

## Chapter 24

# A Decade of Agronomic Research Impact on Commercializing Traditional Homestead Production of Amadumbe in Umbumbulu KwaZulu-Natal



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**Abstract** Severe environmental problems result from unsustainable farming practices leading to natural resource degradation, particularly in rural areas. In response to South Africa's growing population, farming practices that increase productivity whilst compromising natural resources to ensure food security are rising amongst smallholder sectors. Hence, there is urgent need to establish methods and systems that support viable and attractive sustainable agriculture during the climate change *era*. This chapter reviews the impacts of research intervention post-funded project cycle of commercializing homestead agriculture in traditional production systems. The research project provided a platform for adapting traditional farming methods towards sustainable use of locally available resources to strengthen market involvement and sustain livelihoods. Only one of the five engaged villages demonstrated systemic integrity through displaying the wisdom of strong leadership, incremental technological integration and learning for sustainability. Overall research impact on natural resources was positively noted by the continued capacity of the soil to sustain productivity through high yields as well as maintain soil quality and health. Results also revealed that the lack of extension involvement in the project negatively impacts the sustainability of locally established institutional arrangements (socially and environmentally), thus highlighting the significance of extension engagement in sustaining research results achieved.

**Keywords** Amadumbe · Homestead produce · Participatory research · Traditional farming

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## 24.1 Introduction

The vehicle through which the goals of rural development and poverty reduction can be achieved is supporting and advancing smallholder agriculture. The South African government had committed itself to expanding the number of smallholder producers selling their produce from 200,000 to 250,000 by 2014 and 500,000 smallholders by 2020 and onwards (Aliber and Hall 2012). The increased yearly budgetary allocation clearly illustrates these attitudes towards supporting smallholders by the Department of Agriculture, Forestry and Fisheries (DAFF 2018). Ranking number two following the Eastern Cape, KwaZulu-Natal (KZN) is regarded as a rural province with households mainly involved in subsistence and smallholder farming. KwaZulu-Natal was reported to having the highest number of agricultural households, with 23% of the 2.3 million noted for South Africa (Stats 2016). Therefore, agricultural developmental efforts targeting rural communities should be implemented with high impact potential to succeed so that the winning formula can be repeated and distributed in other localities.

The South Africa Netherlands Partnership for Alternative Development (SANPAD) Participatory Project was the result of a long-term building of relationships between researchers at the University of KwaZulu-Natal (UKZN) and farmers who are members of the Ezemvelo Farmers' Organization (EFO). Table 24.1 includes first interventions (2001 to 2003) in Umbumbulu through the Public Understanding of Science and Technology (PUSET Project) focussed on transfer of technology initiated by Professor Rijkenberg and Professor Modi, both of the University of KwaZulu-Natal (UKZN). The strategy was to engage with society to increase awareness of the importance of science and technology in the environment in which we live. The second phase in the relationship initiated a farmer-researcher approach to investigate the organic production of traditional crops (Table 24.2). The third phase of this relationship, the SANPAD Participatory Project 05/32 (2006–2009), initiated a farmer-researcher partnership for research to support the growing involvement in commercial farming. The aim was to address commercialising challenges and understand how market relations changed the way farmers grow their crops and whether this transformation affected social relationships between and within homesteads and villages that constitute the EFO. This phase was a second SANPAD fund and viewed the transformation of homestead agriculture to commercial agriculture through social paradigm and agronomic dynamics.

The SANPAD Project of commercializing homestead<sup>1</sup> agriculture was the third phase of compound research by the UKZN students to develop a model for the successful marketing of traditional produce. As a compound study of social

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<sup>1</sup>Homestead refers to a place where a person and/or family cultivates the land and tries to become self-sufficient. As a way of life, EFO farmers strive to live off the land by growing and raising what they eat (including livestock and poultry). Hence the agricultural production efforts around homesteads are usually a quarter or more of a hectare up to four hectares.

**Table 24.1** University of KwaZulu-Natal Research engagements through individual research projects arising from the EFO needs and participatory research agenda

Researcher	Co-researchers	Year	Project data and learning
Modi		2001–2002	PUSET intervention project: Establishment of the EFO, February 2001, 31 farmers Constitution established for the EFO Supplied PnP (2001–2002) with traditional crops (sweet potato, landrace baby potatoes, <i>amadumbe</i> )
Modi		2003	What do subsistence farmers know about indig- enous crops and organic farming?
Mokolobate	Haynes	2003	Evaluation of the comparative effects of organic amendments, lime and phosphate in alleviation of Al toxicity and P deficiency
Shange	Modi	2004	Amadumbe production by small-scale farmers under dryland and wetland conditions
Naramabuye	Modi	2004	The use of organic amendments to ameliorate soil acidity
Naramabuye	Haynes	2006	Short-term effects of three animal manures on soil pH and Al solubility
Phiri	Modi	2005	Performance of wild mustard under green beans intercropping system
Caister	Modi, Mapumulo, Ndlovu	2006	Participatory research agenda workshop
Naramabuye	Haynes, Modi	2007	Cattle manure and grass residues as liming materials
Mare	Modi	2006	Amadumbe planting dates experiment to extend harvest season—farmer field trials
Ndlovu	Caister, Mapumulo	2007	Role of community gardens with EFO villages, RRA
Caister	Mapumulo	2006–2008	Farm visits: interviews, observations, RRA
Mapumulo	Caister, Modi	2007	Intercropping questionnaire
Maragelo	Mapumulo, Caister	2007	Survey of indigenous farming knowledge
Thamaga- Chitja		2008	Determining the potential for smallholder organic Production through the Development of an empirical and participatory decision support tool
Mapumulo	Modi	2007–2009	Action learning crop trials on biological soil fer- tility amendments—farmer field trials
Caister	Mapumulo	2009	Grounded theory development of commercialisation process
Mare	Modi	2009	Amadumbe starch cropping trials—farmer field trials
Buthelezi	Mapumulo, Caister, Ndlovu	2010	Indigenous knowledge on soils—survey and focus group discussion

These are the individual projects that informed the current study in all aspects of the enquiry: choice of crops (amadumbe, wild mustard and cowpeas), farming system (intercropping), organic amend-  
ments (type of organic manures)

**Table 24.2** Summary of outcomes of relationship between UKZN and the EFO

Phase of relationship	Outcomes
First SANPAD funded project Farmer-researcher relationship 2003–2005	By 2003, EFO membership increases to 54 farmers Organic certification of EFO subsistence farmers Woolworths' Food Market gains its first supply of organically certified traditional vegetables Identification of some vegetables suitable for cultivation and marketing (wild mustard, <i>amadumbe</i> , landrace potatoes) Increasingly respectful relationship between Prof Modi and the EFO Prof Modi elected as gatekeeper
Second SANPAD funded project participatory action research 2006–2009	Researchers were interested in both action and research. Researchers and community members participated in the change process and research took place when the researchers reflected on the change process that occurred. The change process itself was important to generating the new knowledge and places the research within a specific living context.

Adapted from (Caister 2012)

agronomy dynamics of commercializing homestead agriculture, the various aspects of commercializing *amadumbe*<sup>2</sup> were separated into individual research projects, leading to multidisciplinary<sup>3</sup> collaborations within the agricultural faculty over time. The research team leader was interested in designing effective economic models for appropriate small-scale commercial farming. The formal market (Woolworths) was interested in selling produce of high quality at the best price. The organic inspectors were interested in following the rules for certification.

Crop trials were focused on the reliability (potential) of soils and their relationship to the crops and yield improvement. Aspect of strengthening the household was about livelihoods, strategies and ways in which agriculture and people in households are related through the commercialization of homestead agriculture. Overall, the research team intentions were to research over a period of time to look at all the opportunities that farmers had at their disposal and find a new way of thinking and new strategies about how to use resources to make livelihoods sustainable. Our purpose was to one day convince all these different perspectives (people who had their different areas of interest) to compromise and agree to what was needed to

<sup>2</sup>*Amadumbe* is the isiZulu word for taro root or rhizome of *Colocasia esculenta*, a starchy staple eaten throughout rural KZN.

<sup>3</sup>When experts from different fields work together on a common subject, within the boundaries of their own discipline, they are said to adopt a multidisciplinary approach. However, if they stick to these boundaries, they may reach a point where the project cannot progress any further. They will then have to bring themselves to the fringes of their own fields to form new concepts and ideas and create a whole new, interdisciplinary field. A transdisciplinary team is an interdisciplinary team whose members have developed sufficient trust and mutual confidence to transcend disciplinary boundaries and adopt a more holistic approach.

sustain and encourage agricultural-based livelihoods within the Ezemvelo Farmers' Organization (EFO). In this context, we understood the need for diverse strategies by farmers to support agriculture-related livelihoods and were very interested in all their farming aspects. The research focus was imbedded on the way of life in this Umbumbulu community since the planting of *amadumbe* using traditional methods<sup>4</sup> mainly for subsistence was done by almost all households at various scales using only local production resources. In principle, traditional methods used in this area are similar to organic farming with tillage aspects oriented towards soil conservation. Considering the high rural unemployment levels, implementing a research project to commercialise locally available produce to generate an income and sustain livelihoods was appropriate. Umbumbulu is climatically suited to sustain crop production because of the varied higher rainfall of up to 1400 mm/annum (Camp 1999). This climatic advantage is of particular significance in rural agricultural systems that are mainly rain fed due to historical lack of agricultural infrastructure and investment. The success of prior projects phases in the area, especially concerning the environmental sustainability and conservation of natural resources, are therefore ascribed to this environmental advantage.

Historically, the primary mode of knowledge transfer had always been oral communication combined with modelled practice from generation to generation. Generally, most traditional phenomenon have been shaped by social, technical and ecological responses for ensuring food security and social cohesion within the socio-agronomic landscape. Traditional farming as a way of life has, however, been threatened by decades of a shift from the integrated social, political and economic focus of a focused agrarian economy to the multiple livelihood strategies designed to survive in a cash-based society as a result of economic and political power struggles. The loss of arable land and traditional strategies such as keeping livestock, the disruption caused by recent climate change, and especially, the lure of young people to higher, more reliable incomes also contributed to disturbing traditional farming livelihoods. Perceived job opportunities in the urban regions and decreasing food production in rural areas result in youth migration from rural areas searching for better livelihood (DALRRD 2019).

Rural development is almost always conducted in environments where resources are restricted, management is critical, and issues are often challenged. Scientific research generally delights this uncertainty as a new direction for knowledge production, whereas the rural dwellers live with consequences. Hence, research institutions gear their mandates and programmes towards socially robust development processes if outcomes are sustainably achieved. In the current market-driven economy, the opportunity was presented for social learning processes to link technology (including indigenous knowledge), service networks and markets in innovative

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<sup>4</sup>Traditional farming methods in this paper refers to management-based factors of minimal soil disturbance mainly with handheld implements, no synthetic use of fertilizers, only limited quantities of kraal/livestock manure and manual weed control together with indigenous knowledge-based pest control. Continuous cropping of these systems leads to depleted soil resource with nutrient mining at every harvest that are not sufficiently replenished at planting.

ways. The outcomes of social learning lead to solutions that overcome typical agri-food-related constraints. Technological improvements and agricultural research are crucial for increasing agricultural productivity and safeguarding food security leading to poverty reduction and employment opportunities and ensuring sustainability within the development context. Gabre-Madhin and Johnston (2002) concurred that agricultural productivity growth had been driven by improved seeds, new farm technologies, and agronomic practices. Improved household income, creation of labour opportunities for the poor, reduced food prices, environmental sustainability are amongst the benefits of livelihood properties resulting from agricultural technological changes.

Factors that impact soil fertility challenges include the removal of input subsidy, high cost of moving fertilizers from source to the farm, inadequate supplies of organic and inorganic fertilizers, and untimely availability and low quality of fertilizers. Also, the poor cultural practices employed, deteriorating soil science capacity and weak agricultural extension services contribute to soil fertility challenges. Continuous cropping and inappropriate farming practices have had massive negative environmental outcomes characterized by declining soil fertility and erosion, degradation of vast expanses of arable land further causing low yields, food insecurity, and perennial starvation (Guto et al. 2011). In many rural areas where subsistence and smallholder farming is a way of life, these problems are particularly intense. Umbumbulu, like many other rural communities, consist of the majority of subsistence and smallholder farmers who still rely on simple traditional technologies and tools, mainly handheld hoes, minimal use of animal traction and limited tractor access. Recent land scarcity resulting from increasing pressure with residential land needs competing with arable land, poor agricultural management strategies and unsupportive agricultural policies exacerbate the problem. Despite the negative impacts on agricultural productivity, food security and environmental degradation, nutrient mining practices including food shortages and imminent threat of illnesses resulting from poor health lead to loss of social capital. To date, Ezemvelo Farmers' Organization community has been traditionally producing *amadumbe* with limited input sources for decades as a way of life and thus annually decreasing yields experienced are a true reflection of the extent of unintended nutrient mining done by the perpetual mono-cropping of these tubers with limited input supply. Therefore, it is for these reasons that this research was instituted to evaluate the long-term impact on the sustainability of this traditional production system.

Agricultural development interventions and research are known to improve the livelihoods of smallholder farmers. Hence, this study viewed sustainability as the primary objective within the context of overall agricultural production, thus implying that local agricultural success will depend on exploiting natural and man-made resources using human skills and labour. The outcome of this exploitation are products in the form of food for sustenance and their market production. Traditional, sustainable agriculture is based on optimising nutrient flows through the recycling of biomass, improving soil conditions and minimising resource losses (Altieri 2005). Accordingly, this system manages agricultural systems for improved and sustained productivity, increased food security while preserving and enhancing the resource

base and the environment in general. Outcomes of sustainable agricultural practices are the precipitation of increases in food security, household income and general welfare, which are good and desirable livelihood outcomes, especially for the poor groups of smallholder farmers. Experiences with sustainable and conservation agriculture in South Africa have shown that the adoption of productivity-enhancing technologies often accelerate livelihood changes in economic and socio-institutional conditions of actors involved, as expected (Swanepoel et al. 2017).

Research engagement with the Umbumbulu community intended to adapt local traditional agricultural practices towards sustainable agriculture through soil fertility enhancement by using diverse crop species, alternative organic soil amendments and soil cover through non-removal of residues that protect the soil from erosion and suppress weeds with leftover residues during land preparation (adding to soil's physical resilience and gradual nutrient status build-up). Also, adapt farming system through crop rotation where the below-ground crop is followed by above ground helps weed control and boost soil fertility. The main advantage of adapting traditional agriculture for sustainability is the technology's ability to address a broad set of farming constraints particularly common among smallholder farmers in vulnerable communities. In this regard, the constraints in question include continuous hybrid seed requirement, depleted nutrient base, lack of sufficient access to equipment with varied implements for land preparation, sowing, weeding and harvesting. Answers to farming issues are the technologies to address expressed needs obtained through participatory methods using a facilitation model instead of technology transfer (Duvel 2001). Hence, this qualitative study looked at the impact of socio-agronomic intervention through integrated soil fertility management and farmers' use of best practices in the context of EFO values, opinions and behaviour towards sustainable growing *amadumbe* crop for a high-value market. EFO farmers were central from the beginning to the end, where their local farming system and knowledge of *amadumbe* production were recognized as assets honouring their existing livelihood strategy. As a result, the research project through this chapter seeks to:

- Investigate how the research technologies of adapting traditional agriculture for sustainable commercial purposes impacts change livelihood outcomes through changes in productivity, yields, household income, and food security.
- Understand the impact of the research interventions post the research project.
- Understand the effect of formal market loss on commercialization efforts, that is, understanding the determinants of continuity in commercializing homestead agriculture through informal markets.

The rest of the chapter is arranged as follows: Sect. 24.2 identifies the purpose for the return study, Sect. 24.3 discusses the underlying framework followed by the description of the study methods in Sect. 24.4. Section 24.5 presents the results and discussions; conclusions and recommendations are dealt with in Sect. 24.6.

## 24.2 Identification of the Purpose

### 24.2.1 *A Decade Later (Return Study)*

As part of the compound research study, the original study was meant to provide answers to low yields experienced by EFO farmers due to a lack of access to manure. This challenge was identified as a critical issue towards commercializing homestead produce in an organic traditional farming system. In keeping with local practices and farming norms, the study focused on investigating biological strategies towards *amadumbe* yield improvement. Funded by the SANPAD Project, the study took place between 2006 and 2009, and the funding cycle ended. Farmer engagement, however, continued to monitor progress on the use of adapted practices in field operations by farmers. In 2010, the SANPAD Project officially ended, and in 2011, EFO lost the formal Woolworths market. Gradually, many EFO members left the organization and stopped paying their membership fees. Formal monthly forum meetings became informal, with only a few held in a year with dwindling attendance. There were farmer engagements through informal visits to EFO homesteads, occasional attendance of the monthly forum meetings by the researcher to hear of the progress post-project exit. Over the years, through visits to the study site it was devastating to observe the EFO's disintegration of various institutional structures that were previously efficient in their functionality. The challenges of not having a formal market led many farmers to reduce the size of their production areas. Different EFO villages displayed different behaviours with four out of five villages showing signs of being unsustainable. Only, Ezigeni village showed consistent sustainability in its production, marketing and social cohesion patterns.

At the beginning of 2018, the researcher identified the need for the 'return study' to document understanding of what went wrong through a formal collection of qualitative data in assessing the impact of research interventions brought by the SANPAD Project more than a decade prior. In the quest to find answers to what was happening in the EFO community, the 'return study' became a systematic inquiry tool into a set of related events that aimed to explain the phenomenon of interest in social setting for the researcher to understand (Nieuwenhuis 2007). The challenge expressed by EFO farmers over many years post the departure of research team leader as facilitator and gatekeeper was that the organization cannot operate until he returns. In agreement, the EFO committee and members concluded that they cannot see anyone good enough to resurrect the organization (EFO) without the gate keeper. Prospects of ever getting a formal market, specifically Woolworths, have died until the return of the gate keeper, whom they believe will one day return in their lifetime to rebuild the organization. In spite of these challenges, Ezigeni village continued to use all the best practices recommended by the research interventions, whilst in other villages, a few pockets of the same behaviour was observed. The SANPAD Participatory Project (2006–2009) provided opportunities for participatory knowledge creation and actor learning in a movement towards commercialization of traditional agriculture. In this study, the commercialization of homestead agriculture,



specifically *amadumbe* being the main EFO crop, was understood as having access to the Woolworths market. In over a decade, the question of the 'return' element of the study was to assess the impact of having a research intervention (through the SANPAD project) on the production systems of commercializing homestead agriculture.

### ***24.2.2 An Emergent Research Topic***

In 2006, a participatory research workshop facilitated by University of KwaZulu-Natal (UKZN) researchers with EFO farmers in Umbumbulu delivered the foundations for a shared (farmer-researcher) agenda for continued transformation and researchable problem-solving within the proposed SANPAD Participatory Project (Caister 2006). During the three months prior to the workshop held on 25 March 2006, farmers had recorded (written) questions about the problems they were experiencing in the conversion of traditional farming priorities from subsistence to commercial priorities. During the workshop, researchers explored with farmers the complete collection of questions raised, in order to ensure a mutual understanding of the nature and rationality behind the questions. Together, it was agreed who (amongst the research team) would be responsible for addressing these problems. Researchers took these insights away to reflect on and extract researchable problems within the natural learning process anticipated in the participatory agenda for transformation. Farmers have already made explicit their intentions for commercialisation in the constitution of the organization. In this document, they stated a deliberate intention to move beyond what they already knew and to transform traditional agriculture into a practice of market-oriented sustainable agriculture. Potential researchable problems were discussed by student supervisors, identifying individual research projects across a variety of disciplines that addressed farmers concerns. A further priority in these discussions was to ensure that current research activity would contribute to the accumulation of knowledge being produced through the collaborative accumulation of prior (2001–2005) and then current research (SANPAD Project 2006–2009). Through a comprehensive reflection on the farmer's agenda, research consultants and students designed multiple individual research projects for students that would contribute to the farmer's knowledge requirements. The commercialization topic became clear where all aspects were to be investigated by the various student research projects. The study uses the small-holder EFO farmer households with membership in Ogagwini (50%), Ezigeni (35%), Nungwana (10%) and kwaMahleka (5%) communities of Umbumbulu in the province of KwaZulu-Natal as the units of analysis. This chapter seeks to assess the impact of research engagements determinants post the research team's existence within the community thus termed 'the return study'.

### 24.2.3 *An Emergent Research Question*

This study presents research enquiries envisioned in the consultations between EFO and research supervisors as a way of understanding the agronomic dynamics of the 3-year (2006–2009) partnership. The research question emerging as the focus for this enquiry was: what are the biological strategies required towards sustainable *amadumbe* production in commercializing traditional agriculture? As decided by the EFO farmers, the role of this study was to contribute to exploring alternative organic soil amendments to ensure improved soil fertility status for sustainable yield in the production of *amadumbe*. In understanding the challenge of limited and no access to manure by farmers when no other form of soil fertility booster was available since the farming system for *amadumbe* in this area was primarily monocultural, the researcher needed to incorporate multiple strategies to providing improved soil fertility amendment for enhanced yield. Strategies involved the following components as sustainable practices to improve yield:

- System change from monoculture to polyculture and/or intercropping.
- Use of other edible legume intercrop instead of dry beans.
- Introduction of vermiculture for the use of vermicompost.
- Incorporation of mutual benefit crop (wild mustard) with residual nutrient gain to soil.

For this study, the underlying theme for investigation was: what kind of farming system would result in a successful and sustainable production for continued commercialization?

Sustainability measure of a farming system whether it is used for commercial or subsistence reasons depends on the productivity of the soil and is enhanced by the practices employed that takes into account the critical issue of timescale. *Amadumbe* have a nine-month crop cycle which suggests that 3 years of the SANPAD Project partnership with EFO was too short a time to determine any long-term indicators of sustainability in the production system. However, it is to be noted that yield improvement was observed in the third-year funded cycle of the project. Hence, there was a realization of the need for the ‘return’ study to evaluate signs (as perceived by farmers) of sustainability over a period of a decade that has gone since the research intervention. A 10-year lapse was unintentionally allowed to pass so that the initial study of adapting local traditional agriculture could be assessed and the return study of research impact could report on the impact post the intervention. In analyzing the research intervention impact and soil biological strategies gleaned through livelihood survey summarized in the section below, the study thus assumed the necessity to examine farmers’ perception on the different technological adaptation for the promotion of sustainable production thus leading to better livelihoods.

#### **24.2.4 Study Assumptions**

- The study assumed that EFO farmers had access to unlimited organic manure sources to sustain the commercial endeavours of organically producing amadumbe as the main crop and other organically grown field crops (sweet potatoes, potatoes, pumpkins).
- Local crop rotation system (above ground followed by below ground fruiting types of crops) was adequate to ensure sufficient nutrient replenishment for the main crop of amadumbe without compromising the yield.
- Traditional farming system as a livelihood strategy had positive ecological benefits to the productive capacity of the soil.
- Advantage of research agenda being set by farmers would ensure better adoption/adaptation levels of the best practices recommended for sustainable production (intercropping, use of legumes, use of vermicompost as an alternative).
- Over a decade of research interventions and enhanced capacity built amongst farmers will result in social cohesion, unity and strengthen internal institutional arrangements of EFO for sustainable united management in administration and productivity once the intervention period is completed and research team exits the area.

#### **24.2.5 Study Limits**

The study was presented with a variety of limits to its execution:

- The study inquiry was about the impact of biological soil fertility management practices on productive capacity of the soils in the production and yield improvement of amadumbe to sustain commercial aspect over time (10 years).
- The study relied on information provided by farmers directly and not any other sources, farmer perceptions on their lived reality following experiential learning and research team engagements after a decade (10 years).
- Study evaluated soil health status/soil quality (productivity) as a result of interventions based on farmer perception and impact on livelihoods over the years not the amount of money made in selling the produce.

### **24.3 Approach and Livelihood Framework**

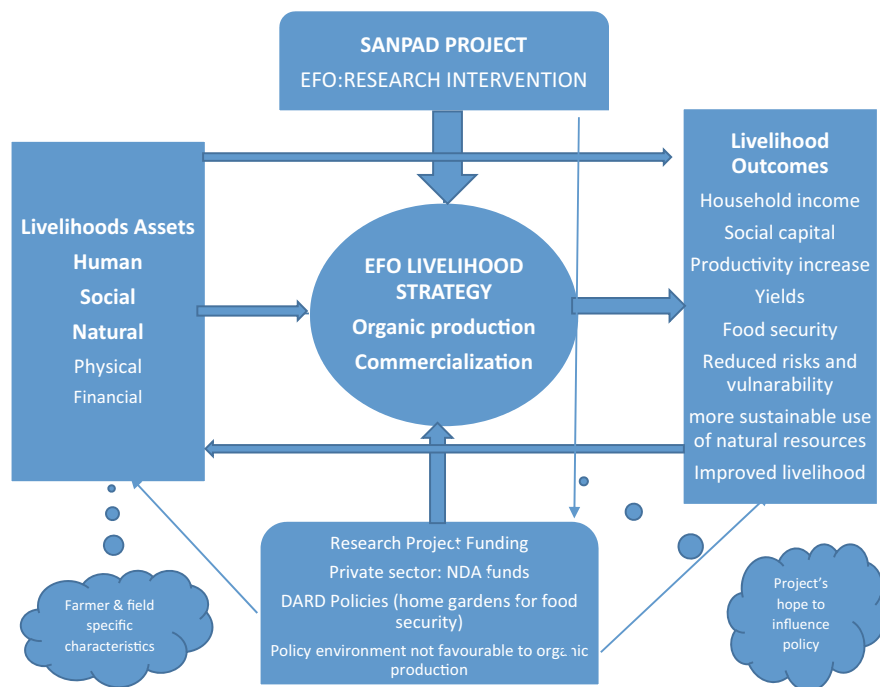
Agricultural research and technologies may not play a central role when we take into account the full picture of people's livelihoods. But understanding the full picture can help develop technologies that better fit in with the complex livelihood strategies, especially of the rural poor like Umbumbulu community. The livelihood framework thus provides a guide for research and intervention. In this chapter, the

framework particularly serves the purpose of linking the previous research work (SANPAD Project phase 1 and 2) and capacities with what people are capable of doing, what they are looking for, and how they perceive their needs especially post the intervention (when the research project ends). Livelihood framework is a particular form of livelihoods analysis looking at more aspects of people's lives, analysing causes of poverty (low yields and reduced production/loss of formal markets), access to resources and their diverse livelihoods considering that amadumbe production was their primary livelihood strategy. The framework recognizes people, whether poor or not, as actors with assets and capabilities who act in pursuit of their own livelihood goals intended to be dynamic recognizing changes due to both external fluctuations and the results of people's own actions, activities and relationship between relevant factors at micro, intermediate, and macro levels (UNDP 2017).

The sustainable livelihoods framework (SLF) explain how livelihoods benefit from available resources through engaging in certain activities in an environment governed by some existing rules and institutions (EFO). People undertake livelihood strategies using assets owned to transform their lives. Assets owned are key in implementing livelihood strategies, such as crop production and livestock rearing, which are necessary for realization of desired livelihood outcomes. An indirect but positive relationship exist between the types of assets owned and envisaged livelihood outcomes (LaFlamme and Davies 2007). This chapter embraces the definition of a livelihood as comprising "capabilities, assets and activities required to make a living and to cope with and recover from shocks and stresses" (Krantz 2001). The framework describes how difficult issues of rural development could be approached and successfully addressed showing the importance of resources and transformation structures in realizing welfare goals (Start and Johnson 2004).

The sustainable livelihoods framework illustrated in Fig. 24.1, adapted from Chambers and Conway (1992), shows the relationship among the context of the farmers' assets (represented by different forms of capital), transformation structures, livelihood strategies, and livelihood outcomes. Specifically, the framework illustrates how, by availing households' opportunities/potential for livelihood strategies through promotion of agricultural technology, research interventions impact livelihood outcomes. The framework shows the indirect relationship between livelihood outcomes and households' assets and the role of transformation structures and livelihood strategies. The assets comprise natural (land and its resources), financial (savings, membership fees, own contributions and project funds), physical (infrastructure such as roads), social (EFO/social networks), and human forms of capital (skills and education levels). Assets form building blocks of sustainable livelihoods, impacting household capacity to withstand challenges of shocks encountered in improving livelihoods.

Given asset endowments, households make decisions regarding adaptation of technology perceived by farmers to generate positive social and economic outcomes. The livelihood context includes important broad political and economic structures and the existing policy environment. Arguably, these policies and economic structures influence livelihood assets holdings, strategies undertaken, activities of development agencies and ultimately resultant livelihood outcomes. Illustrated in



**Fig. 24.1** Link between EFO commercialization and livelihood outcomes. Source: Author's own adaptation of Sustainable Livelihood Framework (UNDP 2017)

Fig. 24.1, the system is characterized by forward and backward linkages in response to changes in fields and farmer-specific variables captured through livelihood assets and observed livelihood outcomes. A specific “package” of field- and farmer-specific factors or livelihood assets is associated with each outcome although each factor may be linked to various other outcomes. Traditional organic production is an intervening mechanism through which farmers, given their socioeconomic characteristics and field characteristics, transform livelihoods. Farmers adapt their traditional organic production to enhance land productivity in order to ultimately improve livelihoods through commercialization of homestead produce. Therefore, socioeconomic and farm-specific characteristics and expected positive benefits from traditional organic production influence the farmers’ decisions about technology adoption/adaptation. The actual and perceived impact of traditional organic production on livelihoods varies with the geographical location of the farm, biophysical and institutional constraints and socioeconomic factors that favour specific practices shown by the varied results in the five villages. Farmers are heterogeneous and face dynamic, local, political, and economic environments that determine adaptation trajectories taking care of ensuing constraints and opportunities for traditional organic production. As the perceptions’ paradigm suggests, farmer behaviours are shaped by the perception that commercialization impacts directly and positively in

improving livelihoods (Uaiene et al. 2009). These behaviours are driven by farmer-specific factors such as age, gender, household size, level of education, and marital status, all of which are indirectly linked to perceptions about livelihood outcomes and intervening technologies. In its approach, the project hopes to influence Department of Agriculture and Rural Development (DARD) policy environment towards supporting traditional organic production as part of rural development through their varied platforms addressing food security and poverty alleviation goals.

## 24.4 Methodology

### 24.4.1 Location and Characteristics of Study Area

The study area is defined by latitudes 29°58'30" and 30°4'45" south and longitudes 30°36'45" and 30°43'15" East; visually south and east from Pietermaritzburg and south and west from the city of Durban. The small town of Umbumbulu marks the closest urban economic hub and straddles the R603 (Sbu Mkhize Drive) between Camperdown (south and inland, west of Durban) and Isipingo (south of Durban), via the M30 (Fig. 24.2).

The area where farmers of the Ezemvelo Farmers' Organisation (EFO) live is commonly understood in South Africa as a former homeland area<sup>5</sup> of southern KwaZulu-Natal in Umbumbulu (Fig. 24.3) under Embo-Thimuni tribal authority. In understanding agricultural rural livelihoods, it is important to know local natural resources are available to support and sustain the lives of the people in the area. Also, the knowledge of structures and processes exerting the pressure in shaping the livelihoods is required. Study area is geographically located as well as described through livelihoods view of social and agricultural interaction with the environmental system context. Except for where otherwise indicated, the information in this chapter is a synthesis of the researcher's subjective observations, participatory experiences and discussions with informants from field notes recorded between 2006 and July 2019. During this time the researcher engaged with EFO farmers from all the villages. On first impression, Umbumbulu has visual boundaries on the rural landscape. One sees large-scale commercial agriculture (mostly vast, rolling

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<sup>5</sup>The geographic location which thus emphasizes the extent of the production system's sustainability, considering that the land was initially marginalized. Geographically, homelands were strategically located in marginalized pockets of land for the settlement of black people according to the 1913 Native Land Act. Then, in 1936, the Native Trust and Land Act effectively formalized the separation of black and white land, causing decades of marginalization and hardship for rural black people. Noting that prior to the democratic dispensation in South Africa, homelands were perceived as a labour pool for the country's growing commercial activity. Hence, the agricultural work ethic embedded in homestead communities as a livelihood strategy or a way of life.

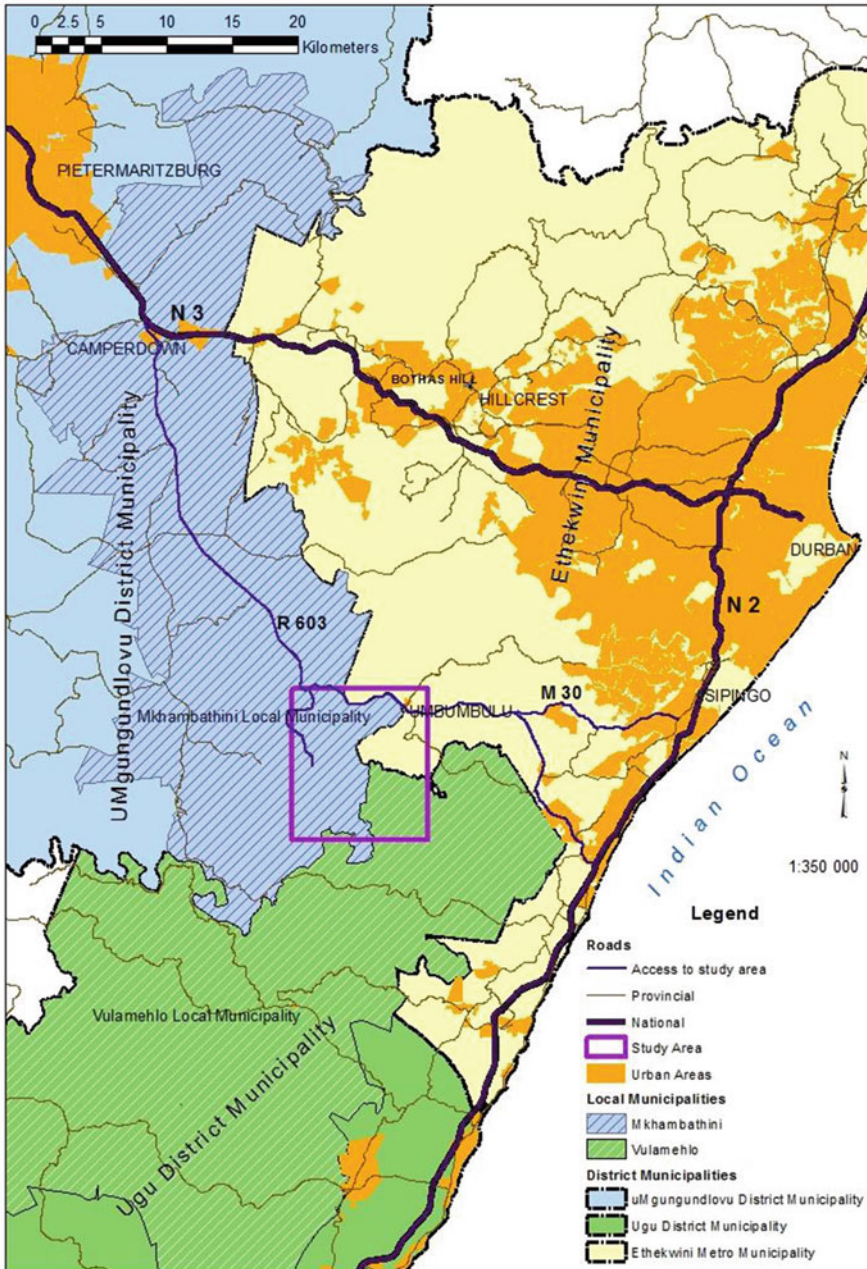


Fig. 24.2 Locality map of study area (Caister 2011)

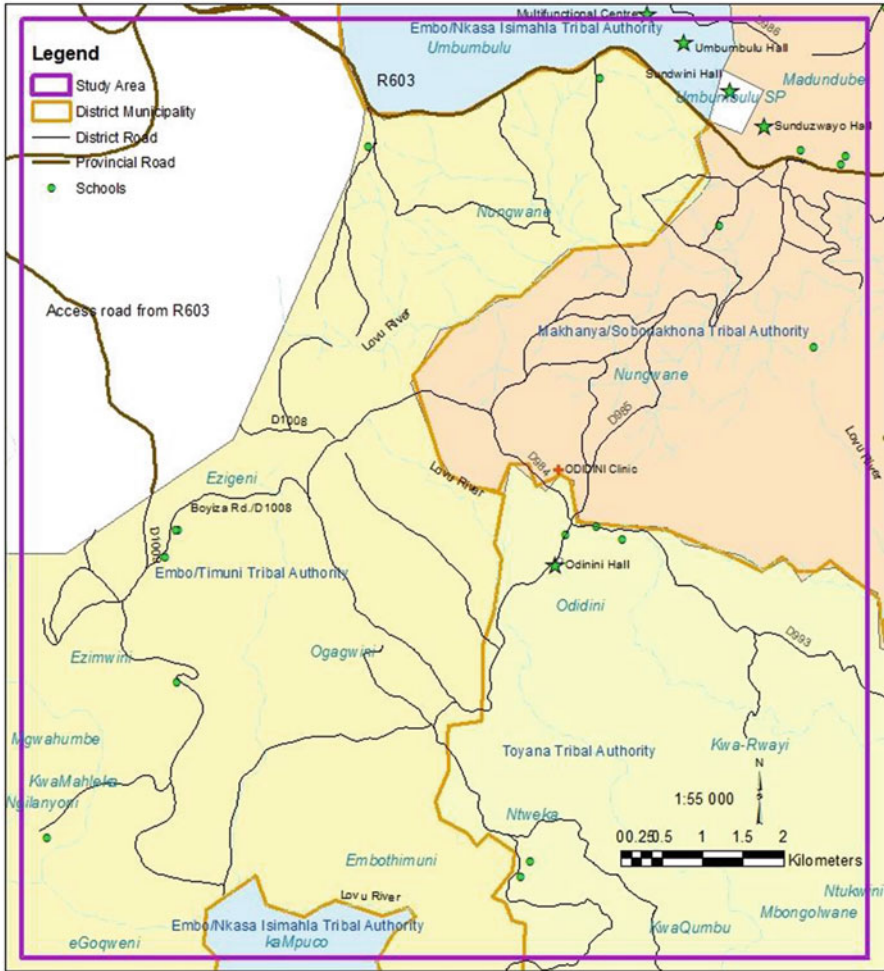
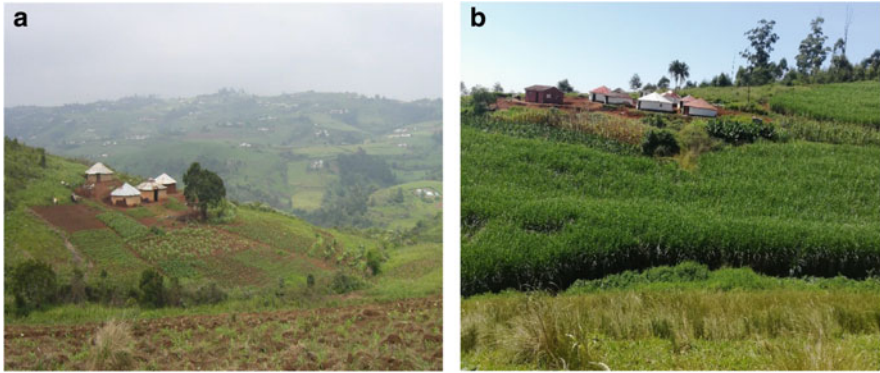


Fig. 24.3 Map of study area (Caister 2011)

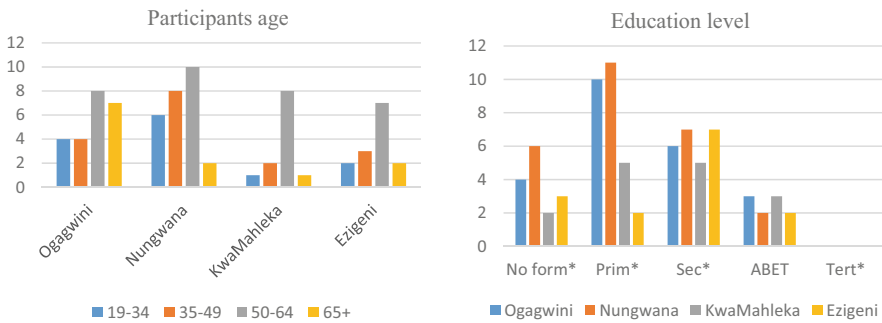
fields of sugarcane) clearly separated from subsistence farming areas, where smaller contoured fields surrounding groups of circular-shaped traditional Zulu homesteads (*rondavels*) forms a patchwork effect.

As in many rural areas of South Africa, one notes that housing, a mixture of traditional and modern block or brick, clusters along the main access roads in an attempt to secure access to infrastructure and services. The study area is mainly agrarian and traditional homesteads with their associated cultivations, fallow fields and grazing lands remain dispersed over the rolling hills (Fig. 24.4a, b).





**Fig. 24.4** (a and b) Umbumbulu, traditional farming homestead (12/12/2007 and 18/05/2018)



**Fig. 24.5** EFO age and educational representation across villages

### 24.4.2 Sampling and Composition of Participants

From its establishment in 2001, EFO had membership growth of 54 in 2003 to about 280 in 2009 with farmers in the five villages (Ogagwini, Ezigeni, kwaMahleka, Nungwane and kwaRhwayi) of Embo in Umbumbulu. Recently, in 2018, membership dropped to <90 in four (excludes kwaRhwayi) of the five villages. For the four villages, a key informant in each section was the one who organised all the other farmers. As a result, a total of 78 farmers were available for engagement in the respective villages. All farmers who participated in the study were considered to give reliable information pertaining to the study since they have been EFO members since 2006. It was noted that composition of participants and EFO in general is dominated by adults (>35 years) in all villages (Fig. 24.5). As expected in many rural smallholder settings, women are in large numbers as they dominate farmer groups in this study and comprise 86% relative to the 14% of men representation. In their dominance, women are generally married, and there is no culture of divorce in this community as none were reported to have occurred (Fig. 24.6).

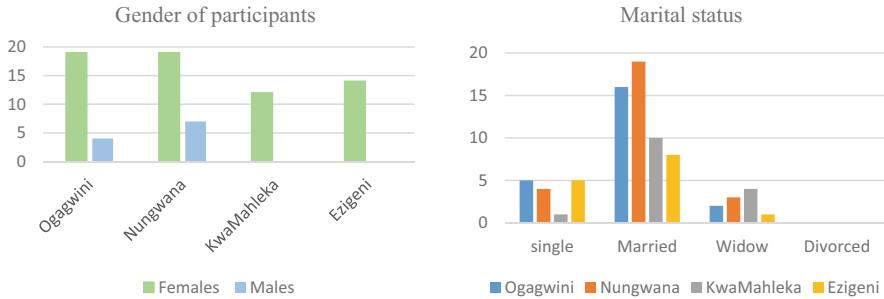


Fig. 24.6 EFO gender distribution and marital status within villages

### 24.4.3 Data Collection and Analysis

In the collection of data, several visits to all villages were made including a few formal group discussions per village. The data collected from all engagements with EFO farmers were both qualitative and quantitative in nature. Observations of objects was a quick and efficient method of gaining preliminary knowledge or making a preliminary assessment of field state or condition (Walliman 2011).

Semi-structured face-to-face in-depth interviews were used to obtain further clarity through probing open-ended type questions with key informants and typical EFO farmers (Fig. 24.7) in their own spaces at home in the field where amadumbe are planted.

All data collection strategies used are depicted in Fig. 24.8. Surveying is done through questionnaire with a focus group of EFO members to concentrate in detail on intercropping as a specific theme on their production system. This method was found to be flexible, cheap and quick to administer to larger groups (up to 16 farmers) in different villages and lasted for up to 2 h for a group. In these focus group discussions, questionnaires were personally used by the researcher for better results (Van Niekerk 2002) as well as to ensure that farmers could be assisted to overcome difficulties with the questions, and could be persuaded and reminded in order to ensure a high-response rate. The open-endedness of the questions allowed farmers freedom to express their opinions as well as qualify their responses (Walliman 2011). Authenticity of the accounts were cross-checked with other farmers to achieve a higher degree of validity and reliability. De Vos (1998) explained this as triangulation where various methods are used to collect information on the same issue so that the strength of one method can overcome deficiencies of other method. The use of secondary data from various sources such as documents and statistics to support views or arguments (Scott 2006) constitutes documents research method. It should be noted that secondary sources of data and information can be published or unpublished and can be historical or contemporary (Laws et al. 2003). The triangulation of data and information can be achieved if secondary data is used in conjunction with other types of data.



Fig. 24.7 Key informants face-to-face interviews with open-ended type of questions

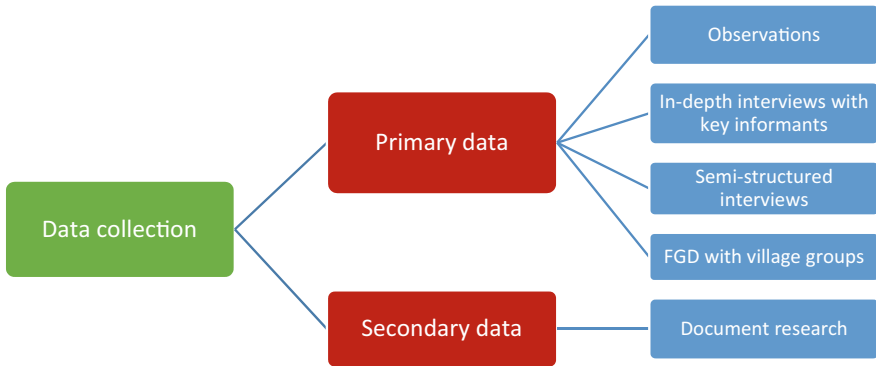


Fig. 24.8 Data collection strategy used during the return study

A total of three field trips per group were made between May and October 2018. Responses were categorised according to similarities; then, a theme was developed from all similar responses. From these themes, relationships and associations were identified to make sense of these relationships. In analysing content, a process of selecting categories of data was the starting point. Sentences (content) with similar meaning were grouped together to form a category that were accurate, exhaustive and mutually exclusive and clearly defined (de Vos 1998).

## 24.5 Results and Discussions

### 24.5.1 Overall Sustainability

Components of sustainable agriculture specific to EFO community are graphically depicted in (Fig. 24.9). These components framed the space in which farmers and UKZN research team operated on for EFO farmers to be successful at genuinely engaging in sustainable agriculture and ensuring that research interventions are successful in supporting them. The five pillars are:

- Maintaining and increasing biological (organic/traditional) productivity.
- Decreasing the level of risk to ensure larger security.
- Protecting the quality of natural resources (soils, water and veld).
- Ensuring agricultural production is economically viable (commercialization).
- Ensuring agricultural production is socially acceptable (strengthening social cohesion).

Ezigeni village presents a good opportunity to discuss these pillars where relevant principles for each pillar was demonstrated through examples of their practical application to illustrate the point. Relative to other villages, Ezigeni’s unique circumstances based on their consistency in practicing sustainable farming will assist in developing appropriate responses to show sustainable practices in the continuous production of *amadumbe*. These pillars will be addressed in an integrated fashion not as individual aspect to be addressed in isolation. Environmentally, land scarcity is causing food scarcity for the ever-increasing population. In the context of EFO community where traditional agriculture is a way of life, it can be said that their

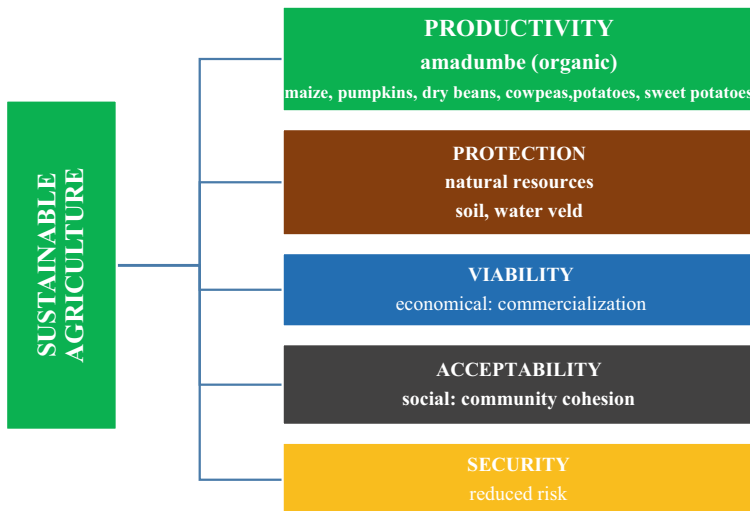


Fig. 24.9 Five pillars of sustainable agriculture (adapted from Khwidzhili 2012)

goals and understanding of long-term impact of their activities on the environment, and consequently, on other species trends toward sustainable agriculture (Francis 1990). Importantly, to be noted is that sustainability is a direction rather than destination. Therefore, it is assumed that EFO will continue to remain sustainable in their farming style. Farmers understood clearly what was being sustained, for who and for how long to afford future generation's agricultural livelihood opportunities. Sustainability was entrenched in the study's resulting technologies that reflected a combination of traditional and modern techniques. Central to sustainable agriculture is the necessity of taking a long-term view, in ensuring the supply of products to future generations, the necessity to maintain and enhance soil fertility, veld condition, water quality, supply and generic resource on which agriculture depend. Sustainable agriculture delivers on these critical elements through a variety of technology options as seen implemented by both phases of the SANPAD project at Ezigeni.

### ***24.5.2 Biological Productivity: Improvements to Soil Health and Quality***

The first pillar of sustainable agriculture is the requirement that the biological productivity of the soil is maintained and, if possible, increased. Biological productivity refers to the ability of soil to promote microbial activities. The continuous application of large quantities (Ezigeni) of cattle manure as part of traditional organic farming ensured that microbial populations are enhanced. Key to the biological productivity of soils at Ezigeni is the high organic matter content build-up as a result of these best practices including minimum soil disturbance that led to reduced mineralization. In this village, farmers understand that their soils' productivity forms the foundation that sustains consistent high yields to keep the commercial viability and maintain livelihoods. In the management of biological productivity, other pillars of sustainability are simultaneously considered like economic viability, social acceptance and reduced production risk. Protecting the quality of natural resources is directly linked to the biological productivity pillar toward attaining sustainable agriculture that works within the bounds of nature not against them. This means matching land uses to the constraints of local environment, planning for production not to exceed biological potentials with no use of synthetic fertilizers and pesticides. Traditional agricultural systems are in their nature a premise for sustainability (Miller and Wali 1995).

Soil is the fundamental capital asset as it is the most important part of any agricultural system. When in poor health, it cannot sustain a productive agriculture. In rural areas, many agricultural systems are under threat because soils have been damaged (due to bad management practices including over grazing), eroded or simply ignored during the process of agricultural intensification programs by government and various non-governmental stakeholders. Soil fertility is the primary

factor affecting agricultural sustainability and known to be a function of current and previous management regimes. Amongst indicators used by farmers, crop production factors are considered most reliable indicators of differences in soil fertility. These crop factors include primarily crop yield and crop appearance during the establishment stage. Hence, it is reported that yield forms a benchmark for soil quality assessment in the indigenous approach (Gruber and Weil 2007). Even so, crop production indicators used by farmers (yield and crop appearance) may not always be a true reflection of soil quality since high yield can be a result of favourable weather and improved seed. In taking advantage of the climatic conditions and the results from the ARC cultivar trial outcomes (2013–2017) that identified the best local cultivar for use at Ezigeni and the good rainy seasons (2015/16 onwards) post the 2014/15 drought year, farmers maximized productivity and increased yield (FN020618: App IV). At Ezigeni, in particular, farmers treat soil fertility as a dynamic character of soil which they improve through maximizing crop diversity by using rotations and intercropping and large amounts of manures in boosting nutrient levels. Barrios and Trejo (2003) explained that soil colour provides a good measure of inherent soil fertility. Together, the dark soil colour and the presence of earthworms are recognized as indicators of soil quality beneficial to fertility. Farmers understand the positive linear relationship of manure addition and dark soil colour. Thus, the strong belief that continuous addition of large quantities of manure will enhance both these indicators for long-term productivity and maintenance of high yields. In turn, soil organic carbon reserves also get established in the build-up of the resilient soil system.

Annual agricultural ecosystems like the EFO *amadumbe* system often deplete soil carbon (C) and release more reactive nitrogen (N) into the water and atmosphere than unmanaged, perennial ecosystems. Yet, we rely on these ecosystems for food security, livelihoods, and they represent the largest stock of soil C we can directly manage to mitigate climate change (Kallenbach et al. 2019). How do we then resolve this dichotomy, in creating a win-win scenario whereby agroecosystems remain productive while contributing to climate change mitigation? To address this grand challenge, Wallenstein (2017) advised that agroecosystem soil biology should increasingly be managed to better regulate soil C and nutrient cycling. Many approaches like the soil biology strategies used in the EFO project focussed on soil C regeneration through increased residue returns and biomass production (legume intercropping) and decreasing C losses via reduced disturbance (minimum till).

In this traditional organic agricultural system, the net return of soil C and its storage was achieved through the adaptation of a wide variety of physical and biological soil conservation measures, use of legumes and intercropping, incorporation of phosphate-releasing plants into rotations, use of composts, cattle manures, vermicompost and maintenance of minimal soil disturbance during tillage. The use of vermicompost is known to enhance microbial life in the soil as the high populations (including earthworms) of microbes are active and continue with nutrient cycling within the vermicasts. The use of legume (cowpeas) that attract nitrogen-fixing bacteria naturally living in soils enhances the root zone with a community of

microbial life. Project framework focused on linkages between best management practices and microbial traits allow us to better describe, predict, and manage the relationships among critical soil services, the microbes that drive them, and the environment under which they are manifested in the long run toward sustained soil health and quality. It is, therefore, suggested that the combination of various types of manure (cattle and vermicompost) to improve soil C sequestration effectively engineer rhizosphere microbiota and enhance nutrient efficiency needed to understand the long-term effects of fundamental soil microbial processes of the dominant microbes within the community created in this specific agroecosystem. Schimel et al. (2007) also found that a diversity of inputs represented a wide range of C and nutrient availability that may have facilitated a balance between individual and community-level C use efficiency optimization, thus indicating a productive system. Practices such as diversifying crop rotations or mixing legume crop biomass with *amadumbe* residues could provide resources that promote species with different life histories to coexist.

### **24.5.3 Impacts on Rural Livelihoods**

#### **24.5.3.1 Ezigeni Village Impact**

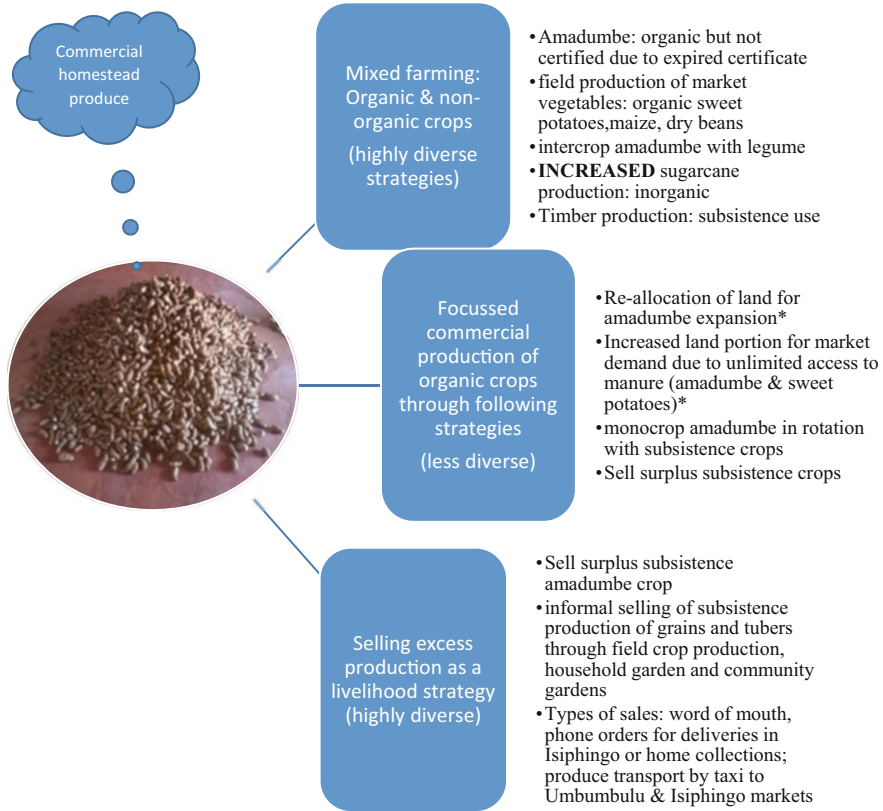
With specific reference to Ezigeni village, results revealed sustainable agriculture improvements had positive effects on people's livelihoods with regard to social capital. Village membership increased and was demonstrated by collective management of natural resources and stronger social bonds, thus resulting in new norms. The perceived sustainability by non-members lured them into wanting to be united with the original members for better connectedness to external institutions bringing about the change at local (village) level. These improvements in human capital led to increased self-esteem in formerly marginalized group, increased the status of women with more local capacity to experiment and solve local problems. This situation gave an outcome of improved nutrition, especially from more food in dry seasons and reversed rural migration whilst creating additional local (village) employment opportunities.

Social learning is a vital part of the process of adjustment in sustainable agriculture projects. The conventional model of understanding technology adoption as a simple matter of diffusion, as if by osmosis, no longer holds. But the alternative is not simple either as it involves building the capacity of farmers and their communities to learn about the complex ecological and biophysical complexity in their fields and farms to then act in different ways (Caister 2012). When process of learning is socially embedded, it provokes changes in behaviour and can bring forth a new world to those engaged. The practical evidence seen at Ezigeni shows that social learning leads to greater innovation together with increased likelihood that social processes producing these technologies are likely to persist. This is noted in the history of EFO where a research relationship provided an excellent platform

on which various kind of initiatives including new indigenous crops and conventional irrigation schemes (rainwater harvesting and supplementary irrigation) were slowly and carefully introduced. To date, these initiatives are still in use and beneficial. At Ezigeni village, farmers exhibited a reflection of the way values, attitudes and goals are shared within a group, thus showing fruition of building relationships in the development process including culture. As their way of life that has gradually progressed over a decade of continuous learning, Ezigeni farmers stayed true to their beliefs and expressions noted in their constitution as “we wish to cooperate with the Department of Agriculture at all levels and any other institution or persons in sustainable, productive, stable and equitable agriculture to commercialize our produce in a manner that improves our economic development without compromising our cultural integrity” (taken from the EFO Constitution 2001). In their understanding of the impact of research intervention as a driver for social change and material gains, Ezigeni farmers understood that momentum was generated to attract various funding possibilities. Acceptance of the ARC cultivar trial when primary EFO has rejected the request showed their progressive nature in aspects of environmental sustainability for economic development through their strength in social cohesion and maintained relationships. The villagers were aware that results from this cooperation will present them with new potential markets opportunities especially because their level of confidence of good quality product would be heightened by the trial outcomes of the best cultivar in their area. A lesson long learned during the UKZN SANPAD Project team was that all research results are built into action and used to sustain, advance and enhance the overall production system.

Farmers at Ezigeni made a conscious effort to elect lead farmers who facilitated the establishment of the human and social capital formation of the village with the understanding that yield improvements and production income do not translate to social capital formation. This was done through encouragement and facilitation of the formation of village-based farmer organisation. Ezigeni has strong and committed leadership and has been able to respond flexibly to the changing EFO set-up/break-up that happened (post 2010) and they managed to keep their village intact. There has been a move from original male-led leadership in the EFO generally to female-led leadership who are more skilled and patient in engaging the process of change and village independence. This move has seen more households being able to earn a good livelihood strategy to the point of sending their children to tertiary institution of learning with success. After leaving the employ of Farmwise Packhouse in 2010, Mr. Mkhize (First EFO chairperson 2001–2004) has been the support system for the village as the individual who played the key role in linking the village with external markets based on his history and experience (see Fig. 24.10). The relationship has been built on trust between the village representatives of lead individuals and new market at the Toyota Plant in Isiphingo. Flexible and responsive collaboration with a supportive market agent (at Toyota) and a wide range of opportunities within has seen a steady increase in sales momentum. Toyota plant is believed to have more than 500 employees per shift at the Isiphingo plant who prefers the system of having the produce delivered to their security gate. Twice a





**Fig. 24.10** System adaptation for commercial production compiled from observations and discussions 2011–2019 at Ezigeni village only

week produce delivery is expected as individual orders are placed with fortnightly (every 2 weeks) payments. This system is efficiently coordinated by Ezigeni lead individuals who then distribute the monies accordingly in the village every 2 weeks to all the respective homesteads who have supplied the produce. Farmers at Ezigeni do not have access to additional land outside their village to expand their area of production. Hence, to continue supplying their market consistently, they have to rely on the Mkhize clan relatives in other villages like Ogagwini to supplement their overall tonnage and extend the *amadumbe* market season (March to July) based on family relations and trust, a mutual financial benefit is thus accomplished.

Human capital appears in the framework for sustainable livelihoods as an asset which affects livelihoods. Aside from its intrinsic value, human capital is needed in order to leverage all other forms of capital. Because of this, whilst not sufficient as a stand-alone resource, it is vital for the achievement of positive results in any dimension regarding livelihoods. Since human capital is a multifaceted concept comprising a range of human attributes which are difficult to quantify, it could be

**Table 24.3** Depiction of unity in women of Ezigeni in view of livelihood assets

Capital	Research intervention		EFO institution		Commercialization	
	Ezigeni	Others <sup>a</sup>	Ezigeni	Others <sup>a</sup>	Ezigeni	Others <sup>a</sup>
Human	3	<b>1</b>	3	1	3	<b>1</b>
Social	3	3	2	3	3	<b>1</b>
Natural	3	3	<b>1</b>	3	3	<b>1</b>
Physical	3	2	<b>1</b>	3	3	<b>1</b>
Financial	3	2	3	2	3	2

<sup>a</sup>Others: Primary EFO members with all villages together excluding Ezigeni

Bold denotes strong emphasis on the given value agreed upon by everyone (all) present

concluded that its stock value cannot be determined by existing knowledge and experience alone. It should also include an assessment of an individual's ability to learn new knowledge and skills according to their future development needs clearly demonstrated by the Ezigeni women over the years post the research intervention (Table 24.3).

### 24.5.3.2 Explaining the Score of 1

The livelihood framework is human-centred and involves a broader understanding of the process, including governance of natural resources and local practices, such as land access and distribution, veld management norms and similar. Hence, because the Ezigeni group is primarily women, they cannot access additional land despite their great need for increasing production as guided by the market trends. Similarly, with the physical capital women alone in a rural setting do not have much influence on development and enhancement of this capital.

The other groups (EFO villages) showed that research interventions did not enhance individual human capital development as many farmers have today gone against all the capacity and training done by the research intervention. This is observed as evidence in their decision of selling prime organic land for a small income brought in by the cane plantations that uses inorganic chemicals (FN130718: App IV). This may also be a result of the old age of many members thus causing them to easily backslide without much care for the future because of the lack of interest shown by their immediate young descendants in agricultural livelihoods. Without the market facilitator, many members believe that all four capitals (human, social, natural and physical) cannot be further developed to gain a livelihood. Their decision to disaggregate the organization by getting rid of the committee and destroying institutional arrangements of the organization are clear indicators that without commercialization not much can be achieved in the absence of their gate keeper. Despite the opportunity for financial gains brought by commercialization, many believe the effort (pursuing informal markets using public transport) is too much to do on their own for not much returns as they cannot get back the premium market they had during the days of having a market facilitator. Whilst at Ezigeni, all

capital assets are viewed and treated as equals because of their understanding that these assets are interrelated. Located at Ogagwini village, EFO headquarters (packhouse) owned by a certain family caused many to view those premises as personal asset to that particular family as depicted by the score of 1 on both the natural and physical assets (Table 24.3). Internal conflicts resulting from collapse of institutional arrangements made the Ezigeni farmers feel unwelcomed at the packhouse, hence the establishment of secondary EFO at Ezigeni. In order to understand the importance which each stakeholder group attributes to each capital, they were asked to assign a value to each from 1–3 (the greater the value, the greater the importance).

## ***24.5.4 Other Factors Impacting on Sustainability***

### **24.5.4.1 Age and Level of Education**

Figure 24.5 shows the distribution of the farmers by their level of education which was generally low across all villages. These results show numbers of participants that have no formal education are 4; 6; 2 and 3 for Ogagwini, Nungwane, kwaMahleka and Ezigeni, respectively. Also, none of the farmers had tertiary education. This places a large proportion of participant farmers within the primary and secondary school level as shown by 10; 11; 5 and 2 for primary and 6; 7; 5 and 7 for secondary schooling for Ogagwini, Nungwane, kwaMahleka and Ezigeni, respectively. These results clarify why most members of the EFO executive committee are from Ezigeni village because of the greater proportion of women with secondary school education. In agreement with small numbers representing the youth, dominating older folks did not have an opportunity to study further as a result of various factors in the South African political context as shown by the lower levels of formal education. This dominance has an influence on several decisions taken by the group in moving forward towards future engagements with other external stakeholders for sustainable development of their continued commercialization of traditional homestead organic production. The issue of age dominance was revealed by the responses on their opinion of the group (EFO) before and after the UKZN research team engagement (Table 24.4). Dominant older members felt that without the leadership of UKZN (gate keeper), the organization will suffer a slow death of internal differences due to conflicts. This was seen by the collapse of institutional arrangements where the first committee members had to resign because of difference of opinions with regard to leadership and development goals of the group without the leadership guidance of UKZN research team coordinator. The older members found it difficult to continue with the organization (EFO) when the SANPAD/UKZN research funds were exhausted and the engagements were reduced and eventually project ended after several years. The fear of the unknown was apparent in their view of a bleak future where sustainability of EFO was not expected especially by the older farmers. As a result of their dominance in numbers (bigger proportion), the

**Table 24.4** Differences/changes in EFO over a period of a decade<sup>a</sup>

EFO characteristic	2006–2010	2011–2019
Institutional arrangement	United group: active committee strong social bonds within EFO community	Disaggregated: in-active committee, no direction, cannot read and understand records/books, extremely poor admin. Hidden records as anyone can learn important information about EFO
Gate keeper (research team)	Present and actively involved	Absent no activity
Organic certificate	Paid for and valid	Expired no funds to re-apply
Markets	Formal and active (all members)	Informal for all members
Field sizes (amadumbe)	1–2.5 ha and increasing	<1 ha and decreasing
Membership	>200 and increasing	<100 and decreasing
Future perception	Sustainable and growing	Hopeless and dying
Crop yields	Gradually increasing	Relatively very low <sup>a</sup>
Generation gap	Equal proportions of young and old	Older members dominate <sup>b</sup>
Executive committee	Representative of all group demographics	<i>Dominated by older members with no leadership skills<sup>c</sup></i>
External stakeholder engagements	Open to a variety of engagements that brought development and growth to EFO	Opposed to any stakeholder opportunity which is detrimental to the growth. Obligation to seek EFO consent for participation from gate keeper “we belong to Prof only”. Some stakeholders have been deterred by this attitude of the EFO
Beliefs	Gate keeper will always be with us and help us grow. Always listens and takes his advice. Only trustworthy person to work with into the future	Will await the return of the gate keeper and in the interim no-one is good enough to help us. Any arising opportunity is thus rejected. Without Prof anyone wants to ‘rob’ or cheat us of something or the other.
Monthly forums Management of EFO assets: tractor, bakkie, PC, camera, general admin and income generation	Constantly every first Monday of the month with formal agenda and meeting protocol observed with >70% attendance All assets properly managed with good record keeping. Income growth and transparent management of funds Efficient display of good institutional management	Random once every 3–4 months with no agenda and no formal protocol observed with less than 30% attendance. Sometimes the forum is just about how much did the tractor make and how much will be spent on repairs, then meeting is adjourned. Currently there are sparse records of a few items, with tracker removal from the bakkie, unwarranted activities

(continued)

**Table 24.4** (continued)

EFO characteristic	2006–2010	2011–2019
		observed by many but cannot be questioned as members are threatened by those holding the specific asset. Trust is completely lost within the organization
Fears	Generally no fears were noted except for the ability to satisfy the market needs (quantities)	EFO belongs to Ogagwini village and specifically to the family that owns the land where the packhouse/hall is situated. Any EFO asset enquiry by members upsets the committee and other Ogagwini members. They Live with perception that access to formal markets is lost for good or at least until the gate keeper returns to lead them. The absence of vision implies no progressive farming until he returns and resurrect the organization. Don't trust genuine efforts by any external stakeholders to bring development.

<sup>a</sup>Data presented excludes Ezigeni village which is detailed in the next table as the best village *i.t.o* sustainability

<sup>b</sup>Low yields: result of decreased planting areas (due to no formal markets) no soil's productivity (high fallow hactarage)

<sup>c</sup>EFO segregation did not attract new and younger members to join the organization for succession planning

<sup>d</sup>Current chairperson not a farmer but a reverend/pastor, entire committee have no leadership capacity training

whole EFO structure was compromised. Younger members were out voted and sidelined when, unfortunately, they had the capacity and skills to lead the group with better administrative and good institutional arrangement skills into a sustainable future. These differences because of age gap led to the break-up of EFO into primary and secondary cooperative entities. The relatively younger better educated members of EFO are more progressive, hopeful (even without the UKZN leadership) and better able to engage external stakeholders for their future betterment as they utilize the leadership capacity built in them by the UKZN research team.

Lower levels of literacy and lack of administrative competence led to farmers not using existing information for their development. However, secondary EFO cooperative made of primarily younger and better educated members based at Ezigeni village is more successful and has benefited from new external stakeholders and

currently boasts a stable market and has increased its production areas (through new membership within the village) to meet its new market demand. At Ezigeni, a clear display of strengthened (age-related) group dynamics is seen in their combined use of local resources (land, labour, planting material) whilst preserving biodiversity. Ezigeni strength is seen through the unity of the village (added new pieces of land) planted with *amadumbe* and sweet potatoes, younger members are now part of the group also with their additional land dedicated to traditional organic planting of tubers. Planting material is shared amongst themselves (within the village) for quality assurance of the produce.

#### **24.5.4.2 Impact on Production Practices**

In honour of existing livelihood strategies and acknowledgement of the farming system, previous research (2006–2009) followed the use of traditional agriculture as part of local knowledge to improve management of locally available production resources in the journey of commoditising *amadumbe* and this allowed learning and new knowledge acquisition in dealing with organic market demands. Farmers learned through experiential work plant spacing and manure quantities that will achieve the market expected sizes of the produce. Over the years, the loss of organic certificate (expired validity) led to reduction of land area that was planted with *amadumbe* in fear of uncertain informal markets. With the exception of Ezigeni village, all other EFO villages have farmers (>50% Ogagwini) that have decreased the production areas over the years due to the lack of formal market. Considering that Ogagwini village is known as the base or centre of EFO, it is a great loss that half of the membership in this village have reduced their production land for *amadumbe*. Many farmers reported a land reduction of between 40–60% with the smallest areas at kwaMahleka village where members now grow *amadumbe* on 0.2–0.25 ha portions of land. Land use for sugarcane production has, however, increased which is rather unfortunate because cane production requirements are highly dependent on inorganic fertilizers. In keeping with organic principles and sharing of same values, attitudes and goals around agricultural productivity farmers reported that a 6 m contour is used as a border between cane fields and *amadumbe* land to manage the inevitable possibility of underground chemical seepage. This practice is accommodated by all new cane growers and those who are expanding their cane lands since access to land is now a constraint; thus large proportions of previously *amadumbe*/organic land is now lost.

#### **24.5.4.3 Land Use and Cropping System**

Mixed cropping that includes livestock has been gradually diminishing over the last decade as a result of changes in land use. Nungwana village, for example, is undergoing quick urbanization with residential land use increase. This trend is placing pressure on both arable and grazing land leaving farmers with limited

production areas which leads to an intercropping adaptation practice increasing to mitigate land pressure using mixed cropping style. Loss of formal markets led to changing livelihood strategies and reshaping of cropping patterns. Results revealed that many home gardens (Nungwana village) are converted to create additional land for mixed cropping (*amadumbe*, legumes intercropping and maize, sweet potatoes rotations). All villages except Ezigeni have experienced decreasing number of livestock herds due to stock theft and lack of grazing land amongst other reasons. The loss of livestock consequently results in limited access to manure which impact yields negatively.

Pointed out by Ortmann and Machete (2003), historically, smallholder farmers have not had the opportunity to produce high-value crops due to limited input resources. This is especially critical for EFO farmers since access to manure is key to their traditional organic production and continuous commercialization goals.

Ezigeni village, on the other hand, has maintained their livestock with a slight increase in the number of herds as they expanded their production areas because of stable markets. Also, the element of unity in the village is indicated by the positive results of less to no stock theft relative to other villages where this challenge is increasing (Nungwana). In their adapting, Ezigeni farmers needed to attend to issues associated with intensified production, and recognise factors that shape market acceptability without any reliance on external resources (loans, organic fertilizers and planting material). This can be viewed as a clear advantage of incremental integration driven by market stability. As expected over a period of 10 years, many valuable lessons were learned through the process. However, due to the scope limitations of the study, only production-related impacts are reported including the adapted practice of legume (cowpeas and dry beans) incorporation in their standard *amadumbe* production routine. It is noted that in their understanding of sustainability within a development context, practices that require less effort on their part and are beneficial to their needs were easily incorporated and thus intergrated as part of best practices.

## 24.6 Conclusions

Ezemvelo Farmers Organization (EFO) conclusive leadership choice through the election of gate keeper (regarded as the interface with external institutions and processes) was key; in that there would be a particular personality influencing decision-making. This role also emphasised the importance of dialogue/inclusive discussion, representation of household, community, researcher's perspectives and external interests. Even the inclusion and acceptance of student researchers was also built on trust and confidence in the gate keeper. This relationship of trust with the gate keeper worked excellently over the years and mutually benefited farmers, students and other external stakeholders involved. The unintended consequence of this strong relationship was, however, seen years later when the gate keeper was no longer available to lead the organization. Standing on its own, the EFO executive

committee revealed the inevitable cracks with issues of internal trust within that led to the collapse of leadership structure. Institutional arrangements within EFO gradually crumbled down as the old committee (active during the gate keeper's era) was expelled and the newly elected committee lacked administrative and leadership skills. Elected on the basis of their educational level, age and physical abilities, the old committee (gate keeper's era) was capacitated and geared to lead the organization in the succession terms of several decades ahead. The distinctive feature between the old and the new committee members was the age difference where the old members were in their midlife age range (45–60 years) and the new members were mostly elderly (65+ years). This age issue contributed immensely to EFO breakdown into primary and secondary factions and formation of new subgroup. The elderly members cannot easily change their beliefs and ways of doing things. Hence, in the absence of the gate keeper, many elderly members felt that, no one (even within EFO) was sufficiently trustworthy to lead the organization despite the good leadership shown by the old committee that reigned during the research team presence under the guidance of the gate keeper. From this observation, it is concluded that in rural settings where elderly folks still hold positions of power and influence, external actors with known and proven good conduct have a better chance of being trusted into local leadership roles compared to younger local people of the area. This is, however, an unfortunate situation of missed opportunities to groom and mentor younger local people into leadership roles towards agricultural development. Many (elderly folks) are still hoping that the gate keeper will return to assume his role and rebuild the fallen organization. It can also be seen that despite the strong foundations of people-centred engagements laid, achievement of sustainability which is a dynamic process can never be fully realized as people change together with their behaviour influenced by various factors over time. Four of the five villages have fallen into this unfortunate predicament of believing that without the gate keeper, EFO can never regain its good old days of enjoying success and agricultural prosperity. Ezigeni village, however, has thrived and demonstrated immeasurable growth utilizing the inherent local assets and the capacity built in them during the research intervention. The intended outcomes of research meeting society over uncertainties (markets, social cohesion and use of local assets and resources) for sustainable growth and improved livelihoods have been accomplished at Ezigeni. This conclusion suggest that in this village sustainable livelihoods not as an end point but as a dynamic process are realized considering that continuous successful production of *amadumbe* is the mainstay or primary livelihood strategy.

Research engagement in Umbumbulu built and tapped on the inherent assets within EFO to ensure that risk aversion or taking as informed by various constraints was a skill taught to realistically consider various alternatives. This was critical because farming is essentially risky, owing especially to unpredictable factors such as climate and economic change. Longer research engagement period (>10 years) was needed to understand the crucial EFO management decision for appropriate extension and development strategies to assist in reducing farmer risks, especially when considering adopting and/or scaling up traditional organic production. Today, many practical lessons learned with EFO community are practised and implemented



in other areas where traditional farming is still a way of life. The low numbers of new membership in three of the five EFO villages draws to a conclusion that traditional organic farming system requires intense knowledge for successful implementation, hence the need for critical mass capacity building locally. It is thus concluded that if sustainable agriculture is to spread to larger number of farmers and communities, future attention needs to be paid to developing social capital within rural communities and between external agencies.

Project participants became confident to leave their narrow discipline traditions (or familiar farming strategies) and cocreated knowledge from multiple perspectives and experienced how people shape, and are shaped by agriculture as a 'way of life'. However, these changes were sustained over a short period of time post the end of research project in the four villages. In the long term (10 years), a divided organization and lack of social cohesion undermined the effectiveness of the sustainable interventions brought in by the research team. In many situations, uncertainty is perceived as a threat because it cannot be resolved and may possibly spin out of control. This situation was evident after the research team left the area and the majority of EFO members were left with uncertainty in many aspects of their practical operations that eventually led to the collapse of organization in 2012. These uncertainties were inevitable consequences left with individual farmers in their respective villages whereas with researchers/scientists these uncertainties were converted to new research agendas for future enquiries. Meanwhile, Ezigeni farmers were able to practically experience natural resource challenges being resolved in their participation on research trials. New informal markets were strengthened in their pursuit of traditional vegetable niche growth through direct contact with organic produce of high value made accessible to many. Contrary though, the participation for direct material gains of having access to formal market was shown by many when the research team left the area. Established and expected sustainability pillars were destroyed, and ensuing natural resource improvements were neglected/rejected after incentives<sup>6</sup> end.

It is unfortunate that the absence of extension officer (Eo) in the growth process of EFO is a historical challenge based on the fact that as a result of their formal training Eo's had limited expertise and competencies in organic farming, especially indigenous crops. In a more formal request through the chairperson of EFO (2001–2004), a reversal of roles was suggested that whereby EFO members provide exposure in traditional and organic farming to extension officers and departmental staff since it was known that farmers already knew a lot more about this system than the officials. This noble gesture was viewed like a subtle offence by the departmental staff which resulted in distance created between these two entities that lasted for more than two decades. This long-term situation yielded negative results as the role of extension

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<sup>6</sup>Incentives in this regard refer to the ease of access to formal Woolworth's market perceived to be the only high-value paying market for organic produce as well as not having the stress to search for own market that may pay way less than the formal market. Formal markets assure farmers of reliability of supply and payments until the produce season ends.

officers, which was anticipated to be of critical importance in the sustainability of EFO post research project duration, was not fulfilled. Extension officers provide a constant advisory and support service to farming groups throughout the province. It is expected that when all projects reach their exit phase, extension officers will take over to play the role of support structure for all the systems created/established during research project to continue and encourage farmers in using the technologies. Government should develop enabling policy environment that will advance sustainable agricultural technologies like traditional organic farming, infrastructural investments toward improvement of market access and communication channels. Therefore, practical evidence seen at Ezigeni after a decade shows that sustainable agriculture can be achieved and maintained when founded upon appropriate technology adapted by farmers' experimentation; social learning and participatory approach between research team and farmers; good linkages between project/initiative and external agencies, together with the existence of working partnerships between agencies including government departments and strengthened social capital at local level. Despite Ezigeni representing just one out of five villages showing sustainable development over the years, their success is noteworthy as the example to highlight and promote for repetition of best practices elsewhere in the future.

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