

Village Monograph of an Agro-pastoral Society in North-central Namibia

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Abstract

This paper aims to examine the local livelihood system and socioeconomic conditions of a specific local village, Onamundindi village, in north-central Namibia through summarizing the results of a baseline survey as a village monograph concerned with a participatory rural development project. A preliminary field survey was conducted in 2010 and 2012, followed by a baseline survey in Onamundindi village in February 2013. Of 147 households, 38 were chosen as geographically representative within the village and enumerators interviewed household heads (or spouse) at their homestead by using a structured questionnaire. The results showed that their livelihood structures and natural resource uses mainly combined crop and livestock farming; the historical background, social setting, issues faced by the people, development challenges, and self-support measures were also clarified. There were some gaps between the initial knowledge of scientists from the project and the farmers' perceptions represented in the results of this survey, thus the project scientists should understand the causes of these gaps and modify the project framework to harmonize with farmers' perceptions.

Keywords : village monograph, baseline survey, rural development, mixed cropping, pearl millet, semi-arid environment.

I. Introduction

In tackling the environmental issues concerning sustainable development in rural areas, one of the important issues is how to share information about the natural environment and livelihood systems among stakeholders, especially among local people and scientists, to create the “new” framework of natural resource uses.

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Extreme climatic conditions, such as flood and drought, frequently occur in the arid and semi-arid environment, and these climatic disasters have tended to increase owing to recent climate change (e.g., Collins et al. 2013; Challinor et al. 2007; IPCC 2007). The fluctuated or uncertain rainfall seriously affects the livelihood of local people, and especially agriculture, which is related to the food security in the area (e.g., Dinar et al. 2008; FAO & ICISAT 1996). In north-central Namibia, a typical semi-arid environment, annual rainfall has fluctuated extremely in recent years. After 1990 in this area, heavy rain and flood disasters occurred in 2007–2008, 2008–2009, and 2010–2011, and drought disasters occurred in 1992–1993 and 2011–2012 (Mendelsohn et al. 2013; Namibia Red Cross 2008; WHO 2010, UN 2011; Mendelsohn & Weber 2011). These climatic disasters impacted the crop production of local people, and especially their staple food crop: pearl millet (*Pennisetum glaucum* L. locally called *omahangu*) (Newsham & Thomas 2009).

The University of Namibia (UNAM) and Japanese researchers initiated rice (*Oryza* spp.) introduction efforts in this area in the early 2000s to improve food production (Suzuki et al. 2014; Iijima et al. 2013). Since 2012, a technical cooperation and a research project named “Flood and drought adaptive cropping system to conserve water environments in semi-arid regions” has been implemented in northern Namibia by Japanese and Namibian scientists, and it will continue to 2017. This project aims to develop “Flood- and drought-adaptive cropping techniques (rice-millet mixed cropping techniques),” which can preserve water resources and produce staple foods to cope with the yearly fluctuations of flood and drought by the use of seasonal wetlands. This project is described as “rice-mahangu project” by local people.

This paper aims to examine the socioeconomic conditions of a specific local village (Onamundindi village) in north-central Namibia through a baseline survey to understand their livelihood system, social structure and issues faced by the local people. To summarize, a village monograph is one of the typical methodologies for understanding the structure and mechanism of the activities of farm and nonfarm households in a specific rural area (e.g., Nishimura et al. 1989; Uchida et al. 1988). Although the quantity of data is limited by focusing on a specific village, it is possible to identify the situation of the local people’s lifestyle in the village more comprehensively when qualitative and quantitative data combined.

Onamundindi village is one of the earliest areas of rice introduction because of its closeness to UNAM Ogongo Campus. In 2007, one UNAM staff (also a villager in Onamundindi) began to try rice cultivation in his own field. Subsequently, around 10 farmers also started to cultivate rice as a part of trialing the rice introduction project. Since

2012, the rice-mahangu project also targeted this village as a project site. The first workshop was held to explain mixed cropping in March 2013, which was after the baseline survey was conducted. This baseline survey was conducted to understand the farmers' perceptions before introducing major extension trials of mixed cropping. To proceed to the participatory research in the rice-mahangu project, it was necessary to first understand the socioeconomic conditions of the households and their issues.

II. Methods

1. Study site

The study site is one of the typical villages in the area; Onamundindi village (17°43'00"S-17°46'00"S, 15°13'00"E-15°16'00"E), is located in the Omusati Region, north-central Namibia (Fig. 1). Omusati is the third most densely populated region in Namibia with a total population of 243,166; population density is 9.1/km² (NSA, 2011). In the Omusati Region, 94% of the total population live in rural communities and 6% in urban communities (NSA, 2011). According to the Census report in 2011 by the Namibia Statistics Agency, there are 147 households in Onamundindi village. The homesteads are scattered in the area except for riverbeds, and not concentrated in a settlement. The dominant ethnic group in terms of population in the north-central area is the Owambo agro-pastoralists, a group that includes more than 90% of the population in this area (CBS 2011). The Owambo are composed of subgroups, and most of the Onamundindi villagers belong to the Kwambi subgroup.

The Omusati Region is located on a vast, flat plain extending from southern Angola to northern Namibia at an elevation between 1,090 m and 1,110 m above sea level. Many seasonal rivers (*oshana* - singular), which flow only during the rainy season from December to March, form web-like channels, primarily from north to south, and flood from the Angolan side to the Etosha pan (Cuvelai System of Seasonal Wetlands; CSSWs) (Hiyama et al. 2014). In addition, small pan-shaped wetlands (*ondombe* - singular) appear during the rainy season. This area is thickly covered by Kalahari Sand, which is mainly composed of sandy loam soil. Clay, and salt accumulates in some seasonal wetlands and pans. The dominant vegetation in the wetland is classified as mopane savannah (Giess, 1971), which is dominated by mopane (*Colophospermum mopane*), a member of the Fabaceae family. Grassland areas are dominated by vegetation in the group Poaceae. The climate can be described as semi-arid with an average annual rainfall ranging from 250 to 600 mm per annum in north-central Namibia (Mendelsohn et al. 2013 : 42-43). Rainfall is seasonal, mostly between the months

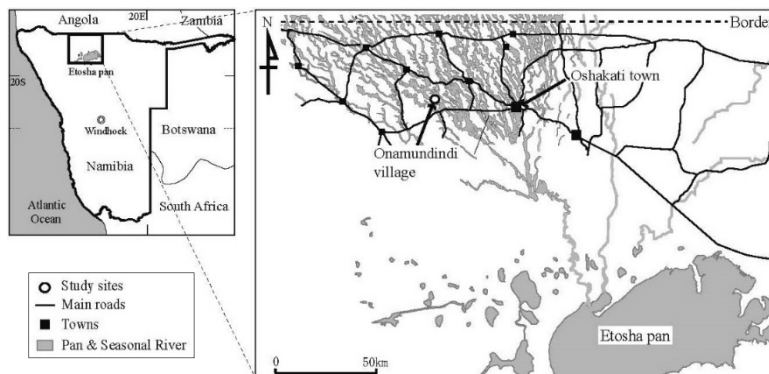


Fig. 1 Research Site

of November to April with January to March normally the wettest period of the year (Mendelsohn et al. 2013: 43). The climate variability entails natural disasters such as recurring droughts and floods. The maximum temperature is between 24°C and 36°C, and the minimum temperature is around 7 to 21°C (Mendelsohn et al. 2013: 51).

The rural area in the Omusati region is characterized by subsistence farming practices and a communal land tenure system. The average farm holdings in this area are around 2.2–3.8 hectares depending on the population densities, but this average varies with wealthier farmers holding up to 10 hectares and poorer farmers holding less than 1 hectare (Mendelsohn et al. 2000: 54). Farm households traditionally depend on rain-fed agriculture, and mahangu (pearl millet) is the principal staple crop grown on the same field with much smaller quantities of sorghum, cow peas, and pumpkins (Mendelsohn et al. 2000). Crop production is for both self-consumption and sale, and most people use the crops for self-consumption and keep them in granaries. With respect to crop production, only people with the resources to provide the high cost of inputs such as irrigation, fertilizer, and significant labor can produce a surplus that can be sold for cash income (Mendelsohn et al. 2013). Livestock such as cattle, goat, sheep, and donkeys also play an important role in farmers' livelihoods and social connection through gift-giving of livestock products (Fujioka 2014). Indigenous fruit trees, including marula (*Sclerocarya birrea*) and bird-plum (*Berchemia discolor*), are also important for providing wild fruit resources to supplement agricultural produce (Fujioka 2010).

2. Research methods

The preliminary field survey was conducted in 2010 and 2012, and information about their livelihood and economic activities was obtained through a semi-structured interview with 38 households in Onamundindi. In 2012 to 2015, our project applied various methods

such as farm sketch drawings (a kind of Participatory rural appraisal: PRA method), a crop pattern survey by GPS receiver, aerial photos by UAV (unmanned aerial vehicle), holding workshops with farmers, and a baseline survey to understand the farmer's agricultural practices and their perceptions (Iida et al. 2015; Thomas et al. 2016). This paper is mainly composed of the baseline survey data.

The baseline survey was conducted in Onamundindi village in February 2013, and enumerators interviewed households' head (or spouses) at their homestead using a structured questionnaire. Thirty-eight households were chosen from 147 households as geographically representative within the village by using a map of the area divided into six small sectors concerned with geographically equal distributions of target households before the interview survey, so that the responding homesteads were scattered throughout the whole village area.

In addition, a wife of the village head (the acting village head, because the headman works and stays in a city) was interviewed about the basic situation and present issues of the village in October 2015.

III. Results

1. Brief history and social setting of the village

The first person to settle in Onamundindi village was Mr. Fanuel Kwedhi (Kwambi subgroup) in around the 1930s (interview with acting headman). The place was a huge forest occupied by wild animals including hartebeest, lions, cheetah, jackals, hyenas, etc. There were no households, schools, clinics, or churches at that time around the village. Onamundindi is named after a waterbird, locally known as "*ondjokwe*." The name came about because of the abundant number of these *ondjokwe* at one of the highlands in the village (interview to acting headman). According to the baseline survey, most of the households settled around the 1960s and 1970s under the rule of South Africa (Table 1). This village is located near to the boundaries between the Kwambi and Ngandjela subgroups, with most of the residents having moved to settle from the center of the former area of the kingdom.

Table 1. Years of settlement in the village

Years	1930s	1940s	1950s	1960s	1970s	1980s	1990s	2000s	2010s
Number of Households (n=35)	1	1	4	10	6	4	1	4	4
%	3	3	11	29	17	11	3	11	11

Source: Baseline survey in 2013.

* Three informants didn't answer.

The number of people in most households is between 8 and 12 people, except for two households which have 13–18 people. According to the marital status of the household head, 39% of the head were married and 26% were single (not married officially) (Table 2). Although the household head is single, he or she lives with their children in most cases.

Table 2. Marital status of the household heads

	Single	Married	Divorced	Widow	Others
Household number (n=38)	10	15	0	12	1
%	26	39	0	32	3

Source : Baseline survey in 2013.

As regards village management, Onamundindi village falls under Uukwambi Traditional Authority, which is headed by the Chief Headman, Mr. Herman Ndilimani Iipumbu. The next level of the structure of social organization is the District headman. Onamundindi village falls under Ogongo District managed by Mr. Sakaria Fillemon. The headman for Onamundindi village is Mr. Tshiimbashike Tshiimbashike. The village headman is nominated by the village community. They nominate at least two people and the one who gets more votes takes up the leadership. The nominated persons should have good character and background (i.e., be well trusted and respected by the community members). This nomination practice came into existence after independence. Before independence, traditional leaders were appointed by the colonial authorities.

2. Economic situation of the village

Most of the households in the village were full-time farmers (92%, Table 3). However, 8% of the household heads had other jobs. According to the interview, non-farm income was relatively high compared with farm income. In particular, the income of a household in which a member obtained a job in the town was extremely higher than other households. Moreover, pension money (old age pension) was an important income source (Table 4). In 2015, the pension was N\$600¹⁾ /person/month, almost the same as the mean monthly income from a part time job in town. According to the interviews in preliminary surveys, most of household heads mentioned the importance of the pension as a source of income. One farmer noted, “If there are two elderly people, the livelihood of the household is better than others.”

1) Namibia dollar: 1N\$=0.07US\$ (2015)

Table 3. Occupation of household heads

	Farmer		Worker in Non-Agricultural Sector	
	Full-time Farmer	Part-time Farmer	Full-time Worker	Temporary Worker
Number of Household (n=38)	35	2	1	0
%	92	5	3	0

Source : Baseline survey in 2013.

Table 4. Non-farm income sources

Source	Remittance	Pension	Other
Number of Households (n=38)	3	28	4
%	7.9	73.7	10.5

Source : Baseline survey in 2013.

Other sources of income are shown in Table 5. Most of the income sources were agricultural products and forest products, with 45% of the households selling millet and sorghum. However, around half of the households did not think the crops were an income source. According to the interviews in preliminary surveys, people mainly consumed the crops and livestock products themselves. Moreover, their economic activities were not strongly linked to the formal sector; they normally sold their products to their friends or in the informal market inside the village or town.

Table 5. Farm Income Sources and Income Figures

	Millet	Maize	Sorghum	Cow Peas	Bambala Ground Nuts	Pumpkin	Beef	Goats & Sheep	Chicken	Fire Wood	Wild Fruits	Other
Number of Household (n=38)	17	11	17	13	13	9	11	14	15	8	8	4
%	45	29	45	34	34	24	29	37	39	21	21	11

Source : Baseline survey in 2013.

To examine the economic condition of the households, the baseline survey enquired about the possession of some assets including agricultural tools and expensive items. Most households owned moldboard ploughs and hand hoes, which are the important tools in crop farming. Half of the households (49%) owned a donkey cart for transportation (Table 6). Only some households had expensive assets such as a car, a tractor or a TV set; 24% of the households owned a car and one household (3%) had a tractor. The household that had the tractor provided the ploughing service for a fee of around 300/hour (2012).

Most of the houses were made of poles with thatched grass and bricks with thatched grass, both of which were traditional types of housing (Table 7). In the past, people used

the trunks of the mopane tree that were collected around the house, but recently the thick mopane trunk has become scarce. Subsequently, the wealthy households bought building materials, and others used alternative materials (stems of pearl millet, stalks of palm tree, etc.). Some households built their houses using bricks and corrugated iron sheets.

Table 6. Household assets

	Plough	Hoe	Cart	Tractor	Bicycle	Car	Radio	TV	Stove
Number of Households (n=37)	34	36	18	1	10	9	30	4	3
%	92	97	49	3	27	24	81	11	8

Source : Baseline survey in 2013. One informant didn't answer.

Table 7. Types of Main House (multiple count)

	Pole & Thatch	Bricks & Thatch	Pole & Bricks	Bricks & Corrugated Iron Sheets
Number of Household (n=37)	18	13	2	11

Source : Baseline survey in 2013. One informant didn't answer.

3. Land holdings

In this community, all farmers hold their land which is given in usufruct because the population density is relatively low compared with other countries, and the land remains within boundaries around the former kingdom area. Therefore, all farmers can produce their own staple food based on subsistence farming and there are no peasant farmers in this area. According to the acting headman, the communal land is allocated by the village headman following a simple principle such as relatedness (familiarity). The application of those who are close to the headman and the entire community is more easily accepted than that of an applicant from a different region. Although every Namibian has the right to settle anywhere in the country, Onamundindi has not received any applications from other regions so far. A piece of land for cultivation costs N\$600 regardless of its size, while land for construction of bars, small shops, etc. costs N\$200 (2015). The village headman receives the money on behalf of the office of the traditional authority. Ownership of land in communal areas is given to both husband and wife. If one of the spouses dies, the remaining spouse will continue to own the land. If both spouses die, their children will own the land, but have to pay the normal administration amount of N\$600.

According to the baseline survey, the area of cultivated land which villagers mentioned was 1–9 ha (excluding the answers “unknown” and “no cultivated land”), and the average size was 3.8 ha. The actual size of cultivated land in 9 households measured by GPS hand

receivers in 2014, found that the average size was 3.0 ha (unpublished data).

4. Livelihood structures, natural resource uses and facilities

According to the interview survey, most of the households engaged in crop and livestock farming. The major crops were pearl millet, sorghum, maize, cow peas, Bambara ground nuts, watermelon and squash. Some farmers cultivated sweet potatoes, sunflowers and butternut squash (Table 8). Products were mainly used for self-consumption. Moreover, some farmers tried to cultivate rice whose seeds and seedlings are given by the University of Namibia (Hangula et al. 2016).

Table 8. List of Field Crops

Species	Scientific name	Local name	2009/10 (n=35)	2011/12 (n=32)
Pearl millet	<i>Pennisetum glaucum</i>	<i>omahangu</i>	100%	100%
Sorghum	<i>Sorghum bicolor</i>	<i>omushokolo</i>	100%	100%
Maize	<i>Zea mays</i>	<i>omapungu</i>	97%	94%
Cow peas	<i>Vigna unguiculata</i>	<i>omakunde</i>	97%	100%
Bambara ground nut	<i>Vigna subterranea</i>	<i>eefukwa</i>	91%	91%
Watermelon	<i>Citrullus lanatus</i>	<i>omanuwa</i>	97%	91%
Sweet potato	<i>Ipomoea batatas</i>	<i>omakapa</i>	3%	3%
Sunflower	<i>Helianthus annuus</i>	<i>sunflower (ongala yetango)</i>	9%	13%
Squashes	<i>Cucurbita maxima</i>	<i>omaliwa, omanyangwa</i>	69%	78%
Butternut squash	<i>Cucurbita moschata</i>	<i>butter nut</i>	9%	25%

Source : Interview survey in 2010 and 2012.

Table 9. Methods of Land Preparation

	Tractor	Draught animal-powered (DAP)	Hand hoe	Tractor & DAP	Tractor, DAP & Hand hoe	Tractor & Hand hoe	DAP & Hand hoe
Number of Households (n=38)	2	13	3	9	6	1	4

Source : Baseline survey in 2013.

Table 10. Method of Fertilization (multiple answers)

	Total number of Fertilizer Uses	Chemical Fertilizer (NPK)	Manure				Leaves
			Manure Use HH	Cattle	Goat	Donkey	
Number of Households (n=38)	33	3	32	22	18	0	5
%	87	8	84	58	47	0	13

Source : Baseline survey in 2013.

As regards livestock, most households own cattle, goat, chickens and donkeys. People eat the meat (minimal for donkey), and also use the cows' milk. Donkeys are used for

transportation and as draught draft animals for ploughing crop fields. The average number of cattle was 15.1, goats were 16.3, and some households did not own any cattle (10 households) or goats (4 households) (Tables 11 and 12). Four households owned more than 50 heads of cattle, and they held private grazing land and cattle posts in other villages for their cattle. The setting up and running costs of a cattle post are relatively high, and therefore it is high-income households that tend to set them up.

Table 11. Number of households owning animals

Owning animals	Cattle	Goat	Sheep	Pig	Donkey	Chicken	Duck	Guinea Fowl
Number of households owning the animal	28	34	4	23	33	37	3	1
% (n=38)	74	89	11	61	87	97	8	3

Source : Baseline survey in 2013.

Table 12. Distribution of livestock among households

Number of animals	Number of households		
	Cattle	Goat	Sheep
0	10	4	34
1-10	16	13	4
11-20	4	11	1
21-30	1	4	0
31-40	3	3	0
41-50	0	0	0
51-60	2	3	0
61-70	0	0	0
71-80	0	0	0
>80	2	0	0

Source : Baseline survey in 2013.

The headman plays a major role in resource management and distribution. If, for example, a resident wants poles for house construction, the headman gives the resident permission to cut trees in a specified area. Resources such as fish, thatching grasses, or water lilies are kept until they reach maturity, and then the headman announces when to start harvesting them. Sometimes the harvested resources, such as the thatching grasses, are kept at the headman's place in case of fire; in that case, the affected residents can be given the grasses to re-construct their huts.

The available resources of essential facilities in the community are as follows: there is

one school and one clinic in the village area. The clinic is not in full operation but the nurses come once or twice a month to provide services such as out-patient treatment and vaccination. There is one village nurse who visits every house providing primary health care services. Public places such as the school, church, clinic and market places are supplied with electricity by Nored (Northern Namibia Regional Electricity Distributor), and each facility is responsible for its utility usage. The payment of electricity is done by the use of pre-paid cards. There are four water points in the whole village. According to the acting headman, there is still a need for extra water points because the village is too big to get enough water at four water points. The water points are provided by Namwater (Namibia Water Corporation Ltd.), a state organization responsible for water distribution in the country. There is a committee responsible for water tap management. The water is paid by pre-paid cards and the amount of cards are in the range of N\$5.00–100.00. The baseline survey shows that 35% of households have their own tap. In addition, 32% of households have a deep well (*omuthima*) and 57% of households have a shallow wetland (*ondombe*) (Table 13). These wells are the water resources for livestock, and are the target of the rice-millet mixed cropping system's introduction that the rice-mahangu project has been promoting.

Table 13. Water sources

Water Source	Shallow Wetland (<i>ondombe</i>)	Deep Well (<i>omuthima</i>)	Borehole (<i>ombola</i>)	Stream (<i>oshana</i>)	Dam (<i>ondama</i>)	Tap (owned) (<i>okapomba</i>)	Other
Number of households using the water source (n=37)	21	12	2	2	2	13	11
%	57	32	5	5	5	35	30

Source : Baseline survey in 2013. One informant didn't answer.

5. Issues faced by the residents, development challenges, and self-support measures

(1) Issues faced by the people residents

The household heads mentioned some problems in their agricultural activities. As regards crop farming, the most frequent answer concerned “pest, disease and birds,” especially bird attacks on matured crops (Table 14). Disturbances because of climate also caused serious problems for crop farming; people particularly mentioned heavy rain damage and flooded fields. They indicated that their main staple crop, pearl millet, was especially weak when submerged, and that heavy rain caused a serious reduction in crop production. They also mentioned the annual rainfall fluctuations and the emergence of drought that also

caused a reduction in production. Although some people mentioned the lack of labor or lack of tools, these problems were not common among the villagers. Concerning livestock farming, they referred to climate conditions, grazing areas, and selling price.

Table 14. Problems with major crops (multiple answers)

Categories	n	% (n=38)
Climate condition		
Heavy rainfall damage, flooded field	7	18
Insufficient rainfall, drought	5	13
Rainfall fluctuation	2	5
High temperature	1	3
Pest, disease, bird		
Insect pest	9	24
Army worms	2	5
Stem borer	1	3
Disease	1	3
Bird	14	37
Others		
Poor seed germination	4	11
Lack of labor power	1	3
Lack of tools	1	3
Poor health condition of donkey	1	3
Unknown reason	1	3
Livestock Farming		
Drought, animals are dying too often owing to drought	1	3
Lack of grazing area to support enough animals for selling, animals are few, in poor health, and lack proper management	1	3
Hard to get customers, and they complain about price	1	3

Source : Baseline survey in 2013.

The acting village headman answered the question about the main challenges in natural resource management by indicating : (1) illegal harvesting of resources (i.e., fish, grass, trees, etc.) and (2) shortage of resources due to drought especially for the past three years (2013–2015). There was a gap between residents' answers about heavy rain problem and the acting headman's answer about drought. This might be caused by the differences in interview years ; the baseline survey was conducted after some years of high rainfall and the interview survey was conducted after some drought years. The village head also mentioned that the Onamundindi community is facing other challenges apart from those associated with natural resource management. (3) The main challenges include lack of food due to drought especially in 2015, and lack of money to settle hospital bills and pay transport fares to go to hospitals. (4) The people most affected by the above challenges are those who have HIV–AIDS. They sometimes fail to receive their follow-up appointments and cannot take

their antiretroviral drugs or even meals.

(2) Development challenges and self-support measures

Major developmental projects and infrastructure in the village over the last 30 years are shown in Table 15.

Table 15. Development projects in Onamundindi village of the last 30 years

Year	Events
1990s	Establishment of school
1996	Establishment of clinic
1998	Establishment of church
2007	Introduction of social grant pay point
2008	Construction of gravel road joining Ogongo-Onamundindi-Omulimbaalimba
2009	Introduction of rice cultivation by Japanese government
2013	Waiving of school development fees of primary school learners
2014	Introduction of hiring scheme of hand tiller
2014	Introduction of village nurses

Source : Interview with acting headman in 2015.

There are some social groups in the village including one support group called Project Hope. The project started in 2010 and is divided into three sub-groups. The first group has 21 members and these members have received trainings on social welfare issues such as living in harmony in the neighborhood, primary health care, and how to take care of children. The first training was offered by the people from Project Hope, Ongwediva town. Thereafter, the training for new members has been offered by the senior members. The second group of the project has 34 members and the third group has 11 members, making a total of 66 members in the project. The project members meet once a week and each member is expected to contribute some (unfixed) amount of money. The purpose of such a contribution is to assist each other to fund social welfare activities such as death contributions, money for hospital bills, school uniforms for learners whose parents cannot afford them, and so forth.

Another support group in the village is an income generation project through introduction of poultry production and marula nut extraction. Members of the project are those with HIV-AIDS orphans, vulnerable children, and a few others who do not fall into any of the above categories. Each member is expected to contribute a chicken. The purpose of this support group is to generate income and ultimately to support its members. The building materials for constructing the poultry house and equipment for marula nuts oil

extraction had not yet been received. Plans are underway to start a rice association. About seven members have shown an interest and are ready to join the association; they have already identified a big pond in the village as the place for the project.

The community is busy preparing for the construction of a poultry house, expansion of water pipeline to other parts of the village where no water is available, and commencement of the basket weaving and pottery project.

According to the baseline survey, the changes the villagers want are shown in Table 16. Some people wanted new items such as the application of fertilizer, pesticides, or use of tractors. In addition, people also wanted new ideas or techniques to manage water conditions or birds. Some farmers hoped for something new to improve agriculture and they mentioned additional government and agricultural extension services were needed.

Table 16. What changes do you want to see in major crops (multiple answers)

Answers	n	% (n=38)
Enough water	1	3
Application of pesticides	3	8
Application of fertilizer	10	26
Use of better varieties	3	8
Early ploughing with tractor	2	5
Ploughing a large area with tractor	1	3
Enough tools and equipment for early cultivation	1	3
Government support, agricultural extension services	7	18
Managing number of birds	1	3
Good crop husbandry	1	3
Adoption of innovative ideas	2	5
Up to date weather forecast and alert system	1	3

Source : Baseline survey in 2013.

According to the acting headman, these current developmental needs (ranked from the most important to the least important) were (1) establishment of a secondary school, (2) construction of a health center and full operation of the clinic, (3) provision of fencing materials for *ondombe* for community rice cultivation, and (4) establishment of a community vegetable garden. These requests were sometimes discussed in the workshops of the rice-mahangu project.

IV. Discussion and Conclusions

This paper has clarified the socioeconomic conditions of a specific village in north-central Namibia. Combined crop and livestock farming are the main livelihoods in this area, and most residents engage in agriculture as full-time farmers. The agricultural

activities are generally common to most of the households. These tendencies correspond with previous research on agro-pastoral livelihood in this area (e.g., Mendelsohn et al. 2000 ; 2013, Uno 2005). Agricultural products are mainly used for self-consumption in a household, but people also sell the agricultural products mainly in the informal sector. Although people indicate that agricultural products and forest products are income sources, the main income sources are, in fact, non-farm income such as work in town or pension money. Pension money especially is an important income source for households with elderly people.

One feature of the economic conditions surveyed is the economic differences among households in the village. Only some household heads engage in the non-farm work and obtain a high income. From the perspective of assets available, this means an uneven distribution of expensive assets such as cars and tractors. These economic differences affect their ways of engaging in agriculture ; for example, some farmers plough their crop field by tractor and 8% of households use chemical fertilizers. These differences in agricultural activities among households are important considerations in introducing new cultivation methods to this area.

With respect to the issues the villagers are facing, various problems were pointed out. While people mentioned the problems caused by climatic annual fluctuations, especially those related to amount of rainfall, many residents also pointed out pest and disease issues. The rice-mahangu project focused on the issues of extreme rainfall, but farmers perceived other problems. These problems also affect the mixed cropping that the project has tried to introduce. There were some differences between the initial knowledge of scientists and farmers' perceptions at the beginning of the project, but the important point is that the scientists should understand the causes of these differences and modify the project framework to co-create a "new" mixed-cropping system that will harmonize with existing social and natural environments.

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