NJE Namibian Journal of Environment

Understanding market, state and community institutions in the development of smallholder vegetable enterprises in north-west Namibia

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ABSTRACT Agricultural value chains can be affected by the failure of market, state and community institutions either separately or jointly. This failure coincides with the social, economic, political and environmental factors in which farmers operate. The objective of this study is to assess the main challenges based on the interrelationship of the market, community and state institutions in the development of the vegetable industry in north-west Namibia. I used a transaction cost approach to assess vegetable enterprise development in the Smallholder Green Scheme Irrigation Project and among smallholder irrigation farmers in north-western Namibia. The results reveal that one of the challenges in the vegetable value chain is information asymmetry, which is an incentive for administrators (politicians or elites), traditional leaders, farmers and other market actors to behave opportunistically to benefit from government projects. Smallholder vegetable producers in the study area also bring with them their socio-cultural beliefs, values and norms when participating in agricultural projects, which makes it difficult for them to accept certain agricultural practices that would improve their productivity. However, there is a continued problem of access to input and output markets for farmers owing to high transaction costs. Policies to support smallholder farmers should focus on multiple transactions that combine the market, state and community institutions.

KEYWORDS agriculture; incentive compatibility; information asymmetries; Namibia; vegetable enterprises

INTRODUCTION

Agricultural development projects and programmes have relied heavily on public investments across Africa since the 1960s (Mason-D'Croz et al. 2019). In some cases, public investment in agriculture is low and even declining (Resnick 2024, Mogues et al. 2015, Mogues et al. 2012). In other cases, it is sufficient for agricultural development, but as Troskie (2013) argues, the main constraint of such development is a lack of well-defined interventions for the sector. Specifically, the failures most often seen are mainly

due to the unsustainable application of technologies (irrigation, herbicides, pesticides, fertilisers) coinciding with the socioeconomic and agro-ecological context in which the farmers operated (Kumar et al. 2021). Thus, government interventions have failed in most southern African countries, such as Namibia, to uplift farmers because of a lack of markets for both inputs and outputs (Meemken et al. 2021). Other barriers to the success of agricultural development are a lack of appropriate technologies and access to those technologies, should they exist, and to information, inefficient extension services, insufficient physical

and marketing infrastructure, a lack of credit, and insufficient development of processing or manufacturing industries (Touch et al. 2024, Jordaan et al. 2014). One of the major barriers to market entry is imperfect access to market information, which is largely a result of the weak and inefficient public market information systems found in most developing countries (Mwema & Crewett 2019). This can result in high transaction costs in value chains of crops (Mardenli et al. 2024).

Other global studies, especially African, indicate that smallholders cannot meet stringent international quality standards, and, on a consistent basis, the quantity demands set by modern supermarkets and retailers (Touch et al. 2024, Mkansi et al. 2024, Barrett et al. 2022, Thomas & Vink 2020, Meemken & Bellemare 2019, Ochieng et al. 2016, Maertens et al. 2012). As a result, smallholder farmers are excluded from continuous supply to formal markets, such as wholesalers, supermarkets and retailers (Nair 2018). Thus, agricultural cooperatives can help farmers access the market and can be classified into three broad categories based on their main activities (Magakwe & Olorunfemi 2024): (1) marketing cooperatives, which are created to enable their members to bargain for better prices, and handle, process or manufacture, and sell farm products; (2) farm supply cooperatives, which are created to enable their members to purchase in large volumes, and to manufacture, process, or formulate and distribute farm supplies and inputs such as seed, fertiliser, feed, chemicals, petroleum products, farm equipment, hardware, and building supplies; and (3) service cooperatives, which are created to provide their members with services such as transport, storage, drying, irrigation, credit, utilities and insurance. However, several challenges related to agricultural cooperatives have been highlighted in literature (Francesconi et al. 2023, Luo et al. 2020, Marcos-Matás et al. 2013).

Some studies also indicate that smallholders in out-grower schemes (contract farming) can benefit from economies of scale, as they collectively supply to access markets (Barrett et al. 2022, Mwema & Crewett 2019), social capital formation has been pivotal in solving many community development problems because of a high level of trust among members, more altruistic behaviour, and more ties to other organisations within and outside their

community (Mwambi et al. 2020). Challenges related to group management or cohesion have been highlighted in the literature (Mwambi et al. 2016). This implies that community institutions can also contribute to the failure of agricultural projects in developing countries, as these are associated with the long time required for communities to adjust to changing forms of culture, norms, taboos, and traditions regarding the interaction of state and market (Maru et al. 2020). State institutions include landholding, water resources, extension services, and physical and marketing infra-structures, while market institutions are made up of access to credit, access to market information, availability and location of local market and collection centres (Chuma et al. 2024).

According to Hayami (1988), agricultural value chains can be negatively affected by market, state and community institutions, either separately or jointly. For instance, markets fail when they are unable to allocate resources efficiently, which could lead to a common need not being met by the market mechanism, resulting in a missing input and output market (Thomas & Vink 2020). In addition, a government cannot solve market failures arising from asymmetric information, as it does not have access to unobservable information (Qurrata et al. 2020). This implies that community institutions can also fail because people within the community can benefit from free-riding and opportunistic behaviour, due to information asymmetries and incentive compatibility structures as well as imperfect property rights, hence, market failures (Sadeghi et al. 2022).

Some studies have been conducted in developing countries (Maru et al. 2020, Mukherji 2013) which have highlighted the importance of the inter-relationship of community, market and state institutions in economic development. These studies indicate that there is a need for further exploration of information asymmetries and opportunistic behaviours among actors in crop value chains. In Namibia detailed information on smallholder farmers' agricultural development based on linking development programmes to issues concerning the interrelationship of government, market and community institutions is limited. As in other countries, in Namibia failure is attributed to a broad range of environmental, political, economic and social factors. This situation

necessitated an investigation of the inter-relationships between the state, market and community institutions.

The Namibian government invested in physical infrastructure and marketing facilities to address the problem of market access for underprivileged farmers. Owing to information asymmetries and incentive compatibility structures, farmers and other market actors behave opportunistically to benefit from government projects. In this sense, the design of agricultural development initiatives by the government is fraught with a poor understanding of community institutions and is not aligned with market and agro-ecological realities, resulting in the failure of projects and a decline in economic welfare.

The objective of this study is to assess the main challenges based on the reality of the inter-relationship of the market, community and state institutions in the development of the vegetable industry in northwest Namibia. The transaction cost economics (TCE) approach was applied to assess the main transaction costs between market, state and community institutions in light of environmental, political, economic, and social factors. This study adds to the existing literature on transaction costs in smallholder vegetable value chains.

Namibia's vegetable industry
Namibia's vegetable production is insufficient to meet the demand. Domestic producers contribute approximately 47% of the total domestic fruit and vegetable demand, while the remaining 53% is supplied by imports, mostly from South Africa (Namibia Agronomic Board [NAB] 2021). The percentage of vegetables produced locally in Namibia is shown in Figure 1. Potatoes, carrots, onions, tomatoes, and cabbages are the main vegetables produced in Namibia.

Vegetable production in Namibia is mainly possible along bordering perennial rivers (Kunene, Orange, Zambezi and Kavango), and where dams feed irrigation schemes or where sub-artesian water can be utilised. The main challenges for irrigated high-value crops in Namibia are the negative effects of climate change, high cost of production, inadequate access to sources of credit and to the market, unavailability of clear product

quality standards, and inadequate infrastructure, such as roads, storage and processing facilities (Neema & Kalitanyi 2023, Thomas & Vink 2020).

Over the years, the country's ethnic groups have been collecting wild edible plants and cultivating and nurturing a variety of indigenous and, to a limited extent, exotic vegetables in home gardens for household consumption, particularly in rural areas of northern Namibia. The most common indigenous vegetables found in Namibia are *Amaranthus* spp. (mainly *A. thunbergii*), spider plant (*Cleome gynandra*), roselle (*Hibiscus sabdariffa*), and cowpea (*Vigna inguiculata*) (Mushabati et al. 2015). These indigenous species are mostly neglected and underutilised as crops, and there are limited statistics available on their production and consumption, however, the focus of this article is on exotic vegetables, which are also a focal point in the development agenda of the country.

In the early 1990s, the government of Namibia recognised the need to develop strategies for the commercialisation of horticultural industries, especially vegetable enterprises, with the objective of producing exotic vegetables to improve household diets where water is available. The most commonly produced vegetables in Namibia include tomatoes (*Solanum lycopersicum*), cabbage (*Brassica oleracea*), sweet potatoes (*Ipomoea batatas*), watermelons (*Citrullus lanatus*), pumpkins (*Curcubuta maxima, Curcubuta pepo*), butternuts (*Cucurbita moschata*) and onions (*Allium cepa*) (NAB 2021). These crops are ready for harvesting three–four months after planting or sowing. Once harvested, vegetables should be processed or sold to the market as fresh produce to prevent postharvest losses owing to their high
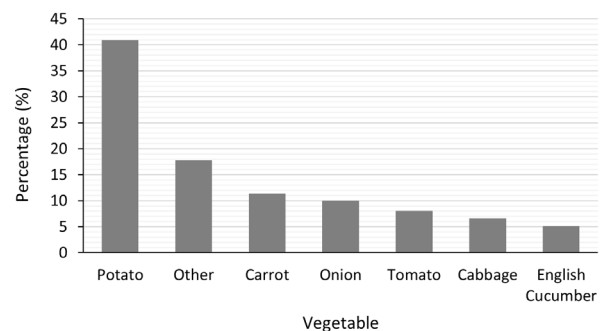
Figure 1 Main vegetables (%) produced in Namibia in 2021. Others include pumpkin, iceberg lettuce, sweet potato, sweet corn, sweet melon, watermelon and gem squash. Source: NAB (2021).

perishability. This timing requirement also has implications for the optimal distance between the market and the vegetable farms.

Fruit and vegetable production and marketing initiatives have been developed and promoted in Namibia under the revised Green Scheme Policy (2008). The Ministry of Agriculture, Water and Land Reform has set a target of putting 27 000 ha of land under irrigation over a 30-year period (Iita 2012). Thus, poor implementation and monitoring of government and uncoordinated farming activities constrain the production and marketing of vegetables in the country. This study highlights important factors (community, state and market institutions) to be considered by participants in the development of vegetable farming in northern Namibia.

Theoretical framework: Institutional arrangements between market, state and community

Hayami's (1988) central tenet is that the inter-relationship of market systems, rural community institutions and government activities is the key level at which decisions are made for economic development in developing countries. The insight obtained from Hayami's framework could lead to an understanding of why market-led and state-led policies have continued to fail in most developing countries in southern Africa since their independence (Oloo & Omondi 2021). Market failures occur because of the presence of externalities, such as the supply of public goods, market power (imperfect competition, monopolistic, monopsonistic, or oligopolistic), and institutional failures (competition distorted due to transaction costs and information asymmetry i.e. when the parties do not have equal access to all relevant information) (Hill & Varone 2021, Mogues et al. 2012). In this situation, transactions in the market result in a divergence between private and social costs and a failure to reach socially optimal levels in either the production or consumption of goods. Thus, market reforms aimed at eradicating barriers to small-holder participation in the market economy have often failed to confront the hidden reasons for the lack of market participation (de Janvry & Sadoulet 2020). These include information asymmetry, unenforceable contracts, lack of skills, and the inability to engage effectively.

As a result, the state has a legitimate reason to intervene through enhanced capacity and new forms of governance, correct market failures, regulate competition, and engage strategically in public-private partnerships to promote competitiveness in the agribusiness sector (Gray 2022). However, in most developing countries, the state has failed to fulfil its role because of inefficiencies and poor implementation of government policies (Oloo & Omondi 2021). One fundamental problem is the weakness or absence of mechanisms through which society can hold the state accountable for its actions on government policies and programmes that do not meet societal needs (Andrews et al. 2017). As a result, the participants (farmers, project administrators and market agents) in the agricultural value chain might be adversely affected by information asymmetry.

Owing to asymmetric information, administrators (politicians) and farmers can behave opportunistically to secure their own benefits from government programmes or projects (Sadeghi et al. 2022). One reason for this is that property rights, for instance, to a particular agricultural project or programme and its benefits, and their costs are not well defined in the marketplace. Therefore, two commitment problems arise (Kroll & Zippere 2020, Ngam 2021). First, politicians (incumbent or rival) cannot make binding commitments regarding their future actions and should be re-elected. Second, voters cannot commit to politicians in the future because the latter no longer possesses the political power to carry out the promises they made when campaigning for re-election. This is mainly because political promises are not formal legal contracts and contractual penalties between politicians and voters are not enforceable by the courts. In addition, it is often assumed that farmers have more information about the effects of agricultural policies on the budgets and interests of different segments of the farming sector. It then follows that farmers can behave opportunistically to benefit themselves because of hidden information that is not known by the administrators or agents involved in agricultural projects (Sadeghi et al. 2022, Mogues et al. 2012).

Community institutions can also fail because of the long time it takes for communities to adjust to changing forms of culture, norms, taboos and

traditions (Maru et al. 2020). Thus, the future of agricultural development in developing countries, especially in Namibia, will depend on a successful model that combines the three pillars of economic organisation of a community, market and state and their complementary role in improving the welfare of society, considering the influence of transaction costs on economic outcomes. This would provide an opportunity to identify key strategies that can guide interventions and policies that link farmers to agricultural markets.

The classical theoretical approach for understanding the interrelationship between market, state and community institutions in agricultural development is the theory of transaction cost economics (TCE) (Williamson 2010). Economic exchange involves transaction costs such as information, negotiations, searching, monitoring and enforcement (Leonardo et al. 2015, Williamson 1985, Coase 1937). According to Williamson (2010), TCE subscribes to the idea that the transaction is the basic unit of analysis and that much of the contractual relationships and dispute settlement actions are dealt with directly by the parties. As a result, trading parties might suffer from information asymmetry, which would inevitably result in opportunism (hidden information known as adverse selection or hidden action known as moral hazard) (Mogues et al. 2012). Technically demanding agricultural projects often have high transaction costs owing to information asymmetries and are more difficult to sustain as a community-driven process (Mukherji 2013). High transaction costs significantly contribute to the failure of agricultural development projects in most developing countries. As shown by several studies in rural areas, farmers are unable to overcome high transaction costs and, as a result, are unable to access the input and output markets (Mmbando et al. 2015). Thus, vertical coordination methods serve to minimise transaction costs (Shahab 2022, Pankowska 2019).

METHODS AND PROCEDURES

Study area
The study was conducted at the Olushandja Dam (with smallholder irrigation farmers) and Etunda Irrigation Project (Smallholder Green Scheme Irrigation Project) in Namibia's Omusati Region. The Etunda Irrigation Project covers an area of approximately 1 200 ha and is situated on state land that is leased to farmers on a five-year renewable contract basis (Neema & Kalitanyi 2023, Thomas & Vink 2020). Of the 1 200 ha, 900 were cultivated. The Olushandja Dam is an artificial permanent dam with a capacity of 42 331 m³ (millions of cubic metres) and a surface area of 29 km² when filled to capacity (NamWater 2015). The land around the Olushandja Dam, communal land (under the stewardship of the State), is allocated by traditional leaders to farmers to generate income and to support their families. These sites were chosen because farmers specialise in vegetable production and water is available from the Kunene River.

The Omusati Region is sparsely populated, with a population density of 11.9 inhabitants per km² (NSA 2024). Additionally, approximately 70 percent of households in the region depend directly or indirectly on agriculture (MAWLR 2021). The climate in the region is semi-arid, with highly variable rains, ranging from 200 to 600 mm across the region (Mendelsohn & el Obeid 2005). The average temperature varies between 30°C to 35°C, with the hottest months occurring from October to February and the cooler months from May to August when the average temperature drops to around 15°C to 25°C (Wilhelm 2012). The vegetation types in the region range from mopane savanna in the west to forest savanna and woodland in the east. Soils in the Omusati Region are associated with moderate fertility and good drainage and, in some cases, have lower nutrient content but support crop production with proper management (Kangombe 2010).

Research design
This study's primary sources of data were focus group discussions (FGDs) and key informant consultations. Interviews with key informants were necessary to gain additional insight into the study area, review historical data, understand the vegetable industry and assess previous research.

Sampling procedures and data collection
Data were collected in 2018 from the Olushandja Dam (Smallholder Irrigation Farmers) and Etunda Irrigation Project (Smallholder Green Scheme Irrigation Project) in Namibia's Omusati Region. Focus group discussions (FGDs) were held with smallholder irrigation farmers around Olushandja

Dam and beneficiaries of the Etunda Irrigation Project (Smallholder Green Scheme Irrigation Project). Each FGD comprised of eight (n=8) leading smallholder vegetable farmers. The FGD method involves convening a group of respondents (4–8) (Robinson 2020) for an open-ended discussion about a topic. The meetings took place on 8 and 9 May 2018 and lasted for two hours. Participants were carefully selected in consultation with local traditional leaders (headmen), the management of the Etunda Irrigation Project, and government extension officials with selection limited to lead vegetable farmers. Participants agreed to conduct meetings in Oshiwambo and English to facilitate communication between them and the research team. Each meeting commenced with a discussion of the main challenges emanating from the reality of the interrelationship of the market, community and state institutions in the development of the vegetable industry in the study area and suggestions on how the challenges could be solved. The discussion then focused on possible interventions for the success of the vegetable industry in the study area.

Permission to carry out discussions with farmers was granted in meetings held with representatives of local traditional leadership, including the headmen, government extension officials and the management of the Etunda Irrigation Project. The regional office of the Ministry of Agriculture, Water and Land Reform also provided field extension officials who accompanied the research team to the FGDs. These officials were also involved in directly liaising with lead farmers selected for FGDs. The FGDs were conducted by a moderator and an assistant who prepared the list of discussion questions (see Appendix) that guided the discussions, and the notes were summarised by the assistant as per the guiding questions. Questions were based on the institutional arrangements between markets and community and government activities in the development of vegetable enterprises in northwest Namibia. The approach was participatory in nature, in which all farmers were involved in the discussions.

One challenge with FGDs is to create an environment in which participants are willing to freely share their concerns, anxieties and suggestions (Nyumba et al. 2018). Although FGDs have other disadvantages, such as a lack of detail

regarding techniques for data analysis and interpretation (Massey 2011), this method was deemed appropriate given the remoteness of the study area, the lack of a farmer database system for the studied units and the qualitative nature of the information sought.

Moreover, key informants' consultations took place in the form of multiple office visits, in some cases interviews were conducted with different experts via telephone and e-mail. Key informants consisted of experts such as the Ministry of Agriculture, Water and Land Reform extension officials (n=6), agricultural boards or marketing agency officials (n= 5), researchers (n=6), members of producer associations (n=12), local traditional leaders (n =2), and a regional councillor (n =1).

Data analysis
The thematic analysis presented in this paper draws on information gathered from FGDs and key informant interviews. Thematic analysis is a method for identifying, analysing and interpreting patterns of meaning (themes) within qualitative data (Clarke & Braun 2017). Data from FGDs were analysed by first comparing transcribed interviews with field notes and audiotaped recordings to check for the accuracy of information. Each interview transcript was scrutinised through manual open coding, as suggested by Tamubula et al. (2023), to extract evidence related to the theoretical approach components to develop codes. Linkages among the codes were examined to create axial codes, followed by triangulation of codes across data from FGDs and key informants (expert opinions), as suggested by Tamubula et al. (2023). Transcripts from the FGDs were analysed by question using the thematic approach to identify key themes. Qualitative data from the FGDs were analysed using content analysis. Content analysis enables systematic coding of data by organising the information into categories to determine patterns that are undetectable by simply listening to the tapes or reading the transcripts (Nyumba et al. 2018). Qualitative data from key informant interviews (expert opinions) were coded and analysed using Microsoft Excel (COUNT function).

Qualitative data were then grouped according to the themes of the state, market and community based on the model, as presented in Figure 2. All extracted information pertaining to the state,
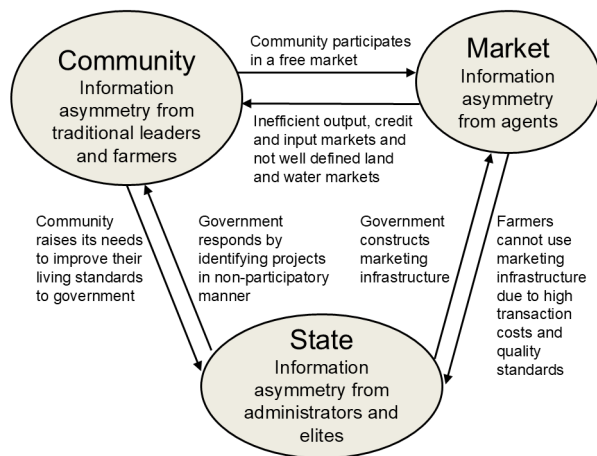
Figure 2 Key relationships between state, market and community institution networks, based on my thematic analysis.

market and community was then grouped together using filtering in Microsoft Excel and presented in the model. Further, the underlying possible solution for each main challenge between the interrelationship of the market, community and state institutions in the development of the vegetable industry was articulated to understand how the vegetable industry can be developed. This analytical emphasis is on the extent to which the empirical interpretations conform to transaction cost economics theory (Williamson 2010).

RESULTS AND DISCUSSION

Main challenges between state and community institutions

Farmers perceived that one of the key challenges in the study area was that agricultural projects were identified by elites (politicians and traditional leaders) and outsiders, without aligning them with the agro-ecological realities of planting specific crops. According to the theoretical framework applied in this study, these challenges are not aligned with indigenous knowledge and community institutions, such as norms, taboos, beliefs, and the organisations that collectively serve the community (Maru et al. 2020). This means little involvement of farmers and the community in identifying the needs concerning their production. Thus, farmers perceived that some of the solutions provided for their needs were not fit for the purpose and often did not consider agro-ecological realities. Specifically, many alleged that the state provides development projects which sometimes bring with them technologies that are not aligned

with the communities' prevailing practices. This makes them inaccessible and impractical, as communities would have to abandon their current practices for new technologies despite not being trained to do so. Hence, cultural tensions limit economic activities, as community values, norms and beliefs take a long time to adjust to external ideas or technologies because of inadequate information (Maru et al. 2020). As a result, community participation is based on incentives but not necessarily on supporting government interventions.

According to Sadeghi et al. (2022) politicians, traditional leaders, and farmers behave opportunistically to accrue benefits for themselves from government projects, with little or no financial outlay. In some cases, politicians pursue activities that directly benefit them and not necessarily farmers, although they may resonate with community concerns. In this way, politicians promote agricultural initiatives that are not sustainable but may be relevant to food security and employment creation. This means that when the elite and selected few (traditional leaders) in the community identify participants in rural projects, the interventions will not be sustainable, as there will be a lack of ownership of these projects. In addition, the lack of trust in outsiders who are not part of the community is a big constraint on the commercialisation of agriculture, in this case, in the form of vegetables. A strong tie to the local community is an important factor because culture may set limits to an agricultural development activity as community values, norms and beliefs take a long time to adjust to external ideas or technologies due to inadequate information and lack of trust (Maru et al. 2020). Inadequate information on agricultural development initiatives shared among community members (farmers) results in high transaction costs.

Main challenges between the community and market institutions

Smallholder farmers face various kinds of market failure, such as scarcity of production factors (land, labour, capital, and entrepreneurship) and limited access to markets (credit, input, and output) (Langyintuo 2020). Participating farmers revealed that the inputs that are promoted, such as chemical fertilisers and pesticides, do not conform to farmers' traditional knowledge and farming

methods, which are less costly while acknowledging that they believe that manure and other organic fertilisers are inferior to chemical fertilisers when endeavouring to increase output. Farmers are not supported in the use of their traditional practices, which forces them to adapt to unfamiliar technologies. I learned that farmers also bring with them socio-cultural beliefs, values and norms, which makes it difficult for them to accept other agricultural practices that would improve their productivity. Their socio-cultural background is not linked to the formalised input market, which aims to improve productivity.

With respect to output markets, farmers compete in a free market where market sales are determined by the forces of demand and supply. Global supermarkets require farmers to meet quality standards and consistent supply standards, which they are often unable to do (Jordaan et al. 2014). The problem with market access is that marketing infrastructure is usually established without preparing farmers and the community to meet the required international food safety and quality standards during production. Thus, smallholder farmers are excluded and marginalised, as supermarket chains tend to favour imports from larger South African farmers who are able to comply with their food safety and quality requirements (Thomas & Vink 2020). This means that local supermarkets import their products because they do not see the need to support local vegetable producers such as contract farmers.

Inadequate information shared with farmers prevents them from meeting the stringent requirements for fresh and processed food products as set by supermarkets and wholesalers, who demand consistent quantity (volume), high quality, food safety, timely deliveries, a certain size and type of product, and so on (Thomas & Vink 2020). The result is that farmers limit the usage of marketing hubs such as that of the Agro Marketing and Trade Agency (AMTA), thereby creating the impression that there is no market for farmers despite the availability of market infrastructure. When marketing agents share relevant information with farmers, this information helps farmers farm in accordance with good agricultural practices (GAP) and cropping programmes. Smallholder farmers face numerous challenges when they want to use formal markets, such as the costs associated with accessing the market, complying with market requirements, and negotiating and managing contractual arrangements (Diao et al. 2023). As a result, it became clear that many vegetable farmers prefer to sell their horticultural produce through informal markets such as the local open markets, roadside stalls and by means of local trade in the community itself. According to Thomas & Vink (2020), in informal markets, the prices obtained are generally lower than those paid by formal markets (supermarkets, shops, and petrol/diesel station outlets).

I observed that the property rights of resources such as land and water for the community (including farmers) residing in communal areas are not well defined, which makes it difficult to obtain credit for investment in production. Land is communally owned, and water is managed by Namibia Water Corporation (NamWater), a parastatal, without any guarantee of continued access to water for the irrigation of crops.

Main challenges between state and the market institutions
One of the key challenges identified by participants in the study area was limited state-sponsored physical marketing infrastructure, such as the cold storage facility at Epapela which only serves farmers who are members of the Olushandja Horticulture Producers' Association. However, this facility does not meet the quality standards demanded by modern markets. This means that the majority of smallholder vegetable farmers in the study area had limited access to delivery load, sorting, washing, and packaging systems required prior to delivery to the markets. Farmers also revealed that the study area lacked processing facilities for high-value crops. In addition, the government has failed to successfully address other supporting activities that take place between the state and market to enable produce to be marketed (Neema & Kalitanyi 2023, Senyolo et al. 2018). These include:

Input market: There is a lack of input (chemical fertilisers, seeds, and pesticides) infrastructure such as manufacturing factories and warehouses in the study area. Farmers revealed that cattle manure is available from cattle posts and commercial farmers but lacks distribution. Consequently, the biggest challenge faced by smallholder vegetable

producers is sourcing inputs, which are mostly imported from South Africa (Thomas & Vink 2020). Farmers perceived the procurement process of these inputs to be associated with transaction costs due to high transport costs. Therefore, farmers' access to inputs and technologies should be improved to potentially increase the production of high-value crops (Ouedraogo 2019). Participants also identified the need to categorise beneficiaries into smaller groups that are easy to manage in the distribution of public goods, such as subsidised tractor services.

Transport of product to market: Farmers indicated a lack of vehicles to transport their vegetables to the markets. It is expensive for farmers to bring their products to the output market when transport is not provided or subsidised because of the significant distances. This affects the availability of products in the market, as some farmers opt for less costly markets, which are usually informal. Thus, lack of transport constrains market access to vegetables (Cooper et al. 2021).

Price setting: Study participants lamented the lack of a state-defined pricing system for vegetable producers making farmers price-takers. When farmers send their produce to the market, they are sometimes not paid well because their produce does not meet the quality standards demanded by the market. It was revealed during our discussions that most domestic consumers do not necessarily demand as high-quality produce as supermarkets, which is yet another reason why farmers sell their produce in informal markets. Additionally, some farmers expressed a desire for heightened product prices and to benefit from government programmes at no cost.

Farmers' organisations or cooperatives: I observed that in the study area, no viable farmers' organisations or cooperatives, based on international principles to address vegetable production and marketing information systems, have been established by the state. Collective action can help smallholder farmers produce large volumes of vegetables that meet the standards set by formal markets (Leonardo et al. 2015).

Interventions for the development of the vegetable production system

I found that it is important to choose the appropriate coordination mechanisms to minimise transaction costs to fully integrate farmers with the market in the commercialisation of agriculture in rural areas such as north-central Namibia. The theoretical framework assessing the transaction costs involved in the interrelationship of the market, state and community institutions in agricultural development shows that there is a need to introduce a vertically integrated (backward and forward) firm (Mindlin & Lebedev 2019) (Figure 3). A vertically integrated firm minimises transaction costs in a crop value chain (Shahab 2022), but I found this type of coordination mechanism to be lacking in Namibia's vegetable value chain. Understanding the constraining factors in the vegetable production system would allow planners and policymakers to review and implement agricultural programmes and projects that would improve people's living standards and contribute to gross domestic product (GDP). The focus is on agricultural projects and their contribution to agricultural commercialisation, the role of public-private partnerships in agricultural commercialisation, and obstacles associated with information asymmetries and principal-agent problems among market, state and community institutions in agricultural development.

Role of private companies

According to Williamson (2010) the introduction of a private company is perceived as bridging the gap between farmers and the market. Hence, the independent vertically integrated (backward and forward) firm is expected to manage the production, marketing and processing of fresh vegetables in northern Namibia. This would enable the company to reduce high input costs, find markets for farmers' outputs and reduce information asymmetry and opportunistic behaviour by both farmers and elites. In addition, smallholder farmers would be coordinated to the input and output markets through contract production, thereby correcting the market failures experienced by high-value crop farmers. This contract would be renewed on a yearly basis in order to review its conditions based on the experience and performance of the farmers. Additionally, the company would divide farmers into farming blocks, which could make it possible
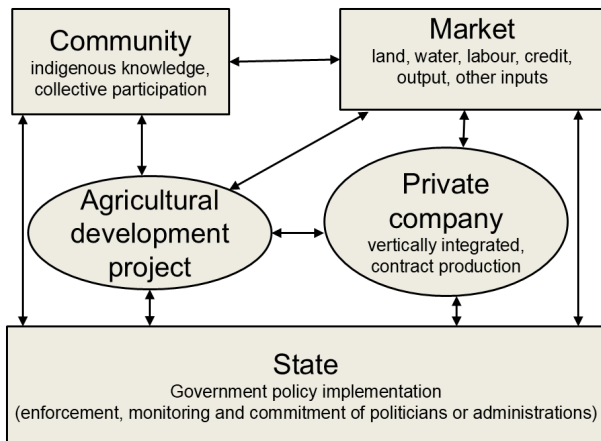
Figure 3 Model of the proposed solutions to relationships in the state, market and community institutions networks. Arrows show produce or contractual information flow or transaction exchange or services provided.

to invest in equipment, undertake joint services (e.g., levelling of land, provision of irrigation canals, bulk supplies of fertilisers and chemicals) and organise labour, harvesting and transport (Matenga 2017).

Moreover, vertically integrated companies are expected to provide expertise in vegetable production and marketing, which would minimise the high transaction costs in the supply chain and reduce the costs associated with research and product development. For this reason, the criteria to select farmers for the commercialisation of agricultural programme should include performance (experience with crop production), availability of productive land, availability of irrigation water, and availability of experienced and skilled labour (growing, grading, and so on). It is expected that vertically integrated firms will also design cropping programmes and train farmers in global good agricultural practices (GAP). Awareness of the importance of global GAP among farmers is a key factor in enhancing competitiveness (Mason-D'Croz 2019).

Proposed solutions between the market and community institutions

My study highlights the need for clearly defined land rights in my study area, which are key to vegetable production. Land belongs to the state (communal land) and is governed by the Communal Land Reform Act No. 5 of 2002 which restricts property rights. Better defined property rights would allow for a land market and the use of

land as collateral to grant farmers access to credit for investment and production. Currently, land in communal areas in northern Namibia is owned by the state and is administered by traditional authorities (De Villiers et al. 2019). Participants revealed that the state and traditional authorities may privatise land at their own discretion and have been accused of allocating large tracks of communal land to themselves, while elites are accused of illegally fencing land at the expense of poor smallholder households. Participants also shared that since land belongs to the state, farmers cannot use it as collateral to obtain credit from financial institutions. The government would need to create institutions that support registration, transfer, and administration of property rights to enable farmers to invest in high-value crop production.

Proposed solutions between the state and the community institutions

My study highlights the role that traditional norms, values, and beliefs play in adaptation and transformation among smallholder vegetable producers. Support services (e.g., education and training) can aid innovation and technology usage among rural farmers, while making sure these align with farmers' norms and values. Innovations and technologies should incentivise farmers to transform and adapt their practices through employment creation and income generation. The government needs to continue building the capacity of farmers to adjust and adapt to new and changing innovations and technologies. In addition, trust is at the core of new technology transfer, production, and marketing information dissemination in the commercialisation of agriculture (Mwambi et al. 2020).

Moreover, transaction costs associated with monitoring activities in the vegetable supply chain are significant (Senyolo et al. 2018). These include the costs of auditing, inspection, and investment in monitoring devices. This study reveals that the high cost of monitoring government activities and individual farmers is a factor that constrains the production and marketing of vegetables in the studied setting. Consequently, the monitoring processes of the project are compromised, and it is difficult to impose penalties on the non-performance of farmers in the project. Thus, it is anticipated that the selection process of the farmers

to be part of the community project must be transparent, with an independent body to oversee the process. This would force individuals to practice and enhance self-monitoring.

Proposed solutions between the market and the state

During the study, I found that the government has continued to invest in physical and marketing infrastructure. However, smallholder farmers continue to have problems accessing input and output markets. Inputs are mostly imported from South Africa and local smallholder farmers experience high transport costs and other high transaction costs because of incomplete information among agents. The main local output market is Windhoek, the capital city which is located approximately 900 km south of the study area and is supplied with large quantities of high-quality vegetable imports from South Africa (Thomas & Vink 2020). Additionally, information from local smallholder farmers showed that they produce a small quantity of vegetables and experience high transport costs when accessing domestic markets, making them less competitive locally. A perceived solution to this problem is to introduce a vertically integrated company (as discussed earlier), that operates on contract production. The company is expected to source inputs in large quantities and benefit from volume discounts and reduced transportation costs. This will allow local farmers access to the output market through the company which will have the capacity to supply to both domestic and export markets in large quantities and meet the food standards demanded by retailers and supermarkets. However, the government is expected to play a regulatory role in this partnership.

CONCLUSIONS

This study assessed a series of interventions based on the institutional arrangements of market, state and community institutions in agricultural development in northern Namibia. The results revealed that transaction costs have prevented farmers from participating in agricultural projects, mainly because of information asymmetries and the opportunistic behaviour of administrators (politicians or elites), traditional leaders, farmers, and other market actors.

My work adds to the empirical literature by presenting a model that can be used to capture community institutions and organisations that result in high transaction costs in crop value chain analysis. There is a need to introduce a vertically integrated company as an organisational instrument linking smallholder farmers to input and output markets through contract production. Thus, it is suggested that government interventions should be based on market and agro-ecological realities and prioritise community needs. Agricultural development activities should also consider the formation of cooperatives, as organisations of this kind are currently lacking.

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APPENDIX 1

A. Check list of questions for key informants

1. According to your own opinion what is the contribution of small scale irrigation agriculture for local or national economy?

2. Do you know how small scale irrigation agriculture started in the North Central of Namibia? If yes how was the project initiated.

3. What are the bases or criteria of access to land for small scale irrigation farmers?

4. Do you think the existing land tenure system is fair and helpful for the sustainability of the irrigation agriculture? If yes how?

5. What are the rules or criteria for water allocation to individual users in North Central (especially small scale irrigation producers)?

6. What are the supports (services) provided by different stakeholders to small scale irrigation producers in the area?

7. What are the impacts of small scale irrigation agriculture on natural resources (i.e. water, land, forest etc.,) in North Central regions?

8. What do you suggest for the improvement of small scale irrigation in North Central regions?

9. What are the sources of conflict in relation to irrigation agriculture in the area and how are these conflicts managed?

10. What are the major problems in irrigated crop production and what support do producers need most and from where do they expect it?

B. Check list of questions for financial or credit institutions

1. What type of loans, amount borrowed, interest rate and terms of contract are available for small scale irrigation farmers?

2. Do all the small scale irrigation farmers fulfil their monthly or season instalment payments? If no what happen to the farmers if they default on loan contract agreement?

3. What do you suggest for the improvement of small scale irrigation in North Central regions?

4. Could you please give any comment or information that you think is necessary to know about small scale irrigation agriculture financing.

C. Check list of questions for farmers' associations or cooperatives

1. What are the socio-economic contributions of small scale irrigation agriculture to the country, especially North Central, for inhabitants?

2. What are the main benefits from joining this organisation?

3. How many members do you have in your organisation?

4. Who qualifies to be a member in the organisation?

5. How much are membership fees?

6. What is the most important source of funding of this organisation?

7. Who originally founded the organisation?

8. How are leaders in this organisation selected?

9. How is conflict handled in the organisation?

10. Does this organisation work or interact with other organisations with similar goals in the country or outside the country?

11. In your opinion what are the problems (challenges) for your organisation?

D. Check list of questions for traders

1. Do you source vegetable products from local farmers? If yes where are these local farmers located? If no, why, and go to question 6?

2. What are the major challenges (problems) from business perspective that characterise the relationship between traders and local small scale irrigation producers?

3. Do you buy on contractual basis? If yes explain the terms of contract? If no what are your reasons?

4. How is transport arranged for vegetable products from local producers to your business?

5. How is price of local vegetables determined?

6. Could you please give any comment or information that you think is necessary to know about small scale irrigation agriculture in North Central Namibia.

E. Check list of questions for Farmers during focus group discussion

1. What is your experience in vegetables production?

2. What types of vegetables have you produced?

3. What are the production challenges experience in vegetables production in your area (inputs, water, irrigation equipment, electricity, fuel etc.)?

4. What are the solutions to vegetable production in your area?

5. Who owns the land you are using for vegetable production?

6. What are the challenges with regards to access to land for crops production?

7. Do you have any form of insurance against theft, loss of income?

8. What are the marketing challenges you experience with your vegetables produce (access to market, transportation, storage, processing, pricing etc.)?

9. What do you do to cope with competition in the market?

10. Do you borrow money for your farming activities (source, security, repayments etc.)?