Private Agriculture Sector Support Trust |
| PPP | Public-private partnership |
| PROPACOM | Support to Agricultural Production and Marketing Project (IFAD project) |
| RIPOMA | Rice Post-harvest and Management Project |
| RCT | Rice Council of Tanzania |
| RUDI | Rural Urban Development Initiative |
| SACCO | Savings and Credit Cooperative Organization |
| SAGCoT | Southern Agricultural Growth Corridor of Tanzania |
| SNDR | Stratégie Nationale de Développement de la Filière Riz |
| S3P | Smallholder Productivity Promotion Programme (IFAD project) |
| SCPZs | Staple Crops Processing Zones |



| | |
|-------|--|
| TAAT | Technologies for African Agricultural Transformation |
| TADB | Tanzania Agricultural Development Bank Limited |
| TASI | Transformation of African Savannas initiative |
| TCI | FAO Investment Centre |
| TIB | Tanzania Investment Bank |
| TLC | Total Land Care |
| USAID | US Agency for international Development |
| USD | US Dollars |
| VC | Value chain |
| ZARI | Zambia Agricultural Research Institute |
| ZCF | Zambia Cooperation Federation |
| ZMW | Zambian kwacha |
| ZNFU | Zambia National Farmers Union |

Introduction



The Feed Africa Strategy, Staple Crops Processing Zones and the Agricultural Transformation Centre Concept

Over the next ten years, the African rural space will be the theatre of profound changes as the activities envisaged for agricultural transformation are drastically scaled up. Increased food demand and changing consumption habits driven by demographic factors, such as population growth and urbanization, are already leading to a rapid increase of net food imports, opening a huge opportunity for the agribusiness sector of many African countries (AfDB, 2016).

Against this backdrop and in line with its mission to spur sustainable economic development and social progress, the African Development Bank (hereinafter referred to as “the Bank”) in 2016 launched Feed Africa, a strategy that is intended to contribute substantially to the transformation of African agriculture by 2025, and reverse Africa’s dependence on imported foods. To reach this goal, it is estimated that Africa will need to produce annually 16 million tonnes more of rice, 43 million tonnes more of maize, 50 million tonnes more of wheat, 41 million tonnes of cassava, 47 million tonnes more of palm oil and 14 million tonnes more of soybean, to mention but a few of the commodities targeted by the strategy. Sustaining this growth in productivity requires a corresponding increase in the current capacity to supply farm inputs, establishing or expanding mechanization services and related maintenance and repair facilities, strengthening the capacity to harvest, store and add value to crops through processing into marketable products, as well as increasing the capacity to distribute and market such products.

Triggering this massive change cannot be done by national governments alone; it requires the participation of the private sector, both African and international, to bring in the needed financing, technical capacity, links to markets, and overall operational efficiency. In each country, national and local governments will need to create an enabling environment consisting of a mix of supportive policies, fiscal incentives, and the basic infrastructure required for agro-industrial development, in order to attract private investors to establish the means of production, processing and marketing of high quality agricultural products. This process needs to be done in cooperation with farmers, their organizations and other important stakeholders in the different value chains.

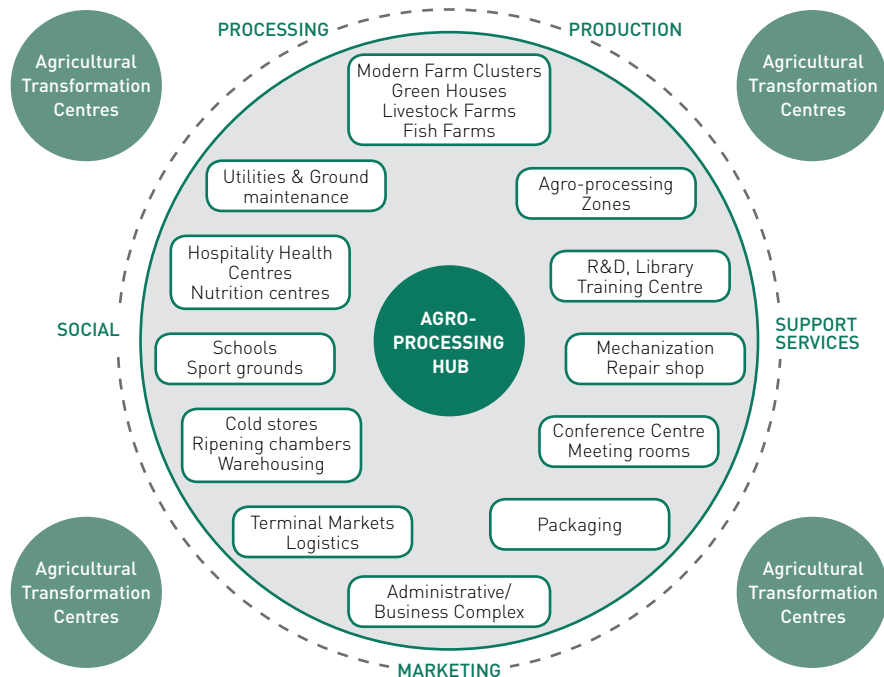
As part of the Bank effort to support national governments in achieving these results, the Agriculture Finance and Rural Development Department of the Bank is launching the concept of Staple Crops Processing Zones (SCPZs) or Commodity Processing Zones. These zones are agrobased spatial development initiatives designed to concentrate agro-processing activities within areas of high agricultural potential to boost productivity and integrate the production, processing and marketing of selected commodities. These initiatives may or may not be granted a Special Economic Zone status (AfDB, 2017). The SCPZ concept includes purpose-built, shared facilities to enable agricultural producers,

processors, aggregators and distributors to operate in the same vicinity to reduce transaction costs and share business development services for increased productivity and competitiveness. As essential components, SCPZs include an agro-processing hub, a number of agricultural transformation centres (ATCs) and agricultural production areas. The ATCs are designed to link smallholder farmers to the agro-processing hub. Each hub covers typically an area of 50–250 ha and includes centrally managed tracts of land developed, subdivided and dedicated to supporting firms and other stakeholders engaged in agro-processing and related activities, located throughout the production area surrounding the hub (FAO, 2017). The hub offers adequate infrastructure, logistics and specialized facilities and services (e.g. electricity, water, cold-chain facilities, laboratory and certification services, business services, ICT, waste treatment, etc.), required for agro-industrial activities to take place (AfDB, 2017).

Linked to the agro-processing hubs (see Figure 1), ATCs are centres strategically located in high production areas, with the scope of serving as aggregation points for accumulating products from the community for supply to the agro-processing hub for further value addition, or for sending to centres of great demand for distribution and retail to consumers (AfDB, 2017).

FIGURE 1

The processing hub and the ATC network

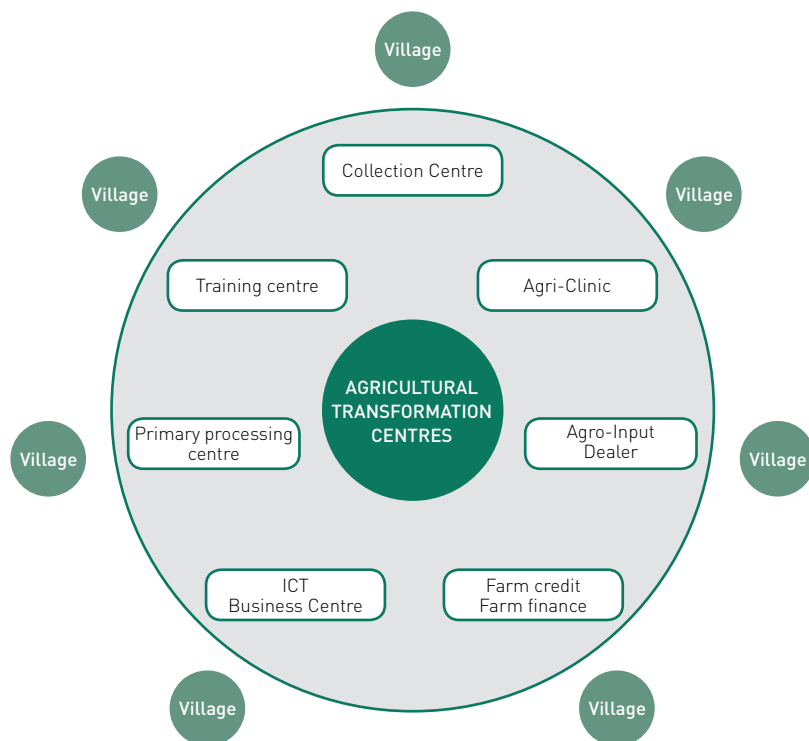


Source: Editors' elaboration based on AfDB, 2017.

In its original conceptualization, an ATC was envisaged as a physical complex of facilities centrally managed and located in a farming community, occupying an area of 10–15 ha, where required services including, but not limited to infrastructure, are offered to the community to reduce on-farm and post-harvest losses (Figure 2). The ATCs could also host dealers of farm inputs (seeds and agrochemicals), plant or livestock health services, a training/extension centre, and social services such as a health centre, an ICT centre and a community hall.

FIGURE 2

The ATC



Source: Editors' elaboration based on AfDB, 2017.

The design of each ATC will differ taking into consideration the specific context and needs of the value chains and the communities it will serve. The operation of an ATC is intended to develop and sustain professional services needed by the community to maximize the value created from agriculture, while at the same

time ensuring the financial sustainability of the ATC itself. A sound business case, technical assistance and capacity building are therefore critical design components of the scheme, alongside any physical infrastructure component developed. Examples of ATC facilities include:

- » Aggregation, sorting, drying, cleaning, packaging and primary storage centres for agricultural products;
- » Agricultural input distribution platforms (seeds, fertilizer, herbicides, etc.);
- » Service centres (agricultural credit, business and entrepreneur skills development services and incubation centres, rental and maintenance of agricultural equipment, zoo-sanitary clinic, etc.);
- » Food quality control and seed certification;
- » An extension and training demonstration centre for producer organizations;
- » Basic social services (schools, health centres, vocational training centres, community hall).

Ideally, the management of an ATC should be tailored to address financial and social sustainability issues at the outset, and will thus require joint representation from both public and private stakeholders, including farmers. While several operating models may be appropriate depending on the scope and scale of the ATC, regardless of the model adopted, the ATCs should be public sector-enabled, and private sector-operated.

At the interface between agroindustry and farming communities, the ATC has the potential to improve the efficiency of value chains with the objective of adding value through a reduction of on-farm and post-harvest losses, and in the process also to improve livelihoods and create jobs at community level. More specifically, any ATCs established will ultimately need to contribute to the five overall goals of the infrastructure programme of the Feed Africa Strategy, namely to:

- 1] enhance competitiveness of agriculture in rural areas;
- 2] promote agricultural value chain organization;
- 3] promote resource efficiency and smart agriculture;
- 4] promote social inclusion for poverty reduction; and
- 5] promote partnerships to speed up rural development.

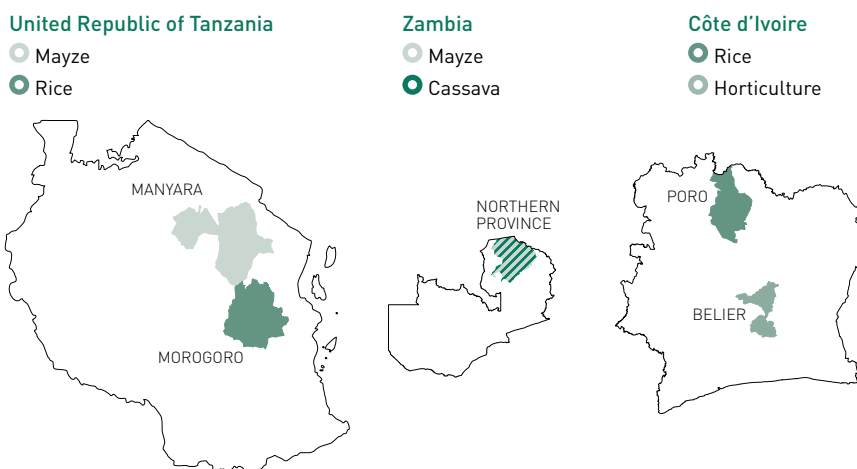
Finally, the ATCs within the broader framework of SCPZs, are expected to provide the basis for accelerated structural change that will transform African agriculture from a subsistence sector to an efficient and market-oriented activity for farmers and rural-based small and medium enterprises (SMEs) and industries.

FAO Collaboration with the Bank, Methodological Approach and Scope of the Study

In 2018, following several months of consultations, the Agriculture Finance and Rural Development Department of the Bank, in partnership with the FAO Investment Centre - Africa (TCIA) and the FAO Côte d'Ivoire Partnerships and Liaison Office, engaged the Agricultural Development Economics (ESA) Division of FAO to provide technical support in the design and conduct of feasibility studies on ATCs. Three countries and five regions were selected for the study: Côte d'Ivoire (Bélier and Poro regions), the United Republic of Tanzania (Morogoro and Manyara regions) and Zambia (Northern Province). Four priority commodity chains were targeted for maize (the United Republic of Tanzania and Zambia), rice (Côte d'Ivoire and the United Republic of Tanzania), horticulture (Côte d'Ivoire), and cassava (Zambia). Figure 3 provides a visual representation of the study geographical scope and VCs selected.

FIGURE 3

Countries, regions and VCs selected



Source: Editors' elaboration, customized by studio Bartoleschi.

The scope of the study aimed at analysing existing conditions and main constraints in the commodity chains selected for each country and region, in order to:

- 1] Assess the feasibility of establishing an ATC within these regions based on market potential, readiness of relevant stakeholders, infrastructure availability, and the possibility to achieve financial sustainability over time; and if deemed feasible,

- 2] Propose a preliminary design for the ATC model identifying the mix of services and infrastructure needed, the ownership and governance structure, investment costs and risks, based on an analysis of the specific context and needs of the value chains and the communities.

In addition, the study was intended to provide relevant information to develop a methodology to be used to carry out feasibility assessments for a range of potential ATC interventions in other countries for some of the Feed Africa prioritized value chain commodities.

Alongside the five overarching objectives related to the rural infrastructure programme of the Feed Africa Strategy, the study was also designed to assess the potential for proposed ATC models to:

- » increase food production;
- » ensure high quality of produce and reduce post-harvest losses;
- » identify required technologies to equip the ATCs for on-farm and value addition activities to generate wealth and jobs in rural areas;
- » facilitate investments in profitable commodity value chains;
- » stimulate the development of the private sector in the rural areas; and
- » improve value chain governance to ensure equity in the sharing of agribusiness benefits.

To carry out the study, a team of two agribusiness and two post-harvest technology consultants were contracted. The study involved two phases of key learning outcomes. The first phase focused on identifying lessons learned from existing experiences in the design and implementation of a range of ATCs operating in the region (e.g. agricultural business centres, agribusiness incubators and innovation centres, PPPs for market infrastructure, cooperative-led business centres, etc.), with a view to identifying how such interventions could contribute to the achievement of the five related rural infrastructure goals of the Feed Africa Strategy. During the second phase, feasibility studies for the design and possible implementation of new ATCs, or the strengthening and upgrading of existing ATCs, were conducted in the field.

Finally, a validation workshop was held in Abidjan on 5 June 2018 to validate the preliminary findings from the study. The validation workshop provided an opportunity for stakeholders involved in the study, as well as public and private sector agencies interested in supporting the implementation of SCPZs and ATCs in the three countries selected (Zambia, the United Republic of Tanzania and Côte d'Ivoire), to validate the initial findings with a view to finalizing the report. The workshop was also well attended by FAO and internal staff of the Bank from both the Agricultural Finance and Rural Development Department and the Agriculture and Agro-Industries Department, keen to learn more about the practical application of SCPZs and ATCs.

The findings that emerged from both the study and the workshop are presented in this report. The intention of the report is to help inform the bank task managers involved in the design and implementation of the SCPZ programme under the Feed Africa Strategy on the potential for implementing ATCs as components of integrated SCPZs. The report also provides a preliminary methodology that can be used to assess the feasibility of proposed ATC models.

Preliminary findings on existing models (Phase 1)

To better understand the applicability of the ATC concept in reality, prior to the field mission, FAO ESA, with the collaboration of the contracted consultants, analysed existing models that could be considered to fit under the ATC definition, or as potential components of the ATC approach. Although reality is usually more fluid than definitions, the list below provides an idea of the different models associated with the ATC concept that can be found on the ground:

- » **Agribusiness centres (or agricultural business centres):** These centres are usually farmer-owned, multi-purpose facilities providing rural communities with a place to process their agricultural produce, buy inputs and sell products. Services can include micro-credit, sale of inputs, rental of agricultural tools and equipment, storage of agricultural produce, transportation of harvest to markets, and access to communication and information technology. FAO has supported the establishment of almost 200 agriculture business centres (ABC) in Sierra Leone as part of a programme of the Ministry of Agriculture (FAO, n.a.).¹
- » **Agribusiness incubators (or accelerators):** Business incubators provide a “common environment to entrepreneurs where they have access to shared infrastructure, coaching, business and financial services, as well as linkages with the broader [business] environment” (infoDev, 2009). Services offered include business development, market access and technology assessment services; financial services; and mentoring and networking. In addition, shared facilities and equipment are often provided to incubated firms. In contrast to other types of centres discussed here, agribusiness incubators’ services can be accessed only by entrepreneurs (usually with zero-stage firms) that have applied and that have been selected to be enrolled in an incubation process that ends with a graduation and post-graduation phase. After graduation, businesses are supposed to be able to engage with potential buyers and sell their products; survive without incubator support; put in place a realistic action plan; and expand. Agribusiness incubators can be established as a public body, mainly depending on governmental and donor funds, or as a private body. However, over the past few years, public-private

¹ For a video of an FAO Agriculture Business Centre in Sierra Leone see: <https://www.youtube.com/watch?v=ilf6U8H1b10&list=PLzp5NgJ2-dK73v2oT0MG5N6iK9wPT6QnJ>

partnerships (PPPs) have become the preferred mechanism for establishing agribusiness incubators (FAO, 2017).²

- » **Agribusiness innovation centres (or knowledge centres):** The name usually refers to one-stop shops where a range of services are provided to new or established entrepreneurs. In particular: training, mentoring and coaching services, facilities, market research and linkages, financing and government, industry and donor networks. As indicated by their name, the objective of these centres is that of promoting the use of innovative agricultural practices and technologies to make agriculture more environmentally sustainable and productive. They can work as incubators providing incubation services to selected clients (see above), or as agricultural development centres open to all interested clients (see below). They are usually established by a public entity in collaboration with a university or research institution.³
- » **Agricultural development centres:** Agricultural development centres (ADCs) serve farmers, livestock producers, beekeepers and fishers, as well as rural populations in general. Their functions embrace agricultural and agribusiness training and extension services; transfer of new technologies and strategies to increase performance and use natural resources more sustainably (e.g. fostering the proper use of inputs through distribution of newly developed technologies such as chemical fertilizers, chemical pesticides, hybrid seeds and farm machinery); support for reducing farming costs; and agricultural marketing and management support services, among others. The ADCs can also establish demonstration plots in farmers' fields to illustrate the impact of new technology in improving farm productivity. These centres are usually established by a public entity in collaboration with a university or research institution (FAO, 2017; Maxwell and Holtzman, 1997).
- » **Agricultural (or market) terminals:** These are centres where farmers can engage in trading, processing, storing and marketing of agricultural and non-agricultural products and services. They terminals usually operate as PPPs. FAO (2016), for example, analysed a case of an agricultural terminal operated through a PPP for market infrastructure (MI) development in the Philippines.
- » **Farmer service centres:** These centres provide village-level basic infrastructure for post-harvest handling, like cleaning, grading and packing. They are established with the scope of supplying inputs to farmers, taking up value addition activities, and engaging in group marketing by establishing linkages with direct marketers, exporters, processors and retail chain operators. They are usually owned by producer organizations. The concept is very similar with that of agribusiness centres.⁴

² For examples of agribusiness incubators in Africa see: infoDev, 2009, 2014a, 2014b, 2014c.

³ For a feasibility assessment of an agribusiness innovation centre see: infoDev, 2013.

⁴ For a video of a farmer service centre in Ethiopia see: <https://www.usaid.gov/news-information/videos/developing-farm-service-centers-ethiopia>

The analysis showed how, in the African context, many models do already exist that serve as aggregation points for producers or that provide agroservices and inputs to both producers and SMEs, with the common objective of improving productivity and efficiency within value chains. However, the differences between these models are considerable. The mix of services offered by these centres can vary dramatically from one model to another. Historically, the focus was on improving production capacity through the provision of subsidized inputs and extension services to farmers, but with very low chances of achieving financial sustainability given the dependence on public funds. Today, a number of initiatives place emphasis on the downstream part of the value chain (processing, marketing) with the idea of creating a catalytic effect on the entire value chain through increasing demand for agrocommodities. Greater attention is also paid now to the reduction of post-harvest losses through the provision of primary processing and storage services. In these new schemes, SMEs and farmer organizations (FOs) play a crucial role as they are expected to act as, or eventually become *owners* of these models as a way to achieve long-term financial sustainability. In line with this trend, mechanisms such as PPP governance structures are increasingly being used to achieve the necessary financing and management of these centres. The 'direct beneficiaries' is also one key distinctive criteria. In some models, services are provided directly to small farmers to improve yield and quality, with the intention of increasing revenue. In other models, support is directed towards SMEs as a way to stimulate the business environment, or to service providers so that they can develop their outreach to farmers and improve the quality of their services.

The identification of the different models presented above helped the team to acknowledge the important differences existing in the practical application of the ATC approach in terms of type of services provided, beneficiaries, ownership and governance structure, and financing schemes. It also helped to highlight the fact that designing ATCs is not only about identifying the best service mix and infrastructure components, but also thinking through the options in terms of the management structure and mechanisms in place to achieve long-term financial sustainability.

The findings confirmed, furthermore, that the design of each ATC could not be decided in abstract, but would need to be adapted to take into consideration the specific context and needs of the value chains and the communities it will serve, in line with existing and potential market opportunities.

With these considerations in mind, field missions were conducted in the selected countries and regions not only to assess the feasibility of an ATC, but also to identify potential models that could realistically work based on the findings from the specific context.

Limitations of the study

As seen in the description of the Feed Africa strategy, the ATC concept was not intended as a stand-alone initiative. It is, on the contrary, embedded in the framework of the SCPZ programme, based on which ATCs are intended to serve a **specific agro-processing hub**. Ideally, the feasibility of an ATC would therefore need to be linked to existing SCPZ initiatives or advanced feasibility studies for these commodity zones. Information on the location, commodities to be processed and quantity and quality requirements of the processing hub are considered crucial in assessing production needs and types of services to be provided through an ATC.

However, given the buy-in required from national governments, the high levels of investment and the time needed to develop the infrastructure component of SCPZs, these initiatives may take years to move from conception to implementation. As of now, the Bank is involved in the promotion of several SCPZ feasibility studies in many countries as well as in active dialogue with interested governments. However, the state of development of these initiatives was still at the initial stages in the countries selected for this study, and thus not yet ready to inform a thorough ATC feasibility study linked to existing SCPZ initiatives and planned agro-processing hubs.

It was decided, however, that although these limitations existed, the benefits of conducting ATC feasibility studies at this stage could be several:

- 1] The feasibility studies can be used to extrapolate findings to formulate a general methodology to be used for future ATC feasibility studies.
- 2] They can help to identify the needed generic infrastructure and investment costs, depending on the commodity selected.
- 3] Conducting value chain and market analysis in each target area can help to inform future selection of SCPZs locations and priority commodity chains.

As anticipated, the findings have helped to elaborate generic checklists including a methodology for establishing ATCs, as well as infrastructure needs and investment costs for commodity specific ATCs. The study has also helped to identify potential areas where an SCPZ would be most likely to have access to sufficient production volumes, and areas in which this would not be the case at present. In addition, depending on the region selected, the study has helped to identify the most commercially viable commodities among those selected.

Finally, it is important to note that the success of spatial development initiatives such as the SCPZ, depends heavily on their capacity to attract enough processing companies, or through the commitment of an anchor investor for example, to generate economies of scales and increasing shared value for all the companies involved. However, the choice of private agribusiness companies to set up new

operations or re-locate into a new area will depend on the existence of a sufficient supply of raw material that meets specific quality standards. The establishment of ATCs could be a first step towards increasing the quantity and quality produced and towards creating a favourable environment for agribusiness companies to re-locate to the agro-processing hub envisaged under the SCPZ approach. Under this perspective, promoting the establishment of ATCs prior to the establishment of a processing hub could be instrumental to creating the pre-conditions for the success of the hub. If such an approach is to be followed, it would make sense to promote ATC feasibility studies during the earlier development stages of SCPZ initiatives.

Structure of the report

The report is structured as follows: an introduction, three main parts, the conclusions, and a list of annexes.

The introductory section (present section) provides background information on the Bank Feed Africa Strategy and on collaboration with FAO. It also provides basic information on the Bank SCPZ and ATC concepts and on the scope and objectives of this study, including some preliminary findings achieved in the first phase of the study.

Parts One to Three represent the core of the study and contain the three country reports conducted in Zambia, Côte d'Ivoire and the United Republic of Tanzania. Each part contains the findings from the VC analysis conducted, the implication for the establishment of an ATC and the description of the ATC model proposed, where this is considered a feasible option. This description includes considerations on the mix of services to be provided, the infrastructure element, the ownership, managerial and institutional set-up, as well as a calculation of operating costs, investment costs and a revenue and income analysis. Finally, impact and risks are described.

The Conclusions section sums up the main findings of the study, starting from the objectives of the study identified in the introductory section. It also provides some practical recommendations on the use of these findings in going forward with the promotion of ATCs and SCPZs.

Finally, Annex 1 provides a generic checklist for the establishment of ATCs, while Annexes 2 to 6 provide tables containing detailed infrastructure requirements for VC-specific ATCs.

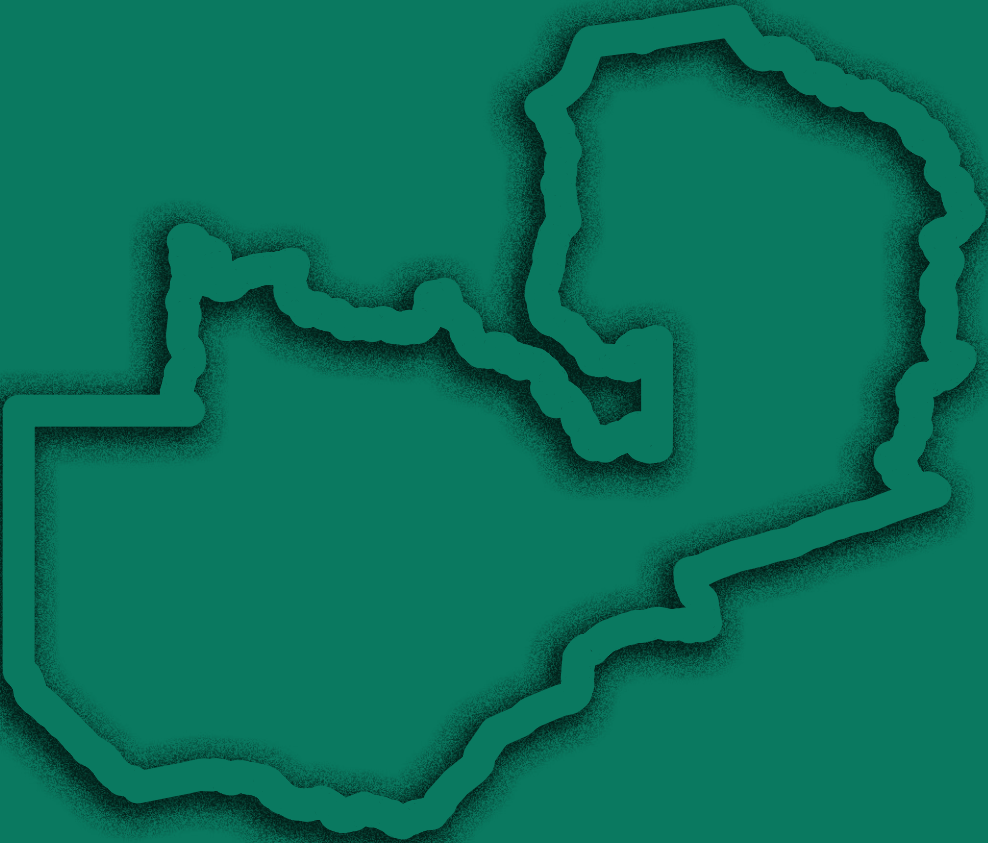
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P A R T 1

Design and feasibility of ATCs in Zambia

By Ngoni Nenguwo and Mathieu Faujas





SECTION 1

ATC for maize and soybean in Zambia, Northern Province

1 » OVERVIEW OF MAIZE VALUE CHAIN

Market potential

- » Maize is the most important staple food crop in Zambia. In 2015, the size of the national market was estimated at over 1.45 million MT (Crop Forecasting Survey 2014/15 from FAO, 2016), which accounts for 57 percent of the total maize produced that year. The remainder is used for subsistence consumption and does not enter the market. The national demand for maize is expected to reach 2 million MT in the next few years, driven primarily by the demand for mealie meal from a population growing at a rate of 3 percent per year (USAID, 2009).
- » The demand for stockfeed from the poultry industry will also grow rapidly in the years to come, as consumption of meat rises with the increase in disposable income (estimated at +8 percent between 2010 and 2020). Poultry exports could result in even higher growth.
- » Zambia is the only country in the region with a regular surplus of maize, while regional demand is very high from deficit neighbours. The country also has a competitive advantage due to the fact that the former requires non-GMO maize, which is what Zambia produces. The forecasted demand for maize from the region is in the range of 300 000 to 500 000 MT in the years to come, with prices possibly 40–50 percent higher than on the Zambian maize market. Yet export uncompetitiveness due to high transport costs and the ban on export from the government has significantly affected Zambia's ability to sustainably serve these markets so far.

Production capacity

- » Maize production has great potential in the Northern Province. There exist good rain patterns throughout the year and fertile soils. Also, arable land is widely available, and this gives the Northern Province a comparative advantage when it comes to increasing production.
- » More than 90 percent of the maize production comes from smallholder farmers in the North. Although the total production has been increasing, the yields are still low, around 2 MT per hectare. The expansion of cultivated land has been the main cause of the increase of national maize production.

- » Important losses occur between harvest and marketing, mostly caused by poor harvesting and poor storage practices (FAO, 2016). They may range from 15 percent up to 20 percent of the total output. Also, grain cleaning is a necessary activity prior to marketing, as poor storage practices may result in deterioration of the grain. Only 8 percent of households in the Northern Province have access to improved storage facilities. Most farmers, worried about theft, keep their grains at home.

Government policies/activities

- » The maize value chain remains under significant control by the public authorities. The major influence on maize marketing is wrought by the Food Reserve Agency (FRA) which is the major buyer for maize produced in the country. While the FRA's original role was merely to buy strategic buffer stocks, from 2004 onwards, the agency has progressively expanded its mandate towards trading much of the national output of maize. The Food Reserve Agency was able to capture between 60 percent and 100 percent of the national output over the last few years (Steinhilber, 2015). The agency's role is now said to have reverted to its initial buffer stock mission. In 2016, it bought only 30 percent of the national surplus production.
- » For many years, inputs have been subsidized in Zambia through a government scheme called the Farmer Input Support Programme (FISP). During the 2015-16 agricultural season, the Ministry of Agriculture (MoA) started to shift towards the use of electronic vouchers with the idea of enhancing the participation of the private sector in the distribution of inputs. Although the FISP has enabled a greater availability of inputs in rural areas, farmers and their organizations are complaining today about FISP's inefficiency. The most common reproach is the late delivery of the inputs due to the protracted transfer of the grant into the voucher cards. In some cases, farmers only obtained inputs at the very end of the growing season. Furthermore, suppliers apparently adjust their prices to make the most of the system.

Private sector

- » As the predominant buyer of maize in the country, the FRA has become powerful enough to fix the market price at national level for the whole production season. With its capacity to offload grains at subsidized rates on a massive scale, the FRA has had a strong distortional effect on the market. The private traders had no choice but to align their purchasing prices to those of the FRA and abandon the standard practice of managing maize supplies through contracts with farmers. Many were unable to compete, and exited. With the government pledge to give more room to the private sector going forward, it is expected to see more private actors committing to maize purchase and trading once more.
- » There are only a few private companies buying maize in the Northern Province. With most of the output leaving the province as raw material, the lack of milling capacities seems to be real.



Services and infrastructure available

- » The Farmer Input Support Programme (FISP) has greatly distorted the input market locally. Input retailers are now well established in the rural areas, but they may be highly dependent on the subsidy programme. On the farmer side, they have become reluctant to buy the needed inputs with their own money, in the hope for free inputs and, despite the delay in receiving them, are more inclined to wait.
- » Storage infrastructure that belongs to the FRA is the most commonly available. There are no bulk grain handling facilities in the Northern Province. Some cooperatives indicated they have storage sheds, but lack of capacities in certain areas and poor distribution lead to high aggregation costs. Many of these sheds are currently idle or are used for other purposes such as classrooms.
- » Access to mechanization (shelling machines, tractors) to increase operational efficiency is extremely limited. The lack of financing tools, technical services and supporting bodies is the main reason for the low level of mechanization. In general, smallholder farmers use manual labour for crop production, which results in delays in the completion of farming activities and increases production costs.
- » In the Northern Province, access to finance for smallholder farmers is highly limited. None of the financial institutions have suitable financing tools for agriculture and interest rates are very high, ranging from 26 percent to 44 percent. Bank involvement in agricultural value chains are mainly limited to their participation in the FISP scheme. Some banks have developed two specific products for farmers, including an asset purchase scheme for equipment, but very few farmers have been able to meet the conditions of these schemes. In particular, the main challenge facing farmers is that they are unable to provide adequate collateral such as title deeds to their land or other property.

Stakeholders and Business development service (BDS) providers

- » A Zambian non-profit company called Musika has been active in facilitating market linkages between producers and buyers in recent years. Musika works with both non-governmental organizations (NGOs) and the private sector to reach a critical mass through bearing part of the operational risk associated with private investment in the value chain. While the Musika approach is certainly of interest and is appreciated by local stakeholders, low levels of coordination between the various projects led by the organization were observed to be inhibiting the potential for greater impact on the private sector, and the ability to go a step further in linking farmers to markets.
- » Farmers are supposed to benefit from the support of two national farmer networks, the Zambia Cooperation Federation (ZCF) represented by the Northern Province Cooperative and Marketing Union (NPCMU) in the Northern Province, and the Zambia National Farmers Union (ZNFU).

However, there is little coordination between them, NPCMU possibly being more involved in providing storage and milling capacities and ZNFU working towards facilitating credit access for farmers and sharing information.

- » The maize value chain remains fragmented in the province and there is no specific institution to make the different actors come together. Farmer cooperatives exist in number at camp level, but governance seems to be weak and resources are scarce. Many cooperatives are said to have been founded with a view merely to gain access to the FISP.

Main constraints to VC development

- » The FRA imposes unfavourable conditions such as buying the grains on credit over a period that could run over one year. On this basis, producers are the ones who finance the whole system. Faced now with low prices, farmers in the Northern Province are becoming reluctant to sell their crops.
- » Farmers lack reliable access to the market; consequently, they have no incentive to increase production. With one major market player dominating to such an extent that farmers are left without any alternative, they are ill-equipped to take advantage of the opportunities that exist in the Southern Africa region. Today, commercialization of production is mainly done on an individual basis. Little capacity exists at the cooperative level, which weakens their bargaining power and limits their ability to access better services.
- » Use of inputs and mechanization remains too low, with negative effects on productivity

2 » SCPZ INITIATIVES IN THE AREA

At present, there are no SCPZ initiatives planned in the area. For this reason, the possible establishment of ATCs would be justified by the need to prepare the ground by increasing productivity and reducing post-harvest losses, facilitating coordination between agrodealers and producers, and producers and buyers, increasing quantity produced, improving quality, and attracting private processors to the area. This would potentially be done in preparation of the establishment of an overall SCPZ.

3 » IMPLICATIONS FOR ATC FEASIBILITY AND DESIGN FOR MAIZE

The rationale which supports the launching of an ATC for maize in the Northern Province, even in the absence of an SCPZ initiative, is as follows:

- » The market is dynamic at national and international levels, and growth in demand is expected for the years to come.
- » The Northern Province is in a good position to become a leading maize producing province thanks to its favourable pedo-climatic conditions and vast areas of available arable land.



- » Market opportunities exist to address import substitution of maize flour coming from other provinces by processing maize locally, and also by tapping into the growing demand for poultry and cattle feed.
- » ATCs could solve the main problems faced by farmers, including low mechanization and productivity, inefficient access to inputs and weak VC coordination.

The following table describes constraints faced by farmers and how ATC services could help to overcome them.

TABLE 1

| ZAMBIA ATC FOR MAIZE: SERVICES AND FARMERS' CONSTRAINTS THAT WILL BE ADDRESSED | | |
|---|---|--|
| BUYER SPECIFICATIONS | CONSTRAINTS | ATC SERVICES TO FARMERS |
| Producing a specific volume | Low yield | Increased access to inputs delivered in a timely manner Technical assistance |
| Producing at high quality level | High post-harvest losses, no quality management systems in place | Better post-harvest handling Quality management processes introduced |
| Timely delivery of outputs according to agreed schedule | Poor supply planning | Support to coordinate planting and harvesting schedule Support to the value chain organization process as a whole |
| Stable prices | High transactional costs associated with sourcing from individual farmers | Improved system of aggregation Bulk transportation option |

Source: Authors' elaboration.

However, some caution is needed. The activities of the FRA affect prices and distort free trading. The private sector cannot enter freely, and producers cannot sell at a fair price. Yet faced with value chain inefficiencies and lured by strong forecasted growth, the government has announced changes in FRA policy and expressed willingness to give more room to the private sector. Some initial change in sentiment on behalf of the private sector can also be witnessed on the ground in terms of renewed confidence in a more favourable enabling environment moving forward. Findings from fieldwork identified one large grain trader, Zdenakie, who is already planning new investments in the Northern Province for 2018, and two others who are already operating and looking to further expand grain trading operations, Afgri and Export Trading Group (ETG).

Recommendations:

- 1] The ATC for maize could be an option **ONLY if the FRA lifts the uncertainty that prevails regarding their policies** and if the government effectively commits to letting the private sector trade maize freely without intervening heavily in the functioning of the market.
- 2] The ATCs should be launched **ONLY** if, without FRA interference, **an increased private commitment in the chain is stimulated**. Despite initial positive findings, some time may be needed to verify the real intentions of the Government of Zambia with relation to FRA activities and the reaction of the private sector. With demand for maize growing nationally, opportunities exist for farmers but actual access to the market is challenging. With a fragmented, inefficient value chain and little incentive for farmers to produce, investments from the private sector are deemed risky and expensive, and it may take time to reap returns. A concerted strategy towards the implementation of the SCPZ and ATCs may be needed to attract private investment in the area. More specifically, the goal would be to attract private companies targeting the provincial flour market (for mealie meal and stockfeed), given its growing potential, and in the long run possibly looking at exporting to immediately neighbouring countries (United Republic of Tanzania, Malawi, Congo, Kenya), hence securing market access for maize growers. However, this would need coordinated actions to remove export bottlenecks, including high transportation costs and government export bans. If these concerted actions were put in place, thanks to a more predictable business environment, private companies would be able to increase their investments in local processing capacities to combat high costs associated with importing products from distant provinces. To overcome the problem of the vicious cycle of low demand/low supply/low demand, as a first move, producers will have to demonstrate their ability to produce according to demand specifications, and the ATC will have a role to play in supporting them. This will not be an easy process and will probably require some initial financial support to be provided to producers to help them cover their investments.
- 3] An actor like Musika could play a **crucial role in facilitating** the development of maize ATC activities. However, efforts must be put in place to ensure that coordination exists in the implementation of the various projects led by this organization, to prevent the duplication of efforts.
- 4] ATC would be feasible **ONLY if farmers are able/willing to pay for the services**. Few services are available as of today, with the exception of access to inputs through FISP. But the analysis shows that despite FISP, yields remain low because of the inefficiency of the programme. The challenge for the ATC will be to initiate supply of services for a fee while prices are still not sufficiently remunerative, and farmers are left with little disposable cash to invest.
- 5] In this regard, **maize cooperatives would need to be strengthened** by providing support for improving their organization and management.



- 6] More than an ATC model, a **transformation strategy** towards a vibrant ecosystem where production capacities exist is needed. To achieve this, **public alignment of intentions and commitment** will be crucial. This would prepare for the effective launching of the SCPZ promoted by the African Development Bank, which would find a more structured value chain for securing their procurement of raw material.
- 7] As they move towards professionalization of their growing practices, **farmers** will also have to be **empowered in business management** so that they can sustainably enter into contract farming/outgrower agreements with agribusinesses, and negotiate fair prices.

4 » OVERVIEW OF THE SOYBEAN VALUE CHAIN

Market Potential

- » Zambia is self-sufficient in the production of soybean. With a recorded production of 267 000 MT (FAOSTAT data from 2016) and a global national demand in the range of 230 000 MT (IAPRI, 2016), Northern Province is the third largest producer with 3 987 MT produced in 2015, representing 7.9 percent of total production for the year (CSO, 2015). Unlike the Central and Eastern Provinces where 77 percent of soya production is from large-scale commercial producers, in the Northern Province soybean is produced mostly by smallholder farmers. Zambia is a net but small exporter of soybeans.
- » The major market for soybean in Zambia is for industrial purposes including edible oil, stockfeeds and processed soy for human consumption. The soybean cake market (roughly estimated at 120 000 MT of soybean in 2016, from 90 000 MT in 2010) supplies animal feed and human products. It has been mainly driven by the growth of the poultry industry (75 percent of the soy cake market) which is expected to continue to grow at 8 percent yearly up to 2020 (Technoserve, 2012). There are some buyers for soya including the main grain traders such as Afgri and a Lusaka-based processor called Seba Foods that has an outgrower programme in the province. However, even with these two major buyers, purchasing levels remain modest, in the range of several hundred MT and many growers are unaware of their activities.

Production capacity

- » Smallholder farmers in the region are mixed farmers and grow soybean mostly as a cash crop, with maize and cassava as staple crops. Farmers are growing around 1 to 2 lima (0.25 to 0.5ha). Yields are in the range of 0.9 MT/ha although yield potential is about 2.5 to 3.0 MT/ha (IAPRI, 2016). According to staff at Misamfu Research Station low yields are due to poor agricultural practices and delayed sowing of the crop. Although the rhizobium inoculant is produced within the Northern Province, availability is limited due to poor distribution and poor promotional efforts.

- » The major costs of production are labour costs for land preparation as well as for sowing, weeding and harvesting. Smallholder farmers generally use very few inputs and so soybean production is profitable for them even when they have low yields. A gross margin analysis calculated by ZNFU in 2014 showed that farmers can make a profit even at yields of 1.64 MT/ha or a price of K 2.26/kg (which is close to the official purchasing price of FRA).

Government policies/activities and donors' initiatives

- » Ministry of Agriculture (MoA) – Activities include the production of rhizobium inoculant at the Misamfu Research Station. The Ministry is also responsible for supervising agricultural extension staff at the local level together with the Department of Cooperatives (Ministry of Trade) which is responsible for organizing producers into cooperatives groups.
- » The Citizens Economic Empowerment Commission (CEEC) is the public investment agency under the Ministry of Trade, working towards empowering people in business and entrepreneurship across sectors and industries. They provide financing facilities to local entrepreneurs, and soybean has been identified as a priority sector in Kasama district. A number of projects have been funded to increase local processing capacities of soybean, including Regitech Limited and NPCMU.
- » The FRA was involved in purchasing soybean in the 2016/2017 season and they bought 500 MT in Kasama out of a total of 3 240 MT nationwide (only 16 percent of initial target). The FRA's intentions are uncertain and previous decisions to undertake purchasing of soybean may have been related to stimulating market participation of smallholders and diversification of production. However, current indications are for FRA to scale back their activities and concentrate on holding strategic reserves only.
- » The MoA is also implementing two projects funded by the International Fund for Agricultural Development (IFAD): the Enhanced Smallholder Agriculture Productivity Project (E-SAPP) which is responsible for the development of new storage sheds as part of the activities to improve market access, and the Smallholder Productivity Promotion Programme (S3P) aimed at improving productivity.

Private sector

- » Currently there is limited processing capacity for soya in the province. There is, however, a potential local market for primary processed products in the Northern Province, especially soy cake for the poultry stock feed market, and local processing companies have started supplying some products, in particular Regitech Limited and NPCMU which are producing poultry feed for sale to the local market.



Services and infrastructure available

- » Lured by the FISP opportunity, a number of agrodealers operating in the region including companies such as Better Changes and Mule-Stus have developed agent systems throughout the province. Seed companies such as Maize Research Institute Limited and Seed-Co Limited also have depots in Kasama and they offer seed of improved varieties.

Stakeholders and BDS providers

- » Musika is currently working to improve private sector linkages with producers by reducing the operational costs of agrodealers and traders. As an example, Musika provides motorbikes to these companies so as to reduce the costs of accessing a wider network of farmers. As identified for the maize value chain, Musika thus has good experience in establishing linkages between the private sector and growers and could therefore be a key partner in setting up the ATC and helping to meet its objectives.

Main constraints to VC development

- » In terms of crop production, the level of productivity of smallholder soya producers is low, mainly due to poor agronomic practices. There is a need for improved methods in the provision of agronomic and technical advice on growing.

5 » IMPLICATIONS FOR ATC FEASIBILITY AND DESIGN FOR SOYBEAN

Uncertainty remains with government policies; these are not always consistent. For example, the FRA may start buying soybeans in one year but not in the following year. Prices are volatile and there are wide swings from year to year, yet the crop is said to have good profitability even at a low price. Support from the government is expected with regard to diversification of crops and soybean is one of the crops that can be promoted for this. Export of soybean is not an option for the time being, taking into account the uncertainty and constraints of the export environment. Although the Congo is nearby, it is a difficult market to operate in due to political and administrative constraints.

However, even in the absence of an SCPZ initiative, considering the demand from the provincial poultry and cattle industry, there seems to be potential for the ATC to support the local processing of stockfeed and also of oil. Today, processed products are sent to the Northern Province from distant zones and therefore the prices for these products are quite high. Investments in local processing capacities for the production of the soy cake and subsequent blending to produce stockfeed, are needed to meet the demand for animal feed products in the region. Bringing processing plants closer to producers would reduce costs of production through slashing transportation costs. A few small SMEs have begun to try out this approach. There is potential to develop this approach and in so doing, to capture of part of the added value for the province, and to create local jobs.

The Northern Province has strong potential for production and selected varieties do exist. There is abundant land for increasing production and seed companies marketing improved varieties of soybean are operating in the region. New companies entering the farming blocks (possibly SCPZ) need to secure access to reliable procurement. The ATC can provide them with a link to the soybean producers and help reduce transaction costs.

Nonetheless, better access to agricultural inputs and extension services are needed for the farmers. Some critical inputs such as rhizobium inoculant are not readily available for producers and the ATC could provide a mechanism for improved distribution which would come with better access to agronomic advice for producers. There is also a need for a more rational aggregating system for output. Buyers are using their own collecting channels from rural growers. The opportunity exists for the ATC to provide uniform and more effective methods of collecting the crop.

Recommendations:

- 1] For ATCs to be feasible, **government commitment** to the development of the soybean VC should be assessed and the possible **interference of FRA minimized**.
- 2] **Growth of local processing capacities should be stimulated** in coordination with the establishment of the ATC. In this regard, coordination with the SCPZ promotion activities should be encouraged.
- 3] To ensure financial sustainability, **farmer awareness should be raised about the potential profitability of yield increases**. This will increase their willingness to commit and pay for the ATC services.
- 4] There may be a need to **strengthen cooperatives** or create new ones.

6 » MODEL PROPOSED

The analysis shows that volumes traded across the province remain quite small for maize and soybean, compared to what is achieved in the top producing regions of Zambia. For soybean especially, the volumes traded are not significant as of today. Also, the two crops face similar opportunities and challenges:

- » On the production side, low yield and post-harvest losses;
- » Limited access to markets;
- » Fragmented and inefficient value chain;
- » Risk that the FRA buying strategy distorts the market and hinders the emergence of a real demand;
- » Many growers are producing both crops, therefore a base level of technical skill exists;



- » Post-harvest operations are similar;
- » Agro-input suppliers are present in rural areas distributing inputs for the two crops.

To address the same constraints and pursue similar opportunities, a unique ATC system could be developed to support the upgrading of the two value chains, with emphasis on increasing output by improving farmers' access to inputs and extension services, and acting as aggregation points for produce to reduce transaction costs. The ATC would become the preferred entry point for input suppliers and buyers to establish business relationships with farmers for maize and soybean.

Since the market system in the Northern Province is still under-developed, the ATC will first be used to reinforce its foundation. The ATC will promote the linkage between market actors with the idea of creating a conducive ecosystem that encourages further commitment. It should be built upon existing infrastructures and should support ongoing initiatives from local actors to reduce the initial risk attached to investments and favour a sense of ownership within the local communities.

The ATC system will have the form of a network of agrodealers already in operation in two districts close to Kasama town. This network will become the cornerstone of the system to reach farmer communities and link them to buyers (see Figure 4). It presents the following advantages:

- » The institutional set-up is already developed in rural areas, sustained by the FISP programme;
- » This is a network of small businesses with experience dealing with farmers, some of whom have already shown interest to further develop their businesses by expanding into downstream primary processing and aggregation services in addition to the input supply activities they currently offer to farmers;
- » Their agents are local people with a good understanding of the context and strong relationships within the communities they serve;
- » They already have storage capacities/small-scale infrastructures and possibly some mechanization and processing equipment;
- » They have a strong local presence in the town and are already linked to markets in Kasama through their input procurement system, since the major suppliers of seed and fertilizers have depots or representatives in Kasama town that provide inputs to them on the basis of commission with unsold stock returned to the depots in Kasama.

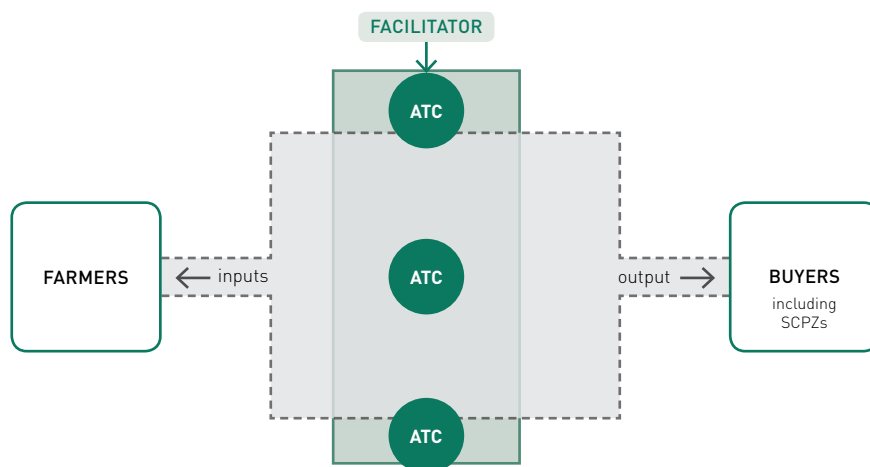
The ATCs will support the upgrading of this network to promote it as the preferred entry point for input suppliers and buyers to establish business relationships with farmers. Agrodealers will be able to increase their transactions by facilitating both the flow of inputs and the capturing of outputs

through the aggregation of the crops, using the same transportation system to reduce transaction costs. To increase their capacities, the ATC will encourage the leasing of existing cooperative warehouses to be managed by agrodealers, based on a mutual agreement under the supervision of the ATC management. They will be further supported to offer extended services in line with market requirements, including shelling services, moisture management and bagging. Using this existing network will reduce the initial need for investment and the associated risk.

Each ATC is designed to become part of a more global approach including the implementation of an SCPZ through linkages to the agro-processing hub, as described in the Introduction. The ATCs will focus only on the upstream part of the value chain (input supply, mechanization services to improve on-farm productivity) and the first link in the off-farm downstream segment (e.g. primary processing and aggregation). Other processors/offtakers, or the agro-processing hub once established under the SCPZ, will then continue with further value adding activities and distribution to final markets outlets.

FIGURE 4

Visual representation of the Zambia ATC for maize and soybean



Source: Authors' elaboration.

This network of satellite ATCs will be enabled and coordinated by a central facilitator whose role will be to oversee the provision of services to farmers and to establish connections with private traders or processors. The facilitator will also be in charge of implementing a phased approach towards progressive upgrading of the proposed services. As will be further discussed, the ATC initiative will be



initially implemented as a pilot project led by Musika, for three years. During this first phase, it will be managed with the goal of encouraging the commitment of service providers and establishing linkages between producers and buying companies. If it proves successful, a structured ecosystem will emerge, which in turn will attract more service providers and private actors. The ATC may then evolve towards becoming a dynamic cluster of companies dedicated to the maize and soybean value chains that could be easily linked to SCPZ initiatives, if operational within the province. The phased approach will be as shown in Table 2.

TABLE 2

| ATC SERVICE UPGRADING PROCESS | | | |
|-------------------------------|--|---|---|
| STAGES | ATC SERVICES TO FARMERS | PRIVATE COMPANIES' COMMITMENT | EXPECTED OUTCOMES |
| Reducing losses | <ul style="list-style-type: none"> » Close aggregation points » Shelling / Threshing service » Storage services: cleaning, moisture monitoring, airtight bagging » Transport service | <ul style="list-style-type: none"> » Investment in central storage capacities | <ul style="list-style-type: none"> » Reaching critical mass to reduce transportation costs » Delivering grains on time » Improving quality |
| Increasing yields | <ul style="list-style-type: none"> » Increased availability of inputs and technical advice » Financing tool to purchase inputs on credit | <ul style="list-style-type: none"> » Payment upon delivery » Negotiated remunerative prices | <ul style="list-style-type: none"> » Increasing yield » Increasing traded volume |
| Increasing plot size | <ul style="list-style-type: none"> » Mechanization – rental services for machinery or full service provision | <ul style="list-style-type: none"> » Price incentives for delivery of additional production/high quality outputs | <ul style="list-style-type: none"> » Increasing traded volume » Reducing production costs |
| Adding value | <ul style="list-style-type: none"> » Saving Service (initiating the next stage) | <ul style="list-style-type: none"> » Investment in local processing capacities | <ul style="list-style-type: none"> » Reduced cost for: <ul style="list-style-type: none"> » producing maize flour for the local market (mealie meal and stock feed) » producing soy cake for the local market (stockfeed) |

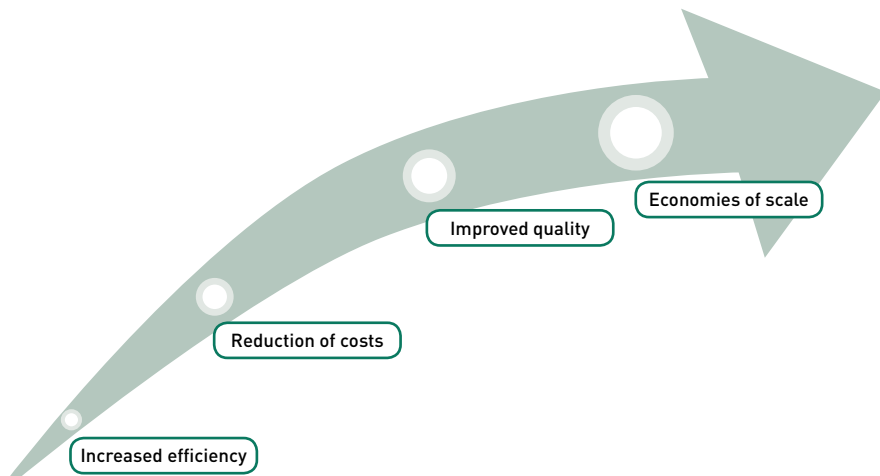
Source: Authors' elaboration.

The first step will be for the ATC to build trust between buyers and growers. The buyers are worried that they cannot find reliable producers to abide by their requirements in terms of quantity, quality or timeliness. The main concern for growers is that they are at a minimum, in search of partners who are able to pay cash upon delivery to match their cash needs. At the beginning, the ATC will focus on providing simple services to establish limited but solid partnerships based on what is of most interest for each. These partnerships will focus on achieving quick wins as a starting point for upgrading the business relationships through a cycle of coordinated co-investments towards increasing volumes, reducing losses and creating more value. The facilitator will have a crucial role to play in strengthening the linkages between producers and buyers via the ATC network. In the longer term, it is envisaged that outgrower and contract farming schemes be established with the support of the facilitator, and coordinated through the ATCs.

This step-by-step, cautious approach will lead to creating more value (see Figure 5) through: 1) Efficiency: reduction of losses, increases in yield and labour productivity, 2) Reduction of costs: lower input prices thanks to more competition and collective purchasing power, 3) Quality improvements, and 4) Economies of scale through increased volumes of trade. This, in turn, will enable better remunerative prices for farmers and increased investment capacities.

FIGURE 5

The value creation process over the course of the phased approach in the Zambia ATC



Source: Authors' elaboration.



Location and size

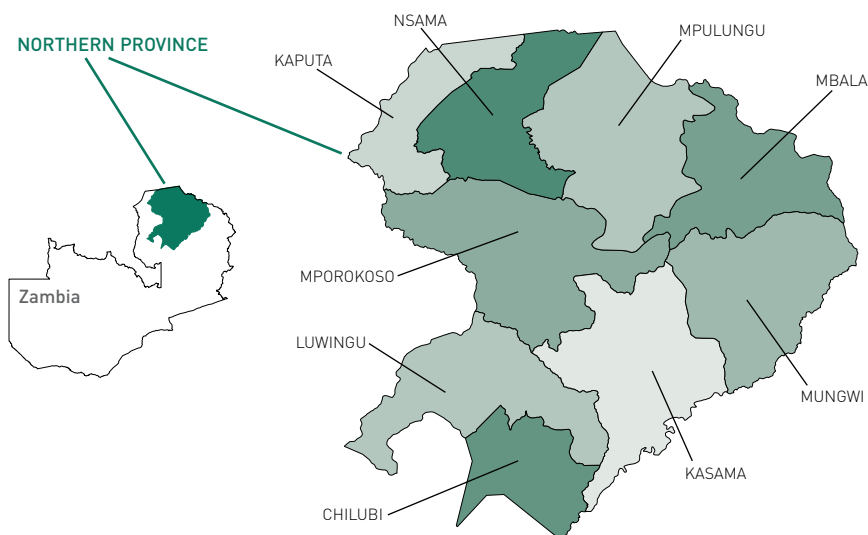
In selecting the location, priority is given to maize, which accounts for the greatest volume. The ATC will be implemented first around Kasama, before expanding further. Two districts will be initially targeted:

- 1] Kasama, as the third largest producing district and because of the proximity of the town,
- 2] Mungwi, as the second largest producing district, with supposedly the best yields in the province. Mungwi is also close to Kasama town.

The ATC network will also be rolled out, based on the existence of cooperative sheds to be operationalized by agrodealers.

FIGURE 6

Location of the Zambia ATC



Source: Authors' elaboration, customized by studio Bartoleschi.

As a first step, the ATC network will look at capturing only a part of the provincial capacity with the idea of concentrating efforts towards validating the model on a small scale. The total output at province level is estimated at 260 000 MT. Considering that AFGRI buys today in the range of 5 000 MT and is still expecting to source up to 10 000 MT, and the FRA is in the range of 60 000 MT, the ATC network will initially consider a total capacity of 20 000 MT per year from farmers, which is double that of the AFGRI expectation.

This is not too high for a pilot phase, and also large enough to attract private companies.

Kasama and Mungwi districts have potential capacities as follows:

- » Kasama: 12 000 Ha and 35 000 MT
- » Mungwi: 13 700 Ha and 48 000 MT

During fieldwork, it was observed that there are a number of existing sheds owned by farmer cooperatives in the Northern Province. The sheds were constructed by previous development projects to improve storage capacity, although it was found that most of these sheds are currently not being used. It is therefore proposed to include sheds owned by individual farmer cooperatives as part of the ATC storage infrastructure. This will reduce the investment costs for the ATCs.

The existing cooperative sheds are recorded in the two districts as follows:

- » Kasama: 33 sheds for a capacity of 9 800 MT,
- » Mungwi: 19 sheds for a capacity of 5 800 MT.

This will give a total of 52 sheds in the two districts with total capacity in the range of 15 000/16 000 MT which is in line with the 20 000 MT targeted, considering they will be operated on a rolling basis.

For 20 000 MT of production:

- » Based on an average individual production of 5 MT per producer, about 4 000 growers would be involved,
- » Based on an average yield of 3 t/ha, about 7 000 ha would be targeted.

Most of the cooperative warehouses have a capacity of 140 tonnes. If it is assumed each farmer will sell 5 tonnes of grain on average, then the warehouses can handle grain of about 28 producers at any one time.

For soybeans, the total output capacity at province level is in the range of 3 500 to 4 500 MT per year. Kasama and Mungwi districts are the two top producers in the province. The ATC network will aim to facilitate the storage and trade of 3 000 MT of soybean per year in the same districts, which is more than double the total actual volume traded today by Afgri and Seba Foods Limited put together.

Service mix

Inputs. An ATC will distribute inputs to growers as its first role, based on existing agrodealers that are already performing this activity. The ATC system will give them the opportunity to increase their sales through broader outreach to farmers and a larger scope of services. Developing a network of agrodealers and giving them access to greater storage capacities will also increase the availability of inputs in rural areas, beyond the FISP. The ATC will make sure to engage several



input companies so that the choice of products is given to farmers, sustaining the competition between them. The network of ATCs will be developed by carefully screening and selecting interested agrodealers across the targeted districts. In the event of the absence of an agrodealer in a growing area where a cooperative shed exists, the ATC would facilitate the installation of a new one.

Aggregation and storage services. The second main activity of the ATC will be aggregation and primary processing or conditioning of grain crops (maize and soybean). This will involve the following services:

- 1] grain cleaning, with a motorized cleaning machine, after shelling operations.
- 2] moisture monitoring: control of the moisture content of the grain before storage will ensure good quality and a longer shelf life. In maize for example, the standard is at around 12 percent.
- 3] proper bagging: the warehouse will use storage of the crops in bags rather than in bulk. This solution will enable easy identification of produce for delivery management based on an individual farmer basis. It will also assist in introducing farmers to the importance of quality control and traceability. The ATC will use hermetic storage bags (the patented Super Grain Bag for example) that provide airtight storage conditions and avoid the need for chemicals or fumigation to prevent grain losses from pests during storage. These bags will be reusable. As farmers need to rely on an external individual to commit to collective crop management, warehouses owned by the cooperatives in the targeted districts will be used by agrodealers and operate under one of the two models discussed above. At least initially, there will be no need to build more infrastructures for storage, although the existing structures may need to be refurbished. The ATC will be able to assist farmer cooperatives in managing a collective production system and delivering a clean and well-conditioned grain, abiding by the quality requirement of a formal buyer.

Equipment and mechanization. The ATC will be equipped with a shelling machine for maize. Manual shelling is slow and labour-intensive while the motorized shelling machine reduces drudgery and increase efficiency in farming operations:

- » Hand shelling usually produces about 8–15 kg/hour
- » Motorized sheller produces about 800–1 500 kg/hour

The high labour requirement and time delays for manual shelling mean that there is potential demand for a shelling service for a fee. The machine could also be used for cowpea, groundnuts and rice, which gives flexibility to ATCs to function outside of the maize season and reduces dependency on only one crop.

The ATC will also be equipped with a threshing machine for soybeans. The threshing machine could be used for groundnuts or ordinary beans as well, which would give flexibility to ATCs to function out of the soy season and reduces dependency on only one crop.

The mix of services offered to farmers could be tailored to specific growing areas, for maize or soy or a combination of both. The storage and cleaning services for both crops are the same, so the difference is related to the processing machines, for which three options will be available to ATCs regarding equipment purchase:

- » shelling machine only for maize,
- » threshing machine only for soy,
- » the two machines to increase flexibility and business base.

This will be decided upon consideration of the growing area and the capacities and profile of the agrodealers.

Each ATC will also have two-wheel tractors (single-axle tractors) that can be hired out for ploughing fields. Two-wheel tractors are smaller and run at lower cost, and are therefore more affordable. They are also better suited to ploughing smaller fields, which is the case for most of the smallholder farmers in the region. In addition, these tractors may be used with different attachments apart from ploughs, such as rippers for deeper soil action, or they may have planters attached to them to be used for sowing. Finally, two-wheel tractors can be used to empower youth where young local entrepreneurs can be given credit to purchase the tractors and they can work with the ATC to provide mechanization and tillage services to farmers. A tractor of 9 kW (12 HP) size can plough about 2 hectares in a day and it can be estimated that they will be busy for three months in the year.

Other supporting services

Transport Service

The enhancement of crop management at the ATC level will support a more rational system of aggregation towards reaching a critical mass to reduce transactional costs through the creation of economies of scale. The ATC will also facilitate a more structured transportation system to optimize transport costs between growing areas and a central depot. Young local entrepreneurs will be provided with three-wheel motorized pickups on credit to offer to farmers a transportation service between the field and the warehouse. These tricycles have loading capacities in the range of 1 to 2 tonnes (when average individual output is 5 tonnes), and are suitable for bumpy roads.

Savings Service

Access to finance is difficult. Farmers do not have access to loans for inputs. Only small-scale savings and credit clubs exist locally, which lend money to their members. But neither the available resources, nor the individual credit amount, are sufficient to match actual financing needs. It is envisaged that in the future, the ATC will be able to support farmers to engage in formal contracts with buyers and in so doing, provide guidance to producers for a better management of their income. Through its connection with the banks, the ATC will aim to facilitate a credit service for farmers based on the deposit of savings in a formal



bank account. This will be done over a long-term horizon, with enough time to constitute significant savings and to build trust with commercial banks. Later on, once the linkage to the market has proved effective, the connection with banks will then be leveraged to negotiate credit to finance seasonal inputs. It is proposed to engage the Citizens Economic Empowerment Commission (CEEC) as a partner in the ATC network, to provide training and advice in financial skills to the ATC beneficiaries.

Capacity building

As it leverages the agrodealer satellite network to reach farmers, the ATC system will provide intense assistance to communities by strengthening their skills and capacities across several areas, particularly in preparing them to manage business relationships with buyers. The delivery of these services will rely on existing local organizations and initiatives already involved in supporting professional organizations and private ventures, and will be incorporated into a strategic plan related to the process of linking communities to market (see Table 3).

TABLE 3

| CAPACITY BUILDING ACTIVITIES AND PROVIDERS, ZAMBIA ATC | | |
|--|---|--|
| SKILLS AND CAPACITY TYPES | NEEDS | POTENTIAL PROVIDERS |
| Business development services and management tailored to communities | Training sessions and mentoring programmes over the long term, on: collective governance, financial literacy, business and investment planning, trading and negotiation. BDS will also prepare communities to play an active role in the management of a collective organization. | Musika CEEC |
| Extension service | Spraying and fertilizer application, good agricultural practices, farm management. | Public extension agents already in place, partnerships with the public Zambian Agriculture Research Institute (ZARI) |
| | Access to innovations and technologies: broadcasting new findings from research: for example, new agricultural practices, natural resources management | |
| Access to information | Sharing market prices and seasonal agricultural planning advice via a mobile | Total Land Care and the marketing platform Lima Links |

Source: Authors' elaboration.

Ownership, management and institutional set-up

The sheds that have been identified in the Northern Province are currently owned by individual farmer cooperatives, although the majority is not being used for storage of rainfed crops. Two issues that will determine the success of this project are the ownership of the facilities and the management of the facilities. Two models of management are proposed for consideration: Model 1, where the ATC leases the warehouse from the cooperative for a fee, and Model 2, where the cooperative is a minor shareholder in the ATC and the warehouses are used for free, but the owners will earn dividends.

In Model 1, the farmers' cooperatives do not have the capacity to process, store or market their produce, and will therefore need to rely on a private sector operator (in this case the ATC) for the processing of their produce. Grain will be purchased by a major trader who will be responsible for payments. A tripartite agreement will be needed between the cooperative, the ATC and the trader. The management of the ATC will be carried out by the agrodealer selected to run the ATC, who will earn income from providing processing and storage services in addition to the existing input supply business. The agrodealers who are leasing the sheds will be responsible for the management of the facilities including daily operations and hiring of workers. The trader will use the ATC for aggregation and collection of the grain crop and pay an associated fee for these services. It is likely that most cooperatives will follow this model.

In Model 2, the agrodealer will do the processing as well as the marketing of the grain crop which will then be sold to the trader. This means that there needs to be a partnership agreement between the cooperative and the agrodealer and then a marketing agreement between the ATC and the trader. The partnership agreement will also need to state the management structure and will have to show how the ATC is managed and how the management costs will be met. It is likely that only a few cooperatives will have the capacity to go into joint partnerships with agrodealers.

The facilitator. The Northern Province Cooperative and Marketing Union (NPCMU) was potentially considered to play the role of facilitating the implementation of ATCs. Indeed, the Union is purported to be representative of hundreds of cooperative members and thus of the small producers at province level, representing farmers' interests. However, the NPCMU strategy is not clear regarding its role of providing services to its cooperative members. It appears that the NPCMU is now operating as a private trader, sourcing raw material from its members but with little benefit spilling over to them. In addition, the NPCMU is heavily in debt and is now engaged in a dispute with the national Head Office of ZCF over the role and responsibility of each entity. Consequently, it is felt that the NPCMU has become unreliable and is therefore no longer considered a suitable candidate as implementing agent to support the introduction of ATCs.



As previously discussed, Musika is the public-private development organization that has been implementing projects to favour business linkages between farmers and buyers. It already provides support to input suppliers so that they can go further in reaching out to farmers and increase the availability of inputs in distant rural areas. Musika is also collaborating with a few grain traders to structure their aggregation system. The company, therefore, has good experience in promoting a business approach as well as in understanding the needs of both producers and private sector actors. Given its reputation, connections and experience of the local ecosystem, Musika is thus considered a suitable partner to take on the role of facilitator for the ATC.

As the facilitator of the ATC system, Musika's main objectives related to each partner will be as indicated in Table 4.

TABLE 4

| MUSIKA ROLES VIS-À-VIS OTHER STAKEHOLDERS, ZAMBIA ATC | | |
|---|--|--|
| PARTNERS | MAIN OBJECTIVES | INPUTS AND ACTIVITIES |
| Agrodealers | Helping them to become aggregating agents and service providers, making sure the system is sustainable | » Providing the equipment and links to existing infrastructure » Training |
| Producers | Supporting them towards upgrading their production system capacity | » Training » Coaching |
| Agro-companies | Advocating the benefits of the ATC system to private companies, attracting them to develop tripartite partnerships with the ATCs networks and producer cooperatives that facilitate efficient production and purchasing flows, providing independent facilitation and overview of the terms of the deal between the partners, to ensure the benefits are equally shared. | » Advocating and promotion |

Source: Authors' elaboration.

More specifically, Musika's role will encompass:

» Implementation

Musika will be responsible for the implementation of the ATC project, particularly in taking the lead in developing fair and transparent selection criteria, identifying agrodealers and cooperative beneficiaries, including the identification of cooperative warehouses where grain will be aggregated and stored. Musika will guide the process of promoting the scheme to agrodealers and preparing the leasing of partnership agreements for the warehouses owned by the farmers' cooperatives.

» **Facilitation through connections**

Musika will facilitate the linkages between the growers and buyers/traders by promoting communication and the information flow between the two groups, in partnership with the ATC network of entrepreneurs. Growers will be provided with information on standards and qualities required by traders, and the traders will receive information on production capabilities and requirements for immediate payments at fair market value for the crop.

» **Planning and coaching**

In order to meet market targets, Musika will provide advice on planning cropping programmes and delivery schedules so that market orders are met in terms of timeliness and standards. The interaction between agrodealers operating the ATCs and the farmers will be mentored by Musika so that disputes can be avoided or resolved quickly. The phased development of the ATC project will be guided by Musika who will ensure that the actors are trained and prepared for each phase so that there is full understanding of the roles and responsibilities as well as outcomes.

Musika will receive funding for three years to achieve these goals. After that time, the minimum conditions for a proper exit will need to be developed. These could include indicators such as:

- » Formal commitment of (X no. of) agrodealers to continue operating ATC facilities and services in a fair and transparent manner, committed to creating shared value with farmers;
- » (X no. of) Professionally managed and financially stable farmer cooperatives capable of planning production cycles, coordinating members and paying fees for ATC services;
- » Established connection between cooperatives and ATCs with private companies (including those involved in the agro-processing hub), who commit to source through the ATC network, ideally via contract farming/off-taker agreements (target no. of agreements);
- » Plan for scaling up/Phase 2 in place, including expansion of no. of farmers involved;
- » Emergence of a value chain governing body or a PPP platform including the main VC actors, especially the traders that could be supported and coordinated by the Ministry of Agriculture.

Other stakeholders and their roles

The private sector

The main private sector partners in the project will be the agrodealers. They will be primarily supported to expand the provision of agricultural inputs such as seed and fertilizers that are used for crop production. Through fostering availability of inputs in rural areas, the ATC system will look at increasing the market size and boosting competition among agrochemical companies in the province, with



the aim of seeing prices lowering. Beyond their present distribution activity, agrodealers will be incentivized to become primary processors and aggregators of the grain crop. They will manage the aggregation centres or warehouses and make sure all the grain received is properly recorded and stored. The centres will also provide primary processing and storage services including grain cleaning and shelling (or threshing services for soybean) for a fee, which will be an additional income for them. The potential for additional income generated through diversified (user-pays) services will be instrumental in engaging the agrodealers in the scheme. The grain traders (or agro-processing companies located in the agro-processing hub of any planned SCPZs in the future) will be responsible for buying the crop from the farmers through the ATC and finding markets for the grain. They will also be responsible for ensuring funds are available for paying the farmers as soon as the grain is delivered. The grain traders will need to make agreements between the cooperatives and the ATC clearly stating that the traders will only purchase grain that has been cleaned and stored by the ATC.

The public sector and other supporting organizations

The CEEC will be approached to provide financing for capital equipment used in the ATC such as maize shellers, soy threshers or grain cleaning machines, that will be used by the agrodealers as part of services provided to growers, and also to the young entrepreneurs for buying the tricycles and two-wheel tractors on credit. Since the growers will be paying a fee for these services, the agrodealers will be able to pay back the loan for the equipment. For selection of the young entrepreneurs to operate the mechanization and transportation services, there will be an open call for applications to access the funds (which is a normal CEEC procedure), and the most promising proposals will be selected. The CEEC would be able as well to offer financing solutions to local entrepreneurs willing to invest in small-scale processing capacities for the production of soy cake or oil from soybean for the local market. The CEEC will also play a role as mentor and coach for agrodealers to support the management of their extended activities. This can be done collaboratively with Musika but the mentoring will provide additional support to agrodealers involved in the ATC project. This will help to guarantee the reimbursement of the loan. Finally, the CEEC will provide business plan advisory services for local entrepreneurs in the maize and soybean sub-sectors, with the idea of promoting the creation of new service companies that will improve the global business environment and spur the emergence of a local cluster around the two value chains. The CEEC may also finance them using the government investment fund already up and running. The ATC initiative will be an opportunity for Musika and CEEC to better align their activities on a global structured approach, and to concentrate their resources towards a common goal.

The Ministry of Agriculture has extensive presence on the ground with staff in the province, district, ward and camp level (smallest administrative division),

and they are active in supporting and advising farmers, mainly through farmer groups. It is proposed to have Ministry staff involved at the value chain coordinating level and this will be important in ensuring the exit strategy is successful.

Non-governmental organizations (NGOs) that could be useful partners include Total Land Care (TLC) that has experience in developing the capacity of smallholder farmers to improve their marketing skills. The NGO will be involved in the capacity building component of the ATC.

A coordinating committee should be set up comprising of MoA representatives at the appropriate levels, the facilitator, trader representative, agrodealer representative, CEEC representative, farmer representative (through their cooperatives), NGO representatives, and representatives from FAO and the Bank, who will help guide the development of the ATCs and ensure they receive the support of government departments and policies. A higher level steering committee may also be set up with representatives at provincial level to oversee and guide the implementation of the project and to act as a dispute resolution committee when needed.

Partnerships that could also be considered for collaboration under the ATC project include the International Fund for Agricultural Development (IFAD) that has the E-SAPP and S3P projects, active in the Northern Province. These projects are being implemented by the MoA and aim at improving the production and marketing of agricultural produce by smallholders.

Operating costs

Assumptions for maize:

- » Warehouse stores 140 MT/2 800 bags of 50 kg, with value of Zambian kwacha (ZMW) 168 000 based on the cost of maize at farm level in 2017, which was ZMW 60 for a 50 kg bag.
- » Assuming harvesting period of 4 months, and 140 MT aggregated for each ATC.

Assumptions for soybean:

- » Over a 3-month season, $3\ 000/52 = 57.7$ tonnes are sourced at each ATC level, which is 1 154 bags of 50 kg, with value of ZMW 184 640 based on the cost of soybean at farm level in 2017, which was ZMW 160 for a 50 kg bag.

Aggregation and storage services. The main operating costs are likely to be labour for handling, cleaning and guarding the premises. Labour costs are set at ZMW 800 per person per month and a total need for 8 man months.



Total operating costs:

- » Labour cost is at ZMW 6 400 for 2 800 bags, so labour cost is ZMW 2.3 per bag,
- » Rental fees are flat and equal 1 percent of the value of the grain when the shed is full, which gives a total of ZMW 1 680.00 per month in this case, so leasing cost for one season of 4 months is $6\,720/2\,800 = \text{ZMW } 2.4$ per bag.
- » Depreciation and overheads costs are set at ZMW 0.1 per bag.

This leads to a total operating cost for warehouse at ZMW 4 per bag or ZMW 80 per tonne. Total estimated costs for grain warehouse are reported in Table 5.

TABLE 5

| ESTIMATED OPERATING COSTS FOR GRAIN WAREHOUSE IN ZAMBIA | | | |
|---|--------------|----------------------|-------------------------------|
| COST TYPES | COST PER BAG | COST PER TONNE [ZMW] | COST PER SEASON [140 t] [ZMW] |
| Labour | 2.3 | 68 | 9 520 |
| Leasing Costs | 2.4 | 72 | 10 080 |
| Administration Costs | 0.1 | 2 | 280 |
| Total Operating costs | 4.8 | 142 | 19 880 |

Source: Authors' elaboration.

For a total of 140 MT/ZMW 168 000 of grain stored over the maize season, the storage operating costs would amount to **ZMW 19 880 or 11.8 percent**.

Grain Cleaning Machine. Processing rate: a grain cleaning machine has capacities in the range of 1 000 – 3 000 kg/hour. Assuming a grain cleaning machine processes 2 000 kg/hour for 4 hours a day, the quantity processed per day is 8 000 kg per day or 160 bags.

Operating costs:

- » Fuel is estimated at ZMW 30 per day,
- » Labour is estimated at ZMW 33 per day for one operator, based on a salary at ZMW 800 per month,
- » Maintenance is estimated at ZMW 130 per day during the harvesting season, based on an estimation at ZMW 800 per month.

This gives a total operating cost of ZMW 193 per day or **ZMW 1.21 per bag**.

For a total of 140 MT / ZMW 168 000 of grain stored, the cleaning operating costs would amount to **ZMW 3 388 or 2 percent**.

Shelling service for maize. Processing rate: a shelling machine has capacities in the range of 800–1500 kg/hour. Assuming it processes 1 150 kg/hour for 4 hours, the quantity processed per day is 4 600 kg per day or 92 bags.

Operating costs:

- » Fuel is estimated at ZMW 50 per day,
- » Labour is estimated at ZMW 33 per day for one operator, based on a salary at ZMW 800 per month,
- » Maintenance is estimated at ZMW 130 per day, based on an estimation at ZMW 800 per month.

This gives a total operating cost of ZMW 213 per day or **ZMW 1.9 per bag**.

For a total of 140 MT/ZMW 168 000 of grain stored, the shelling operating costs would amount to **ZMW 5 320 or 3.1 percent**. If only one operator were employed for both the cleaning and the shelling machines, cost of labour would be half for each. Revenue generated if shelling is an extra service available on demand, out of a specific contract order:

Shelling fees: assuming ZMW 4 per 50 kg bag, paid by farmers.

At 4 600 kgs per day and ZMW 4 per bag: $92 \text{ bags} \times \text{ZMW } 4 = \text{ZMW } 368$ per day generated. If the sheller works for $280/6.9 = 41$ days during the harvesting season then the revenue generated is:

$41 \times \text{ZMW } 368 = \text{ZMW } 15\,088$.

Fuel cost: $41 \times \text{ZMW } 50 \text{ per day} = \text{ZMW } 2\,050$.

Labour is ZMW 1 353 for 41 days and a provision of ZMW 4 000 has been made for maintenance.

Total operating costs are therefore ZMW 10 750, resulting in a net income of **ZMW 7 403**.

Soybean thresher for soy. Processing rate: a thresher has capacities in the range of 500–800 kg/hour.

Assuming it processes 650 kg/hour for 4 hours, the quantity processed per day is 2 600 kg per day or 52 bags of 50 kg.

Operating costs:

- » Fuel is estimated at ZMW 33 per day,
- » Labour is estimated at ZMW 33 per day for one operator, based on a salary at ZMW 800 per month,
- » If the soy season runs over three months, maintenance is estimated at ZMW 2 400, based on an estimation at ZMW 800 per month; for processing 57.7 tonnes on the same period, unit cost would be $2\,400/1\,154 \text{ bags} = \text{ZMW } 2.1$ per bag, or 109.2 per day.

This gives a total operating cost of ZMW 175.2 per day or **ZMW 3.4 per bag**.

For a total of 57.7 MT/ZMW 184 640 of grain stored, the threshing operating costs would amount to **ZMW 3 924 or 2.1 percent**.



Cost and revenue analysis

Maize. The potential revenue for the ATC is presented starting with Model 1, where the ATC leases the warehouse. Based on a purchasing price at ZMW 60 for one 50 kg bag, the total operating costs of 20 000 MT of clean maize grains packed in bags over one season, and ready to be delivered to traders, would be as showed in Table 6 (transport cost excluded):

TABLE 6

| ESTIMATED OPERATING COSTS, MODEL 1 MAIZE ATC, ZAMBIA | | | |
|--|-------------------------|---------------------------|-----------------------------|
| COST TYPES | UNIT COST PER BAG (ZMW) | UNIT COST PER TONNE (ZMW) | TOTAL COST (20 000 T) (ZMW) |
| Aggregation and storage service costs | 4.8 | 96 00 | 1 920 000 |
| Cleaning service | 1.21 | 24 20 | 484 000 |
| Shelling service | 1.9 | 38 00 | 760 000 |
| | 7.91 | 158 20 | 3 164 000 |

Source: Authors' elaboration.

In this case, the aggregation and conditioning cost to purchasing cost ratio would be at 13.2 percent. Total cash needed would be ZMW 27.16 million, or 13.58 million in two cycles which is about USD 1.5 million. In this model (Model1), revenues are generated by fees paid for the services by farmers. The ATC acts merely as a service provider facilitating collective order management; it has no voice in the fixing of the purchasing price between traders and farmers and is not involved in the deal management. The cash would then be provided by the buyer.

The cost and revenue scenario for the second model (Model 2) for the management of the ATC is presented below. Assuming the warehouse could be let for free to the ATC who will in return provide premises management and maintenance, and free storage to the cooperative members, only conditioning (handling and bagging), cleaning and shelling services will be operated for a fee. Table 7 shows what a full 140 MT shed of maize grain to manage would cost.

TABLE 7

| ESTIMATED OPERATING COSTS, MODEL 2 MAIZE ATC, ZAMBIA | | |
|--|-------------------------|--------------------------------------|
| COST TYPES | UNIT COST PER BAG (ZMW) | TOTAL COST FOR ONE ATC (140 t) (ZMW) |
| Conditioning service | 2.4 | 6 720 |
| Cleaning service | 1.21 | 3 388 |
| Shelling service | 1.9 | 5 320 |
| | 5.51 | 15 428 |

Source: Authors' elaboration.

Revenue from the same full 140 MT shed of maize would be as shown in Table 8.

TABLE 8

| ESTIMATED REVENUES, MODEL 2 MAIZE ATC, ZAMBIA | | |
|---|------------------------|---------------------------------|
| FEE TYPES | UNIT FEE PER BAG (ZMW) | TOTAL REVENUE FOR ONE ATC (ZMW) |
| Conditioning service | 3.50 | 9 800 |
| Cleaning service | 3.00 | 8 400 |
| Shelling service | 4.00 | 11 200 |
| | 10.5 | 29 400 |

Source: Authors' elaboration.

Apart from its activity as input distributor, one ATC would thus be able to generate almost **ZMW 14 000** of profit on one cycle of maize, all other costs being equal.

Based on an average production of 3 MT per hectare, 46 growers will be involved in one deal of 140 MT. From a farmer perspective, each individual would have to pay ZMW 1 050 service fees for 100 bags, or ZMW 10.5 for one bag, which could be sold, for example, at ZMW 75 as a premium price for good quality. The service cost to revenue ratio would be at 14 percent in this case. Without any storage service, the grower would have been able to sell his bag at ZMW 60 only and with 10 percent minimum of loss (see Table 9).

TABLE 9

| COMPARISON OF FARMERS' EARNINGS WITH OR WITHOUT ATC STORAGE SERVICES, MAIZE ATC, ZAMBIA | | | | |
|---|-----------------------------|----------------------------|---------------------------|----------------|
| | REVENUE FROM 100 BAGS (ZMW) | COST OF SERVICE (ZMW) | LOSSES | TOTAL EARNINGS |
| With storage service | $100 \times 80 = 7\,500$ | $10.5 \times 100 = 1\,050$ | 0 | 6 450 |
| Without storage service | $100 \times 60 = 6\,000$ | 0 | $6\,000 \times 0.1 = 600$ | 5 400 |

Source: Authors' elaboration.

In this specific case, all other costs being equal, the quality storage services would allow a 19.5 percent increase of income.



Soybean. Based on a purchase price at ZMW 160 for one 50 kg bag, the total operating costs of 3 000 MT of clean soybean grains packed in bags over one season, and ready to be delivered to traders would be as showed in Table 10 (transport cost excluded).

TABLE 10

| ESTIMATED OPERATING COSTS, MODEL 1 SOYBEAN ATC, ZAMBIA | | | |
|---|--------------------------------|----------------------------------|-----------------------------------|
| COST TYPES | UNIT COST PER BAG (ZMW) | UNIT COST PER TONNE (ZMW) | TOTAL COST (3 000 t) (ZMW) |
| Aggregation and storage service costs | 4.8 | 96 00 | 240 000 |
| Cleaning service | 1.21 | 24 20 | 85 200 |
| Threshing service | 3.4 | 68 00 | 222 000 |
| | 9.41 | 188 20 | 564 600 |

Source: Authors' elaboration.

In this case, the aggregation and conditioning cost to purchasing cost ratio would be at 5.9 percent. The total need of cash would be ZMW 10.16 million, or 5.1 million in two cycles which is about USD 535 000. Assuming each ATC would collect the same amount of soybean over the course of the season they will aggregate 57.7 tonnes each.

In the case of Model 2, where the cooperative is a shareholder and assuming there are no leasing costs for the warehouse, the costs of handling and processing 57.7 tonnes of soybean and the revenues are as indicated in Table 11.

TABLE 11

| ESTIMATED OPERATING COSTS, MODEL 2 SOYBEAN ATC, ZAMBIA | | |
|---|--------------------------|--|
| COST TYPES ZMW | UNIT COST PER BAG | TOTAL COST FOR ONE ATC (57.7 t) |
| Conditioning service | 2.4 | 2 770 |
| Cleaning service | 1.21 | 1 396 |
| Threshing service | 3.4 | 3 924 |
| | 7.32 | 8 090 |

Source: Authors' elaboration.

Revenue from the handling of 57.7 tonnes of soybean would be as showed in Table 12 (unitary fees are assumed).

TABLE 12

| ESTIMATED REVENUES, MODEL 2 SOYBEAN ATC, ZAMBIA | | |
|---|------------------------|---------------------------------|
| FEE TYPES | UNIT FEE PER BAG (ZMW) | TOTAL REVENUE FOR ONE ATC (ZMW) |
| Conditioning service | 3.00 | 3 462 |
| Cleaning service | 3.00 | 3 462 |
| Threshing service | 7.00 | 8 078 |
| | 13.00 | 15 000 |

Source: Authors' elaboration.

In this case, the soybean processing activities would generate an extra income of ZMW 6 550 of profit, all other costs being equal.

Tillage and transportation services. Mechanization services will include tillage using two-wheel tractors and transportation using motorized tricycle pickups.

The operating costs for the tricycle pickups include:

- » Fuel: 10l per day to transport 15 tonnes or 300 bags, generating a cost of ZMW 0.46 per bag,
- » Maintenance: ZMW 10 per day, or ZMW 0.034 per bag.

Total operating cost: **ZMW 0.5 per bag**. At a service fee of ZMW 1.5 per bag, the profit is ZMW 1 per bag. For transporting 20 000 t in one season:

400 000 bags X ZMW 1 per bag = ZMW 400 000 profit.

400 000/26 = ZMW 15 385 earned by one entrepreneur, or USD 1 620.

The tricycle pickup might thus be paid back in less than two years; therefore, the minimum commitment of a young entrepreneur selected by the CEEC to receive funding for this business model would need to be at least two years.

Investment needs

Equipment. As no new storage facility will have to be built, investment need only concern the equipment for warehouse operations and service delivery. However, there may be some refurbishment needed for the warehouses such as doors or replacing missing roofing sheets. Assuming the warehouses are not connected to electricity, only fuel-powered machines are used (see Table 13). A more detailed description of infrastructure and equipment requirements can be found in Annex 2 and 3.



TABLE 13

| COSTS FOR EQUIPMENT AND MAINTENANCE ZAMBIA, ATC | | | |
|---|---|------------------------------|------------------------------|
| ITEM | SPECIFICATIONS | COST (USD) | QUANTITY REQUIRED |
| Costs for equipping one warehouse | | | |
| Refurbishment or repairs to building | To replace broken doors, roofing sheets, plastering | 2 000 | |
| Moisture meter | For use in wide range of grain crops » Range 6–40% moisture content » Portable with replaceable batteries | 400 each | One for each ATC warehouse |
| Trolley scale | Scale for weighing grain in sacks » 10–250 kg range | 1 000 each | One for each ATC warehouse |
| Reusable super grain-bags | Multi-layer polyethylene storage bags, hermetic storage | 1.50, and total of USD 4 500 | 3 000 for each ATC warehouse |
| Pallets | To stack the bags away from the floor | 4.00, and total of USD 120 | 30 for each ATC warehouse |
| Machines | | | |
| Grain cleaning machine | Grain Cleaner with oscillating action and aspirator » 3.5–5 kW » To be used for maize, cowpea, groundnuts and rice » 2.5 to 3.0 tonnes/hour capacity » To be supplied with spare sieves | 3 500 | One for each ATC warehouse |
| Maize sheller – motorized | » 2.2 kW/7.5 HP motor » 800–1 500 kg/hour | 1 500–2 500 each | One for each ATC warehouse |
| Soy thresher – motorized | 3 kW/6 HP motor, 500– 800 kg/hour | 800–1 500 | One for each ATC warehouse |

Source: Authors' elaboration.

- » The total cost to equip one **MAIZE** warehouse is about **USD 13 500** or ZMW 128 250.
- » The total cost to equip one **SOY** warehouse is about **USD 12 600** or ZMW 119 700.
- » The total cost to equip one **MAIZE+SOY** warehouse is about **USD 14 650** or ZMW 139 175.
- » For the 52 ATC satellites, the total investment needed will amount to **USD 702 000** or ZMW 6.7 million if they are **equipped for maize processing only**.

- » For the 52 ATC satellites, the total investment need will amount to **USD 762 000** or ZMW 7.2 million if they are **equipped for maize+soy processing**.

It is proposed, however, to adopt a phased approach to the introduction of the ATCs: in the first year only 15 ATCs will be initiated and set up, while 20 will be introduced in year 2, and 17 in year 3.

Mechanization. The mechanization equipment will include two-wheel tractors for land tillage services and the motorized tricycle pickup for transportation services. Costs are described in Table 14.

TABLE 14

| COSTS OF MECHANIZATION, ZAMBIA ATC | | | |
|------------------------------------|--|------------|-------------------|
| ITEM | SPECIFICATIONS | COST (USD) | QUANTITY REQUIRED |
| Two-wheel tractor | 9 kW/12 HP tractor with attachments | 3 000 | 26 |
| Motorized tricycle pickup | <ul style="list-style-type: none"> » 800–1 000 kg load capacity for a 150–175 cc engine » 2 000 kg for a 250 cc engine | 2 500 each | 26 |

Source: Authors' elaboration.

Tillage services can be estimated as follows: the two-wheel tractor works at a rate of 2 hectares in a day but costs per hectare are estimated at:

- » Fuel costs 6 litres per hectare, at 1.24 per litre = 7.44
- » Labour is estimated at ZMW 33 per day or 3.33 per day or 1.72 per hectare
- » Maintenance is estimated at 1.72 per hectare

Total cost per hectare is **10.88**

Leasing of the tractor is set at 22 per hectare. (This is comparable to current costs of ZMW 800 per hectare or 82.50 that farmers are paying for hiring manual labour).

Monthly work rate = 48 hectares and for three months = 144 hectares.

Income from 3 months $144 \times 22 = 3\,168$.

Costs in three months $144 \times 10.88 = 1\,566.72$.

Earnings = 1 601.28.

This means that a two wheel tractor that costs 3 000 can be paid for in about two years. It is proposed to purchase 26 two-wheel tractors since each tractor can adequately cover two ATCs. For 26 two-wheel tractors **USD 78 000** is needed, or ZMW 744 120. Considering that collecting 140 t from 28 producers would require in average 85 loadings over 10 days, the ATC would provide tricycles based on 1 vehicle for 2 aggregating centres, or a total 26 vehicles. For 26 tricycle pickups: about **USD 65 000** is needed, or ZMW 620 000.



Working capital needed. The only requirement concerns the fuel to operate machinery:

- » For the **cleaning machine**: consumption of 4.5 l for processing 12 tonnes.
For 20 000 tonnes of maize: $20\ 000/12 \times 4.5 \times \text{ZMW } 12/\text{l} = \text{ZMW } 90\ 000$. For 3 000 tonnes of soybean: $3\ 000/12 \times 4.5 \times \text{ZMW } 12/\text{l} = \text{ZMW } 13\ 500$
- » For the **shelling machines**: consumption of 6.5 l for processing 6.9 tonnes.
For 20 000 tonnes of maize: $20\ 000/6.9 \times 6.5 \times \text{ZMW } 12/\text{l} = \text{ZMW } 226\ 100$
- » For the **threshing machines**: consumption of 4.5 l for processing 3.9 tonnes.
For 3 000 tonnes of soybean: $3\ 000/3.9 \times 4.5 \times \text{ZMW } 12/\text{l} = \text{ZMW } 41\ 500$

Total working Capital need, assuming operations in two cycles: ZMW 185 500 or USD 19 500. One option would be to consider financing only the needs for half a season, to reduce the investment costs.

Funding for the ATC facilitator.

a) Staff

Musika already has its headquarters in Kasama town, with a management and administrative team in place. For the ATC initiative, it would need extra staff to:

- 1] Overview of ATC functioning and development, including training of beneficiaries and coaching cooperatives on collective governance, investment planning and finance management. Assumption is that one agent will overview 10 satellites;
- 2] Promoting and advocating the ATC approach with private companies, including improving Musika market intelligence.

Musika will receive funding for a period of three years, in order to pay for extra staff, as shown in Table 15.

TABLE 15

| COSTS OF MUSIKA EXTRA STAFF, ZAMBIA ATC | | | | |
|---|--------|--|-------------------------------------|--------------------------------|
| | NUMBER | SALARY COST PER MONTH FOR ONE INDIVIDUAL (ZMW) | TOTAL UNIT ANNUAL SALARY COST (ZMW) | TOTAL ANNUAL SALARY COST (ZMW) |
| Overseeing agent | 5 | 3 000 | 36 000 | 180 000 |
| Promotion agent | 2 | 3 000 | 36 000 | 72 000 |
| | | | | 252 000 |

Source: Authors' elaboration.

The total cost for the extra staff for three years is ZMW 756 000, or **USD 80 000**. The Swedish International Development Cooperation Agency (SIDA) is the major funder for Musika activities at present. A partnership may be established between them and the ATC network to build a balanced funding scheme based on respective goals.

b) Equipment

Assumptions are as follows:

- 1] Vehicles - Motorbikes: 7 motorbikes are provided for the overseeing agents: $45\,000 \times 7 = \text{ZMW } 315\,000$, with fuel allowance of ZMW 50 000.
- 2] Office equipment: an allocation of ZMW 100 000 is provided for improving Musika office settings.

Total allocated for equipment = ZMW 465 000 or USD 47 938.

Capacity Building costs. Capacity building costs are listed in Table 16.

TABLE 16

| CAPACITY BUILDING COSTS, ZAMBIA ATC | | |
|--|---|---------------|
| TRAINING TYPE | DESCRIPTION | AMOUNT (USD) |
| 1. Management training: » Financial literacy » Organizational management » Marketing skills » Preparation business plan | 3 training sessions in 2 districts = 6 trainings every year 52 cooperatives send 4 representatives each = 208 participants trained | 17 040 |
| 2. Agrotechnology training » Good Agropractices, including use of fertilizers and chemicals » Homestead management » Quality and Standards measurements and control | » Trainer fees: 100 each session = 600 » USD 10 per trainee for food and refreshments: $10 \times 208 = \text{USD } 2\,080$ » Training materials USD 500 per session: $500 \times 6 = \text{USD } 3\,000$ | 17 040 |
| 3. Access to information | 3 training session in 2 districts = 6 trainings in year 1 52 cooperatives send 2 representatives each = 104 participants trained » Trainer fees: USD 100 each session = USD 600 » USD 10 per trainee for food and refreshments: $10 \times 208 = \text{USD } 2\,080$ » Training materials USD 500 per session: $500 \times 6 = \text{USD } 3\,000$ Mentoring: Each cooperative: 1 day per month during 6 months, every year $52 \times 6 \times 3 = 936$ days » Mentor: 42 months x USD 300 | 12 600 |
| Total | | 46 680 |

Source: Authors' elaboration.



Total funding needs. Given the above estimation, total funding needs are indicated in Table 17.

TABLE 17

| TOTAL FUNDING NEEDS, ZAMBIA ATC | | | | |
|----------------------------------|--------------|--------------|--------------|------------------|
| BUDGETS | YEAR 1 (USD) | YEAR 2 (USD) | YEAR 3 (USD) | TOTAL (USD) |
| Equipment (maize+soy processing) | 219 750 | 293 000 | 249 050 | 761 800 |
| Mechanization | 38 500 | 55 000 | 49 500 | 143 000 |
| Working capital | 6 500 | 6 500 | 6 500 | 19 500 |
| Facilitator extra staff | 26 667 | 26 667 | 26 667 | 80 000 |
| Facilitator equipment | 38 421 | | | 38 421 |
| Building capacities | 15 560 | 15 560 | 15 560 | 46 680 |
| Total investment needs | | | | 1 089 401 |

Source: Authors' elaboration.

In terms of value created, the analysis showed a potential to generate more than ZMW 2.73 million in profits over one season for 52 ATCs, or more than USD 287 000, which accounts for almost 30 percent of the total investment.

For the funding model, different options should be considered with a mix of loan and grant, playing out on the different factors and assumptions. This example shows that the equipment component of this model of ATC would potentially be able to be financed on a public loan with a perspective of reimbursement in three years, which coincide with the initial duration of the implementation phase.

Impact

Throughout the launching and development of the ATC, achievements and performance will be evaluated and monitored through the use of indicators. A comprehensive logical framework will be proposed, which will track at least the following outcomes:

- » Reduced losses;
- » Improved yields and quality;
- » Volume traded;
- » Increased market linkages as measured by formal contractual arrangements;
- » Increased revenues for farmers;
- » Extent of inclusion of smallholders, youth and women;
- » Employment creation.

Risks

The success of the project could be affected by several issues.

The first issue worth mentioning is that the harvest season of maize and soybean takes a maximum of 6 months. This means that the ATC will need to compensate the lack of business activities for these crops during the rest of the year, in order to remain profitable. It will be left to the liability of the agrodealer to manage activities throughout the year. Possibly, if conditions allow, the ATC could be used by farmers to store their produce on a longer term with the aim of benefitting from higher prices during the low season. But this would raise the issue of cash availability for farmers in need.

Agroclimatic conditions usually affect Zambia's crop production and in years of very good rainfall there will be high production country-wide resulting in lower maize prices. This may be a problem if no alternative markets exist such as the export markets that can absorb the extra volumes produced. The opposite may happen with poor rainfall seasons that result in lower volumes and higher prices. This situation may bring more buyers into the market and cause strains on the buyer-seller relationships, with the risk of side-selling. Other agroclimatic issues that may affect the project include pest and disease outbreaks that may affect productivity. A large-scale pest or disease outbreak requires a rapid response from farmers and from the authorities but it usually takes time to mobilize funds for control and this may affect the output. The most recent case was the fall army worm invasion on maize, for which an effective pesticide is still needed. In just two years, it has colonized three-quarters of Africa and it is now present in the Northern Province of Zambia. It is potentially devastating.

Socio-political factors may also affect the project. If the government – through the FRA or the FISP project – makes changes to current policies, farmers' decisions to grow and market the crops will be affected. Previous decisions by the government to ban exports of maize, for example, have affected the viability of private sector exports and limited their activity in this sector.

The approach taken for the initial phase of the ATC is to allow involvement on the part of a limited number of farmers but it is possible that the subsequent demand to be part of the scheme exceeds the availability of facilities, and this may cause negative sentiments within the community. Where the storage shed is being leased it is important to make clear that the lease agreements should be respected, as there may be a danger that the cooperative members want to take over the activity if it is seen to be very successful, and this may well ruin future business relationships.



Where the ATC is run as a partnership between the agrodealer and the cooperative, there needs to be good understanding about the expected profitability of the venture; otherwise there may be unrealistic expectations by the members that may lead to a breakdown of the relationship. There is also the risk of non-members of the cooperative using the facility (such as neighbours, other family members) without paying for the services, and this may reduce the viability of the scheme.

The farmers are currently organized into associations and cooperatives and this is very useful as a means of reaching large numbers of farmers. Capacity building activities will be provided through these groups and not all farmers will be direct beneficiaries of the training activities. It is important, therefore, that the social cohesion of the groups be well maintained and developed, otherwise there will be the risk of a breakdown.

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SECTION 2

ATC for cassava in Zambia, Northern Province

1 » OVERVIEW OF CASSAVA VALUE CHAIN

Market potential

- » Most cassava produced is for domestic consumption and only 7 percent is traded, usually in the form of fresh tubers and dried chips. Current use includes mainly flour and starch for diverse industrial applications but volumes are small.
- » Breweries and mining are the most dynamic potential markets for commercial cassava at the national level. Mining companies at the moment are not able to source the global volume of starch of 9 000 MT annually that they currently have to import. Breweries may need up to 3 000 MT annually which will be purchased locally.
- » South Africa is the main importer of cassava chips for industrial use and the main exporter of processed cassava products in terms of value. Regionally, the largest producer of cassava is the Congo. However, the country is also a major importer in terms of value as cassava is the staple crop. Namibia and Botswana are also importers of cassava chips and pellets. At the moment, only a very small proportion of Zambia's production of cassava is sold in the export market (In 2013, 241 MT for USD 26 000).
- » Market demand in the Northern Province remains low, probably because of the distance to Lusaka and the Copperbelt province where processing activities are located (cassava roots have a very short shelf life, and cannot be transported for long distances without deteriorating).
- » In Luapula region where cassava is the principal crop produced, marketing of cassava is also still in its infancy but is more developed. Several companies buying and processing cassava on a large scale have started sourcing cassava there. Besides, several investment projects are under development

Production capacity

- » Cassava is the second main staple crop produced in Zambia after maize (Musika, 2017). Cassava production has experienced steady growth in recent years mainly due to the new varieties that were introduced. However, total production remains very low when compared to neighbouring countries, with an average just over 1 million MT in the time frame 2004–2015.

- » The Northern Province is the second highest producing province, after Luapula province, with 355 373 MT (30 percent of the national output). Cassava is produced almost entirely by smallholder growers. Generally, cassava remains unharvested until market opportunities arise.
- » The overall level of productivity is low. Cassava production is profitable due to low input use but in fact productivity could be dramatically increased by encouraging better practices such as use of fertilizers and selected varieties. Interventions in the cassava value chain should also include improved agronomic training to increase the productivity of selected farmers who are developing closer market linkages.
- » Cassava has the advantage that it is drought-resistant, is a good crop for food security and is grown with minimal inputs even on poor soils. However, the overall level of productivity is low, with yields at 3.2 t/ha for farmers growing traditional varieties. Improved varieties are now available and being multiplied and distributed and yields are estimated to increase up to 8-20 t/ha. It is not certain whether the yield potential of the improved varieties can be achieved at the farmer level and this is most likely due to continued disease and pest pressure, as well as to poor agronomic management.

Government policies/activities and donors' initiatives supporting the chain

- » The CEEC has activities in cassava investments mainly in Luapula Province. This includes support to cassava producers to help them supply material to the breweries.
- » The MoA has two IFAD-funded programmes on cassava growing and marketing in the Northern Province, which are geared towards smallholder producers: S3P, whose activities touch on the promotion of cassava selected breeds through facilitating multiplication and distribution of cuttings, demo plots and training on seed production; and E-SAPP, on the promotion of agribusiness through linkages between producers and private companies and the building of marketing infrastructures.
- » The Bank has been promoting the development of the cassava value chain through its Skills Development and Entrepreneurship Project (2016-2020). Activities include improved variety promotion and multiplication, development and marketing of new products and installation of milling centres and bulking centres. It focuses mainly on the Luapula Province. However, bulking centres will also be established in the Northern Province.

Services and infrastructure available

- » The main input used for cassava production by smallholder producers is planting material, which is mainly purchased from neighbours. There is, therefore, minimal private sector participation in the supply of inputs for cassava production in the Northern Province of Zambia.



- » There are no sheds for storage of cassava in the Northern Province. Huge investment in storage infrastructure in the Luapula region has demonstrated their importance for aggregation efficiency and reduction of transactional costs.
- » No processing facilities exist either. There are a number of small hammer mills that are used for grinding chips into flour but this is for home consumption only.

Stakeholders and BDS providers

- » Cassava is mainly a smallholder crop in Zambia and smallholder producers are represented locally by ZNFU and ZCF although these organizations appear to be mainly focused on other crops such as maize and soybean.
- » Important players in the cassava sector include the government through the Zambia Agricultural Research Institute (ZARI), which is involved by supplying cuttings of the new varieties that are high yielding and virus free. There are also some NGOs involved in the multiplication of cassava planting material including TLC and Self Help Africa.
- » Musika, as seen in the maize VC report, is an independent non-for-profit organization that provides technical support for the promotion of agribusiness projects and has activities in Luapula Province supporting companies buying cassava from farmers.
- » Private sector players involved in the purchase of cassava for industrial customers include GrowAfrica which was contracted by Zambian Breweries in 2016 to source 300 MT of cassava per year in Mansa District (Luapula province); they are also looking at Northern Province. Chiwite Investment is considering sourcing 500 MT per year of cassava in the Northern Province for delivery to the Zambian breweries. The procurement contract has not yet been finalized, as challenges exist with regard to aggregation and quality of the output.

Main constraints to VC development

- » Organized market structures in the Northern Province are missing. Smallholders do not sell cassava mainly because they have no information on potential markets.
- » Kasama is purely a growing area with no processing capacities installed. Raw material is exported from the region mainly to Lusaka and processed products are sent back for local consumption. As a consequence, no added value remains and the processed products obtain high prices because of transportation costs. The region would therefore benefit from the introduction of local processing facilities.
- » The long distances to the main urban markets and processing centres like Copperbelt explain why only small volumes are sourced in the Northern Province for delivery to these markets. As cassava output is small locally, it

would take time to bulk the expected volumes, and there is a need for more storage capacities of the cassava in the meantime.

- » Facilities to support commercialization of cassava marketing such as aggregation centres and bulking points are also lacking and private sector actors such as processing companies are thus discouraged from investigating the potential of the region.

2 » IMPLICATIONS FOR ATC FEASIBILITY AND DESIGN FOR CASSAVA

- » An increase in demand from different sources (food processing industries, industrial starch users) is observed nationally and could potentially provide a stable market for the cassava crop. However, without interventions targeting production, market potential alone may not justify the ATC investment. More efficient production methods are still required to lower production costs, ensure effective offtake and make cassava viable as a commercial crop for farmers.
- » The ATCs in the Northern Province could be instrumental to help farmers produce sufficient surplus. ATCs would need to address inefficient production methods, the problems of available aggregation centres and bulking points and the poor processing capacity.
- » Although cassava is produced widely in the Northern Province, the current marketing and production systems remain weak and need to be strengthened before further investments in value chain development that link farmers to markets are made. Several initiatives from various development agencies with regard, for example, to the distribution of planting material of improved varieties of cassava are ongoing and still need to be completed.
- » Generally speaking, investments in the cassava value chain at the province level have just started. The scale of related activities remains small for a crop still viewed as a food reserve and not yet as a commercial commodity. Infrastructures and resources, which are part of the Bank project, and will take cassava one step further towards the commercial horizon and encourage farmers to commit, are missing. Market demand is concentrated today on the neighbouring province of Luapula, and very few private firms are considering sourcing in the Kasama region, probably because of the distance to Lusaka and the Copperbelt where processing activities are located, and because of the under-development of the value chain.
- » Finally, Luapula seems to have a decisive competitive advantage over the Northern Province when it comes to promoting cassava production. This advantage touches mainly on its proximity to buyer processing centres; a tuber that is of low value and that cannot be transported over long distances without significantly affecting its competitiveness. Furthermore, Luapula is already well advanced in attracting investments and installing processing capacities locally. As the value chain performance has already significantly improved there, the province has strong potential to increase output in the short term and meet a surging demand.



For all these reasons, and in the absence of a defined and well developed SCPZ initiative, it is probably too early to invest in cassava growing for industrial purposes in the Northern Province and it is recommended not to proceed with an ATC for Cassava before the market conditions have evolved. For the present, investing in service centres for farmers growing cassava would make more sense in the Luapula province, especially in relation to the promotion of an SCPZ (i.e. Luswishi Farm Block) in the Copperbelt province. A possible intervention model is shown in Annex 4 together with a checklist of equipment that would be needed.

It is recommended instead to coordinate with organizations such as Musika on the installation of sheds and on the outgrowing schemes promoted by GrowAfrica as a first step towards the emergence of conducive market conditions in the Northern Province.

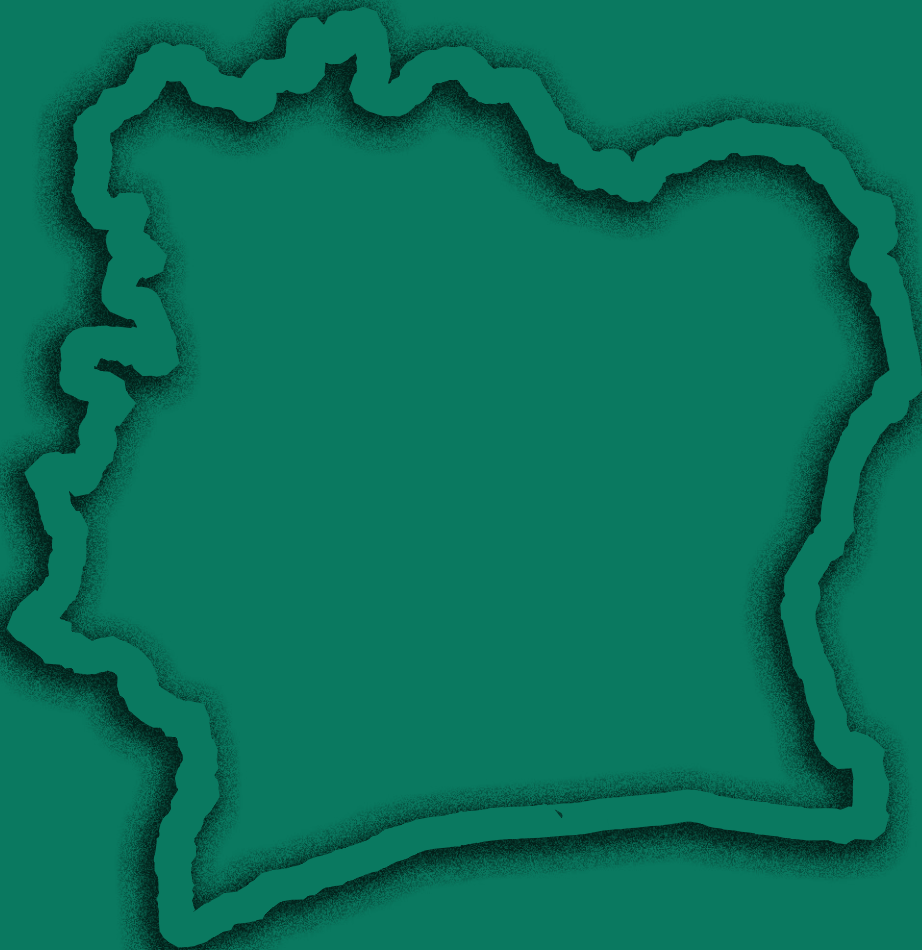
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P A R T 2

Design and feasibility of ATCs in Côte d'Ivoire

By Mathieu Faujas and Ngoni Nenguwo



SECTION 1

**ATC for horticulture in Côte d'Ivoire,
Bélier Region****1 » OVERVIEW OF HORTICULTURE VALUE CHAIN****Market potential**

- » Based on the FAO recommendation for a yearly requirement of 38 kg of vegetables per individual, the market potential would be at 1 million tonnes.
- » The demand for fresh vegetables emanates mostly from urban consumers and accounts for 95 percent of the marketed products. Most of the agroproducers across the country (which accounts for the overwhelming part of the Ivoirian population) are producing their own vegetables on small personal plots.
- » Côte d'Ivoire is a net importer of vegetables. The country is able to cover only between 60 percent and 70 percent of its needs (Rongead, 2014). However, this concerns only a few specific products, mainly onion (more than 50 percent of the total), tomato and potato.
- » The national market is characterized by a high level of inefficiency of the supply chain, with a demand and supply situation that is constantly unbalanced across the country and throughout the year. Moreover, due to the limited use of irrigation in the fields, availability is highly dependent on the seasons. Consequently, prices fluctuate a lot under the constraints of amount of rain, time of the season and imports.
- » Import substitution represents today a market opportunity of about 200 000 t, in particular canned tomato which accounts for 75 percent of imported processed food (PARFACI, 2015).
- » Demand for vegetables is increasing with the rapid urbanization of Côte d'Ivoire, but also in the West African region. Also, in urban centres, an emerging middle class with higher incomes spurs demand growth for processed food. Since processing capacities are very low at national level, industrial companies are already looking to invest in expanding local processing capacities, especially for production of tomato sauce.

Production capacity

- » As of today, the actual production breakdown would be as follows, from most to least consumed vegetables: okra (150 000t), African eggplant (gboma) and chilli (140 000t), cabbage and squash (110 000t), onion (105 000t) and tomato (80 000t) (Rongead, 2014). Losses would be in the range of 20 percent.

- » Production of vegetable crops is highly seasonal, and is mostly carried out by smallholder producers using traditional practices for crop cultivation and manual labour, with a high proportion of women (between 70 percent and 80 percent of growers). They are facing several constraints including low yields, poor agronomic management, limited access to inputs and pest and disease outbreaks. Vegetable crops produced include bell peppers, tomatoes, okra, chillies and African eggplant.
- » Selected varieties are available from a number of local agrosuppliers. However, many are imported varieties and it is not certain that the new products are fully adapted to the local environment, or that they meet the customers' preferences. Some donor projects have attempted to introduce off-season vegetable varieties to benefit from low availability during the off-season, but it is uncertain at this stage how successful the initiative has been.
- » To a large extent, vegetable production is dependent on rainfall, and therefore productivity and quality are affected when they are grown during this period. More importantly, most farmers will grow their vegetables at the same time and this results in gluts in supply and low, non-remunerative prices.
- » A number of plots for commercial production of vegetables, both collective and individual, exist in the Bélier region. These plots, whose size ranges from a few hectares up to dozens of hectares, aim at producing for the urban market only, possibly with the support of donor projects (for example the *Programme d'Appui à la Relance des Filières Agricoles en Côte d'Ivoire – PARFACI*).⁵ Some are already equipped with drip irrigation systems and the promoters have demonstrated better technical agronomic expertise. Access to market remains the main constraint to developing their activities.

Government policies and donors' activities

- » The government is supporting the Agropôle project Bélier (Projet de pôle agro-industriel dans la Région du Bélier - 2PAIB) funded by the Bank. Further details are provided in paragraph 2.
- » IFAD supports two programmes in Côte d'Ivoire, the Support to Agricultural Production and Marketing Project (PROPACOM)⁶ and the Commodity Value Chain Support Project (PADFA) which include horticultural activities although not in the Bélier region. Interestingly, the two programmes promote establishment of handling, cleaning and conditioning centres in vegetable growing areas in the western part of the country, and assist farmers towards collective trading. These centres are managed by a consortium that includes farmer groups and buyers.

⁵ PARFACI is an agriculture support programme, now closed down, which was funded by the Agence Française de Développement (AFD), the French development agency. It provided assistance to a number of value chain with regard to land tenure, productivity and institutions

⁶ <http://www.propacom-ci.org>

Services available

- » A few examples of value chain financing are occurring with some of the major traders interviewed being able to obtain loans from banks which they use to provide inputs for onward lending to their regular growers. But this is very limited and done on a small scale. Some microfinance institutions, such as the Coopérative d'épargne et de crédit (COOPEC), are available for lending to farmers, but they require a detailed business plan which most farmers are ill-equipped to provide.

Main stakeholders

- » A multistakeholder platform for horticulture in the Bélier region is now up and running, initially supported by PARFACI, but still in the process of increasing its membership from the different groups of actors. The platform already buys inputs in bulk from input supplier members at a cheaper price to the benefit of growers, which is a first step towards creating linkages. It might also be used to gather output from producers and act as a trading body to secure fair prices for farmers, but as of now buyers seem to be reluctant to commit, probably for fear of losing their advantageous position as intermediaries.

Main constraints to VC development

- » Prices for vegetables are highly volatile. Part of the problem is doubtless due to the seasonal nature of vegetable production resulting in periods of over and under supply. Although prevailing prices are being broadcast via mobile phone platforms (such as the Bureau de Ventes des Producteurs), identifying buyers or negotiating for better prices with traders remains complex. The absence of a processing capacity makes producers highly dependent on the fresh market intermediaries, with the perishability of the products drastically reducing their bargaining power.
- » In addition, the poor post-harvest handling facilities for vegetable crops means that producers are not able to supply to high value markets such as supermarkets. Also, due to the poor quality of the packaging used, significant damage to the produce takes place. In 2015, post-harvest losses were estimated at 30 percent.⁷
- » The modes of transport used are also unsuitable for transporting vegetables and in some areas the condition of the roads is poor. There are mixed loads of different products and very few refrigerated vehicles available that are more suitable for vegetables. The bags and boxes of vegetables are loosely stacked in the trucks without any consideration for the fragility of the products, which generates considerable losses.

⁷ Data provided by field informers

2 » SCPZ INITIATIVES IN THE AREA

The government is supporting at the country level the 2PAI project, an SCPZ initiative which involves the collaboration of the Bank. Bélier is one of the regions selected for the implementation of the SCPZ (2PAIB). The initiative aims at concentrating resources towards building competitive agro-value chains in the region. It is not based on specific supply chains but rather on enhancing the general ecosystem to attract investments from the private sector. Activities will be implemented at three levels: 1) support for production: inputs, mechanization, training and organization of farmer groups, 2) infrastructure support: land preparation, irrigation, roads, sheds and storage, local market places, and 3) refurbishment of the agro-industrial park of Yamoussoukro. A coordination team is in place in Yamoussoukro to manage involvement of a large number of stakeholders. Activities are now in the process of launching major technical studies which will be used to beef up the implementation plan. Planning includes the rehabilitation of 17 rural markets and the building of 12 packhouses for improved handling of vegetable crops. The project has just been launched and the location and specifications for these facilities are still being worked out. For this reason, the ATC model proposed below is conceived in the provisional absence of an SCPZ. It is, however, recommended that any ATC initiative in the area be conducted in coordination with the existing SCPZ initiative.

3 » IMPLICATIONS FOR ATC FEASIBILITY AND DESIGN FOR HORTICULTURE

The rationale which supports the launching of ATC in the Bélier region, even in the provisional absence of an SCPZ, is as follows:

- » There is potential to link ATCs to the 2PAIB agropole initiative in the future. This initiative is yet to provide more details on the design and specifications of their approach. However, at present no specific model has been identified for the delivery of services to farmers (level 1). The ATCs could be one of the models to be considered for the implementation of the first pillar, as the approach aligns well with the agropole system and the envisaged role of the private sector in particular.
- » Market analysis shows that growing urban demand for semi-processed vegetables and processed tomato products could provide an opportunity for upgrading the horticulture value chain in the region and could support the emergence of industrial processing capacities within the proposed 2PAIB. A number of upstream production issues firstly need to be overcome so that production volumes can be increased to required levels. An ATC model that focuses initially on improving production and post-harvest handling issues could help to achieve this.

- » The ATC primarily needs to address the most pressing constraint: post-harvest losses. Indeed, it would make little sense to invest in productivity and increased output if losses remain at current levels. The reduction of losses will generate the needed revenue for farmers to invest further in productivity.
- » The ATC would be able to introduce key solutions to producers for reducing the post-harvest losses through better handling, conditioning and transportation. One possibility might be the establishment of aggregating and conditioning facilities for vegetables that could be linked to the proposed packhouses to be built under the Agropôle Project and to potential tomato processing firms. It is recommended to have suitable facilities such as grading tables, washing facilities, and low cost cooling facilities. Cooling using solar powered AC units is now being developed and may have potential in areas with no electricity. It may also be useful to promote the use of improved types of packaging such as smaller size containers that reduce damage to the produce.
- » The ATC would be instrumental in securing a reliable supply of the required quantities and qualities of produce for industrial companies (thus attracting investments, in particular within the 2PAIB) and, as a ripple effect, ensure a permanent and predictable uptake for producers' output.
- » Particular emphasis could be placed on the potential for the development of the tomato-processing industry which is accorded lower quality requirements than for fresh produce, while at the same time improving basic post-harvest practices.
- » This value chain presents strong potential for gender inclusion as women are highly involved in horticulture.

Recommendations:

- 3] As of now, ATCs would be feasible **only if coordinated actions, bringing together the supply and demand side**, are undertaken. The 2PAIB initiative and the multistakeholder platform for horticulture recently created would be key in supporting this coordination. However, as both initiatives have only recently been launched, some time will be needed for them to prove their solidity and commitment. **ATCs should not proceed without clear commitment from potential buyers to sourcing directly from them.**
- 4] Given the importance of the use of irrigation for horticulture production, **it is recommended that ATCs be promoted only in areas where irrigation schemes and infrastructure are in place**, or can realistically be introduced over time. This will ensure a business stream all year long for farmers, and help the ATC to swiftly reach cost-effectiveness.
- 5] **Growth of local processing capacities should be stimulated** in coordination with the establishment of the ATC. This should be done **in coordination with the 2PAI Agropôle** initiative with a clear indication of proposed end-markets for processed products.

4 » MODEL PROPOSED

It is proposed to introduce improved handling facilities for vegetables for producers in the Bélier region that will be used for collection of vegetables and preparing and grading them prior to shipping to urban markets. The ATCs will take the form of physical centres in the vicinity of the growing areas. Producers will convey their output there for it to be conditioned and packaged, before being properly stored and finally loaded in a truck for delivery to markets. In addition, a small processing facility to produce tomato purée for the local market will be added to the ATCs, with the idea of processing the low-grade fruits and the fully mature fruit before it perishes.

The first expected impact is a dramatic reduction of post-harvest losses through a proper process of cleaning, grading and packaging. Also, the cool storage facility will extend shelf-life and give producers enough time to manage harvests and negotiate better terms with buyers. Finally, the ATCs should evolve towards becoming collective aggregation and marketing centres for farmers on behalf of the platform, with the ability to collect output on a larger scale and fulfil buyers' requirements in terms of quality and timeliness.

In parallel, investment should be made at the platform level to increase the skills and capacities of the actors in terms of planning and quality management and help to improve farmers' access to inputs. This, in turn, will help to ensure a steady and coordinated increase in production to meet a growing market demand.

The ATC will initially target the main vegetables produced in the region, but the facilities will be flexible enough to process any other fresh products. The potential for crop production increase would be as shown in Table 18.

TABLE 18

| POTENTIAL INCREASE IN PRODUCTION, HORTICULTURE ATC, CÔTE D'IVOIRE | | | | | |
|---|---------------------------|----------------------|--|---|---------------------------------|
| PRODUCTS | ACTUAL AVERAGE YIELD t/ha | POTENTIAL YIELD t/ha | YEAR 3 TONNAGE BREAKDOWN OF THE ACTUAL PRODUCTION MIX IN THE BÉLIER REGION | HECTARAGE PER PRODUCT ACROSS THE TARGETED AREAS | TOTAL POTENTIAL OUTPUT (tonnes) |
| Tomato | 8.7 | 15 | 24% | 60 | 900 |
| African eggplant | 14.5 | 18 | 29% | 72.5 | 1 305 |
| Chilli | 5.8 | 8 | 20% | 50 | 400 |
| Okra | 5.8 | 8 | 15% | 37.5 | 300 |
| Cabbage ⁸ | 14.5 | 18 | 12% | 30 | 540 |
| | | | 100% | 250 | 3 445 |

Source: Authors' elaboration based on PARFACI (2015) and IFAD (2017).

⁸ For the potential yield of cabbage, this is an assumption only

Based on observed capacities of an aggregation centre in Bondoukou (PROPACOM), and taking tomato as a reference, an ATC would have processing capacities at around **600 tonnes** per year, leading to installing one ATC for a **maximum of 45 ha** based on an average yield at 13 t/ha.

As this capacity is based on a season of six months, the centres are sized to process 100 tonnes per month each, or an average of 4.5 tonnes a day. Based on an assumption of 20 kg per box (tomato), the facilities will have the capacity to handle 225 boxes a day.

However, if irrigation systems are well managed throughout the year and off-season varieties are used, there is a potential to process more than 600 tonnes over the course of the year. Consequently, there is a need to promote **6 ATCs** across the growing areas.

Location and size

In a first phase of three years, the ATC will be implemented in the Bélier region over a total potential area of 250 hectares, targeting initially the most prominent growing zones that are already equipped with irrigation systems from previous projects (though in various levels of working order). There exists significant production capacity suitable for testing the ATC model. These growing zones are a mix of individual and collective plots that produce vegetables for commercial purposes only. Going forward, the success of ATCs and 2PAIB in attracting private companies could create a ripple effect on a larger area across the region, benefitting also those less resourced farmers once the value chains have been established. A total of ten areas have been identified, as shown in Table 18.

TABLE 19

| SELECTED AREAS FOR HORTICULTURE ATCs AND IRRIGATION SYSTEM STATUS, CÔTE D'IVOIRE | | | |
|--|---|---|--|
| DEPARTMENT | CONSTITUENCY | HECTARAGE (actual + possible extension) | IRRIGATION SYSTEM DETAILS |
| Yamoussoukro | Balakro, Sahabo | 15 | Drip system |
| | Zatta | 20 | Overhead system |
| Toumodi | Toumodi, Yobouékro, Gbohua, Djetranyaokro | 20 | Drip system 15 ha, Manual overhead system 5 ha |
| Tiebissou | Duybo-Kpato | 15 | Drip system |
| | Kan Koubi | 120 | Overhead system |
| | Koriakro | 60 | Overhead system |

Source: Authors' elaboration based on PARFACI (2015).

The Zatta, Kan Koubi and Koriakro growing areas would need first to have their irrigation systems refurbished with support from the Agropôle 2PAIB project, before expecting an increase in output.

ATCs proposed distribution is indicated in Table 20.

TABLE 20

| ATCs DISTRIBUTION ACROSS AREAS SELECTED, HORTICULTURE ATC, CÔTE D'IVOIRE | | | |
|---|---|------------------|-----------------------|
| DEPARTMENT | CONSTITUENCY | HECTARAGE | NUMBER OF ATCs |
| Yamoussoukro | Balakro, Sahabo | 15 | 1 |
| | Zatta | 20 | |
| Toumodi | Toumodi, Yobouékro, Gbohua, Djetranyaokro | 20 | 1 |
| Tiebissou | Duybo-Kpato | 15 | 2 |
| | Kan Koubi | 120 | |
| | Koriakro | 60 | |

Source: Authors' elaboration.

The actual production capacity of these growing areas concerns today a hectare of maximum 100 ha with yield limited at 8 to/ha on average, hence a total production of 800 tonnes. Targeting a total output of 3 600 tonnes means ATCs are sized from the start to face a 4,5 times upsurge of output due to increased yield, extension of hectare and/or yearly operations. At most, ATCs will handle vegetables from a total of 2 500 producers if each producer is growing on average 1 000 m² of vegetables based on what has been observed for tomato in the field, and production is staggered through the year following a cropping schedule.

Service mix

Primary services that will be provided by the ATCs include those listed in Table 21.

TABLE 21

| SERVICE MIX, HORTICULTURE ATC, CÔTE D'IVOIRE | | |
|--|--|---------------------------|
| ACTIVITIES | DESCRIPTION | EQUIPMENT |
| Transport | Each ATC will be equipped with a motorized tricycle to offer farmers a transportation service between the field and the centre. These tricycles have loading capacities in the range of 1 to 2 tonnes and are suitable for bumpy roads | 1 tricycle for each ATC |
| Weighing and recording of the produce | | 2 scales for each |
| Cleaning | Access to water to clean the freshly harvested products and rinse them with chlorine | Washing tubs |
| Drying | Air-drying of vegetables after cleaning, possibly using fans to speed up the process | Drying racks |
| Trimming | Removing by hand the outer leaves of cabbages, cauliflower, onions, cutting the excess leafy tops; removing also any leaves, stems and plant debris from beans, chillies | |
| Sorting and grading | Manual grading for preparing orders with the same grade and quality according to market specifications | Grading tables |
| Packaging | Use of appropriate containers to protect output from damage during handling and transportation, and harmonize operations to ensure efficiency | Reusable stackable crates |
| Storage | | Solar-powered cool room |

Source: Authors' elaboration.

As far as the services are concerned, bearing in mind there is no need for specific technical expertise, the equipment and facilities may be made available to the growers for them to process their own production themselves, and for a low access fee. This approach would allow the ATC to maintain low fees and to foster commitment. An option will be available also for the provision of a labour force. This is also particularly important in the beginning because properly sizing the facilities is a complex task. This approach would provide for more flexibility while maintaining a low operating cost.

The Cool Room. In order to reduce costs, a simple air conditioner can be used for providing cooling for a space of 12m². A small device (for example, CoolBot on www.storeitcold.com) can be attached to it that will override the normal controls and make it easier to achieve temperatures between 2° (cabbage) to 13° (eggplant, tomato) Celsius. This constitutes an innovative way to allow for

professional services while maintaining costs low. Since electricity may not be available, it is proposed to use solar PV panels to generate electricity for running the cold room, which will contribute to further reduce operational costs.

Tomato processing service. Since it is likely that not all tomato fruit will meet the market requirements in terms of size and shape, it is proposed to transform them into a different product by processing them. Tomatoes can be processed on a small scale without too many food safety problems because they are a high acid product and have naturally reduced levels of spoilage by microbial organisms. Using appertization techniques also allows for longer shelf-life. For this, the use of glass jars is essential.

Tomato products that can be made on a small scale include various tomato pastes and sauces, and cooked, bottled tomatoes. Typical product preparation from sub-standard fruits will be as follows, after washing and sorting:

- » Processing into purée using pulping machine,
- » Cleaning and sterilizing glass jars to be used as containers for the sauce,
- » Filling the hot jars with sauce and closing tightly,
- » Placing sealed jars in pots of boiling water for 30 minutes to sterilize,
- » Removing jars and allowing to cool.

The process should remain simple and avoid costly operations. The tomato sauce will be basic but produced in good sanitary conditions. For such a simple product, targeted markets will be the rural areas where quality expectations are lower. The selling price will reflect this quality level, while keeping it low will further guarantee success.

If necessary, preservatives such as potassium sorbate may be added to help increase shelf-life. This low-cost tomato processing will provide an additional income stream while reducing losses.

Another option would be to use plastic containers to reduce cost and ensure a more competitive price but it may be that plastic is not suitable for appertization and in this case, it would impact product shelf-life. This should be adapted to the products (sauce, cooked tomatoes) and the targeted market. More research is needed to adapt this technique while keeping costs low.

At the outset, it is assumed one ATC will process 5 percent of the total yearly output, or 30 tonnes.

The ATCs will be used in the following situations:

- » Preparation of orders,
- » Harvest management,
- » Aggregation centres for large-scale orders and contract management,
- » Processing of by-products (downgraded output and near deterioration products) for increased sales,

- » Logistic centre,
- » Packaging management.

The centre will be designed using the PROPACOM/IFAD model, already operational in other regions: a 300m² building (12 mx25 m) comprising of a washing area, sorting tables including a packaging space, classic storage for crates, and a 12m² cool room of 10 tonnes capacity (estimation based on tomato output), in line with rolling activity of loading a truck twice a week.

The distribution of space for the facilities to meet the targeted capacity would be as indicated in Table 22.

TABLE 22

| DISTRIBUTION OF SPACE, HORTICULTURE ATC, CÔTE D'IVOIRE | |
|--|------------------------------------|
| FACILITIES | APPROXIMATE SIZE (m ²) |
| Offices / lavatory | 20 |
| Washing and drying area | 100 |
| Sorting and grading tables + packaging | 130 |
| Storage | 18 |
| Cool room | 12 |
| Processing area | 20 |

Source: Authors' elaboration.

On the outside, the ATC will include:

- » A roofed loading bay, so that handling operations are sheltered from rains,
- » A water tank to collect rainwater and ensure clean, good quality water for washing operations,
- » Solar panels covering an area of 12 m², probably installed on the roof,
- » Covered storage area for field crates,
- » The AC system.

Equipment includes: scales, hand truck, and all the utensils for processing products.

Considering the need for these outside installations, the ATC should be built on a plot with a minimum size of 700 m². The land could be contributed by the public sector as part of their support to the establishment of the ATC. It should be established in a suitable location accessible to the different growing areas so that it can channel output out in a convenient way. Located close to a main road, it should be easy for trucks to reach it; there should also be easy access to utility services, running water and electricity, even if the ATC is designed to be able to operate with limited use of them.

Ownership, management and institutional set-up

The involvement of the platform promoted by PARFACI in the management of the ATCs is essential as it is the only representative body at the value chain level. It is now up and running but has yet to demonstrate its ability to federate the supply chain actors and make it work. Its involvement will provide an opportunity to establish a strong base and ensure a concrete foundation for the partnership between the industry stakeholders and the ATCs. The ATC could constitute the starting point towards broader areas of cooperation and strengthening of structures within the supply chain. Potential impacts will include increased access to consistent quality raw material for buyers, and better bargaining power for producers. As a consequence, membership in the platform should grow which in turn will further enhance the representative status of the platform.

The Platform's role will also include:

- » Planning access for farmer groups to use the ATC throughout the year to monitor availability and ensure optimal use.
- » Training and coaching of farmer groups on topics related to quality (HACCP, traceability) across the ATCs' procedures to build buyers' trust and ensure reliability of the consortium.
- » In line with better market knowledge, the platform will provide access to selected varieties of seeds for farmers with a view to improving the quality and resilience of crops. In general, the platform will become the entry point for the promotion of new technologies to farmers and the ATCs will act as the distribution channels.
- » With regard to agro-chemicals, a funding scheme will be installed at the platform level to support the bulk buying system already in place. This scheme will be a revolving fund to prefinance inputs. Farmers will have to rebuild it from one year to another to ensure sustainability.
- » In the medium term, and in coordination with farmer groups, it will prepare and manage the planning of production across growing areas, in line with market opportunities and the capacity of the ATCs. This will ensure farmers do not compete with each other over the same vegetables, and will avoid over-supply at the season peak, which drives prices down.

The ATC investment plan will include funding for the strengthening of capacities at the platform level. The costs associated with the training sessions (quality, organization of farmers and production planning, selection of new varieties) and the input fund will be financed on the same plan as the infrastructure (see below).

It is recommended that a board of trustees be appointed above the steering committee already in existence, comprised of public representatives (Direction régionale de l'agriculture, Agropôle 2PAI), who will be in charge of making the platform accountable for the public funding committed to the ATCs, and ensuring that the goals set are effectively reached.

At field level, the ATC will be commercially managed to reach financial sustainability and in so doing, generate its own resources to maintain services in the long run. The local team appointed to manage the facilities, for each ATC, will be comprised of:

- » One operations manager, responsible for day to day operations. He will be recruited through a competitive process from the PARFACI platform members. Emphasis will be put on his management skills and professional experience.
- » One versatile worker, in charge of maintenance and operation of the tricycle to transport products from the field to the ATC.

At least initially, the ATCs may be registered with a status of Economic Interest Group (EIG), under the management of the platform. This status is flexible and can be easily adapted. It is suitable for an organization that does not necessarily include profit-sharing. It could also be applied without involving the provision of capital from stakeholders. At the platform level, a steering committee will be set up, with representation of every EIG member group, with responsibility over strategic decisions and the overview of the operations.

Operating costs

Costs are given for one ATC for 600 tonnes of produce processed per year.

Power. Cooling requires 35 kWh per metric ton. If 600 MT of produce are processed yearly and stored in the cool room, then need for power is: $600 \times 35 = 21\,000$ kWh.

The tomato pulper would need 0.15 kWh for 50kg of processed fruit. For processing 30 tonnes over one season, the energy consumption will be 90 kWh. In addition, general ATC usage requires 2 kWh per MT: $2 \times 600 = 1\,200$ kWh.

The total need of energy will be: 22 290 kWh. Assuming the solar system will provide 50 percent of the overall power need, actual electricity need is half or 11 145 kWh.

Professional kWh cost in Côte d'Ivoire is as follows:

- » Up to 180 kWh: 92.59 FCFA/kWh
- » Over 180 kWh: 78.75 FCFA/kWh

For 11 145 kWh, the total cost of electricity would be about FCFA 900 000 per year, including taxes, or USD 1 700.

Management costs. The total management costs would be in the range of 9 000 000 FCFA, or USD 16 700, per year for one ATC and 600 tonnes processed (see Table 23).

TABLE 23

| MANAGEMENT COSTS, HORTICULTURE ATC, CÔTE D'IVOIRE | | | |
|---|--------------------|----------------------------|---------------------------|
| | NUMBER FOR ONE ATC | MONTHLY SALARY COST (FCFA) | ANNUAL SALARY COST (FCFA) |
| Operation manager | 1 | 500 000 | 6 000 000 |
| Versatile worker | 1 | 250 000 | 3 000 000 |
| Total | | | 9 000 000 |

Source: Authors' elaboration.

Water. The need for water is estimated at 400 litres a day, with the cleaning water being changed twice a day. If one ATC processes 4.5 t per day, the total need for water is 54 m³ per season. Assuming that the water tank will provide 10 m³ for each ATC, the total need for water will be: 44 m³ and the total costs for the whole season would be **USD 30**.

Fuel. Tricycles will operate within a distance of 10km around the ATC. Assuming their load capacity is 800 kg, 750 loadings would be necessary for transporting 600 tonnes per year. Tricycles will achieve 15 000 km per season and the need for fuel is 270,000 FCFA, or **USD 500 per year**.

Maintenance and depreciation. Maintenance and depreciation costs are estimated at 2.5 percent of the investment costs per season, or **USD 1 625**.

Gas. For processing 30 t of tomato over one season, the cost of the gas is estimated at **USD 600**.

Administration. Administration costs are estimated at USD 50 per month or USD 600 per year.

Cost wrapping up. For one ATC/600 tonnes of produce over one season, the costs for a whole year are estimated at USD **21 755** (see Table 24).

TABLE 24

| ANNUAL COSTS FOR ONE HORTICULTURE ATC, CÔTE D'IVOIRE | |
|--|---------------|
| TYPES | TOTAL (USD) |
| Power | 1 700 |
| Management | 16 700 |
| Water | 30 |
| Fuel | 500 |
| Maintenance and depreciation | 1 625 |
| Gas | 600 |
| Administration | 600 |
| TOTAL | 21 755 |

Source: Authors' elaboration.

Revenue and income analysis

Sales of fresh tomato. Taking into account that one ATC will process 600 t per year, minus 5 percent sub-standard fruits that will be processed into sauce, the total is 570 tonnes. Based on these first assumptions, ATC break-even point would be reached at a service cost for farmers of:

$$(21\,755 \times 540) / 570\,000 = \mathbf{20.61 \text{ FCFA/kg treated.}}$$

If the service cost is set at only 25 FCFA/kg in a low scenario, the total revenue will be 14.25 million FCFA or **USD 26 400** and the profit will be **USD 4 634** for one ATC over one season in this case. This means that if the market price for tomato is at 300 FCFA/kg (which is quite low), the ATC service costs will account only for 8 percent, but farmers will probably be able to negotiate a 10 or 15 percent premium over the market price, thanks to the quality and the reliability of the delivery. For a target of 600 t treated in one year, and with a unit price of 21 FCFA/kg, the ATC will reach sustainability while farmers earn an extra income. In this example, for a 10 percent premium, this extra income would amount to $(30-21) = 9$ FCFA/kg and a total of 5.13 million FCFA to be shared between growers. This would give the service price enough flexibility to be adapted to the context and the time in the season, and considering also the need for profit for the ATC, providing the centre is not designed to maximize earnings but rather to reach sustainability while maintaining investment capacity, to possibly upgrade further available services to farmers.

Based on the current estimations, potential extra capacities would exist beyond the 600 t considered here. It would be the responsibility of the ATC management to increase the volume processed over the year, and possibly to diversify activities and services, and make the most of the ATC capacities which would lower the unit cost and make it easier to reach financial sustainability. It would also allow to reduce the price paid by farmers, making the ATC services even more affordable to them.

The final determination of the service price will also take into consideration the profit made from the processing of tomato.

Sales of processed tomato. The direct operational costs of processing tomato into sauce are gas, electricity for the pulping machine, the raw material and labour, jars being reusable (through a “returnable jar” scheme). Gas and electricity are non-significant, only about 11.1 FCFA /kg tomato processed. For labour, this activity would need three operators to process an average quantity of 227 kg per day. Assuming that each would cost 100 000 FCFA per month, the total of labour cost would amount to 300 000 FCFA per month, or 60 FCFA/kg tomato processed.

The assumption is made that the low-grade tomato used to produce sauce will be paid to farmers by the ATC. Indeed, the most likely option is that the ATC will be involved on behalf of farmers for marketing the sauce jars, as farmers are today ill-equipped to manage this activity. As a consequence, once the grading and packaging of output have been completed, the low grade quality tomato will be set apart and weighed, and the ATC will be responsible for doing the processing and the marketing.

The price paid to farmers for these low-quality tomatoes could be aligned to the lowest price farmers could expect for their output from the market during the peak season, for example 50 FCFA/kg. With ATC support, they have thus an opportunity to sell their whole output at a better price, reducing losses, and drawing value even from the lowest grade fruits.

For the marketing, a dedicated commercial agent would need to be appointed to manage distribution and sales. His salary cost may be in the range of 200 000 FCFA, or 6.66 FCFA/kg processed.

For ATC, total processing operational costs would be as shown in Table 25.

TABLE 25

| TOMATO PROCESSING COSTS, HORTICULTURE ATC, CÔTE D'IVOIRE | |
|--|----------------|
| TYPES | COST (FCFA/kg) |
| Labour | 60 |
| Raw material | 50 |
| Energy | 11.1 |
| Distribution | 6.66 |
| TOTAL | 127.76 |

Source: Authors' elaboration.

The cost of processing 30 t would be 3.83 million FCFA over 6 months. Assuming a processing yield at 70 percent (including extra losses that may still occur), 30 tonnes of tomato would give 21 tonnes of tomato sauce per year. The break-even point is then at **182.4 FCFA /kg** processed.

The selling price should remain quite low to be competitive vis a vis the tomato price on the market. At 200 FCFA/kg of sauce, the revenue from the sales would be:

$21\ 000 \times 200 = 4.2$ million FCFA. In this case, the profit would amount to 370 000 FCFA in total over one season.

Investment needs

Facilities. List of equipment needed for one ATC Vegetable Collection Centre with capacity of 100 tonnes per year is provided in Table 26. More detailed description of infrastructure and equipment requirements can be found in Annex 5.

TABLE 26

| LIST OF EQUIPMENT, HORTICULTURE ATC, CÔTE D'IVOIRE | | | | |
|--|--|------------------|--------|---|
| ITEM | SPECIFICATIONS | TOTAL COST (USD) | NUMBER | REMARKS |
| A. Building | | | | |
| 12 m x 25 m | Concrete floor and walls and metal roof | 28 000 | 1 | See more details in Annex 5 |
| Cold room | 3.5 m x 3.5 m Insulated room for storage of vegetables | | 1 | |
| B. Equipment | | | | |
| Vegetable washing tub | Stainless steel One tank for washing and one for rinsing | 500 | 2 | |
| Water tank | 20 000 litre water storage and water filtration system | 2 500 | 1 | |
| Drying rack with rollers | Stainless steel shelving for air drying vegetables after washing | 1 000 | 2 | Fans may also be used above the drying rack to speed up drying rate |
| Grading tables | Stainless steel tables » 4 x 3.0 m long tables | 200 | 8 | |
| Plastic crates | 10 kg capacity and 20 kg capacity crates » 50 each size | 1 000 | 100 | Requirements include: stackable when filled, foldable or nestable to limit cumbersomeness |
| Top loading scale | Scale for weighing vegetables in boxes » 1 to 50 kg range » 1 to 20 kg range | 500 | 2 | |
| Hand truck | Hand pallet truck or trolley | 500 | 2 | For moving boxes that are packed on pallets e.g. to cold room or to trucks |
| Pallets | Standard wood pallets 0.9 x 1.2 | 40 | 10 | |
| Roller conveyors | Gravity fed roller conveyor | 1 000 | 2 | For easier movement of boxes from grading area to packing area |

▶ ▶ ▶

| ITEM | SPECIFICATIONS | TOTAL COST (USD) | NUMBER | REMARKS |
|----------------------------------|--|------------------|--------|---|
| C. Cool storage equipment | | | | |
| Air conditioner | 21 000 BTU (British Thermal Units) AC for cooling vegetables with device to control temperatures | 1 000 | 1 | |
| Solar panels and inverter | To provide power to AC – 2 000 W system to have charger/inverter and storage batteries | 8 000 | 1 | |
| D. Processing equipment | | | | |
| Tomato pulper | Electric blender for pulping tomato fruit | 2 000 | 1 | Capacity of 50 kg per day |
| Gas stove | 2-plate gas stove | 200 | 1 | |
| Stainless steel tables | Stainless steel tables » 4 x 3.0 m long tables | 200 | 4 | |
| Stainless steel pots | | 500 | 1 set | |
| Utensils | Knives, cutting boards, tongs, etc. | 500 | 1 set | |
| Glass jars | | 2 000 | 1 set | |
| E. Vehicle | | | | |
| Motorized pickup tricycle | » 800 -1 000 kg load capacity for a 150-175 cc engine » 2 000 kg for a 250 cc engine | 15 000 | 1 | One tricycle for each, USD 2 500 each |

Source: Authors' elaboration.

Total facility investment needs will be USD 64 640 (see Table 27).

TABLE 27

| TOTAL INVESTMENT COSTS FOR ONE FACILITY, HORTICULTURE ATC, CÔTE D'IVOIRE | | |
|---|------------------------|---------------|
| | TYPES | COST (USD) |
| A | Building work | 28 000 |
| B | Equipment | 7 240 |
| C | Cool storage equipment | 9 000 |
| D | Processing equipment | 5 400 |
| E | Vehicle | 15 000 |
| TOTAL COST for establishing one ATC facility | | 64 640 |

Source: Authors' elaboration.

For building 6 ATC, the total investment costs would amount to **USD 388 000**.

Capacity Building costs. Training and coaching at platform level for the installation of trainer-of-trainees, that will cascade training sessions down to farmer groups and ATC managers will cost USD 10 520. Details are provided in Table 28.

TABLE 28

| CAPACITY BUILDING COSTS, HORTICULTURE ATC, CÔTE D'IVOIRE | | |
|--|---|---------------|
| TRAINING TOPICS | DESCRIPTION | AMOUNT (USD) |
| 1. Management training (platform level): » Strategic planning » Organizational management | 2 training sessions for 3 representatives of one day: 6 trainees » Trainer costs: 200 each session x 2 = 400 » Logistics costs: 100 each session x 2 = 200 | 5 260 |
| 2. Quality training (ATC level) » HACCP » Traceability and standard measurements | » USD 10 per trainee for food and refreshments: 10 x 6 = 60 » Training materials USD 500 per session 500: x 2 = 1 000 Coaching: 3 days per month during 6 months in year 1 = 18 days » Coach costs: 18 x 150 = 2 700 » Logistics: 18 x 50 = 900 | 5 260 |
| Total | | 10 520 |

Source: Authors' elaboration.

Input fund. This is an input financing scheme working as a credit revolving fund: a certain amount is made available to farmers on season #1 to buy inputs. The fund must be rebuilt at the end of the season for it to be available again and possibly increased for the next season. A first assumption for the whole package cost (seeds, fertilizer and chemicals) would be 200 000 FCFA/ha, or **USD 370**. As a consequence, to cover the need for 250 ha, the input fund would be of **USD 100 000**. This fund will be under the management of the platform steering committee, which will have to establish access rules and conditions for farmer group. The training sessions will provide management tools to the persons in charge for proper use.

Working capital. The need for working capital concerns only the gas. The investment costs would include the required quantity to initiate the processing activity for 3 months: **USD 300** for one centre. For 6 ATCs, the need amounts to **USD 1 800**.

Path to full capacity. Over a pilot phase of three years, the following assumptions are made regarding the progressive extension of growing areas and increasing on-farm productivity. Six centres will be up and running from year 1, each processing the same volume (see Table 29).

TABLE 29

| PATH TO FULL CAPACITY, HORTICULTURE ATC, CÔTE D'IVOIRE | | | |
|--|-------|-------|-------|
| | Y1 | Y2 | Y3 |
| Hectarage | 150 | 200 | 250 |
| Yield (tonnes/ha) | 10 | 12 | 14.4 |
| Output (tonnes) | 1 500 | 2 400 | 3 600 |

Source: Authors' elaboration.

With an ATC service price set at 21 FCFA/kg, the operational costs, revenue and profit would be as indicated in Table 30.

TABLE 30

| OPERATIONAL COSTS, REVENUE AND PROFIT OVER THE FIRST THREE YEARS, HORTICULTURE ATC, CÔTE D'IVOIRE | | | |
|---|--------------|--------------|------------|
| | Y1 | Y2 | Y3 |
| Total operational costs | 65 200 000 | 67 500 000 | 70 500 000 |
| Total revenue | 31 500 000 | 50 400 000 | 75 600 000 |
| Total profit | - 33 700 000 | - 17 100 000 | 5 100 000 |
| Total profit in USD | -62 410 | - 31 700 | 9 450 |

Source: Authors' elaboration.

The losses for the first two years will have to be financed by the general ATC investment budget. These amounts are the maximum possible losses because in this case the service price has been set at the break-even point. They could be less if this price is higher.

Total investment costs for promoting 6 ATCs. Based on the above assumptions, total investment costs for promoting 6 ATCs would be USD 594 430 (see Table 31).

TABLE 31

| TOTAL INVESTMENT COSTS FOR 6 HORTICULTURE ATCS, CÔTE D'IVOIRE | |
|---|----------------|
| TYPES | COST (USD) |
| Total cost for establishing six ATC facilities | 388 000 |
| Building capacity costs | 10 520 |
| Input fund | 100 000 |
| Working capital need | 1 800 |
| First losses | 94 110 |
| TOTAL | 594 430 |

Source: Authors' elaboration.

For the funding model, different options should be considered with a mix of loan and grant, playing out on the different factors and assumptions, in particular from the 2PAIB. Considering that ATCs have the capacity not only to be self-sufficient, but also to generate a profit, the initial investment would be at least partly recovered over time. For example, an average profit of 10 FCFA per kilo over one season would generate a total of: $10 \times 3\,600\,000 = 36\,000\,000$ FCFA or **USD 70 000** per year (11 percent of the investment cost). One option to be considered would be to leverage other resources from development partners to finance part of the cost, the input fund for example. In this regard, a more comprehensive partnership with financial institutions could be envisaged to finance and manage the fund.

Impact

The ATC system proposed is expected to:

- » Reduce post-harvest losses;
- » Improve yields and quality of produce;
- » Increase revenues for farmers;
- » Include more women in the VC.

Risks

One of the major risks relates to the institutional set-up. The ATC structure proposed relies heavily on the functioning of the PARFACI platform, as without this it seems unlikely that a coordinated approach to developing the VC can be achieved. However, the platform has been established only recently and therefore its capacities to play such a role are yet to be tested.

From a financial point of view, although in the model proposed revenues are expected to exceed costs from the third year, losses in the first year appear consistent. This may inhibit public investors and/or donors from participating in a similar initiative. However, it should be borne in mind that in the model proposed the service price has been set at a minimum. With a higher price (25 for example) the picture would change significantly. For example, there would be no losses at a price of 43.

From an operational point of view, one of the main risks will be factors related to the processing aspects of the centre. Producers need to understand that the prices received for the processed products are much lower than for fresh market produce. Good education and awareness needs to be provided otherwise the producers may not want to support the processing activities of the centre.

Similarly, awareness will be needed to convince them of the importance of paying a fee to access the ATC services. According to the model, to keep the fees low, producers will need to use the equipment by themselves, and this also can represent an important risk that services are not going to be used as much as expected. A crucial aspect will also be that related to the trust relationship that needs to be established between producers and the ATC manager with whom they will have to interface.

Another problem area is that of container management. Very good tracking and follow-up must be maintained otherwise the reusable and stackable crates will quickly go missing. Crates are very useful to the general public and may be appropriated for use by other people. Plastic crates going to the market with produce may come back empty and this would mean an additional cost. Empty plastic crates take up a lot of space and adequate provision for their storage must be made; if they are left out in the sun they will quickly deteriorate.

A demand assessment for the tomato purée would also need to be conducted in partnership with identified retail outlets before proceeding further with product design, to evaluate actual demand, consumer preference and an acceptable selling price. This work would be instrumental in addressing the issue of payment terms which would need to be clarified beforehand, with the goal to have downstream retailers pay promptly to facilitate cash payments to farmers via the ATC for processing-grade tomatoes.

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SECTION 2

ATC for rice in Côte d'Ivoire, Poro Region

1 » OVERVIEW OF RICE VALUE CHAIN

Market potential

- » Rice is the most widely consumed cereal grain in Côte d'Ivoire and in 2016, the country had a demand for about two million tonnes of processed white rice on a yearly basis. Local production is about 1.4 million tonnes, so the country can cover only 60 to 70 percent of its needs (National Rice Development Office, 2012). The remaining volume is imported, mainly from Asia. The demand for white rice is increasing at a rate of 6 percent per year mainly due to rapid urbanization. National supply is increasing as well but at an uneven pace and tends to lose ground in the substitution with cheaper imports.
- » In terms of competition and dynamism, the rice market in the Poro region is vibrant with multiple actors each playing their role to meet the demand. There is a good segmentation around three grades, with different features based on quality (impurities and percentage of broken rice), variety and price. Increasingly, the top tier consumers are shifting their preferences and putting more emphasis on aroma and flavour, and less on broken grain content.

Production capacity

- » Rice production in Côte d'Ivoire is mainly of three types: rainfed, lowland or from irrigation schemes (National Rice Development Office, 2012). Rainfed rice accounts for about 95 percent of all the rice grown in Côte d'Ivoire (about 600 000 ha). Yields are about 0.8t/ha. This is a low input system with little or no use of improved seeds, fertilizers or mechanical equipment.
- » There is limited production from lowland rice or flood plains rice (about 15 000 hectares in total for Côte d'Ivoire). Here, however, the average yields are much higher, at 2.5 t/ha. Use of pedigree seed is higher but there is still minimal use of fertilizers or herbicides.
- » Rice produced in irrigation schemes is about 5 percent of the total area (about 35 000 ha). Yields are higher with a range from 3.5 to 5.0 t/ha and two producing cycles. There is greater use of seed and agricultural inputs (by about 60 percent of producers). However, most of the irrigation systems are ageing and are in need of rehabilitation.

- » Pedigree seed of selected varieties is relatively available and is being promoted by the Office National de Développement de la Riziculture (ONDR) who have programmes disseminating rice seed of new varieties developed by the Centre National de Recherche Agronomique (CNRA). Most growers are confused about which varieties they should grow since there are so many that are available, including those from the ONDR programme. In the Poro region, it seems there is no clear alignment between the varieties grown and the market demand.
- » Farmers do not have a problem with access to markets, on the contrary the crop is in demand and they can sell their entire crop surplus. However, most of them have limited storage facilities and since they have an urgent need for cash they usually sell soon after harvest at lower prices that are not necessarily remunerative.
- » Many rice milling plant operators do not have adequate supply of paddy to be fully operational the year round. The first reason for this situation is that, since most rice is rainfed, supply is seasonal. In low rainfall years, there will be a decrease in supply and greater competition to buy the paddy that is available. The second reason is that milling plants have to pay cash for the paddy but many have limited working capital to buy the quantity they need from farmers. Larger traders who have the cash and the ability to store paddy will usually speculate, buying cheap at the peak of the harvest season and offloading at a higher price later in the low season.
- » Impurities found in the paddy have a negative impact on price and on the global efficiency in the value chain. Most rice harvesting and threshing operations are carried out by hand, resulting in debris being introduced. Moreover, most of the time the paddy is dried on bare ground. The poor quality also stems from harvesting at the wrong stage (over or undermature).
- » There appear to be adequate milling facilities in the Poro region, from the small mini rice mills to the larger mills. The quality produced by the mills varies from the small mini mills which produce a lower quality and the cheaper product containing many impurities, mainly for local rural markets, up to the larger mills producing clean white rice that is more expensive, going mainly to urban markets.

Government policies and donors' activities

- » The ONDR plays a major role in coordinating rice production and marketing, and also invests heavily in the upgrading of the value chain. It has developed the national rice strategy (Stratégie Nationale de Développement de la Filière Riz - SNDR), that aims to increase production through financing irrigation schemes or subsidizing inputs, and also to enhance value addition through building the national milling capacities.
- » The ONDR is increasingly looking at establishing partnerships with the private sector and cooperatives for them to take over and manage the

facilities it has provided. For example, the Korhogo main mill, financed and installed by ONDR, has been let to Socomci (Louis Dreyfus Commodities) for daily use and management.

- » The International Fund for Agricultural Development (IFAD) is about to start a new 7-year programme in five regions in the north including Poro, called PADFA. Activities for rice will include support to farmers, in particular for access to financing, mechanization and inputs. The programme plans also to assist the platform towards better internal functioning. The PADFA total budget is almost USD 72 million.

Available services and infrastructures

- » Although organizations such as the ONDR have been trying to encourage use of inputs and are making available mechanization equipment, it appears not much use is made of them and many producers are not aware of their availability. The approach has not yet yielded good results and new models are needed, with the increasing involvement of the private sector.
- » The ONDR has been promoting the use of inputs through a subsidy programme where the fertilizers and seeds were sold at 50 percent of their cost. Unfortunately, the scheme failed because growers tended not to pay back their share. It may be that farmers have reportedly become used to a culture of dependence on ONDR support.

Prominent stakeholders

- » Rice farmers are usually members of cooperatives with the main benefits being access to inputs available through the ONDR, which has also supported the creation of a regional platform designed to make all stakeholders come together, with the idea to initiate better relationships and ultimately, to delegate leadership over the supply chain to the platform itself. However, this platform is not yet functional, and some actors are reluctant to participate. Preliminary feedback suggests they fear losing their current advantageous bargaining position.
- » Lomana is a consulting company that offers training and assistance in improved management of rice cooperatives. With the public agency Fonds interprofessionnel pour la recherche et le conseil agricole (FIRCA), they have started providing advisory services to cooperatives that are intended to induce behavioural change and smarter decision-making in farm management through the demonstration that some activities in the field are more profitable than others. This initiative is part of the programme Filières Agricoles Durables de Côte d'Ivoire (FADCI) funded by the French development agency, which also includes the rehabilitation of the irrigation system for 1 420 ha in the Poro region, and the promotion of local management advisory service centres. Lomana is also active in the coaching of 500 entrepreneurs in the Poro region.

2 » SCPZ INITIATIVES IN THE AREA

The new 2PAI initiative for the North has just entered the design process and at this stage it is still unclear what approach will be followed. For this reason, the ATC model proposed here is conceived in the absence of an SCPZ.

3 » IMPLICATIONS FOR ATC FEASIBILITY AND DESIGN FOR RICE

The rationale which supports the launching of ATCs in the Poro region is as follows:

- » National supply is expected to catch up with the rising demand. The government has expressed its determination to continue to support the rice supply chain towards self-sufficiency. It is expected to further its commitment to invest in key infrastructures to develop production, processing and distribution at national level.
- » The ONDR is supporting the rice value chain actors in every aspect so as to spur a hike in production. Yet it is now shifting implementation models towards partnership with the private sector to ensure better efficiency. The ATC approach has the potential to fit in with ONDR strategy and should be included in that global framework to avoid any competition between initiatives that have the same purpose. The ATC would be of interest for ONDR as a new business model to deliver support services to rice farming.
- » Based on the value chain analysis, the areas that would be targeted by the ATC initiative would be the delivery of agro-services to farmers to ensure better productivity through increased use of input and mechanization, and enhancing post-harvest handling for a better quality of paddy.
- » An ATC could first play a role in improving access to agro-equipment: there is potential to increase productivity and efficiency of the rice producers through the use of rototillers and tractors for faster and easier land preparation, and by introducing threshing machines for easier harvesting.
- » The ATC could also play a role in the delivery of cleaner, higher quality paddy to the rice processing mills, which is the main driver of value creation in the downstream part of the supply chain: there is a major problem of debris in paddy due to poor post-harvest handling. This lowers the quality and reduces market opportunities but could be improved by introducing suitable grain-handling equipment such as blowers and cleaners.
- » With the ONDR strategy turning towards establishing a partnership with the private sector, the ATCs could play a role not as direct service providers to farmers, but rather in assisting young entrepreneurs to come up with innovative models to deliver those services on a fee-paying basis.

Recommendations:

- 1] The ATCs should be promoted in coordination with existing government initiatives and institutions, such as ONDR, in line with the national rice strategy (SNDR). Within this global framework, it will aim at proposing a model for the delivery of agro-services to farmers.
- 2] Due to the fact that support activities for the development of the rice value chain in the past have created a culture of dependence on external support, it is crucial for ATC sustainability that the model proposed address this situation. Any activities and incentives must therefore be carefully designed to clearly demonstrate value added to farmers and stimulate gradual commitment towards a user-pays approach for inputs and services.
- 3] Given the importance of the size and scope of the activities promoted by PADFA in the rice VC, it is recommended to favour synergy over competition, and to propose an approach that tends rather to complement the programme activities.
- 4] The proposed ATC model should be designed with the perspective of the upcoming launching of the SCPZ in the region. Considering the initiative will support investment in the downstream part of the VC, it is recommended that the ATC provides assistance to farmers for increasing the availability of paddy, thus securing a reliable procurement for private companies located within the agropole.

3 » MODEL PROPOSED

In the process of identifying a role for ATC to play, it should be borne in mind that many functions are already covered by FADCI and PADFA in the rice VC. The ATC must be complementary to these and should provide solutions to optimize what has already been done. As a consequence, the ATC will be installed to provide mechanization services to farmers on two production aspects: productivity and quality. The overall objective is to drive farmers towards using more fee-based services, and thus to increase production and efficiency.

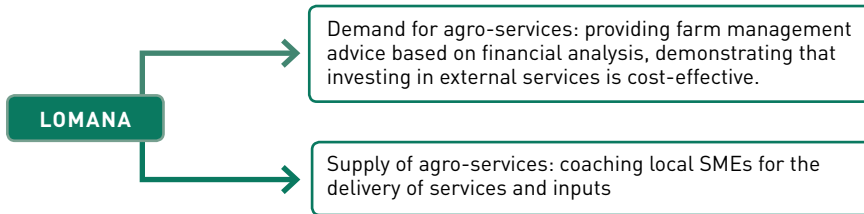
To that end, a general system is proposed, to be rolled out within the SNDR developed by ONDR, to change the incentive structure for farmers and encourage them to invest in varieties in high demand, inputs and post-harvest mechanization. The main challenge is for farmers to renounce the subsidy system and change their attitudes towards paying fees for quality services.

To spur the demand for services, the ATC will partner with FIRCA and Lomana. The two organizations have started the Conseil en gestion agricole as a 3-year pilot project (within the FADCI programme funded by AFD). This advisory service project aims at conducting financial diagnostics of agrocooperatives and inducing smarter decisions in farm management through the demonstration that some activities in the field are more profitable than others. Going further in this approach, the ATC would rely on Lomana to provide producers with



farm management advice and financial planning services, with the goal to show the way forward towards better revenues from rice farming through profitable investments in productivity. In addition, the demand for services would be supported by demonstration plots and field days to show the benefits of using mechanization. On the supply side, the ATC can act as an incubator for the development of private sector-driven services for rice producers. This will be done by supporting and coaching SMEs and entrepreneurs to start up and expand businesses such as rice threshing services or rice rototillers for hiring out to rice farmers. Again, this will be based on a partnership with Lomana which has the expertise and is already involved in the coaching of local SMEs.

FIGURE 7

Lomana role, rice ATC, Côte d'Ivoire

Source: Authors' elaboration.

During an initial phase of two years, the ATC will act as a public-private company delivering services to farmers for a fee. Its paid operators will be selected and trained by Lomana on using and maintaining equipment. This phase will be an incubation period during which the selected individuals will be trained to become small entrepreneurs. At the end of this period, machines will be transferred to them so that they can continue the services to farmers on their own, replacing the ATC. The training period will also include building capacities in business management.

In the second phase, the ATC should evolve to become an independent cluster of agro-SMEs and would possibly be merged with the Centre de gestion et d'économie rurale (CGER), to be installed by the FADCI programme in the region. Considering the need for mechanization services to support the implementation of this programme in the region, the demand for services will inevitably increase to cover more growing areas. In cases where the model is successful, a second round of training and incubating new entrepreneurs could also be envisaged.

With this approach, young entrepreneurs are trained and coached during a period of two years. The training cost will be partly supported by the farmers

through paying a fee for the mechanization (tilling, threshing, and cleaning) services. Also with this model, time is made available to better understand the needs and expectation of farmers regarding mechanization. Lomana, through facilitating the financial diagnostics of cooperatives, would be able to come up with a market assessment of the need for mechanization, which would allow to better design the right services at the right price for farmers.

In addition, regarding the SMEs' business model, starting under the ATC umbrella would allow entrepreneurs to adapt and tweak an appropriate model to ensure their success once they become independent.

Finally, the ATC will be instrumental in ascertaining the "real" market for entrepreneurs, and the conditions for reaching it, and in preparing the SMEs for this challenge. The ATC will promote good coordination and planning between farmers, service providers and the market, to ensure that entrepreneurs have a structured existing market by the end of the two years. Through identifying and supporting local people to become entrepreneurs, the ATC will help youth, and women in particular, in achieving employment.

Infrastructures in the area must be rehabilitated by the different development partners (ONDR, AFD, IFAD). In these areas, the output would potentially be increased by 43 percent, from 7 000 tonnes of paddy (3.5 t/ha) up to 10 000 tonnes (5 t/ha) thanks to intensification. The number of operators required will be as shown in Table 32.

TABLE 32

| NUMBER OF NEEDED OPERATORS, RICE ATC, CÔTE D'IVOIRE | | | | |
|---|-----------|---|---------------|---------------------|
| | HECTARAGE | SEASONAL PADDY OUTPUT (t) BASED ON A 3.5 t/ha YIELD | MACHINE YIELD | NUMBER OF OPERATORS |
| Tillage | 2 000 | | 2 ha/day | 40 |
| Threshing | | 7 000 | 3 t/day | 30 |
| Cleaning | | 7 000 | 2 t/day | 50 |

Source: Authors' elaboration.

A total of 120 operators are thus needed to provide mechanization on 2 000 ha. However, considering that agro-services represent seasonal work, the ATC will recruit and train versatile operators/entrepreneurs, operating the three machines in turn, to make sure they will have enough activity over a significant period of time, thus securing a remunerative revenue for them. This is workable because the three agro-services are not required simultaneously in the cropping calendar, but consecutively. Finally, 50 young entrepreneur candidates will be recruited and trained for the three operations. On a 2 000 ha area, each should

have a minimum of 135 working days over one season. For every operator, the three different machines will be sold based on the residual value.

The recruitment of operators for the ATC and the development of their working plan will be done gradually along with the rehabilitation of the irrigation infrastructures. Two buildings will be used: one will be the ATC per se, used as a mechanization service centre, where the machinery will be stored and maintained. As the use of this centre will be temporary, it is recommended to rent the facility, and not to build it. The second building will be the training centre for entrepreneurs. As an assumption, this will be the Lomana HQ where training sessions will take place.

Location and size

The ATC will be initially sized to deliver services to farmers based on 2 000 ha irrigated land in the Poro region. No specific areas have been identified at this stage.

Service mix

Notably, the mechanization services delivered to farmers by agro SMEs would include:

- » Productivity: tillage,
- » Quality: threshing, cleaning.

Going forward in the ATC implementation, more mechanization services may be added as needed.

Tillage Service. Land preparation for paddy is usually done by hand and this is a slow and labour-intensive process. Many farmers use hoes to dig up and prepare the fields and it will take several days to complete one hectare. An alternative is to use animal traction but this is also slower: a simple cultivating action in a dryland field with animal traction will cover 1.5 hectares per day but using a two-wheel tractor it will cover 3 hectares per day, so the motorized cultivators will double the work rate, and the quality of the work will be better. Power tillers are important for preparation of wet soils in paddy fields and service providers supported by the ATC can provide this service for a fee. A power tiller or mechanized rotavator is used for tillage of the soil (puddling) for rice production. It is recommended to use 8–10 HP machines. These cost about USD 2 400 to 3 400 and operational capacity is about 8–10 hours/ha, with fuel usage being about 2 l/hour.

Threshing service. Manual threshing is slow and labour-intensive, while the motorized threshing machine reduces drudgery and increases efficiency. In addition, the manual methods usually result in contamination by dirt and debris, but the motorized thresher will result in cleaner paddy being delivered to the rice processing mill. The high labour requirement and time delays for manual

threshing mean that there is a potential demand for hiring out a motorized threshing machine. The SME service providers affiliated to the ATC can therefore start a service to hire out machines for threshing paddy. A motorized threshing machine processes about 500 kg/hour, or 3 tonnes/day.

Grain Cleaning Machine. A major problem that was identified during the value chain analysis was that of paddy contaminated with dirt and trash coming from the field to the rice processing mills. Paddy that has sand and stones can cause damage to the milling equipment and it is necessary to remove all this foreign material prior to processing. The presence of this material reduces the percentage of milled rice and as a result the mill is more inefficient. In addition, if stones or sand are not removed and are found in the final processed rice, it will reduce the overall quality of the rice and result in lower prices for the product.

Machines for cleaning paddy are readily available and many operate using a combination of actions. The machine may have a screen with an oscillating or vibratory action or it may use a rotating drum that is designed to separate heavier materials from lighter paddy. The cleaner may have different size sieves for the removal of finer particles of dirt or larger particles such as straw. The grain cleaning machines may also have blowers or aspirators for the removal of particles that are lighter than the paddy. Cleaning of the paddy can be an important service that will result in higher quality rice being marketed and the rice mills becoming more efficient. A grain cleaning machine processes about 1 000–3 000 kg/hour. Therefore, quantity processed per day: assuming 1 000 kg/hour = 1 000 x 4 hour = 4 000 kg per day or 80 bags.

A more detailed description of the infrastructure and equipment required for the rice ATC can be found in Annex 6.

Ownership, management and institutional set-up

The ATC should be used to promote a better organization of the value chain; it is important, therefore, that the centre is placed under the leadership of the regional rice platform. With the ATC, the platform will gain more legitimacy in its representative role and this will support a greater membership.

The ATC may be registered with a status of EIG installed at the platform level. This status is flexible and can be easily adapted. It is suitable for an organization that does not necessarily include profit-sharing. It could also be applied without involving the provision of capital from stakeholders. The EIG will be created with the participation and ownership of every member group (collège). A steering committee will be set up with responsibility for strategic decisions and operational supervision.

As the platform and its EIG will receive public funding, it is recommended to appoint a board of trustees over the steering committee, which will be comprised of public representatives (Direction régionale de l'agriculture, ONDR, etc),

in charge of making the platform accountable for the funding committed to the ATCs, and ensuring that the goals set are effectively reached.

Lomana will have a critical role to play in the ATC scheme, but will operate as an implementing agency only, reporting to the platform steering committee. In particular, the consulting firm will be involved in the identification of entrepreneur candidates, which will be a key stage to ensuring the success of the entrepreneurial phase of the plan.

The centre itself will be managed by a pair of professional skilled officers on behalf of the platform, in charge of the machinery management and the coordination of the incubating process. Specifically, they will ensure that the centre is financially sustainable, looking at securing sufficient revenues from the service fees to finance the centre operations without expecting a profit from them.

Implementation. Lomana will play two distinctive roles in the model:

- » First, it will extend its ongoing work with FIRCA/FADCI to achieve financial diagnostics of rice cooperatives and prepare with them an investment plan which includes access to mechanization services towards increased output and revenues. This work will be instrumental in preparing the right offer to farmers.
- » Second, it will train and coach for two years the operators recruited to work as salaried employees at the ATC. The training programme will be two-pronged: 1) techniques for using the machinery and maintaining it, and 2) SME management and finance.

The ATC is also designed to complement and maximize synergies with the other programmes in the Poro region. Table 33 illustrates the areas of partnership with them.

TABLE 33

STAKEHOLDERS' PARTNERSHIP AREAS, RICE ATC, CÔTE D'IVOIRE

| PARTNERS | PARTNERSHIP AREAS |
|----------|---|
| FADCI | <ul style="list-style-type: none"> » Leveraging the work of Lomana to promote mechanization services and intensification of production. » Convergence between ATC role and the CGER to provide advisory services to farmers and agro-entrepreneurs. |
| PADFA | Provide collaboratively to farmers: <ul style="list-style-type: none"> » Access to inputs to growers, » Financing solutions, » Possible funding for the ATC training activities. PADFA should also build organizational capacities within the regional platform. |
| ONDR | Provide machinery, including the existing functioning items. |
| 2PAI | Ensuring paddy uptake for growers. |

Source: Authors' elaboration.

Operating costs

The work planning will be seasonal over 6 months, aligned with the rice cropping calendar. For the calculation of the total operating cost, fixed costs are considered over 12 months, but variable costs over 6 months only.

- » Building rental: 1 000 000 FCFA/month and 12 000 000 FCFA/year, or USD 21 430 per year.
- » Fuel:
 - » Power tiller: consumption of 3 l/ha, or 6 000 l for 2 000 ha. At 600 FCFA/l, the total is 3 600 000 FCFA for 2 000 ha, or **USD 6 430**.
 - » Thresher: for operating 3 t/day, need for fuel is 4.2 l; cost for 7 000 t is **USD 10 500**.
 - » Cleaner: for operating 2 t/day, need for fuel is 2 l; cost for 7 000 t is **USD 7 500**.

The total need for fuel is shown in Table 34.

TABLE 34

| TOTAL COSTS FOR FUEL, RICE ATC, CÔTE D'IVOIRE | | | |
|---|--|-----------------------------------|------------------------------------|
| | TOTAL FUEL COST ON 2 000 ha / 7 000 t (USD) | UNIT COST FOR 1 ha/3.5 t (USD) | UNIT COST FOR 1 ha/3.5 t (FCFA) |
| Tiller | 6 430 | 3.215 | 1 800 |
| Thresher | 10 500 | 1.5 | 840 |
| Cleaner | 7 500 | 1.07 | 600 |
| | 24 430 | 5.785 | 3 240 |

Source: Authors' elaboration.

The cost for one hectare would be: **3 240 FCFA**, and for one tonne: **925 FCFA**.

- » Management costs: For two management officers paid at 200 000 FCFA each per month (total salary cost), total is 400 000 FCFA per month, or **USD 715**. For 7 000 tonnes produced over one season of 12 months, the unit cost per tonne is: 685 FCFA/tonne. Considering the effective rice production season lasts more or less 6 months, this unit cost could be halved if the management cost could be spread over more activities at the ATC level over the other 6 months.
- » Labour operator cost: The cost of labour is based on a monthly salary of 150 000 FCFA. The labour cost is estimated on a season of 6 months. For producing 7 000 tonnes on 2 000 ha with 50 operators, the total cost of labour is: 150 000 x 50 x 6 = 45 000 000 FCFA, or **USD 80 360**. The unit cost per tonne is thus: 6 430 FCFA.
- » Maintenance and depreciation costs: they are based on an assumption of 2.5 percent of the investment cost per month.

Tiller: at USD 2 500 each, cost per month is USD 62.5, or 35 000 FCFA.

Thresher: at USD 1 000 each, cost per month is USD 25 or 14 000 FCFA.

Cleaner: at USD 1 500 each, cost per month is USD 37.5, or 21 000 FCFA.

The total monthly maintenance and depreciation cost is 70 000 FCFA. For 50 machinery sets used over 6 months, the total cost of labour is:

$70\,000 \times 6 \times 50 = 21\,000\,000$ FCFA, or USD 37 500. The unit cost per tonne is thus: 3 000 FCFA.

» Administrative cost: estimation at USD 50 per month, or USD 600 over one year. Unit cost per tonne is: 48 FCFA.

» Operation cost wrapping up.

Table 35 summarizes operating costs.

TABLE 35

| TOTAL OPERATING COSTS, RICE ATC, CÔTE D'IVOIRE | | |
|--|-----------------------------------|------------------------------------|
| | UNIT COST FOR 1 ha/3.5 t (USD) | UNIT COST FOR 1 ha/3.5 t (FCFA) |
| Building rental | 12 000 000 | 1 715 |
| Fuel | 13 680 000 | 925 |
| Management | 48 000 000 | 685 |
| Operator labour | 45 000 000 | 6 430 |
| Maintenance and depreciation | 21 000 000 | 3 000 |
| Administration | 336 000 | 48 |
| Total | 128 016 000 | 12 802 |

Source: Authors' elaboration.

To better cover fixed costs and reduce the unit operating cost, it will be critical to ensure the ATC will have activities throughout the year so that these costs could be better spread.

Revenue and income analysis

Assuming the cost of the mechanization services at 12 802.7 FCFA/t, this leads to a unit cost per kg at maximum 13 FCFA/kg. This means that even in the low season, at a paddy price of 150 FCFA/kg, the service costs would not account for more than 9 percent of the selling price. Moreover, there would be room for the producers to enjoy a premium price for a cleaner paddy, with which they would recoup the mechanization cost, and probably earn an extra profit from it.

At this break-even price, the ATC would recoup its costs. At such a low price, this gives the ATC enough flexibility to adapt its offer to the context and the time in the season, considering also the need for profit, providing the centre is not designed to maximize earnings. However, the profit made could be used to finance the training process of the operators towards becoming entrepreneurs at the end of the two years.

This is a first round of analysis. There is a need to go into more detail, especially regarding the cost of transportation: indeed, for transporting the equipment to the field, the ATC will have to pay for the service. But this cost can only be estimated from the real location of the growing areas. At this stage, these areas have not yet been identified.

Investment needs

Investment for equipment is shown in Table 36.

TABLE 36

| INVESTMENT FOR EQUIPMENT, RICE ATC, CÔTE D'IVOIRE | | | | |
|---|--|-------------|--------|-----------------------------------|
| ITEM | SPECIFICATIONS | COST (USD) | NUMBER | REMARKS |
| Paddy field rotavator | 9–15 HP diesel power single axle/walking tractor with rotavator blade | 2 400–3 400 | 50 | For use in preparing paddy fields |
| Rice thresher - motorized | 2.2 kW/7.5 HP motor, 300–500 kg/hour | 800–1 500 | 50 | |
| Grain cleaning machine | Grain cleaner with oscillating action and aspirator » 3.5–5 kW » To be used for maize, cowpea, groundnuts and rice » 1 000–3 000 kg/hour capacity | 1 500 | 50 | |

Source: Authors' elaboration.

For 50 sets of the three machines, the total investment cost would be in the range of **USD 250 000**. It may also be necessary to provide a comprehensive set of tools to equip the maintenance workshop at the ATC level.

Financial analysis and market assessment

As a first assumption, Lomana will conduct this work for 10 cooperatives of farmers, growing 200 ha each. For one cooperative, the analysis work will be conducted over 5 days by two consultants. Total consulting fees for one consultant will be **USD 100**. The total cost for this work will amount to: $10 \times 5 \times 2 \times 100 = \text{USD } 10\,000$.

Training cost

It is estimated that a cohort of 50 operators will undertake a total of four months of training sessions, spread across the two years, on mechanics and business management. Sessions will be held at the Lomana HQ in Korhogo. This will reduce possible logistics costs.

Considering:

- » 21 x 4 = 84 days of training sessions,
- » 2 classes of 25 operators,
- » Trainer cost at 100 000 FCFA/day.

The total training costs would amount to: $84 \times 2 \times 100\,000 = 16\,800\,000$ FCFA, or USD 30 000.

Working capital

The ATC will provide 1/3 of the cost of fuel needed for the first season or $24\,430/3 = \text{USD } 8\,140$.

Total investment cost

As a first estimation, the total investment need for an ATC covering 2 000 ha are shown in Table 37.

TABLE 37

| TOTAL INVESTMENT COSTS FOR 6 HORTICULTURE ATCS, CÔTE D'IVOIRE | |
|---|----------------|
| TYPES | COST (USD) |
| Equipment | 250 000 |
| Financial analysis | 10 000 |
| Training | 30 000 |
| Working capital | 8 140 |
| TOTAL | 298 140 |

Source: Authors' elaboration.

For the funding model, different options should be considered with a mix of loan and grant, playing out on the different factors and assumptions, in particular from the 2PAIB.

One option to be considered would be to leverage resources from partner programmes to finance part of the cost. For example, co-financing could be envisaged with PADFA which has a dedicated budget line for the facilitation of mechanization services through small entrepreneurs. A specific partnership could also be set with FADCI for the financing of the financial analysis, in line with what the programme it is already doing with rice cooperatives in the region. Finally, the ATC could explore financing solutions with ONDR, which has already provided equipment to cooperatives, albeit with limited success.

The capacity of the model to pay back investment costs could be estimated as follows: assuming 5 FCFA margin per kg over 10,000 tones produced, the ATC has the potential to generate 50 million FCFA of profit per year at full capacity, or roughly **USD 90 000**, which accounts for more than 30 percent of the total investment costs.

Impact

The ATC system proposed is expected to:

- » Improve yields and quality of produce;
- » Improve chain coordination;
- » Increase revenues for farmers;
- » Generate new jobs, especially for the youth.

Risks

This work is a first attempt to design a model that will fit in with the needs of the rice VC locally, and with what is already in place. More work is needed to go further, collecting complementary data and tweaking the financial model.

Further thought must be given to the management and ownership model of the ATC, and in particular on how the transfer of equipment to SMEs will be handled following the two-year incubation period.

One specific question to be addressed is that the platform is not currently operational and still needs to be built. The ATC will not need to be supported by a functioning platform, but will, rather, engage the actor groups individually in the GIE. On the contrary, it is precisely the establishing of the ATC that will support the emergence of a strong platform, as the centre will constitute a concrete opportunity for the actors to collaborate. In addition, the PADFA is expected to provide support for the development of the platform. In this regard, coordination will be key.

More generally, the proposed model relies on the commitment on the part of a number of external partners who will have to validate it before implementation.

At first glance, the model appears to be workable and able to reach sustainability, with room to offer the best service price possible, both affordable to the farmers, and still ensuring that the ATC can recoup its operating costs.

Going forward, it will be of paramount importance to address the question of the seasonality of the mechanization service. To ensure the operators will have a stream of revenue all year long, different solutions should be considered, such as expanding the services to other alternative crops through playing on the flexibility of the machinery (using the thresher for maize for example), or possibly purchasing specific equipment for these crops.

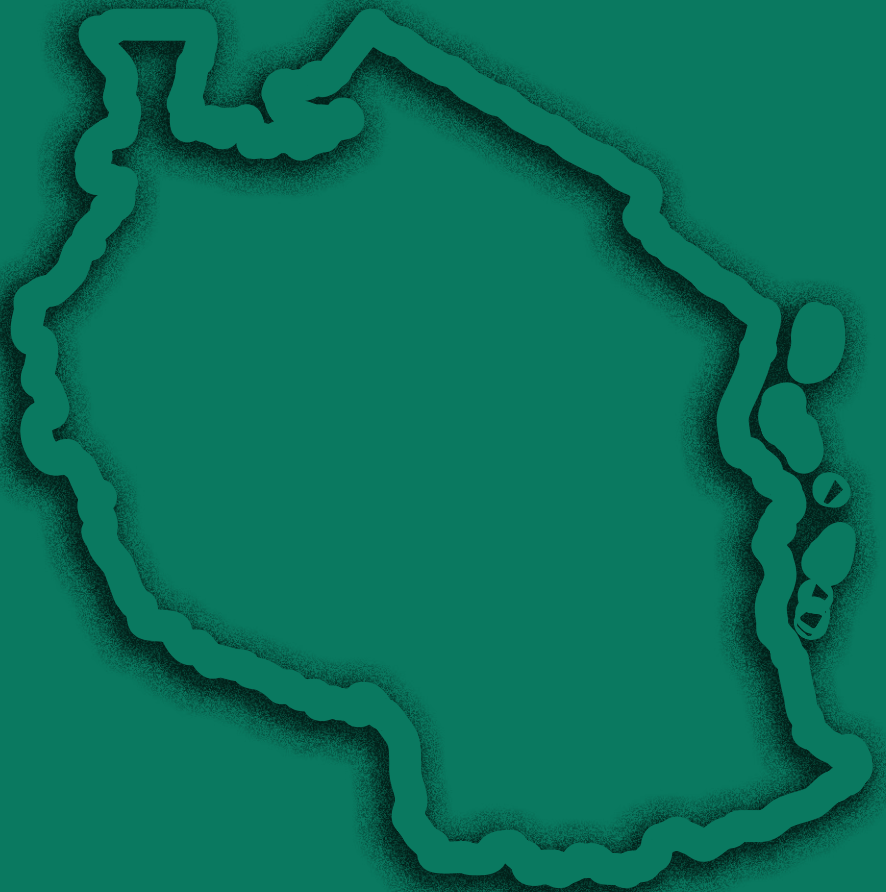
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P A R T 3

Design and feasibility of ATCs in the United Republic of Tanzania

By Esperance Mukarugwiza and Janne Remmy



SECTION 1

ATC for rice in the United Republic of Tanzania, Morogoro region**1 » OVERVIEW OF RICE VALUE CHAIN**

Market for rice in the United Republic of Tanzania. Rice is a staple food in the United Republic of Tanzania, and is consumed in both urban and rural areas. The country is the East African Community's (EAC) largest rice market, its consumption was estimated at 1.68 million MT of milled rice in 2017.⁹ Dar-es-Salaam is the principal end-market and accounts for about 60 percent of national consumption (USDA, 2018). In rural areas, smallholder farmers retain 10–20 percent of their production for household consumption.

The national consumption of rice has been increasing over past years and will continue to do so, due to population growth, urbanization and economic growth in general. The country produces 92 percent of rice consumption needs and the gap is filled with imports from the Asian market. The national demand for rice is estimated to be increasing at 4 percent per annum. Tanzanian rice is exported to neighbouring countries, including Kenya, Rwanda, Uganda, Burundi, Congo, Zambia and Malawi. About 70 000 MT were exported to these countries in 2015, and the demand growth for rice in the East African Community is about 4 percent per year.

Normally, Tanzanian rice achieves a 15 percent premium over imported rice. There are also regional preferences, and rice is often labelled as being from regions that are perceived by consumers as offering special qualities, for example: Rice from Kyela is perceived as the best, followed by rice from Mbeya; followed by Morogoro rice, then Shinyanga rice, viewed as low quality as it is not aromatic and has historically contained a large amount of foreign matter. Tanzanian rice is sold as paddy and polished milled rice. Very few other products are available although there are limited supplies of brown rice and rice flour. Value added products such as rice crackers are not yet available on the Tanzanian market.

Production of rice. The United Republic of Tanzania is the main rice producer in the EAC region, producing over 75 percent of all available rice. It is the second largest producer in Southern Africa, after Madagascar. Its production reached

⁹ Data provided by the RCT from official statistics of the Ministry of Agriculture, Livestock & Fisheries, United Republic of Tanzania

2.5 MT in 2017 (USDA, 2018). Rice is also the second most important food crop in the country after maize. It is among the major sources of employment, income and food security for Tanzanian farming households. An estimated 74 percent of production areas are under traditional rainfed systems, in lowland flood and upland dry areas, dominated by smallholder farmers with areas ranging from 0.5 to 5 acres. Twenty percent of the rice production areas are under improved, small-scale rainfed production with some limited irrigation, operated by organized farmers, while 6 percent of the land is under large-scale production, dominated by commercial farms such as Kilomero Plantation Limited (KPL) in Morogoro region.

The annual growth of rice production is estimated at 12.1 percent per year. The rice production share for the Southern highlands is about 43 percent (of which 12 percent is from Morogoro), which is the highest across all production zones in the country.¹⁰ However, the average yield is 2.1 MT/ha but Morogoro has a potential to reach 4–5MT/ha. Moreover, Morogoro is among the top five areas utilizing irrigation and has relatively high levels of irrigation potential.

On average, about 30–40 percent of overall crop production is lost annually due to pre- and post-harvest losses, and due to lack of appropriate technologies for harvesting, drying, shelling, cleaning and milling, as well as poor storage of paddy by farmers who do not have access to warehouses (REPOA, 2013).

Government strategies, policies/activities. The Agricultural Sector Development Programme, Phase II (2015–2024) focuses on increasing agricultural productivity and incomes of smallholder farmers for priority commodity chains, including rice; linking agribusinesses and farmers, smallholder agriculture commercialization, agritechnology and advisory services and market infrastructure (roads, electricity, irrigation, and warehouses). The national rice development strategy (2013–2018) had the vision to transform the existing subsistence-dominated rice sub-sector progressively into a commercially profitable and viable production system.

In 2017, the Swiss Agency for Development and Cooperation and the European Union initiated a three-year project called Rice Post-harvest & Management (RIPOMA). It focuses on rice post-harvest and marketing, especially in Morogoro, Mvomero and Kilosa districts. The project is still new and has no concrete achievements to learn from at this stage but may be of use in informing the proposed ATC approach in the near future, especially for market linkages.

The Southern Agricultural Growth Corridor of Tanzania (SAGCoT) has been tasked to coordinate the Public Private Partnership (PPP) arrangements in large- and medium-scale rice production investment and smallholder aggregation

¹⁰ Data provided by the RCT from official statistics of the Ministry of Agriculture, Livestock & Fisheries, United Republic of Tanzania

schemes, to increase the rice production in the country. The SAGCoT offers quick-win opportunities in the form of matching grants to leverage agribusiness investment in the Southern Corridor, to support the development of basic infrastructure (feeder roads, electrification, etc.).

Although rice is one of the key staple crops, its market is sometimes distorted, due to export bans and high export tariffs occasionally imposed by the Tanzanian Government. These bans can make the contractual commitments of traders with other traders/supermarkets across the border difficult to fulfil. The bans also encourage the emergence of a black market, as traders try to maintain exports in neighbouring countries. This creates business uncertainty at all levels, which ultimately discourages investments in the sector.

On the input supply side, the government has introduced a bulk procurement system for fertilizers, where imported fertilizers are already subsidized and commissioned to one company to import and distribute to others. This system has not been very successful due mainly to small margins generated as a result of the indicative prices set by government. These prices did not take into consideration the transportation costs to distribute inputs to the furthest regions from Dar-es-Salaam, hence other companies failed to purchase and distribute the inputs to farmers, and as a result, there were no fertilizers available in the shops when they were needed.

Private sector. The private sector actors include buyers, processors, retailers and fertilizer sellers (agrodealers). Primary buyers and secondary buyer-agents operate throughout the country and much trading takes place at the farm gate. There are a multitude of middle- and small-sized rice traders and some large ones.

Rice processors: most mills have a capacity of 5 to 20 tonnes of paddy per day and these account for more than 90 percent of milling operations. The larger mills – up to 120 tonnes per day – generally operate for about five months in each year. Small mills generally produce inferior rice of ‘standard’ quality (30–50 percent broken) whereas larger mills produce ‘Grade One’ rice with less than 15 percent broken grains. Retailers of raw milled rice are owners of local shops, restaurants, supermarkets, etc.

Infrastructures available. Morogoro region has 364 warehouses with a capacity of 52 913 tonnes. Kilombero district has 50 percent of them, followed by Ulanga district which hosts 29 percent. Some of these go-downs are too small (0.6 t) while others are big and can contain about 1 000–2 500 t. They belong to the village community, individuals and companies, especially rice processors, and a few to farmers’ organizations, according to data available from the Morogoro Regional Administrative Secretary (RAS). Despite the presence of the warehouses, no warehouse receipt system has been developed in the rice value chain. Many farmers do not have access to warehouses, and store their paddy in their homes

or in disorganized warehouses at village level owned by millers, which increases post-harvest losses as there are no control measures taken against post-harvest losses such as the use of pallets, measuring of moisture content before storage, or fumigation to control storage pests such as rodents and grain-borers, etc.

In general, the use of mechanization equipment is limited in rice production for smallholder farmers. They use hand hoes in production and other traditional tools for harvesting instead of labour-saving machinery (tractors, power tillers, harvesters). On the positive side, the Southern highland is endowed with planned and existing infrastructure to support agriculture including a major road system (national highways), rail and power grid backbones which run through the zone. Morogoro region is well connected by international highways to main consumer markets in Dar-es-Salaam, Arusha, Nairobi and Lusaka.

Access to finance and BDS. Bank loans are difficult to access for smallholder farmers, due to lack of collateral and the high interest rates that can exceed 36 percent per annum. Traders and processors face the challenge of not getting the required financing needed to purchase equipment (between USD 20 000 and USD 200 000) because banks are reluctant to give them loans due to low margins in the chain and perceived high risk of default. In the United Republic of Tanzania, commercial banks such as the Tanzania Agricultural Development Bank Limited (TADB) or the National Bank of Commerce (NBC) and a large number of Savings and Credit Cooperative Organizations (SACCOs) provide loans to rice value chain actors but still, the gap between the demand and supply for loans is large.

The TADB has suitable products to finance agriculture but it is still new, and does not yet have regional branches or sufficient resources to fund all the project proposals it receives. Other kinds of access to finance exist in the form of equipment (lease), which is used in Morogoro region. Efta Limited, a finance company of the United Republic of Tanzania, provides production equipment in the form of loans, and the equipment itself is used as collateral. However, the company requires monthly repayment instalments, which may be a challenge for farmers whose revenues are seasonal.

The lack of strong collective organization at farmer level is a key hindrance to accessing finance because it leads most farmers to sell their produce individually (no collection centres), and contract farming is limited to areas with large-scale millers.

Service providers for the rice value chain exist and are mostly motivated by donor support:

- » The Private Agriculture Sector Support Trust (PASST) provides financial linkage, business development services and credit guarantees to producers, processors, transporters, input suppliers, agricultural entrepreneurs, etc. Access to the guarantee is usually directly tied to the use of BDS provided

by Private Agriculture Sector Support (PASSP) at a fee, and this condition discourages farmers from requesting their services.

- » The Rice Council of Tanzania (RCT), a local NGO, funded by the European Union and the US Agency for international Development (USAID) carries out interventions in capacity building for value chain actors, collecting and disseminating market information and building market linkages. The RCT is present in Morogoro region and the organization is trusted by all parties involved in the rice value chain.
- » The Rural Urban Development Initiative (RUDI) is a local NGO dealing with empowering SMEs and farming communities through improved market linkages and distribution channels for their products. The RUDI could play a facilitation role for farmers' organizations but its interventions in the region depend to a great extent on donor-funded projects.

Main constraints to VC development. The rice sector in general lacks governance. No single player controls or drives the development of the chain, although the millers and wholesalers exert the greatest influence. The chain is characterized mostly by spot market transactions between rice value chain actors, instead of through a coordinated approach to sharing value amongst actors within the chain, to deliver the quality product required by end consumers.

Smallholder farmers are willing to invest in the chain if they have a sure market, paying them fair prices. Rice prices fluctuate from time to time, and farmers have little access to market information, which reduces their willingness to invest in production; thus the yield remains low. Moreover, lack of efficiency in the chain affects profitability for chain actors. As previously mentioned, the lack of strong farmers' organizations also makes farmers more vulnerable as price-takers because they do not possess any collective bargaining power.

2 » SCPZ INITIATIVES IN THE AREA

Feasibility studies for the establishment of SCPZ initiatives are in progress in the country. However, no decisions have been taken to date. The analysis conducted here can inform further feasibility studies on ATCs and SCPZs for the area, but given the absence at the moment of a clear SCPZ plan, the ATC model proposed will focus only on creating the market conditions for the well-functioning of future SCPZ initiatives.

3 » IMPLICATIONS FOR ATC FEASIBILITY AND DESIGN FOR RICE

There is strong market potential for Tanzanian rice, both domestically and in the region. However, access to the market remains a challenge for smallholder farmers, and thus farmers do not have a strong incentive to increase production and productivity. The ATCs could help solve the problem by linking farmers to

the market, ensuring high quality of processed grains, graded to meet standards without foreign material and with low levels of broken grains, especially designed to target the export market and selected domestic market niches.

Recommendations:

- 5] Given the high level of government commitment and that of other private actors participating in the rice VC, it is fundamental that the ATC promotion is carried out in coordination with other public and private institutions, such as SAGCoT, RIPOMA and RCT, to avoid conflicting initiatives or duplication of efforts. Similarly, any planning for the ATC must be done in coordination with the Bank to link it to the proposed SCPZ for the United Republic of Tanzania currently under development.
- 6] However, ATC feasibility will depend highly on the efficiency of the entire VC. As such, it may be hindered by the use of market distortive actions promoted by the government, such as the use of export bans, which would therefore need to be reduced.
- 7] To ensure the success of the ATC, some preparatory work needs to be done at policy level. Support is needed to establish strong farmers' organizations and also in the reinforcement of contract farming.

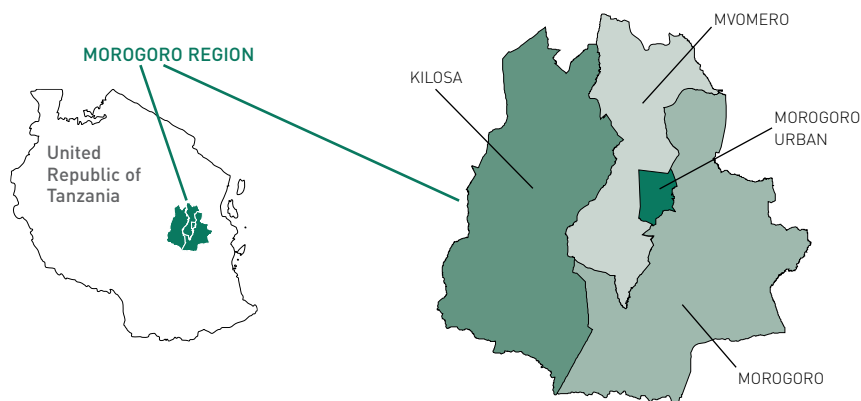
4 » MODEL PROPOSED

It is expected that the ATCs will serve as the interface between a large-scale processor in the region and producers who would benefit from a mix of services, and will be able to supply consistent quantities and quality of paddy rice. Moreover, the ATCs will play a role in increasing efficiency in the rice subsector to ensure the competitiveness of the same.

Location and size

The ATC will be located at Mvomero district, and will also serve Morogoro DC and Kilosa districts (Figure 7). The choice of the location is motivated by the high production of the district, the central position for the three districts and access to the highway connecting to the main markets of Dar-es-Salaam, Arusha, Nairobi and Lusaka.

FIGURE 8

Location of the rice ATCs, United Republic of Tanzania

Source: Authors' elaboration, customized by studio Bartoleschi.

Storage, production and post-harvest losses in the three districts are indicated in Table 38.

TABLE 38

STORAGE, PRODUCTION AND POST-HARVEST LOSSES IN ATCS LOCATION, RICE ATC, UNITED REPUBLIC OF TANZANIA

| DISTRICT OF MOROGORO REGION | | | | |
|-----------------------------|----------------|----------------|------------|------------|
| | Morgoro DC | Mvomero | Kilosa | TOTAL |
| No. of warehouses | 14 | 4 | 33 | 51 |
| Storage capacity (tonnes) | 70-600 | 200-350 | 0.5-700 | |
| TOTAL (tonnes) | 5 440 | 1 150 | 2 013 | 8 603 |
| Remarks | 50% not in use | 50% not in use | All in use | |
| Production 2016/17 (tonnes) | 95 818 | 149 331 | 73 550 | 318 699 |
| Home consumption (15%) | 14 372.70 | 22 399.65 | 11 032.50 | 47 804.85 |
| PHL/ha (tonnes) | 0.6 | 0.4 | 0.47 | 1.5 |
| Balance (tonnes) | 76 004.70 | 125 781.00 | 60 504.00 | 262 289.70 |

Source: Authors' elaboration based on data shared by the Regional Agriculture Office and RIPOMA project.

From the data presented in the table above, assuming that the warehouses which are not in use will be rehabilitated and will function as usual, the storage capacity available will be 8 603 tonnes out of the total quantity of 318 699 t of paddy produced in the three districts from 97 744 ha, with an estimated productivity of 3.2 t/ha. Taking in account the post-harvest losses and home consumption, the remaining 262 280 tonnes will need to be stored if not sold immediately.

This means that there is a need to establish a mega-warehouse which will accommodate part of the non-stored produce, to be sold to the processors operating within the agro-processing hub of the SCPZ or other large-scale processors. To start with, the ATC can build a warehouse with a capacity of 15 000 MT since a new warehouse in Mkindo will begin operations, and will accommodate 2 500. The capacity of the warehouse is a moderate estimation of the quantity of paddy rice to be outsourced by the paddy millers from the SCPZ and around it. Currently, the targeted region has millers with the capacity to process about 10 000 MT per year, which may be covered by the existing warehouses. New investors operating from within the SCPZ will need large quantities of rice, above 30 000 MT per season. However, these processors may also invest in farming, following the example of Kilombero Plantation Limited, as well as outsourcing rice production through the ATC, which makes sense if a reasonable quantity is to be stored.

The ATC will seek to make agreements with owners of the existing warehouses on how they can play the role of satellites to the mega-warehouse by supplying the same quality of rice and providing some services to farmers (extension services, demo plots, professionalization of farmers' organizations). The resources needed to achieve these objectives will be secured by the ATC. Reliable input suppliers will use the ATC facilities as well as the small warehouse premises. The major aim is to ensure the availability and sustainability of farmers' access to services even after the phasing out of the implementation of the project.

Service mix

The Agriculture Transformation Centre will serve as an innovation centre for the rice value chain in Morogoro. Farmers and service providers need the ATC to link them together in order to work towards matching supply to the market demands of the chain.

The ATC will help to build trust and fairness between producers and processors, which will trigger an increase in production. All the services will be provided in steps. During the first year, the ATC will work with organized farmers in the areas of the RIPOMA project and will be used to provide different services, targeting the increase of production and the reduction of post-harvest losses. The second year, emphasis will be put on services that will contribute to the increase of efficiency in the value chain, and other services will be added in subsequent years, when the regulatory framework is favourable.

Considering the needs of value chain actors, the ATC will provide several services, as can be seen in Table 39.



TABLE 39

| RICE ATC SERVICES, UNITED REPUBLIC OF TANZANIA | | |
|--|---|--|
| STEP 1 (FIRST YEAR): Focus on production increase and post-harvest losses | | STEP 2 (SECOND YEAR): Emphasis on more efficiency |
| Access to inputs | Access to equipment and infrastructure | Market linkages |
| <ul style="list-style-type: none"> » Partnering with other stakeholders to avail inputs at the warehouse level » Hosting Asa to sell improved seeds to farmers » In collaboration with agrodealers, set up demo plots at each warehouse | <ul style="list-style-type: none"> » Rent of production, and post-harvest equipment Warehouse to store the paddy » Transport and aggregation of paddy & rice » Linking to buyers/processors » Linking to financial institutions and crop insurance » Introduction of market information tool | <ul style="list-style-type: none"> » Introduction of contract farming » Introduction of warehouse receipt system |

Source: Authors' elaboration.

The ATC will work first with SACCOs, agricultural and marketing co-operatives societies (AMCOS) and associations that are being created under RIPOMA's project and other initiatives. As the ATC mobilizes resources from donors, the Rice Council of Tanzania (RCT) will be commissioned to facilitate the creation and strengthening of producers' organizations. Thus, it is expected that additional producers' organizations will gradually join once they are committed to be part of the initiative.

During the first year, focus will be put on production increase and efficiency through access to inputs, use of mechanization equipment and reduction of post-harvest loss, access to finance and to markets.

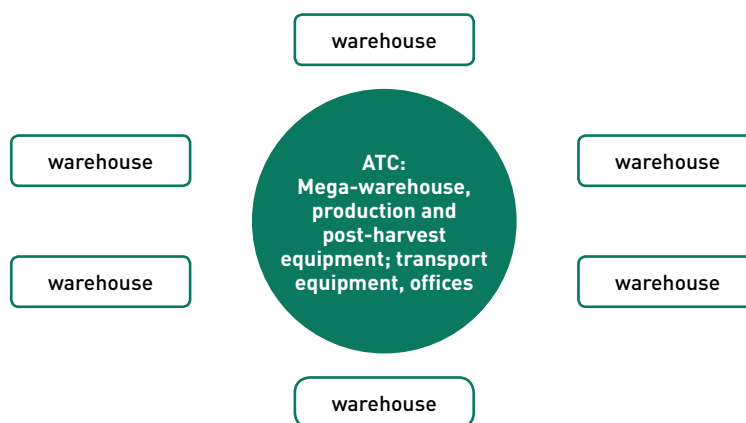
The second step will be to bring on board the processors who will sign contract farming agreements with farmers' organizations. The RCT will facilitate the negotiations between farmers' organizations and large- scale processors to ensure a win-win situation between both parties.

The other main activity is negotiating with owners of warehouses in the targeted districts to serve as satellites for the mega-warehouse proposed under the ATC model, which will also host input suppliers as well as demonstration plots to show farmers how to apply fertilizers, chemicals and seeds. The objective is achieving a productivity of 5 MT/ha after three years in irrigated areas and 3 MT/ha in rainfed areas.

The ATC will have a mega-warehouse which will provide storage services to farmers' organizations (see Figure 8). Moreover, mechanization equipment/tools will be rented to farmers or will be sold to farmers via leasing agreements.

FIGURE 9

Visual representation of the rice ATCs, United Republic of Tanzania



Source: Authors' elaboration.

Access to finance will be very important to purchase inputs and to facilitate the aggregation of paddy; in this regard, tripartite contracts between farmers' organizations, financial institutions and the off-taker(s) will be used. After building trust among the stakeholders, contract farming will be introduced, and a warehouse receipt system will be used in negotiating bank loans for farmers. The WRS is being promoted by IFAD in the maize sector but in the rice sector, financial institutions are reluctant to use it at present and farmers have shown little interest in its adoption, as it is perceived as costly. Strategies on how to make WRS a successful tool in the rice VC will be developed. Lessons have already been learned from other regions, for example in the Southern highlands, where the warehouse receipt system was modified and remained a warehouse management system, and farmers were satisfied with the new model.

Ownership, management and institutional set-up

The rice ATC will be run under a public-private partnership (PPP) model, in which the following actors will be shareholders:

- » Farmers' Associations (which will pay membership fees when they sell their produce to create sense of ownership);
- » Local Government Authority (which provides the land);
- » Private entities involved in all aspects in the rice value chain from production through marketing, which can purchase shares;
- » The RCT, as a supporting organization with a social and economic mission, will buy shares from the ATC.

The ATC will be governed by a board of directors representing all shareholders, but the daily activities will be run by a professional manager who has extensive experience in agribusiness. Moreover, a production and post-harvest specialist will be needed to facilitate smooth operations of all the post-harvest technologies provided at the centre.

The ATC will run as an autonomous institution and is expected to be self-sustaining after the second year by charging rental fees to private operators based in the mega-warehouse, and service fees to farmer organizations who will be using the infrastructure and services of the ATC.

Operating costs

The main expenses include the salaries for staff, the fuel to run all machines, overheads, and depreciation.

For fuel, the consumption (l per hr):

Tractor: 8 l/hr and it takes 1 h on 1 acre, which is 20 l/ha

Combined Harvester: 16 l/hr, it takes 3 hr/acre, which 48 l/ha

Power tiller: 1 l/hr, and for 1 acre, it takes 3 hr, which is 3 l/ha

The total consumption on 1 ha is 71 l/ha.

It is expected that that for the first year, the equipment will be used on 8 000 ha, which will require 568 000 litres of fuel, but the demand will increase as it is expected to use the equipment on maize as well.

For administrative and overhead costs, the ATC will employ a full-time manager and three other support staff, followed by part-time staff to operate the mechanization equipment (tractor, harvester and power tiller), and truck conductors:

- » The manager will be paid about **USD 2 300/month** and the post-harvest expert will be paid **USD 2 200 /month**. The three support staff will be paid a total of **USD 2 600 /month**.
- » The tractor and harvester operators will be paid 1.3 USD/acre, which is 3.3 USD/ha.
- » The drivers of the trucks will be full-time employees as well and will be paid 357 USD/month each.
- » Overhead costs will be about **USD 3 000 /month**.
- » Maintenance of equipment will cost about **USD 10 000** the first year and the amount will increase by 3 percent each year.
- » The depreciation for the building and equipment is constant and the rate applied is 5 percent for the building and 10 percent for the equipment.

- » To start construction and to buy equipment, a loan of USD 1 200 000 will be contracted from an international financial institution with a lower interest rate of 10 percent (possibilities to explore include the Bank, or the International Finance Corporation (IFC)/World Bank). The ATC will pay back the loan every year for five years, which implies a payback of USD 360 000 each year. Thus, the total costs will not include the loan repayment, while the total expenses will not include the depreciation for equipment.

Producer organizations who store their paddy in the warehouse will obtain a loan from a financial institution in order to pay for services offered by the ATC (mechanization, storage fees, etc.), and the Tanzanian Development Bank has expressed commitment to act as the preferred agent. It is expected that during the second or third year, the WRS will be operating, which will facilitate access to finance. Total expenses are showed in Table 40.

TABLE 40

| EXPECTED COSTS AND EXPENSES FOR THE FIRST 3 YEARS, RICE ATC, UNITED REPUBLIC OF TANZANIA | | | | | | |
|--|-------|-----------------|-----------|------------------|----------------------|----------------------|
| DESCRIPTION | UNIT | NUMBER OF UNITS | UNIT COST | TOTAL COST/ YEAR | 2 ND YEAR | 3 RD YEAR |
| Fuel for machines & trucks | Litre | 586 000 | 0.93 | 544 980 | 660 300 | 673 506 |
| Salary manager & post-harvest expert | Month | 12 | 4 000 | 48 000 | 49 920 | 51 917 |
| Salary support staff | Month | 12 | 2 600 | 31 200 | 32 448 | 33 746 |
| Seasonal tractor operators | Ha | 8 000 | 3.3 | 26 400 | 33 000 | 39 600 |
| Seasonal harvester operators | Ha | 8 000 | 3.3 | 26 400 | 33 000 | 39 600 |
| Truck conductors (3) | Month | 12 | 1 071 | 12 852 | 12 852 | 12 852 |
| Rent additional trucks (harvest) | MT | 12 000 | 6 | 72 000 | 72 000 | 72 000 |
| Overhead costs | Month | 12 | 3 000 | 36 000 | 36 360 | 36 724 |
| ICT platform market info. | Year | 1 | 30 000 | 30 000 | 10 000 | 10 000 |
| Equipment maintenance | Year | | | 10 000 | 10 300 | 11 330 |
| Interest on loan | Year | 1 800 000 | 12% | 216 000 | 172 800 | 129 600 |
| Depreciation (building/equipment) (A) | Year | 1 | 125 300 | 125 300 | 125 300 | 125 300 |
| Total costs (B) | | | | 1 179 132 | 1 248 280 | 1 236 174 |
| Loan reimbursement (C) | Year | 1 | | 360 000 | 360 000 | 360 000 |
| Total expenses (D=B-A+C) | | | | 1 413 832 | 1 482 980 | 1 470 874 |

Source: Authors' elaboration.

Revenue and income analysis

The ATC will generate self-sustaining revenues after the second year, from the rent of production and post-harvest equipment, offices, warehouses and trucks, and from service fees paid for by processors, as the ATC will play a brokerage role between farmers' organizations and companies to ensure quality and sufficient quantities of paddy to be supplied to them. Processors in the region have expressed a willingness to pay if they are assured of obtaining the quality and quantity they are looking for.

The recovery cost will depend on the capacity and the willingness to pay on the part of farmers' organizations, companies and service providers.

More in detail, the ATC will generate revenues from diverse services to be provided to farmers' organizations and companies (see also Table 41):

- 1] Rent for offices: The ATC will host 7 companies and organizations who want to be closer to farmers and each will pay about 100 USD/month which is 700 USD/ month.
- 2] Tractors, power tillers: Normally, other suppliers of such production equipment charge about 50 000 Tsh/acre for land preparation and planting. For the ATC, the amount charged will be 30 000 Tsh/acre or 750 000 Tsh/ha, which is about 32 USD/ha and the total area to be covered is about 8 000 ha per year. In subsequent years, the equipment will be hired by both rice and maize producers, which will increase revenues.
- 3] Combine harvesters: Current cost is 120 000 Tsh/acre but the ATC will charge 90 000 Tsh/acre or 222 000 Tsh/ha, which is about 98 USD/ha. This post-harvest equipment will be used on 8 000 ha. The number of hectares will increase in subsequent years as the equipment will be used both by the maize and rice producers.
- 4] Truck collecting paddy rice: Normally, transporters charge 2 000 Tsh per bag of 100 kg, but the ATC will charge 1 200 Tsh/Bag, which is 12 000 Tsh/tonne or 5.3 USD/t. It is estimated that the three trucks will collect about 9 000 t for the main warehouse during the harvesting season, but they will also be rented to generate additional income for the ATC. If each is rented for 250 days to carry about 25 MT tonnes a day, the three trucks will carry in total 18 750 MT per year.
- 5] Storage: The storage costs 2 000–3 000 Tsh per bag but the ATC will charge 1 200 Tsh per bag of 100 kg which is about 5.3 USD/t. The storage facility will have 15 000 tonnes per season, or 30 000 tonnes per year.
- 6] Connecting companies to farmers: It is estimated that the companies buying from farmers will pay a facilitation fee of about 1 Tsh/kg or USD 0.5/MT aggregated at the warehouse, which is 30 000 000 Tsh per year or USD 52 200 per year. Processors have expressed a willingness to pay the fee since it too costly for them to aggregate the rice.

TABLE 41

| EXPECTED REVENUES FOR THE FIRST YEAR, RICE ATC, UNITED REPUBLIC OF TANZANIA | | | | | | |
|---|--------|-----------------|------------|------------------|------------------|------------------|
| DESCRIPTION | UNIT | NUMBER OF UNITS | UNIT PRICE | TOTAL/ 1st YEAR | 2ND YEAR | 3RD YEAR |
| Office rent | Month | 12 | 700 | 0 | 8 400 | 8 400 |
| Rent of truck | Tonnes | 19 500 | 5.3 | 103 350 | 106 000 | 116 600 |
| Rent of tractor and power tillers | Ha | 8 000 | 32 | 256 000 | 384 000 | 512 000 |
| Rent of harvesters | Ha | 8 000 | 98 | 784 000 | 1 176 000 | 1 470 000 |
| Rent of warehouse | Tonnes | 30 000 | 5.3 | 159 000 | 159 000 | 159 000 |
| Service fee paid by the buyers | Kg | 30 000 | 0.5 | 15 000 | 15 000 | 15 000 |
| Total | | | | 1 325 750 | 1 848 400 | 2 281 000 |

Source: Authors' elaboration.

All calculations are based on exchange rate: <https://www.oanda.com/currency/converter>.

Investment needs

The investment will be utilized to acquire land, build a warehouse and offices, and to purchase production and post-harvest equipment/tools and trucks to transport paddy to collection centres/warehouses and to the mega-warehouse. Details are provided in Table 42.

- » It is planned to use tractors. Considering that the farmers will not start production all at the same time, and that there are other service providers for mechanization equipment who are likely to be interested in providing their services to the farmers, 4 tractors and power tillers will be used for the 3 districts.
- » Three trucks will be used to collect paddy rice from producers to transport to the warehouses and to the ATC.
- » Combine harvesters will be rented and it is planned to have 4 of them at the beginning. Their number may increase later if the demand increases.
- » A flat amount has been allocated to upgrade at least 15 existing warehouses depending on the needs for each.

TABLE 42

| INVESTMENT COSTS, RICE ATC, UNITED REPUBLIC OF TANZANIA | | | |
|---|-----------|-------------------------|--------------------------|
| DESCRIPTION | No | UNIT PRICE (USD) | TOTAL PRICE (USD) |
| Land & acquisition costs | 1 | 200 000 | 200 000 |
| Building a complex with a warehouse for 15 000 MT, conference room, 7 offices & a dryer | 1 | 1 000 000 | 1 000 000 |
| Trucks to transport paddy | 3 | 55 000 | 165 000 |
| Tractor | 4 | 27 000 | 108 000 |
| Power tiller | 20 | 3 500 | 70 000 |
| Harvester (combine) | 4 | 27 500 | 110 000 |
| Small equipment to ensure quality of stored rice | | | 300 000 |
| Amount to upgrade satellite warehouses | | | 150 000 |
| Total investment | | | 2 103 000 |

Source: Authors' elaboration.

The ATC will work hand-in-hand with projects and donors for other hard investments (e.g. irrigation) and soft skills (e.g. training, formation and strengthening producers' organizations).

The land will be contributed by the local government as their share towards the investment. The sum of USD 103 000 will be brought in by investors (in cash) while the remaining **USD 1 800 000** will be a contracted loan.

Impact

The ATC will play a key role in the rice subsector in Morogoro. Specifically, it will contribute to the following:

- 1] Farmers will be better organized, which will have an impact on the quantity aggregated to be sold to the processors.
- 2] All measures to access input and technologies will result in an increase of the yield from 3.2 t/ha to at least 4 t/ha and will reduce post-harvest losses.
- 3] The access to market and use of efficient technologies will have an impact on farmers' incomes and on improving the governance of the value chain as a whole, as processors will have improved access to higher quality paddy both throughout the season, and the entire system will benefit from improved storage.

Risks

All activities designed to stimulate production increases are planned on the assumption that the ATC will be linked to a large-scale processor who will buy about 15 000 t/season of paddy rice from the ATC and from the warehouses. However, it is not certain that such a processor will be available soon. The SCPZ planned for the United Republic of Tanzania is still in the feasibility stages; therefore, it is hoped that a major anchor investor for the rice processing sector will be identified and that the ATC model proposed can be clearly linked to this processor operating out of the agro-processing hub. However, this is a major risk to consider if implementation is to proceed at any time in the near future. More detailed analysis of the demand for paddy from a number of existing medium-scale processors should also be considered in the next stages of the feasibility assessment. The Government of the United Republic of Tanzania and the Regional Office in Morogoro have also expressed a willingness to help in the identification of the processors/buyers.

The recovery cost for the ATC investment will depend on the willingness of farmers' organizations and processors to pay for the services offered by the ATC. Service fees given in the model have been set at lower than current market prices to encourage farmers and processors to use ATC services, but these prices will probably need to be increased over time – it is hoped that by then the farmers and processors will already have experienced the benefits of the services in terms of increased income and profitability, and will therefore be willing to pay an increased fee.

The quantity of rice may reduce due to climate change (floods, droughts) or pests and diseases. Irrigation and maintenance of dykes will be adopted to mitigate that risk. Research and pest management will also be needed and the operation of the ATC should be linked to the rice research system for the country so that it can draw on emerging knowledge and innovative solutions.

The use of warehouses in the targeted districts as satellites to the ATC will depend on the willingness of their owners to cooperate with the ATC. Therefore, they will need to be convinced about the benefits to be gained from the business; especially the increased quantity of paddy to be aggregated and the assurance of the market.

The PPP model proposed for the ownership and management of the ATC is a complex model that requires a specific institutional set-up that is governed by different rules to those of a private company or public investment. Further investigation is required to identify how the ownership structure would operate in practice and what type of contractual arrangement (e.g. build-operate-manage, operate and manage contract, etc.) would fit best with the model proposed.

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SECTION 2

ATC for maize in the United Republic of Tanzania, Manyara region

1 » OVERVIEW OF MAIZE VALUE CHAIN

Market potential

Maize is the main staple food for most Tanzanians; it is grown by 3.5 million farming households (60 percent), and accounts for 40 percent of calories consumed. The annual production was 6 147 000 MT in 2016 (National Bureau of Statistics, 2017) and has declined in subsequent years to reach about 5 500 000 MT (USAID, 2018). In the United Republic of Tanzania, 50 percent of the maize is consumed by farming households, whereas 10 percent is used as animal feeds, 26 percent consumed by other rural and urban households, 9 percent is exported to neighbouring countries, and 5 percent is used for food reserve and seeds.¹¹ The major domestic market is Dar-es-Salaam, followed by Mwanza, then by Mbeya, while the main countries importing maize from the United Republic of Tanzania include Kenya (the biggest buyer), Zambia, Malawi, Rwanda, Congo and Burundi.

The domestic market growth is estimated at 3 percent per year, and there is also a high potential for maize as an input for livestock production – i.e. the animal feed industry. Current estimates suggest that the country's eight neighbours regularly import at least 300 000 MT of maize, and that this demand could quadruple when rains fail in one part of the region or another. If the United Republic of Tanzania becomes a reliable source of grains, the country could well become a regular exporter of 500 000 MT of grain or more. However, the export trade remains opportunistic and often illegal, and depends on many internal and external factors. Periodic export bans have discouraged traders from seeking large export contracts and encouraged illegal routes, especially the bush 'panya' routes across the nation's highly-permeable borders.

¹¹ <http://www.saiia.org.za/value-chains-in-southern-africa/1055-008-tanzania-maize/file>

Production capacity

In 2017, Manyara produced 873 758 MT on 427 663 ha. About 80 percent of the production comes from smallholder farmers with 0.5–5 acres and the rest from commercial farmers. Production trend in Manyara shows a steady increase over the years with the productivity of 2 t/ha. There is a potential to increase production due to the availability of land and it has two rainy seasons (short-rains minor cropping season and a long-rains season). The projection is to cultivate about 495 073 ha in the next three years, with an expected to yield about one million tonnes. The region has a significant potential to grow maize.

There has been no appreciable use of agro-inputs and fertilizers except recently when there was an outbreak of Fall armyworm which caused high losses to farmers, although the percentage is not yet known.

The overall level of productivity for maize in the United Republic of Tanzania is low. The average productivity at country level is 1.3 t/ha and it is 2 t/ha in Manyara, which is lower than the worldwide average productivity of 4.3 t/ha. Farmers are reluctant to invest in production-enhancing inputs until they are assured of a rewarding market. Besides the lower yield, about 20 percent post-harvest loss occurs due to lack of skills and appropriate technology for harvesting, drying, shelling, transporting and storing.

Government policies/activities

With the support of the Bill and Melinda Gates Foundation, the Collective Warehouse Based Marketing system (COWABAMA) was established in 2013 to be a nationwide programme linking village warehouses with regional and national grain stockholding and trade systems. The maize value chain was the first to test the model. Under the model, more than 275 warehouses were installed or rehabilitated in the country, especially in the Southern Corridor and started in districts with relatively high maize production and productivity, and good potential for expanded commercial crop sales. These warehouses have an average capacity of 300 MT. The model focused on farmer-based organizations (FBOs) and was expected to generate a practical payoff within three years of operating and was based on demand-pull. Unfortunately, the project has not proved very successful, due to limited follow-up to encourage full commitment from farmers' organizations and buyers. The programme started as a top-down initiative from the government, but closed down when the Bill and Melinda Gates' Foundation programme was forced to cease activities.

The National Food Reserve Agency (NFRA) operates under the Ministry of Agriculture, Livestock and Fisheries of Tanzania. Its purpose is to guarantee national food security during food shortage. The budget allocated to NFRA depends on the amount allocated by the Ministry of Agriculture and the extent of the food shortage.

The agency purchases maize grains from organized farmers but its quantities have reduced since 2015 from 32 426 683 tonnes in the 2014/15 season to 1 500 tonnes in the 2017/18 season. Although some farmers were used to selling to NFRA, they complained about delayed payments due to budget constraints. However, farmers are now becoming used to selling without the NFRA.

Maize is one of the priority commodities under the Agricultural Sector Development Programme, Phase II (ASDP II) which is planned to cover ten years, starting in 2018/19. Maize will be developed in all ASDP II clusters, including central, coastal, lake, Northern highlands, South and Southern highlands. The ATC approach will respond to two of the three ASDPs components: a) Enhanced agricultural productivity and profitability; b) Commercialization and value addition.

Private sector

The maize business is dominated by thousands of brokers or aggregators who buy maize grains from the farm household and sell to millers or take them to other maize traders. The local aggregators reside close to the farmers in trading centres, districts, or small towns along the highways. It is estimated that there are about 250 000 local brokers. During the high season (June to August) local aggregators pay farmers about 250 Tsh to 300 Tshs per kg of maize, while the price may go up from 500 Tsh to 600 Tsh during the low season (January to May). However, when the government imposes export bans, as happened in 2017, the situation changes.

Urban traders buy maize from farmers and local brokers. They store the maize in town and sell it to millers, larger traders or even the NFRA. They may also enter into contract farming arrangements with smallholder farmers. Their price markup usually varies from 3 to 5 percent above the market price. Urban large traders buy maize from smaller traders and supply the maize mainly to urban retail traders; in fact, they control most of the urban maize markets in larger cities. These traders reside in Dar-es-Salaam or Arusha. They are usually paid 50 Tsh per kg for their efforts.

Infrastructures available

There are 343 warehouses available in Manyara region which can handle an average of 10–1000 tonnes of cereals each.¹² Based on this, Table 43 shows the number of warehouses needed in Manyara.

¹² Conclusion based on statistics provided by the Regional Agricultural Office

TABLE 43

| WAREHOUSE NEED IN MANYARA, UNITED REPUBLIC OF TANZANIA | | | |
|--|--------------------------------|----------------------------------|---------------------------------|
| PRODUCTION/ YEAR (tonnes) | No. OF WAREHOUSES AVAILABLE | Av. STORAGE CAPACITY (tonnes) | TOTAL STORAGE CAPACITY |
| 750 000 | 343 | 300 | 102 900 |
| CONSUMPTION (50%) | 9.3% KIBAIGWA | BALANCE (tonnes) | REQUIRED WAREHOUSES: 1 000 t |
| 350 000 | 69 750 | 227 350 | 227 |

Source: Authors' elaboration.

Manyara is also four hours away from Dodoma, which hosts the Kibaigwa market, and has storage facilities with a capacity of 18 500 MT (three warehouses), normally hired by traders and or large-scale farmers to store their produce. The quantity of maize brought to this market per year ranges from 50 000–113 695 tonnes.¹³

Financial Institutions and BDS providers

Access to finance: There are four banks lending to maize value chain actors. The Cooperative Rural Development Bank (CRDB) indirectly finances maize farmers through SACCOs; the National Microfinance Bank (NMB), a partner of RaboBank, provides loans to organized farmers and has put in place specific products that fit the seasonal character of each crop. The Tanzania Agricultural Development Bank (TADB) is a state-owned bank providing loans to farmers' groups and other chain actors. It was launched in 2015 but started providing loans towards the end of 2016. The bank has shaped its products according to the needs of the value chain actors, including pre-harvest and post-harvest loans, infrastructure and asset finance loans. Moreover, the bank will launch three farm clinics, which will be centres for mechanization services, storage facilities, a self-help portal providing information on markets and best agricultural practices, as well as post-harvest handling. Given the similarity between the potential services to be provided by the ATC and those to be provided by the TABD farm clinic, it will be interesting to learn how well the farm clinics are received by farmers and any lessons learned that could help to inform the design of the proposed ATC in the future. The Tanzania Investment Bank (TIB), Finca Microfinance Bank and Pride finance some agricultural marketing and cooperative societies (AMCOS) involved in the maize value chain. Although some initiatives exist, in general smallholder farmers face challenges in accessing finance. Neither contract farming nor the warehouse receipt system are fully developed, although they could represent strong collateral for financial institutions but the uncertainty about maize prices due to export bans discourages banks.

¹³ Data shared by Kibaigwa Secretariat at Kibaigwa Market Office

Agri-BDS:

- » The Agriculture Markets Development Trust (AMDT) has been established by the governments of Denmark, Ireland, Sweden and Switzerland. For the maize value chain, the AMDT aims at unleashing systemic change through: a) collaboration and contractual arrangements among value chain actors; b) enhancing the information and extension system; c) enhancing availability and adoption of improved post-harvest technologies and good post-harvest practices; d) enhancing strategic coordination and the business environment for agricultural micro, small and medium enterprises in the value chain. The AMDT is in partnership with WFP in the Farm to Market (FATMA) framework.
- » Building Rural Incomes Through Enterprise (BRITEN) is a social enterprise, dedicated to increasing incomes and improving livelihoods through empowering rural agribusinesses (farmers and entrepreneurs). The enterprise specializes in agricultural development initiatives, designed to facilitate market access, enhance agribusiness competitiveness, increase productivity and improve access to inputs and finance. The area of intervention is mostly in the Southern Highlands; BRITEN supports farmers in organizing themselves into farmers' groups, but it is the farmer who decides which type of group they want to belong to, among the recognized groups. Ninety-eight cooperatives have been supported in their efforts to be legalized, and have been strengthened, thanks to BRITEN. The approach used by the enterprise is business-oriented and where farmers are not able to aggregate their produce, a private sector operator is brought in to buy their maize and BRITEN plays the role of match-maker, ensuring payment of fair prices to farmers.
- » The Rural Urban Development Initiative (RUDI) is a local NGO dealing with empowering micro-small enterprises (MSE) and farming communities through improved market linkage and distribution channels for their products. Key interventions of RUDI include formulation and advocacy on policy reforms; improving market linkage through information sharing; facilitating access to credit and expanding crop production through skills management training. The NGO covers intervention in the Southern Corridor, including Dodoma, and operates within the FATMA framework in collaboration with WFP, focusing on capacity building for farmers' organizations.
- » Mtandao wa Vikundi Vya Wakulima Tanzania (MVIWATA) is a network of farmers' groups in the United Republic of Tanzania, which focuses on advocacy to influence policy process, and organize farmers into strong groups and networks in order to have common voice to advocate for their interests, and to obtain access to finance and markets. MVIWATA is active in the maize value chain and is a board member of the KIBAIGWA market.
- » The International Fund for Agricultural Development (IFAD) has an ongoing programme called the "Marketing Infrastructure, Value Addition and Rural Finance Support Programme" which focuses on increased access of rural finance to a wider range of financial services for productivity-enhancing technologies, services and assets; increased access to sustainable agricultural inputs and output markets and opportunities for rural enterprises. Through this programme, the

WRS has been developed and is being implemented in different parts of the country. However, the financial institutions contacted were hesitant to use the WRS for the maize value chain due to the likely risk of market disturbances.

- » Farm Africa is an international organization working to build a prosperous rural Africa. They are helping farmers to increase their harvests, build their incomes and sustain natural resources, partnering with governments and the private sector to find effective ways to fight poverty. They have an ongoing project from 2016-18, targeting marketing, training on post-harvest handling (moisture control, on-time harvesting, weighing and measuring, use of hermetic bags and aggregation and storage in collective warehouses).

Main constraints to maize VC development.

The maize value chain of the United Republic of Tanzania has an immense potential for future development. However, there are many constraints that need to be addressed, especially those related to a low level of production, market and profitability. The fluctuations of maize prices and yields limit investment on the part of farmers in buying quality inputs and technology and has a negative impact on access to finance due to the perceived risk by farmers and financial institutions. Moreover, the lack of strong farmers' organizations limits their aggregation capacity and their bargaining power, which leads them to sell their maize at the farmgate.

Finally, the lack of storage facilities and quality control by farmers is a hindrance to processors as they are not sure of obtaining sufficient quality and quantities of maize. In Manyara region, an estimated 269 973 tonnes is not stored properly, as calculated in Table 44.

TABLE 44

| STORAGE NEED IN MANYARA, UNITED REPUBLIC OF TANZANIA | | | | | | | |
|--|----------------------|-------------------|----------------|--------------------------|---------------------|----------------|-------------------------------|
| DISTRICT | NUMBER OF WAREHOUSES | CAPACITY (tonnes) | TOTAL (tonnes) | PRODUC. 2016/17 (tonnes) | HOME CONSUMP. (30%) | PHL/ha (20%) | BALANCE TO BE STORED (tonnes) |
| Babati district | 138 | 50–1000 | 72 450 | 136 511 | 40 953 | 27 302 | (4 195) |
| Babati town council | 36 | 10–1000 | 18 180 | 44 132 | 13 240 | 8 826 | 3 386 |
| Mbulu | 31 | 10–800 | 12 555 | 121 550 | 36 465 | 24 310 | 48 220 |
| Kiteto | 50 | 50–1000 | 26 250 | 112 565 | 33 769 | 22 513 | 30 032 |
| Simanjiro | 45 | 50–800 | 19 125 | 319 000 | 95 700 | 63 800 | 140 375 |
| Hanang | 43 | 30–800 | 17 845 | 140 000 | 42 000 | 28 000 | 52 155 |
| | 343 | | 166 405 | 873 758 | 262 127 | 174 752 | 269 973 |

Source: Authors' elaboration based on data collected from Manyara Regional Office.

In addition to the problem of maize volumes with no opportunity to be stored, even some of the existing warehouses (about 40 percent) are not fully utilized due to poor management or the need to be rehabilitated.

2 » SCPZ INITIATIVES IN THE AREA

As stated in the previous section, feasibility studies for the establishment of SCPZ initiatives are in progress in the country. However, there are no planned activities at the moment. The ATC model proposed will focus, therefore, on creating ideal market conditions for the well-functioning of future SCPZ initiatives.

3 » IMPLICATIONS FOR ATC FEASIBILITY AND DESIGN FOR MAIZE

Manyara is part of the Northern highlands zone which produces 14 percent of the total maize in the United Republic of Tanzania, and the government envisages a high potential for maize to be promoted in the ASDP II. Many development projects and PPPs have been focusing more on the Southern highlands but the government wants to promote other zones according to their potential and Manyara region is suitable for maize as well.

The Manyara region is strategically positioned because it covers the bigger markets of Arusha and Kilimanjaro, and the neighbouring countries (Uganda, Kenya and Rwanda). In addition to this, Manyara region is favoured by good weather. In the United Republic of Tanzania, maize is produced by smallholder farmers who depend on rainfed agriculture. The region receives bimodal rains and the wet zones have more increased yields.

The ATC is expected to be a sustainable solution to address constraints assessed in the maize value chain and will bring viable solutions to be explored by other stakeholders (see Table 45).

TABLE 45

| CONSTRAINTS IN MAIZE VALUE CHAIN AND CAUSE TO BE ADDRESSED BY THE ATC, UNITED REPUBLIC OF TANZANIA | | |
|---|---|--|
| CONSTRAINTS | CAUSES | CROSS-CUTTING CAUSES |
| Low yields | <ul style="list-style-type: none"> » Low-level use of improved seeds and fertilizers » Dependence on rainfed production | <ul style="list-style-type: none"> » Limited access to finance » Weak farmers' organizations |
| Market | <ul style="list-style-type: none"> » Lack of storage facility » Fluctuation of prices | <ul style="list-style-type: none"> » Limited skills in post-harvest management |
| Profitability | <ul style="list-style-type: none"> » High production costs due to manual work » Significant post-harvest losses » High number of intermediaries in the chain which minimizes margins for smallholder farmers | <ul style="list-style-type: none"> » Limited access to market information » No irrigation infrastructures » Low mechanization |

Source: Authors' elaboration.

Recommendations:

- 4] ATCs should be promoted in coordination with existing government/donors' initiatives to ensure coordination and avoid conflicts.
- 5] Capacity of farmers' organizations should be strengthened.
- 6] Increase mechanization to reduce production costs and PHL.
- 7] Improve storage infrastructures and direct market linkages to processors to increase value within the chain.

4 » MODEL PROPOSED

In the model proposed, the existing warehouses, not efficiently utilized at the moment, will be rehabilitated and will serve as ATC satellites, as they are located in close proximity to farmers.

The first activity to be conducted is the negotiation with the owners of existing warehouses, to transform them into service centres for farmers providing input supply, access to information and knowledge, production and post-harvest technologies as well as storage.

The second activity proposed is to negotiate with private sector actors in the maize value chain to use the satellite warehouses to offer service provision to farmers.

The success of the ATC will depend heavily on the partnership and synergies with various stakeholders. Some activities will need to be completed before others start. For a list of main activities see Table 46.

TABLE 46

| MAIN MAIZE ATC ACTIVITIES, UNITED REPUBLIC OF TANZANIA | | |
|--|---|---|
| ACTIVITY | OUTPUT | STAKEHOLDER TO BE ENGAGED |
| Activity | Output | <ul style="list-style-type: none"> » Seed companies » Agrodealers » Financial institutions/processors to provide input loans » Warehouse owners to host input suppliers » Farmers' organizations |
| Use of ICT for agriculture | Farmers' access to market information, pest management and others to take appropriate decisions | <ul style="list-style-type: none"> » District extension officers » Input suppliers » Satellite warehouse owners to accept demo plots at the warehouses and trainings » ICT developers to develop an application to be used to share information on good agricultural practices (GAP) » Collaboration with the post-harvest training centres built with the support of IFAD and the Bank through MIVARF. » Collaboration with AMDT on market information |
| Capacity building for farmers' organizations | Strong business-oriented and well managed farmers' organizations | <ul style="list-style-type: none"> » BRITEN » WFP |
| Rent of production and post-harvest equipment/tools | Farmers access affordable technologies which reduces production costs and post-harvest losses | <ul style="list-style-type: none"> » Sellers of equipment (under leasing arrangements) » Innovators producing production and post-harvest tools and equipmen |
| Storage services | Farmers' access to warehouses which reduces post-harvest losses and increases availability of grain for processors | <ul style="list-style-type: none"> » Small warehouse owners » IFAD |
| Linking to processors | Farmers gain access to reliable and fair markets while processors obtain a consistent supply in maize, respecting quality and quantity required | <ul style="list-style-type: none"> » Processors » Farmers' organizations » WFP » BRITEN |

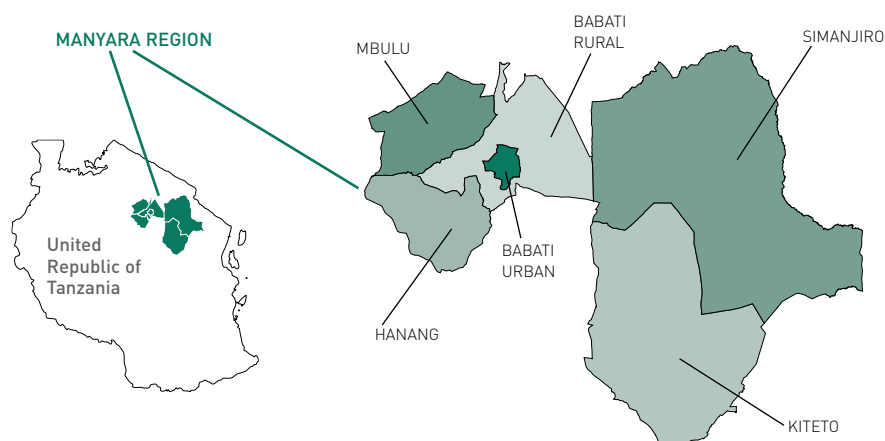
Source: Authors' elaboration.

Location and size

The ATC will be located at the Babati Town Council (see Figure 9). There are two districts with higher production, namely Kiteto and Simanjiro but they are both a long way from the market and the roads and basic infrastructure are not in good condition. Babati, on the other hand, is strategically located and can be easily accessed from neighbouring regions such as Arusha and Kilimanjaro. The ATC will serve the following districts: Kiteto, Babati, Simanjiro, Babati Urban, Hanang and Mbulu. The ATC will be closer to farmers from the districts compared to the Kibaigwa (Dodoma), an international market covering an area of 400 km, with the exception of Kiteto and Simanjiro. The city of Babati is centrally located in Manyara region and thus will attract maize investors (large-scale processors).

FIGURE 10

Location of the maize ATCs, United Republic of Tanzania



Source: Authors' elaboration, customized by studio Bartoleschi.

Service mix

The ATC is proposing a set of services and products to address the identified constraints in the maize value chain to increase production, improve access to market and create more efficiency and thus more profitability. The key services to be provided are the following:

- » Input distribution
- » Production and post-harvest equipment

- » Primary processing: shelling, cleaning, drying, grading and proper packaging
- » Storage
- » Access to finance
- » Market information
- » Linking to buyers/processors

For input supply, the ATC's management will work closely with existing warehouses, agrodealers and farmers' organizations who will be willing to provide services and make use of these services in their respective groups. The seed companies as well as Asa will be brought on board to ensure the timely availability of seeds.

The ATC will start working with farmers who are in the network of WFP, RUDI and IFAD projects. Strengthening the business skills and management of farmers' organizations will be key to ensuring the aggregation of sufficient quantities of maize. However, this is a non-commercial activity which should be covered by donor funds to be mobilized by the ATC. If resources are obtained, BRITEN will be hired to use its experience from the Southern Highlands in building the capacities of the farmers' organizations.

Production and post-harvest equipment will be made available at the satellite ATCs, to be rented at a discount price to farmers; private companies will also be encouraged to sell or rent their equipment to farmers or their organizations. To set a good example, the ATC will equip four centres with mechanization and post-harvest equipment. For this purpose, the following equipment will be purchased:

- » 4 tractors,
- » 4 planters,
- » power tillers,
- » 4 harvesters
- » 3 trucks
- » Small equipment and tools: trolley scales, wood pallets, high-moisture shellers, cleaning machines, flattop dryers, solar bubble dryers, ultra-hermetic cocoons, collapsible dryers, pics bags, moisture meters, and aflatoxin detection meters.

The storage will be maintained at existing warehouses and the number of warehouses to work with will increase gradually. For the first year, the ATC will rehabilitate 15 warehouses and will scale up that number to 20 and 30 warehouses over the second and the third years respectively.

Contract farming will be used to render the linkage between farmers and processors operational, and this will facilitate farmers' access to finance. The ATC will find a solution to the problem of access to finance through partnerships with financial institutions, and the warehouse receipt system will be used to obtain

collateral for farmers but the success of these efforts will depend on the level of willingness to participate on the part of both the farmers and the financial institutions. The ATC will learn from the IFAD's experience in the region.

Ownership management and institutional set-up

Similarly to the rice ATC model proposed, the maize ATC in Manyara will be created as a PPP model and will be owned by different shareholders, including:

- » Farmers' organizations,
- » The Local Government Authority, which will provide the land from the village,
- » Private companies (processors, agrodealers, etc.),
- » BRITEN, which as a social enterprise, is also willing to buy shares.

The ATC will be governed by a board of directors representing all shareholders but the daily activities will be run by a professional manager, who will also be a qualified post-harvest expert. The ATC will generate revenue by charging rental fees to private operators based in the mega-warehouse and service fees to farmers' organizations who will be using the infrastructure and services of the ATC.

Operating costs

The costs will be related to the fuel for the mechanization and post-harvest equipment, the salary for staff and temporary staff and manpower to be hired on a seasonal basis; the overhead costs, the fumigation costs, maintenance of equipment, loan interest, ICT for agriculture for farmers to obtain market-based and other relevant information needed in farming, and depreciation.

For the fuel,

Tractor: 8 l/hr and it takes 1 h on 1 acre, which is 20 l/ha

Combine harvester: 16 l/hr, it takes 3 hr/Acre, which 48 l/ha

Power tiller: 1 l/hr, and for 1 acre, it takes 3 hr, which is 3 l/ha

The total fuel consumption on 1 ha is 99 l/ha

The equipment will be utilized on 3 000 ha the first year, which will be 297 000 litres, but the demand will increase by 20 percent as it is expected to use this equipment also for rice and sunflower.

For administrative and overhead costs, the ATC will employ a full-time manager and three other support staff, part-time staff to operate the mechanization equipment (tractor, harvester and power tiller) and truck drivers:

- » The manager who will also be post-harvest expert, will be paid about 2 300 USD/month and support staff will be paid 1 600 USD/month total.
- » The tractor and harvester operators will be paid 1.3 USD/acre, which is 3.3 USD/ha.
- » Drivers of the trucks will be full-time employees and will be paid 357 USD/month each
- » Overhead costs will be about 1 000 USD/month
- » Maintenance of equipment will cost about 5 000 USD the first year and the amount will increase by 3 percent each year.

It is assumed that the ATC will work with a warehouse with 15 000 MT the first year and the quantity will increase in subsequent years up to 20 000 MT in the second year, and 25 000 MT in the third year. Warehouse costs will be paid for by farmers themselves. Total costs are summarized in Table 47.

TABLE 47

| TOTAL OPERATING COSTS, MAIZE ATC, UNITED REPUBLIC OF TANZANIA | | | | | | |
|---|-------|-----------------|-----------------|----------------------|----------------------|----------------------|
| DESCRIPTION | UNIT | NUMBER OF UNITS | UNIT COST (USD) | TOTAL COST/ 1ST YEAR | TOTAL COST/ 2ND YEAR | TOTAL COST/ 3RD YEAR |
| Fuel for machines | Liter | 297 000 | 0.93 | 276 210 | 331 452 | 369 900 |
| Salary for the manager & post-harvest expert | Month | 12 | 2 300 | 27 600 | 28 704 | 29 852 |
| Salary of the support staff | Month | 12 | 1 600 | 19 200 | 19 968 | 20 767 |
| Seasonal tractor operators | Ha | 6 000 | 3.3 | 26 400 | 33 000 | 39 600 |
| Seasonal harvester operators | Ha | 6 000 | 3.3 | 26 400 | 33 000 | 39 600 |
| Truck conductors (3) | Month | 12 | 1 071 | 12 852 | 12 852 | 12 852 |
| Overhead costs | Month | 12 | 1 000 | 12 000 | 12 240 | 12 485 |
| ICT for agriculture platform | Year | 1 | 30 000 | 30 000 | 10 000 | 10 000 |
| Maintenance of equipment | Year | | | 10 000 | 10 300 | 11 330 |
| Interest on loan | Year | 307 200 | 12% | 36 864 | 29 491 | 22 118 |
| Depreciation (building and equipment) (A) | Year | 1 | 75 300 | 75 300 | 75 300 | 75 300 |
| Total costs (B) | | | | 552 826 | 596 307 | 643 805 |
| Loan reimbursement (C) | Year | 1 | | 61 440 | 61 440 | 61 440 |
| Total expenses (D=B-A+C) | | | | 538 966 | 582 447 | 629 945 |

Source: Authors' elaboration.

Revenue and income analysis

The revenues will come from service delivery (see Table 48):

- 1] Rent of mechanization and post-harvest equipment,
- 2] Rent of trucks to transport maize,
- 3] Rent of small equipment and tools,
- 4] Brokerage fee paid by processors.

TABLE 48

| TOTAL REVENUES, MAIZE ATC, UNITED REPUBLIC OF TANZANIA | | | | | | |
|--|--------|-----------------|------------|----------------------------|----------------------------|----------------------------|
| DESCRIPTION | UNIT | NUMBER OF UNITS | UNIT PRICE | 1 ST YEAR (USD) | 2 ND YEAR (USD) | 3 RD YEAR (USD) |
| Rent of truck | Tonnes | 10 000 | 5.3 | 53 000 | 63 600 | 76 320 |
| Rent of tractor and power tillers | Ha | 3 000 | 32 | 96 000 | 115 200 | 138 240 |
| Rent of harvesters | Ha | 3 000 | 98 | 294 000 | 352 800 | 423 360 |
| Rent of small equipment and tools | Tonnes | 10 000 | 5 | 50 000 | 60 000 | 72 000 |
| Service fee by buyers | Tonnes | 15 000 | 0.5 | 7 500 | 10 000 | 12 500 |
| Total | | | | 500 500 | 601 600 | 722 420 |

Source: Authors' elaboration.

The ATC will be able to make profits starting from the second year. However, costs for capacity building for farmers' organizations will need to be covered by donors and are not counted in the model.

Investment needs

The initial investments for the ATC are the following (see also Table 49):

- » Land to build the ATC innovation centre with some offices. The village government office will make the land available, and purchase shares in the ATC;
- » Building the centre with offices, with modest infrastructure;
- » Mechanization and post-harvest equipment: Tractor, power tiller and small equipment and tools including high-moisture shellers (3); dryers (3); local shellers (3); solar bubble dryers (3); ultra-hermetic cocoon; collapsible dryer (3); moisture meter (10); trolley scale (5); oxygen meter (5); grain cleaning machine (3); sewing machine (3), and grain graders (5).
- » Working capital needed for the first 6 months before generating own income.

TABLE 49

| ESTIMATED INVESTMENT, MAIZE ATC, UNITED REPUBLIC OF TANZANIA | | | |
|--|----|------------------|-------------------|
| DESCRIPTION | No | UNIT PRICE (USD) | TOTAL PRICE (USD) |
| Land to build the innovation centre | 1 | 60 000 | 60 000 |
| Building the ATC centre with some offices | 1 | 150 000 | 150 000 |
| Trucks | 3 | 30 000 | 90 000 |
| Tractors | 4 | 27 000 | 108 000 |
| Power tiller | 20 | 3 500 | 70 000 |
| Harvester (combine) | 4 | 27 500 | 110 000 |
| Amount to rehabilitate some warehouses | 15 | 2 000 | 30 000 |
| Small equipment and tools* | 1 | 150 000 | 150 000 |
| Working capital needed | | | |
| Total | | | 768 000 |

Source: Authors' elaboration.

The needed investment amount will be availed by the shareholders at 60 percent or (USD 460 800) and the rest (USD 307 200) will be a loan from the bank.

Impact

The expected initial impact of the ATC to be established in Manyara region will be on the welfare of the farmers. With a more secure and fair market, and with efficient production and post-harvest technologies, there is potential for an increase in income per season by at least 40 percent. This can be achieved as a result of a potential increase in yield of 100 percent, reduction of post-harvest losses and savings on labour costs from using the mechanization and post-harvest equipment. In addition to this, buyers will obtain consistent supplies of maize (in quantity and quality) and the trust built will contribute towards increasing investments in maize processing.

Risks

The model proposed is based on the findings from a rapid value chain assessment of the maize supply chain and would require further verification to ensure the validity of the model. The model also relies heavily on the existence of a sure market for maize. Ideally, the ATC should be directly connected to the agro-processing hub envisaged under the SCPZ to provide a constant supply of raw materials to the hub. However, as discussed for the rice ATC model, the SCPZ planned for the United Republic of Tanzania is still in the feasibility stages;

therefore, a more detailed analysis of the demand for maize from a number of existing medium-scale processors in the region should also be considered in the next stages of the feasibility assessment, given that the SCPZ is likely to take several years for implementation to begin. The ATC management will need to identify potential contracts with processors from the beginning so that accurate forward-planning can be made to achieve production targets with producers, and to ensure a steady stream of revenue from the services provided to farmers' organizations and processors.

It is expected that farmers will be actively involved in the business of the ATC through their organizations. Their willingness to aggregate their produce and their business mind-set will be key to the success of the ATC. Thus, capacity building and coaching are needed but the cost for this training is dependent on the availability of donor funding as these costs have not been incorporated into the investment costs for the model. The recovery cost for the ATC investment will also depend on the willingness of farmers' organizations and processors to pay for the services offered by the ATC. Uptake of services is likely to take time and will depend on the capacity of the ATC to demonstrate the clear benefits and value added to farmers' organizations and processors.

It is also worthy of note that there are several other external factors that may affect the business model, including the potential for the government to enforce export bans, and negative impacts on production from climate change. To address the risk of export bans, stakeholders in the ATC will need to constantly engage with the government to ensure that an enabling environment for investment in the sector is maintained. For issues related to climate change, the ATC will need to maintain strong connections to national research institutions and endeavour to introduce farmers to technologies such as piloting of small- scale irrigation to overcome some of the potential adverse effects.

The use of warehouses in targeted districts as satellites to the ATC will depend on the willingness of their owners to cooperate with the ATC. Therefore, they will need to be convinced about the benefits to be accrued from the business, especially the increased quantity of maize to be aggregated and the assurance of the market.

The PPP model proposed for the ownership and management of the ATC is a complex model that requires a specific institutional set-up that is governed by different rules to that of a private company or public investment. Further investigation is needed to identify how the ownership structure would operate in practice and what type of contractual arrangement would fit best the model proposed.

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Conclusions





Findings of the study

As discussed in the introduction, the purpose of this study was to:

- 1] assess the feasibility of establishing ATCs in specific countries and contexts for the predetermined commodity chains identified in Zambia, Côte d'Ivoire and the United Republic of Tanzania;
- 2] propose preliminary models for ATCs by identifying the mix of services and infrastructure needed, as well as the ownership and governance structure, investment costs and risks;
- 3] provide relevant information to develop a general methodology for future feasibility assessments of ATCs; and
- 4] assess the potential for ATCs to support the achievement of the overarching Feed Africa objectives associated with the rural infrastructure programme.

An additional purpose [5] that emerged during the course of this study was the need to create clarity regarding the definition of the ATC concept, its link to the overall SCPZ framework, and the real potential for the application of ATCs in the field.

A key finding from the first phase of the study (i.e. desk-based research) was the identification of a diverse range of models demonstrating several of the features described by the ATC concept, that already exist in the African region. Examples such as farmer service centres and agribusiness incubators were identified, that offer different mixes of services and infrastructure, target beneficiaries (farmers or SMEs) and diverse governance and ownership structures that ultimately affect their sustainability. While these findings initially helped to inform the conceptualization of the ATC models, what emerged from the feasibility analysis conducted in the field and discussions held with stakeholders during the validation workshop for this study, is that ultimately, an ATC needs to:

- » sit at the nexus between farmers and midstream buyers (whether that be the agro-processing hub under the SCPZ or independent agroprocessors, wholesalers or traders);
- » provide integrated upstream services to farmers to increase on-farm productivity (e.g. inputs, mechanization, finance and ITC);
- » **and** provide midstream services as the first link of the value chain off-farm with the objective of improving post-harvest quality and reducing losses (i.e. through aggregation, primary processing, storage and transport).

It is this mix of both upstream and midstream services when combined with commodity-appropriate infrastructure (capitalizing on existing infrastructure where possible), that will make an ATC different in its role to the past examples identified. Therefore, it is this mix of hard and soft services that is considered a prerequisite for success based on the findings from the feasibility assessments and the models discussed below.

1] Findings from the feasibility assessment

The different models presented in the report for Zambia (maize and soybean), Côte d'Ivoire (horticulture and rice) and the United Republic of Tanzania (rice and maize) show how, and under what circumstances, ATCs can be considered as a feasible option to stimulate inclusive rural transformation based on existing market potential, readiness of relevant stakeholders, infrastructure availability, and the possibility to achieve financial sustainability over time. The models presented clearly highlight that no one-size-fits-all model exists for ATCs, but that when country, regional and commodity-specific contexts are taken into account, innovative models can be proposed that demonstrate real potential for stimulating agro-industrial development at community level, targeting the involvement of farmers and SMEs. However, the models show that this must be done in a way that is market-driven and commercially sustainable, that targets not only on-farm production issues but also tackles off-farm, post-harvest losses as highlighted above, in order to pre-empt the needs of actors further down the chain, whether that be through linkages to the agro-processing hub as part of the SCPZ initiatives, or to existing customers in markets identified as having strong potential for growth.

Findings from the Zambia study for cassava also provide a useful example of where the necessary market linkages to make an ATC investment worthwhile are missing. On this basis, the decision was taken that under these circumstances it would not be feasible to establish an ATC at this time in the Northern Province for cassava. However, other geographic locations such as the Copperbelt Province, where markets for cassava are more developed, and investment in agro-processing is beginning to emerge in line with the proposed Luswishi Farm Block SCPZ, may prove to be more suitable to explore the establishment of ATCs for cassava. Annex 4 provides useful information on the generic infrastructure and investment requirements that could be used to support the design of an ATC for cassava.



2] Preliminary models proposed

a. Service mix

All of the ATC models proposed provide a tailored mix of both hard and soft services targeting upstream production issues and midstream off-farm, post-harvest handling and storage. However, the focus or core business of the ATC varies, depending on the specificities of the commodity and local context. For example, in Zambia, to address low levels of productivity for soybean and maize, input provision (high quality seed and fertilizer) and mechanization services are critical components of the ATC service mix, followed by off-farm cleaning of grain and storage services.

In Côte d'Ivoire, for the horticulture ATC model, the primary focus of ATC services is on the reduction of post-harvest losses through improved handling of products, including cooling and packing. The model also goes one step further in an attempt to demonstrate to producers and SMEs (on a small scale), the value addition potential of processing low grade tomato into basic tomato sauce, as first step towards addressing import substitution by meeting the demands of the local market for processed products. Similarly to the mixed model proposed for Zambia, the rice ATC model for Côte d'Ivoire will focus on providing productivity enhancing services to help meet the growing domestic demand for processed rice. The model will work on both the demand and supply side to improve the provision of mechanization services (rototillers, tractors and threshing machines) to farmers by acting initially as an incubator for young agripreneurs interested in setting up this type of business.

In the United Republic of Tanzania, the scope of services to be provided by the ATC satellite network for both rice and maize are more all-encompassing. The model proposed is expected to become a sustainable solution to address main VC constraints, including low levels of productivity, lack of adequate storage capacities, and significant post-harvest losses, as well as addressing issues associated with access to finance and limited market information. The proposed model aims to rehabilitate existing infrastructures with the aim of creating a network of ATCs to be linked to a mega-warehouse (to be built) which will provide storage services to farmers' organizations. It is expected that the ATC will serve as the interface between a large-scale processor in the region and producers who will benefit from a mix of services, and be able to supply consistent quantities and quality of paddy rice. During the first year, the focus will be on increasing production through access to finance and inputs, use of mechanization equipment and reduction of post-harvest losses. The second step will be to bring on board the processor who will sign contract farming agreements with farmers' organizations.

In all models the need for capacity building services for producers, their organizations and SMEs in business development and management has been

acknowledged, and attempts made to link the proposed models to externally funded (donor) projects that may be able to provide these services without increasing the investment costs for the model.

b. Institutional set-up, ownership and management

Findings from the country studies also show how the institutional arrangements for ATCs may differ depending on the level of interest, capacity and commitment of the stakeholders involved, as well as the infrastructure needs (new versus existing). The findings from Zambia – i.e. combined ATC model for soybean and maize – show that an ATC approach could capitalize on the existing network of established agrodealers, some of whom have already begun to branch out into post-farm, value addition activities. This demonstrates strong potential for the financial sustainability of the model as these actors have already recognized the opportunity to respond to existing downstream market needs. The proposal to also use existing (yet idle) infrastructures that could be redeployed for use by the ATCs for the primary processing and storage of both commodities, is a cost-effective and lower risk alternative to additional investment in new infrastructures. For the same reason the repurposing/upgrading of existing infrastructures has also been investigated in the Tanzanian models.

In Zambia, the hiring of a local implementation agency (Musika) to manage the pilot phase of ATC establishment (i.e. first three years), also represents a sound approach towards promoting gradual community acceptance of ATC services, given their strong knowledge of the region and target markets, and demonstrated experience in linking producers to markets. This also reduces the risks of the ATC being developed in isolation of existing market opportunities, while at the same time preparing smallholders for the introduction of a possible agro-processing hub/SCPZ initiative in the future.

From an institutional perspective, the ATC models proposed for Côte D'Ivoire for the horticulture and rice sectors demonstrate clearly the importance of coordinating any planned activities for establishing ATCs with existing donor projects, government initiatives (e.g. ONDR national rice strategy) and value chain/commodity platforms. This is necessary to ensure that any model proposed both complements and provides additional value to existing interventions, while minimizing the potential for duplication witnessed in the past.

Regarding the ownership and management structures proposed, the mandate of public sector enabled, private sector managed ATCs has been kept at the forefront of all models to the extent possible. SMEs play a critical role as service providers (agrodealers) and owner/operators of the ATCs, and farmer cooperatives are proposed as either ATC shareholders or lessors of storage facilities (Zambia and the United Republic of Tanzania), or as the entry point for the ATC, to engage directly with farmers as fee-paying users of the services provided by the ATC. All models acknowledge the need for professional private sector management



of the day-to-day operations of the ATC, and investments to be made to further build the capacity of farmers' organizations to increase their professionalism and business know-how. Public sector support will primarily be sought to help co-finance capital investment in the equipment needed to set up the ATC and to offer short-term loans for agripreneurs to establish activities. They will also be responsible for creating the enabling environment conducive to private sector investment in agro-industrial development by minimizing the potential for market-distorting policies.

For Zambia two ownership options have been proposed for consideration: model 1, where private agro dealers acting as owner-operators of the ATC lease existing warehouses from the cooperatives for a fee, or model 2, where the cooperative is a minor shareholder in the ATC and the warehouses are used for free but cooperatives will earn dividends. Under this model, during the pilot phase the ATC network will be managed by an external facilitator (Musika), with the plan to eventually hand over coordination of the network to a public-private coordinating committee.

In Côte d'Ivoire, it is proposed that the ATCs be registered with the status of economic interest group (GIE) under the management of the commodity platforms for horticulture and rice. The reason given for this approach is the increased flexibility the GIE status offers to a newly established business operation. It is suitable for an organization that does not necessarily include profit-sharing, and can be readily adapted to meet the needs of the organization as the business operations evolve. The VC platform is proposed to play a role in the management and overview of the ATCs because it is the only representative body at the value chain level. The establishment of ATCs can potentially be used as the starting point towards broader areas of cooperation between VC actors and strengthening of structures within the supply chain. A steering committee composed of public representatives from the 2PAI Agropole initiative is also proposed to keep track of the VC platform and ensure accountability for any public funding committed to the ATCs.

In the United Republic of Tanzania, the rice and maize ATC models proposed will be created via a public-private-partnership ownership model whereby farmers' organizations, the local government, and private companies (processors, agrodealers, etc.) will act as shareholders. The ATC will be governed by a board of directors representing all shareholders, but the daily activities will be run by a professional manager who has extensive experience in agribusiness. Moreover, a production and post-harvest specialist will be hired to facilitate smooth operations of all the post-harvest technologies provided at the centre.

c. Investment costs and risks

Based on the findings from the field work and financial analysis of the models proposed, the estimated investment costs for each model are presented below.

TABLE 50

| INVESTMENT COSTS AND PAYBACK IN THE FIVE ATC MODELS PROPOSED | | | | | |
|--|-------------------|--|---|---|--|
| COUNTRY | COMMODITY | No. OF ATCS PROPOSED | TOTAL INVESTMENT USD | ESTIMATED PAYBACK PERIOD ON INVESTMENT | REVENUES → OPERATING COSTS |
| Zambia | Maize and soybean | 52 (existing infrastructure) | 1 089 401 (including operating costs for the first 3 years) | Year 4 | Year 1 possible, depending on number of ATCs immediately operational |
| Côte d'Ivoire | Horticulture | 6 (to be built) | 594 430 (including operating costs for the first 3 years) | Dependent on funding model selected and loan + grant mix. | Year 3 |
| Côte d'Ivoire | Rice | 1 (existing infrastructure) | 298 140 | Year 3-4 | Year 2 |
| United Republic of Tanzania | Rice | 15 (existing infrastructure) + 1 (mega-warehouse to be built) | 2 103 000 (excluding operating costs) | Year 5 | Year 2 |
| United Republic of Tanzania | Maize | 15 (existing infrastructure) + 1 (innovation centre to be built) | 768 000 (excluding operating costs) | Dependent on funding model selected and loan + grant mix. | Year 2 |

Source: Editors' elaboration.

Each model is subject to a range of operational, financial and institutional risks. For the model proposed for Zambia some of the key risks include:

- » Short harvest season. The harvest season of maize and soybean takes only a maximum of six months. This means the ATC will need to compensate the lack of business activities for these crops during the rest of the year to remain profitable. This will be left to the liability of the agrodealer to manage.
- » Agro-climatic conditions that will influence prices and availability of production. Years of good rainfall will result in high production countrywide resulting in lower maize prices unless alternative markets have been identified to absorb the extra volumes produced. The opposite may happen with poor rainfall seasons that result in lower volumes and higher prices, which increase the potential for side-selling to occur. Other agro-climatic issues that may affect the viability of the ATC include pest and disease outbreaks. The fall army worm invasion on maize is of particular concern.
- » Socio-political factors. If the government through the FRA or the FISP project makes changes to the current policies then the farmers' decisions to grow and market these crops will be affected. Previous decisions by the government to ban exports of maize for example have affected the viability of private sector exports and limited their activity in this sector.



- » Partnerships with farmer cooperatives. Where the storage shed is being leased from the cooperative, transparent lease agreements must be in place and respected to prevent cooperative members from reclaiming premises once the ATC is operational.

In Côte d'Ivoire, the main risks associated with the ATC models proposed are institutional and financial. For the horticulture ATC, the governance structure proposed relies heavily on the functioning of the PARFACI platform, as without this it seems unlikely that a coordinated approach to developing the VC can be achieved which will be critical for the introduction of the planned agropole initiatives over the longer term. However, the platform has been established only recently and therefore its capacities to play such a role are yet to be tested. Similarly for the rice ATC model, the platform exists but is not currently operational. It is envisaged that the implementation of the ATC will provide the concrete opportunity needed for VC actors to collaborate, with the support of PADFA.

From a financial point of view, in the horticulture model proposed revenues are expected to exceed costs from the third year; however, losses in the first year are likely. This may inhibit public investors and/or donors from participating, and make access to finance challenging. Across the three countries, one of the key risks faced by all ATC models will be convincing farmers of the value of paying fees to access the ATC services. This is a particular challenge for the rice ATC model in Côte d'Ivoire where farmers have become accustomed to years of subsidized services provided by the ONDR. To encourage farmers and processors to use ATC services, service fees have been set at lower than current market prices across several of models proposed, but these prices will need to be increased over time. Continued uptake of services will be dependent on the capacity of the ATC to demonstrate clear benefits and value added to farmer organizations and processors.

In the United Republic of Tanzania, the main risk for the models proposed is assuring the market for processed rice and maize by linking the ATC to a large-scale processor. All activities designed to stimulate production increases are planned based on the assumption that the ATC will be linked to a large-scale processor who will buy paddy rice or maize from the ATC and its associated satellite warehouses. However, it is not certain that such a processor will be available soon. The SCPZ planned for the United Republic of Tanzania is still in the feasibility stages; therefore, it is hoped that a major anchor investor for the maize and rice processing sector will be identified, and the ATC model proposed can be clearly linked to these processors operating out of the agro-processing hub. However, more detailed analysis of the demand for paddy and maize from a number of existing medium-scale processors should also be considered in the next stages of the feasibility assessment to help mitigate this risk in the short term.

The PPP model proposed for the ownership and management of the ATCs in the United Republic of Tanzania is a complex model that requires a specific

institutional set-up that is governed by different rules to those of a private company or public investment. Further investigation is therefore required to identify how the ownership structure would operate in practice and what type of contractual arrangement (e.g. Build-Operate-Manage, Operate and Manage contract, etc.) would fit best with the model proposed, and the risks associated with each.

As mentioned earlier, it is expected that farmers will be actively involved in the business of the ATC through their organizations. Their willingness to aggregate produce and operate as independent business partners will be key to the success of the ATCs in the United Republic of Tanzania. Thus, capacity building and coaching are needed but the cost for this training is dependent on the availability of donor funding as these costs have not been incorporated into the investment costs for the model.

As seen in Zambia, there are several other external factors that may affect the ATC business models, including the potential for the government to enforce export bans and negative impacts on production from climate change. To address the risk of export bans, stakeholders in the ATC will need to constantly engage with the Government of the United Republic of Tanzania to ensure that an enabling environment for investment in the sector is maintained. For issues related to climate change, the ATC will need to maintain strong connections to national research institutions and endeavour to introduce farmers to innovative, small-scale technologies to overcome some of the potential affects.

3] General methodology for assessing the feasibility of ATCs

The information gathered throughout this study has helped to identify a number of generic steps to be taken when intending to establish an ATC. The generic checklist provided in Annex 1 outlines eleven important steps that must be taken into consideration when conducting any future feasibility studies related to the design and establishment of an ATC. These steps include:

- Step 1:** Selecting potential locations for the agro-processing hub
- Step 2:** Identifying the target commodities
- Step 3:** Identifying the ATC locations
- Step 4:** Identifying VCs constraints
- Step 5:** Assessing the infrastructure and service needs of ATCs
- Step 6:** Designing ownership and management structure
- Step 7:** Assessing the interest of the community and the stakeholders' buy-in
- Step 8:** Calculating the ATC costs
- Step 9:** Assessing financial sustainability
- Step 10:** Excluding any other impediment to the establishment of an ATC
- Step 11:** Elaborating an implementation plan



4] ATC and the Feed Africa Strategy

In terms of the potential for ATCs to achieve the related objectives outlined under the Feed Africa Strategy, findings show that the specific ATC design, including the types of services to be provided and management structure proposed, will influence the potential for achieving these objectives. The table below summarizes the potential of the specific ATC models proposed in this report to achieve the main Feed Africa objectives:

TABLE 51

POTENTIAL OF ATC MODELS PROPOSED TO ACHIEVE FEED AFRICA STRATEGY OBJECTIVES

| OVERALL GOALS OF FEED AFRICA | MAIZE AND SOYBEAN ATC/ ZAMBIA | HORTI-CULTURE ATC/COTE D'IVOIRE | RICE ATC/ COTE D'IVOIRE | RICE ATC/ UNITED REPUBLIC OF TANZANIA | MAIZE ATC/ UNITED REPUBLIC OF TANZANIA |
|--|---|---|--|--|---|
| Enhance competitiveness of agriculture in rural areas | <p>Maize VC: High, if FRA does not interfere, the ATC will create new market opportunities and stimulate new buyers to (re) enter the market and compete with each other; Low with FRA interference, as the private sector will have no incentives to enter the market.</p> <p>Soybean VC: High, as there is an unmet demand that would be met if productivity increases, which is the primary scope of the ATC.</p> | <p>Medium. The urban demand for semi processed vegetables and processed tomato products is growing. By matching supply with demand, the ATC could in the long run stimulate additional investment and competition in the sector.</p> | <p>High. With its focus on providing coaching to entrepreneurs it can have high impact on enhanced competitiveness.</p> | <p>Medium. Although competitiveness might be enhanced in the long term, in the short term the ATC will try to link producers to one single large-scale processor, therefore issues associated with the potential for unequal bargaining power should be considered.</p> | <p>High. The VC presents great potential and the ATC will help to overcome main constraints which are currently hindering its development.</p> |
| Promote agricultural value chain organization | <p>Maize & Soybean VCs: High, as ATC will focus on strengthening VC actors' linkages and coordination, as well as supporting the creation of a network of agrodealers and strengthening farmers' cooperatives.</p> | <p>High, if the horticulture multi-stakeholder platform is strengthened and further developed.</p> | <p>High, through coordination with ONDR and other relevant VC actors involved in the rice commodity platform.</p> | <p>Medium, as the ATC will link producers to several service providers but one single buyer as a first step.</p> | <p>High, as the ATC will link producers to service providers and to processors through contract farming.</p> |



| OVERALL GOALS OF FEED AFRICA | MAIZE AND SOYBEAN ATC/ ZAMBIA | HORTI-CULTURE ATC/COTE D'IVOIRE | RICE ATC/ COTE D'IVOIRE | RICE ATC/ UNITED REPUBLIC OF TANZANIA | MAIZE ATC/ UNITED REPUBLIC OF TANZANIA |
|---|---|---|---|---|---|
| Promote resource efficiency and smart agriculture | Maize & soybean VCs: High , as the ATC will act mainly to improve farmers' access to inputs, mechanization, and extension services, which will impact dramatically on resource efficiency. | High , using technologies such as air conditioners for cold rooms fueled with solar PV panels. This will reduce costs as well as impact on the environment. | Medium . The use of mechanization will substantially decrease labour time. | Medium . The use of mechanization will substantially decrease labour time. | Medium . The use of mechanization will substantially decrease labour time. |
| Promote social inclusion for poverty reduction | Maize & Soybean VCs: Ideally high , as both commodities, especially maize, are produced almost exclusively by smallholder farmers. However, the need to pay for services may exclude the smallest producers. | Medium , as in the short term the target will be commercial farmers from most prominent zones already under irrigation systems. However, long term potential to target inclusion of women is high women as 70% to 80% of smallholder growers are women. | Medium for poverty reduction but potentially high for social inclusion, as the target will be SMEs and local entrepreneurs, including many youth. | High , as majority of producers are smallholders. However, the need to pay for services may exclude the smallest producers. | High , as 80% of the production comes from small holder farmers. However, the need to pay for services may exclude the smallest producers. |
| Promote partnerships to speed up rural development | Maize & Soybean VCs: Medium , as the ATC is intended to bring together different public and private stakeholders. However, actual impact will depend on their real commitment. | High , as the ATC could have substantial impact on strengthening the multi-stakeholder platform for horticulture which has recently been created in the Bélier region. | High , as many different stakeholders, private and public, will have to come together to establish the ATC under the supervision of the rice platform. | High , as the ATC will work in collaboration with RIPOMA, a project initiated by the SWISS cooperation and the European Union. | High , as the ATC will work in coordination with existing development projects (WFP, IFAD, and others). |
| More specific objectives | | | | | |
| Increase food production | Maize & soybean VCs: High , as through access to inputs and mechanization yields are expected to increase substantially (maize from 2 MT/ha to 3 MT/ha; soybean from 0.9 MT/ha to at least 1.64 MT/ha). | High . With substantial reduction of post-harvest losses (estimated at 30% in 2015) more vegetables will be available. Production is also expected to increase. | High , as the ATC will focus on improving productivity through increased use of input and mechanization. | High , with an expected increase in productivity after 3 years: from 2.1 to 5MT/ha. | High , as focus will be on improving access to inputs and on improving production practices. |



| OVERALL GOALS OF FEED AFRICA | MAIZE AND SOYBEAN ATC/ ZAMBIA | HORTI-CULTURE ATC/COTE D'IVOIRE | RICE ATC/ COTE D'IVOIRE | RICE ATC/ UNITED REPUBLIC OF TANZANIA | MAIZE ATC/ UNITED REPUBLIC OF TANZANIA |
|---|---|---|--|---|--|
| More specific objectives | | | | | |
| Ensure high quality of produce and reduce postharvest losses | Maize & soybean VCs: Medium , for quality improvements as ATC is intended as a first step to focus on increasing quantity produced with gradual quality improvements to follow. High in relation to a reduction of post-harvest losses as a core focus of ATC services. | Medium for quality, as although quality issues will be addressed by ATCs, focus will be on tomatoes for processing, where demand is high, and quality requirements are lower compared to fresh tomatoes. High for post-harvest losses, as the ATC aims to reduce them through better handling, conditioning and transportation. | High, in terms of quality, as the ATC will focus on enhancing the quality of rice paddy, for example through provision of cleaner higher quality paddy to the rice processing mills. | High. As a first step, the ATC will focus on reducing post-harvest losses through improving access to post-harvest equipment and improved storage infrastructure. | High, as 269 973 Tonnes of maize is not stored properly at the moment and the issue is expected to be addressed by the ATC. |
| Identify required technologies to equip the ATCs for on farm and value addition activities | Maize & soybean VCs: High , especially for off-farm technologies (i.e. cleaning and shelling machines). | High , especially for off-farm technologies (drying racks, solar power cool rooms, etc.) | High , as required technologies were identified for on farm (i.e. tillage service) and off farm (i.e. threshing and cleaning machines). | Medium , especially on farm (e.g. use of tractors) and in the design of storage services to reduce post-harvest losses. | High , especially for off-farm technologies (cleaning machines, flattop dryers, solar bubble dryers, etc.) |
| Facilitate investments in profitable commodity value chains | Maize & soybean VCs: Medium , in the short-term but high in the long-term as the ATC is intended to promote linkages between market actors in both upstream and midstream segments of VC. | High , as the ATC is expected to stimulate investment in an underdeveloped sector with high growth potential. | Medium . The growing supply resulting from the use of ATC will potentially stimulate further investments in the chain potentially through PPP models supported by ONDR. | High, as the ATC is supposed to overcome main constraints of a very promising sector (Tanzania is the main rice producer in the East African Community). | High, as maize has great potential to become an export commodity given that neighbouring countries regularly import at least 300 000 MT of maize per year. |



| OVERALL GOALS OF FEED AFRICA | MAIZE AND SOYBEAN ATC/ ZAMBIA | HORTI-CULTURE ATC/COTE D'IVOIRE | RICE ATC/ COTE D'IVOIRE | RICE ATC/ UNITED REPUBLIC OF TANZANIA | MAIZE ATC/ UNITED REPUBLIC OF TANZANIA |
|--|--|---|---|---|---|
| Stimulate the development of the private sector in the rural areas | <p>Maize VC: High, without FRA interference, as ATC will firstly work to increase trust between buyers and producers as a way to incentivize private sector development; low if FRA interference remain high, inhibiting private sector development.</p> <p>Soybean VC: High, as the ATC is intended to create enough quantity of produce to meet an unmet demand, thus stimulating private sector development.</p> | High , improving the coordination of the VC to meet downstream demand will likely stimulate investment in an underdeveloped sector with high growth potential. | High , as the ATC will provide coaching to entrepreneurs. | Medium , although initially producers will be linked to only one large processor, linkages will also be strengthened with service providers. | Medium , although initially producers will be linked to only one large processor, linkages will also be strengthened with service providers. |
| Improve value chain governance to ensure equity in the sharing of agribusiness benefits | Maize & soybean VCs: High , as support will be provided to VC actors and their coordination. | High , if enough support is provided to further develop the horticulture multi-stakeholder platform. | High . The ATC will work with the rice commodity platform to demonstrate the potential for coordinated efforts along the VC. | High , especially during the second year, which will specifically focus on improving chain efficiency through increased market linkages. Also coordination will be strengthened through the PPP ownership structure. | High , as ownership will be shared by several relevant stakeholders in the maize chain. In addition, through contract farming, coordination between producers and buyers will be improved. |

Source: Editors' elaboration.



5] The link between ATCs and SCPZs

Another important and unexpected finding is related to the usefulness of conducting ATC feasibility studies prior to the development of SCPZ studies. As already noted in the introduction, ATCs are not conceptualized as a stand-alone initiative. However, when the study was conducted, there was limited information available about the planned SCPZs in each country selected. Instead of being seen as a major limitation, this gave the consultants a chance to examine in more detail existing market opportunities for the commodities selected, and the potential to begin addressing issues of on-farm productivity and post-harvest losses at a community level in a way that could create the pre-conditions for the successful introduction of the SCPZ.

However, alongside these findings, some gaps emerged. As noted during the Validation Workshop, further efforts are needed to clarify the ATC concept in the framework of the SCPZ and to better explain the link to the agro-processing hub. Missing this step has implications in terms of the methodology selected to conduct feasibility studies (ATC and agro-processing hub – which study comes first, or should joint studies be proposed?) but can also have practical implications if there is insufficient coordination of strategies under the SCPZ umbrella (e.g. inconsistent selection of locations or priority commodities; duplication of efforts and costs for similar studies, etc.). Clarifying concepts and their linkages in future Feed Africa outreach material of the Bank will also help to improve the understanding of the elements that clearly distinguish an ATC from an agro-processing hub, and how the two are framed under the SCPZ concept, to avoid creating confusion moving forward.

Another limitation of the current study discussed during the workshop was the insufficient detail given to issues such as financing and ownership of ATCs. Although these crucial aspects have been covered in this study, the scope of the present study was more explorative, more like a pre-feasibility study. Therefore, prior to moving forward with any implementation plans for the ATCs, further in-depth analysis is required to validate these aspects of the models proposed.

Where to from here? Integration of ATC feasibility findings with planned SCPZ Initiatives and other Agriculture Development programmes for Africa of the Bank

As mentioned in the introduction, when this study started, SCPZ initiatives and feasibility studies were in their initial stages of development and not yet ready to inform a thorough ATC feasibility study. This was one of the major limitations of the present study as the ATC models proposed could not be directly linked to the planned SCPZ initiatives. However, as a consequence of this limitation, the findings have also helped to recognize the potential role that ATCs can play independently from, or as the first step towards, the implementation of SCPZ initiatives. But in practical terms, where do we go from here?

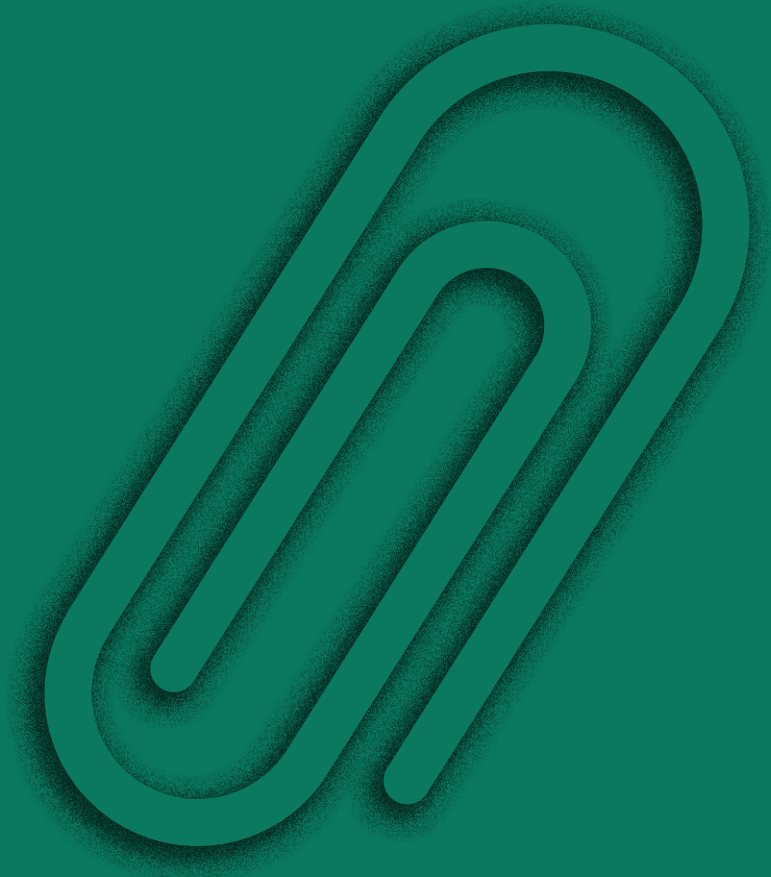
The practical implications from this study are as follows:

- » The study has helped to develop a generic checklist that can be considered and used as a guide for the establishment of ATCs;
- » The study has helped to identify the specific infrastructure requirements that an ATC should include, based on the findings from the selected VCs. These checklists can be used as a reference guide for the establishment of ATCs serving these VCs, several of which are likely to be selected for inclusion in the SCPZ initiatives given their impact on food security;
- » The VC analysis, as well as the analysis of stakeholders and investment costs can be used to inform more in-depth analysis related to the selection of agro-processing hub locations, priority commodities, key stakeholders, available services and infrastructure at the community-level in the countries and regions investigated. Several advanced feasibility studies are now in progress for the SCPZs, where information gathered from this study can help to enrich the findings of the ongoing studies. For example:
 - » Feasibility studies for the establishment of an SCPZ in the United Republic of Tanzania are in progress and will be available soon.
 - » A relatively advanced feasibility study has been conducted in Zambia, Copperbelt Province, where the Bank is helping the government to conceptualize an SCPZ initiative in the framework of the Luswishi Farm Block.



- » A further practical recommendation would be to link the SCPZ and ATC approaches to existing agriculture projects and programmes of the Bank to ensure better coordination and avoid costly duplication of activities. In particular, strong linkages should be made to the two flagship programmes TASI - Transformation of African Savannah initiative, and TAAT-S - Technologies for African Agricultural Transformation. These initiatives share with the SCPZ approach the overall objective to address Africa's growing dependence on food imports, through the promotion of increased productivity and value addition of key agriculture commodities.

Annexes





ANNEX 1

Establishing ATCs: From conception to implementation

Preliminary considerations:

- » Under the umbrella of an overall SCPZ initiative, it is recommended that pre-feasibility and feasibility studies for the agro-processing hub and ATCs are done in strict coordination to avoid:
 - » duplication of effort;
 - » adoption of different and/or conflicting methodologies;
 - » incomplete studies, where agro-processing hubs and ATCs are proposed in isolation of one another.
- » Similarly, coordination is needed to ensure that any feasibility studies also take into account existing national strategies and initiatives with similar objectives (e.g. Zambia Farm Block approach, ONDR national rice strategy (Stratégie Nationale de Développement de la Filière Riz) in Côte d'Ivoire.

Step 1: Selecting the agro-processing hub potential locations – Ideally, the choice of potential locations as to where to establish the agro-processing hub should precede that of ATC locations. The location choice is crucial and approaches that follow a “build and they will come” philosophy should be avoided at all costs. Location selection must depend on the existence of certain prerequisites. In particular, in the area to be selected there must be:

- » *Land available at reasonable prices (taking into consideration land-grabbing issues and law and regulations on land use).*
- » *Production potential for strategic commodities.*
- » *Clearly defined export, regional and/or domestic market potential for selected commodities.*
- » *Good infrastructure, including power and water, connective infrastructures (main roads as well as last mile infrastructure, railways, airports, ports, etc.) and a telecommunications infrastructure.*
- » *Presence of at least a few agribusiness companies/anchor investors currently involved in the processing of selected commodities. It is not recommended to choose locations where there is currently no industry developed at all.*
- » *Presence of at least a few support services, including farmers’ cooperatives, input providers, research organizations and financial institutions.*

- » *Social acceptance – serious and ongoing stakeholder consultations must be conducted with communities and producers residing within the demarcated SCPZ area prior to any commitment to establish agro-processing hubs and large-scale commercial farms.*

Step 2: Identifying the target commodities – Based on national strategies, on the above analysis on production and market potential, and on stakeholders’ analysis and consultations, a list of priority commodities to be targeted should be identified.

Step 3: Identifying the ATCs location – Exact identification of location will depend on decisions taken in Steps 1 and 2. Nevertheless, out of the wide area selected for the agro-processing hub, specific sites for ATCs must be identified. One important indication to consider is that ATCs are supposed to be established within a 50 km radius from the processing hub. The decision taken on the exact location will further depend on:

- » *Production capacity of the commodities selected: this must be sufficient to serve the agro-processing hub or the market (in those rare cases where implementation of an agro-processing hub occurs after the establishment of ATCs). Considerations on product quality should also be made here. In the event of constraints for both quantity and quality, it must be assessed if the ATC alone can address these, or whether other interventions will be needed either concurrently or before establishing the ATC.*
- » *In those cases where the establishment of the ATC precedes that of the processing hub, market potential to come out of the SCPZ scheme.*
- » *Availability of land in the area selected to establish the physical infrastructure, if needed (taking into consideration of land-grabbing issues and laws and regulations on land use).*
- » *Availability of necessary supporting infrastructures such as power, water and telecommunications. Particular attention should be given to connective infrastructures such as roads connecting the ATC to the processing hub and the SCPZ neuralgic areas. Quality of infrastructures should also be addressed to assess if interventions are needed either concurrently or before the establishment of the ATC.*
- » *Presence of at least a few support services, including farmers’ cooperatives, input providers, research organizations, and financial institutions.*
- » *Social acceptance.*
- ✓ **Against these criteria, a provisional number of ATCs to be established in each SCPZ can be identified.**
- ✗ **No go decision should be taken here for those locations that do not present good characteristics based on the criteria listed above.**

Methodology and tools for Steps 1 to 3.

- » Desk research.
- » Value chain analysis.
- » Stakeholders’ consultations.



Step 4: Identifying VC constraints – Analysis should be conducted in the sites selected to assess main constraints of the selected VCs. Main scope of the analysis is to assess if existing constraints can be overcome either concurrently, before or through the ATC establishment.

- ✗ **No go decision should be taken in those cases where existing constraints seem too hard/impossible to be overcome concurrently, before or through the ATC establishment.**

Step 5: Assessing the infrastructure and service needs of ATCs. At this stage, a more precise idea of the number of ATCs and locations should be defined. In this phase it could be important to assess if, in the sites identified, there exists a more logistic infrastructure that can be improved and work as ATCs. To effectively reduce ATC costs in those areas where there are unused/underused infrastructures, building ATCs from scratch should be avoided. A value chains analysis conducted at an earlier stage, should also inform about the needs of machinery and services for each ATC site; for each commodity, and for each community to be served. ATCs can provide services to more than one commodity and the infrastructure and services to be provided should be clearly tailored to the commodity chains selected to be served. However, for each ATC, it is important to decide with care on the service mix/infrastructure, based on the capacity of the adjacent production areas. Even in those cases where the processing hub processes a number of different commodities, each ATC should be designed to serve a specific production area, which may be specialized only in one or few commodities.

- ✓ **At this stage, a first draft of the ATC design can be prepared. It should include:**
 - » *Physical dimensions of each ATC, expected to be in the range of 10–15 ha;*
 - » *Commodity chains to be served;*
 - » *Types and amount of machinery and equipment;*
 - » *Human resources needed to run the centre;*
 - » *Types of other services to be provided in the centre (training, input provision, etc.).*

In some specific cases, depending on the needs of the communities, the ATC model will be more soft-service-oriented than hard-service-oriented, and will therefore need less infrastructure/machinery.

Methodology and tools for Steps 4 and 5.

- » Value chain analysis.
- » Stakeholders' consultations.

Step 6: Designing ownership and management structure – Crucial for the sustainability of the ATC system is the identification of the best ownership and management structure that will govern the scheme. The structure may be an extension of the one established for the processing hub/SCPZ, or be independent from it. A sound structure should include all the relevant actors:

- » *Private sector stakeholders;*
- » *Public sector representatives;*
- » *Farmers and their organizations;*
- » *Donors, NGOs and international development agencies.*

The level of formality of the structure will vary depending on specific needs and circumstances. Examples can include sector platforms, economic interest groups or public-private partnerships.

Step 7: Assessing the interest of the community and the stakeholders' buy-in – Although first consultations on social acceptance should take place prior to the selection of the location, more concrete ones can take place at this stage to assess the real interest and commitment of the community and the VC stakeholders on a specific ATC design, and on the ownership and management structure identified. This stage is crucial to assess stakeholders' interest in having active roles in the ATC governance system. Public (mainly local) actors should be involved in consultations at this stage to identify a converging interest on approaches, and promote coordination. Similarly, NGOs or donors' initiative representatives should be consulted.

- ✓ **At this stage, a first draft of the governance model of the ATC can be prepared. Also, based on further stakeholders' consultations, the draft design of ATC hard and soft components developed under step 5 can be adjusted here.**
- ✗ **Stakeholders' buy-in and social acceptance are crucial for the sustainability of ATCs. Therefore, a **no go** decision should be taken in those cases where it is not achieved.**

Methodology and tools for Steps 6 and 7.

- » Stakeholders' consultations.

Step 8: Calculating the ATC costs – Based on the adjusted design prepared under step 7, a detailed list of costs can be compiled. Costs must include those to build or rehabilitate ATCs, costs of machinery and equipment, training or other service costs, operational costs.

Methodology and tools.

- » Costs analysis.



Step 9: Assessing financial sustainability – Possible financing options and models should be tested under this phase. The objective would be that of identifying the best financing model able to achieve sustainability in a given time-span, ideally no more than three years.

- ✓ At this stage, a first draft of the ATC financial model should be prepared.
- ✗ If analysis conducted shows that financial feasibility cannot be achieved, a **no go** decision should be taken.

Methodology and tools.

- » Cost-benefit analysis.

Step 10: Excluding any other impediment to the ATC establishment – Once an ATC model has been designed, clear stakeholders' roles and responsibilities ascertained, and a feasible financial plan defined, any other element that could inhibit the success of the ATC and that would need to be addressed before its establishment, should be assessed at this stage. Examples include unfavourable legal and regulatory frameworks, inefficient public policies, market distortions, etc.

- ✗ **No go** decision should be taken if these impediments appear impossible to overcome in a short time horizon.

Methodology and tools.

- » Desk research.
- » Stakeholders' consultations.

Step 11: Elaborating an implementation plan – This should be done on the base of the draft model prepared and after consulting all the relevant stakeholders once more. The plan should specify:

- » *The scope and main elements of the initiative;*
- » *The governance scheme, including all the stakeholders involved and their roles;*
- » *The costs, the financial means and the financial sustainability plan;*
- » *The timeline of activities;*
- » *The monitoring and evaluation strategy to be adopted and the actors responsible for it.*

Depending on the specific cases, the creation of multistakeholder platforms, special purpose vehicles or steering committees can be crucial in providing clear leadership to the initiative as well as to achieving accountability. In any case, to ensure commitment it is recommended that at least simple agreements, for example in the form of Memoranda of Understanding, are signed by all the stakeholders involved.

ANNEX 2

Specific infrastructure requirements for maize

Equipment that can be useful for maize handling and storage include machines to help with shelling and cleaning of the grain, as this was identified as one of the limiting areas. Measurement of quality is also important and machinery to improve transportation will be useful.

TABLE 52

| EQUIPMENT FOR MAIZE ATC | | | |
|---------------------------|--|-------------|--|
| ITEM | SPECIFICATIONS | COST (USD) | REMARKS |
| Essential equipment | | | |
| Moisture meter | For use in wide range of grain crops » Range 6-40% moisture content » Portable, with replaceable batteries | 400 | |
| Trolley scale | Scale for weighing grain in sacks » 10 – 250 kg range | 1 000 | |
| Maize sheller - motorized | 2.2 kW/7.5 HP motor, 800–1 500 kg/hour | 1 500–2 500 | |
| Motorized tricycle pickup | 150–175 cc engine, 800–1 000 kg load capacity | 2 500–3 500 | |
| Wood pallets | 0.9 x 1.2 m size wood pallets for stacking bags | 3–4 | |
| Optional equipment | | | |
| Super grain bags | Multi-layer polyethylene storage bags, hermetic storage. | 2.50–3.00 | To be used for long term storage. Can be used for 2–3 harvests |
| Bag sewing machine | For closing of 50 kg sacks of processed grains, 1.5–2 kW | 200 | |
| Maize dryer | Batch dryer, 500 kg capacity dryer with kerosene or gas burner | | Low demand for maize drying services except in years with extended rainfall season |

» » »



▶ ▶ ▶

| ITEM | SPECIFICATIONS | COST (USD) | REMARKS |
|---------------------------------|---|------------|--|
| Optional equipment | | | |
| Grain cleaning machine | Grain cleaner with oscillating action and aspirator » 3.5–5 kW » To be used for maize, cowpea, groundnuts and rice » 2.5 to 3.0 tonnes/hour capacity » To be supplied with spare sieves | 3 500 | |
| 2 Wheel tractor plus implements | 15 HP 2 wheel tractor » To be supplied with disc plough, tiller, ripper, planter water pump, trailer | 6 500 | Can be used for land preparation for a fee |
| Maize sheller – hand operated | 80–100 kg/hour | 200–67 000 | |

Calculation of Grain Store Size: The specific volume of maize (1.8 m³/t) can be multiplied by the tonnage to give the total volume. This is divided by the stacking height (most convenient needed) to leave the surface area. Allowances should then be made for pathways (about 2 m), handling area (about 3m) and space of about 1m around the outer perimeter.

Taking an example from FAO for a 1 000 tonne store:

$$1000 \text{ (t)} \times 1.8\text{m}^3/\text{t} = 1800 \text{ m}^3$$

If bags are stacked 5 m high, floor area: $1800/5 = 360 \text{ m}^2$

If length(L) = 2 x width (W), then $2W^2 = 360 \text{ m}^2$, or $W = 13.4 \text{ metres}$

This can be equated to 12 x 30 m.

If bags are kept in four lots each 6 x 15m, then the following floor space is needed:

$$W = 1 \text{ m} + 6 \text{ m} + 3 \text{ m} + 6 \text{ m} + 1 \text{ m} = 17 \text{ m}$$

$$L = 1 \text{ m} + 15 \text{ m} + 2 \text{ m} + 15 \text{ m} + 1 \text{ m} = 34 \text{ m}$$

$$\text{Total floor area} = 578 \text{ m}^2$$

It is important to note that the walls should be 1 m higher than the stacking height resulting in walls 6 m high.

ANNEX 3

Specific infrastructure requirements for soybean

Soybean is a crop produced mainly for industrial processing. Observations made on soybean production by smallholder farmers is that they have minimal mechanization. Soybean handling equipment that would be of use is the motorized thresher that would speed up this process and reduce drudgery. Other equipment that may be of use includes cleaning equipment.

Processing of soybean will involve oil pressing equipment and oil milling equipment that will result in soya cake which can be used for further processing.

TABLE 53

| EQUIPMENT FOR SOYBEAN ATC | | | |
|----------------------------------|--|-------------------|--------------------------------|
| ITEM | SPECIFICATIONS | COST (USD) | REMARKS |
| Essential equipment | | | |
| Soybean thresher - motorized | 3 kW/ 6 HP motor, 500–800 kg/hour | 800–1 500 | |
| Trolley scale | Scale for weighing grain in sacks » 10–250 kg range | 1 000 | |
| Moisture meter | For use in wide range of grain crops » Range 6–40% moisture content » Portable, with replaceable batteries | 400 | |
| Processing equipment | | | |
| Soybean extruder machine | 60–200 kg/hour capacity, 15–37 kW power | 4 500– 6 000 | Final product is high fat cake |
| Soybean oil expeller | Screw oil press 3–5 t/day capacity with oil filter attachment, 7.5–15 kW | 1 500–5 000 | Final product is low fat cake |
| Hammer mill | 500–800 kg/hour, 11 kW | 800–2 000 | |
| Grain cleaning machine | Grain cleaner with oscillating action and aspirator » 3.5–5 kW » 2.5 to 3.0 tonnes/hour capacity | 3 500 | |



Soybean Processing Equipment. Soybean needs to be processed in order to make it suitable for consumption. The anti-nutritional factors in soybean are called Trypsin inhibitors and they can be denatured by heat after which the soybean can be digested. Soybean is mainly used for production of edible oil as well as production of soya cake that is used in preparing animal feeds.

The screw-press oil expeller will be used for edible oil production and will leave a low-fat soya cake residue. The soybean extrusion machine will macerate the soya at a high temperature but will not remove the oil; the final product is a high fat soya cake that is also used in stockfeeds.

ANNEX 4

Specific infrastructure requirements for cassava

TABLE 54

| EQUIPMENT FOR CASSAVA ATC | | | |
|---|---|------------|--|
| ITEM | SPECIFICATIONS | COST (USD) | REMARKS |
| Costs for equipping one cassava processing centre | | | |
| Peeling machine | 2 tonnes per hour | 1 200 | Peeling can also be done manually with knives |
| Cassava grater – motorized | 2 tonnes per hour, stainless steel drum/blades | 1 200 | |
| Milling/ Grinding machine | 250 kg/hour | 2 000 | Use for grinding or breaking up compressed cassava cake into flour |
| Screw press or Hydraulic Press | Manual screw press for compressing bags of cassava mash to remove water | 800 | |
| Dryer | Batch dryer, 500 kg capacity dryer | 1 600 | |
| Weighing scale | 10–250 kg range | 400 | |
| Bag sewing machine | For closing of 50 kg sacks of processed grains, 1.5–2 kW | 200 | Need for one for each ATC warehouse |
| Wooden pallets | To stack the bags away from the floor | 4 | Need 5–10 for each ATC warehouse |



ANNEX 5

Specific infrastructure requirements for horticulture

TABLE 55

| EQUIPMENT FOR HORTICULTURE ATC | | | | |
|--------------------------------|---|-----|------------|--|
| ITEM | SPECIFICATIONS | No | COST (USD) | REMARKS |
| Vegetable handling equipment | | | | |
| 5 m x 20 m shed | Shed with concrete floor and walls and metal roof. | | 20 000 | |
| Vegetable washing tub/tank | Stainless steel | 2 | 500 | One tank for washing and the second tank for rinsing. NOT for leafy vegetables or beans |
| Drying rack | Stainless steel shelving for air drying vegetables after washing | 2 | 1 000 | Fans may also be used above the drying rack to speed up drying rate |
| Grading tables | Stainless steel tables » 1.2 m wide x 3.0 m long tables | 8 | 1 600 | |
| Water tank | 20 000 litre water storage and water filtration system | | 2 500 | |
| Plastic crates | 10 kg capacity and 20 kg capacity crates - 50 each size | 100 | 1 500 | |
| Cold room | 5 m x 6 m insulated room for storage of vegetables | 1 | 8 000 | |
| Air-conditioner and CoolBot | 21000 BTU AC (or 6000 W) for cooling vegetables with CoolBot device to achieve lower temperatures | 1 | 1 000 | AC cost USD 700 and CoolBot costs USD 300 |
| Solar panels and inverter | To provide power to AC - 2 000 W system to have charger/inverter and storage batteries | 1 | 8 000 | |
| Forced air precooler | Portable fan with tarpaulin cover | 1 | 150 | Portable fan and tarpaulin placed in cold room to provide forced air through produce in crates for rapid cooling |
| Top-loading scale | Scale for weighing vegetables in boxes » 1 – 50 kg range x 2 » 1 – 20 kg range x 2 | 2 | 500 | |



▶ ▶ ▶

| ITEM | SPECIFICATIONS | No | COST (USD) | REMARKS |
|---------------------------------------|---|----|------------|---|
| Vegetable handling equipment | | | | |
| Hand pallet trucks | Hand pallet truck or trolley | 2 | 300 | For moving boxes that are packed on pallets, e.g. to cold room or to trucks |
| Pallets | Standard wood pallets 0.9 x 1.2 | 10 | 3 | |
| Roller conveyors | Gravity fed roller conveyor | 2 | 500 | For easier movement of boxes from grading area to packing area |
| Vegetable processing equipment | | | | |
| Gas stove | 2-plate gas stove | 1 | 200 | |
| Stainless steel tables | Stainless steel tables » 4 x 3.0 m long tables | 4 | 200 | |
| Stainless steel pots | Various | | 500 | |
| Tomato pulper | Electric blender for pulping tomato fruit | 1 | 2 000 | |
| Utensils | Knives, Cutting boards, Tongs, etc | | 500 | |
| Glass jars | Various | | 2 000 | |

ATC for tomato processing. Tomato products that can be made on a small scale include various tomato sauces and cooked bottled tomatoes. Product preparation will be as follows:

- » Clean and wash tomatoes;
- » Slice and peel tomatoes;
- » Prepare ingredients and cook in pots until desired consistency is reached;
- » Clean and sterilize glass jars to be used as containers for the sauce;
- » Hot-fill the jars with sauce and close tightly;
- » Place sealed jars in pots of boiling water for 30 minutes to sterilize;
- » Remove jars and allow to cool.

The recipes for the tomato sauces will depend on local tastes and if necessary, preservatives such as potassium sorbate may be added to help increase shelf-life. This low-cost tomato processing may also be suitable for women's groups and will provide an additional income stream.



ANNEX 6

Specific infrastructure requirements for rice

TABLE 56

| EQUIPMENT FOR RICE ATC | | | |
|----------------------------|--|-------------|--|
| ITEM | SPECIFICATIONS | COST (USD) | REMARKS |
| Essential equipment | | | |
| Paddy field rotavator | 8–10 HP diesel power single axle/walking tractor with rotavator blade | 2 400–3 400 | For use in preparing paddy fields |
| Rice thresher - motorized | 2.2 kW/7.5 HP motor, 300– 500 kg/hour | 800–1 500 | |
| Motorized tricycle pickup | 150–175 cc engine, 800–1 000 kg load capacity | 2 500–3 500 | |
| Optional equipment | | | |
| Super grain bags | Multi-layer polyethylene storage bags, hermetic storage. | 2.50–3.00 | To be used for long term storage. Can be used for 2 – 3 harvests |
| Trolley scale | Scale for weighing grain in sacks » 10–250 kg range | 500 | |
| Bag sewing machine | For closing of 50 kg sacks of processed grains, 1.5–2 kW | 200 | |
| Moisture meter | For use in wide range of grain crops » - Range 6–40% moisture content » - Portable, with replaceable batteries | 400 | |
| Grain cleaning machine | Grain cleaner with oscillating action and aspirator » - 3.5–5 kW » - To be used for maize, cowpea, groundnuts and rice » - 1 000–3 000 kg/hour capacity | 1 500 | |

Rice Milling Equipment. There are some small-scale, modern rice mills now being manufactured and these have the potential to produce good quality rice. These mills use rubber rollers and can be used together with a precleaner that removes stones and dirt and other trash. If this mill is placed in a spacious and clean building, it can have a major impact on the quality of rice sold on the market.

Equipment needed includes a grain cleaner. The best option is to have equipment with vibrating/oscillating action combined with an air blower. Mesh screens may also be added to further improve efficacy.

TABLE 57

| RICE MILLING EQUIPMENT, RICE ATC | | | | |
|----------------------------------|---|----------|-------------------|----------------------|
| ITEM | DESCRIPTION | QUANTITY | POWER REQUIREMENT | ESTIMATED COST (USD) |
| Destoner and Blower | Destoner/grain cleaner (gravity separator) with blower for additional removal of light impurities » To be used for maize, cowpea, groundnuts and rice » 3.0 to 5.0 tonnes/hour capacity » To be supplied with spare sieves | 1 | 1.5–2 kW | 1 500 |
| Combined rice mill | Rice mill with polymer/rubber coated roller for the removal of paddy husks and with additional polishing action for bran removal » Capacity of 2.0–2.5 tonnes/hr | 1 | 20–25 kW | 5 000 |
| Rice grader | For grading of whole grains and separation from brokens and fines and coarse | 1 | 20–25 kW | 7 000 |
| Grain Elevator | For bulk conveyance of grains or rice from one unit to the next | 2 | 1.5 kW | 1 200 |
| Bag sewing machine | For closing of 50 kg sacks of milled/ processed rice or grains | 1 | 1.5–2 kW | 200 |

Agricultural Transformation Centres in Africa

Practical guidance to promote inclusive agro-industrial development

With 65 percent of the world's most arable, uncultivated land, abundance of fresh water and more than 60 percent of the economically active population engaged in agriculture, Africa presents invaluable agricultural potential. Nonetheless, the continent's dependence on food imports continues to increase.

In line with its mission to spur sustainable economic development and social progress, the African Development Bank launched the *Feed Africa* strategy, whose objective is to contribute substantially to the transformation of African agriculture by 2025, and to reverse Africa's dependence on imported foods.

As part of this strategy, the Bank is promoting the establishment of staple crops processing zones (SCPZs), which are agrobased spatial development initiatives, designed to concentrate agroprocessing activities within areas of high agricultural potential. These zones include an agroprocessing hub, a number of agricultural transformation centres (ATCs) and agricultural production areas. The centres are intended to be community-based rural institutions providing a mix of hard and soft infrastructure and services to smallholders and agripreneurs. They aim to reduce on-farm and post-harvest losses, improve quality, aggregate production and create efficiency in transportation by linking them to the agroprocessing hubs within the SCPZs for further value addition.

Under the technical supervision of FAO, this publication analyses the applicability of the ATC concept to the African context, by assessing the feasibility of establishing ATCs in three African countries: Zambia, Côte d'Ivoire and the United Republic of Tanzania, for selected value chains.

The findings represent a preliminary attempt to better understand the practical and nuanced implications of promoting the establishment of ATCs in Africa as part of the broader SCPZ concept under the Feed Africa strategy.

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