MAPPING OF OFADA RICE PRODUCTION AREAS FOR RICE VALUE CHAIN DEVELOPMENT IN SOUTH-WEST NIGERIA

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Abstract: Mapping exercise of Ofada rice production areas was motivated by the need to develop, spatially targeted interventions that will positively impact local rice value chain in south western Nigeria. The study aimed at identifying production areas and associated constraints for development of decision support to aid geographical targeting of interventions. 254 Ofada rice farmers in 55 villages in 11 local Government areas of three Nigerian States were identified. Hand held GPS devices were used to obtain coordinates of farms, parboiling milling centres and markets for the commodity. The coordinates were imported into GIS and added to existing base maps. Simple distance analysis was done to show proximity to facilities along the value-chain of the commodity. Results show that the total output per year in the entire production area is about 500 tons while only two production clusters exceeded 130 tons per year. The indication is that Ofada rice production still requires intervention. States that production inputs locations were far from majority of the rice farmers had very low output. There is the need for direct intervention to improve access of farmers to all rice production inputs.

Keywords: Ofada rice, production areas, mapping, targeting of interventions

Introduction

Rice (*Oryza sativa L.*) which was once considered a special treat during festivals in most homes in Nigeria (Omotayo *et al*,, 2007) has assumed the position of one of the most important staple foods (Ojogho and Erhabor, 2011) in recent years. While domestic production of the commodity estimated at 5.5 metric tonnes (Punchonline, 2017) as at 2017 have not kept pace with the increasing demand (Oladimeji, 2017) and the country has had to resort to massive importation over the years. Nigeria imports mostly from Brazil, Thailand, India, Vietnam and USA to meet the 4.3 million metric tonnes shortfall valued at over N365 billion to meet the annual demand which stands at 7 million MT. (Nkwazema, 2016). The domestic production levels remained either stagnant or even depressed in some cases due to crude and back breaking methods still employed by most producers, weak infrastructural base, high production costs and numerous market imperfections (Ajala and Gana, 2015). Rice in the last five years has become a very expensive commodity in Nigeria owing to new government policies on importation of food items. In an attempt to boost local production and reduce the market prices some State governments (Vaguardnews, 2017) embarked on direct production and or processing of locally cultivated rice. Ogun State government precisely launched its MITROS Rice in January 2018. The aim is to improve farmers' income while making the commodity available and affordable for the citizens. The modality of Mitros rice is to encourage local production through improvement of the value chain. The rice processing factory owned by the State government will in addition to supplies from its farm in Eggua will also accept quality paddy rice from farmers and pay them promptly. Meanwhile, Ofada rice is one of the most widely accepted and locally cultivated in many parts of south western Nigeria (Adekoyeni *et al*., 2018).

Ofada rice has recently become popular as specialty rice often served at parties and other status events by the elites; sold in fast food restaurants, and also in ½ kg boxes by marketers in Lagos, Ibadan Abeokuta and other cities in the South West with spread effects to other parts of the country. The past interventions by civil society organisation such as ProOpcom to support activities that impact on the entire Ofada rice value chain underscores its importance in the south-west Geopolitical zone of the country. Geographic information on the value-chain of the commodity is essential if such interventions and the move by the State government will be impactful. Mapping of the Ofada rice value chain is therefore important in developing a decision support mechanism for the overall improvement of the rice production system. Mapping will facilitate geographical targeting of interventions where they are needed, improve cost effectiveness of infrastructural development spending and more efficiently reach those who need intervention most (Geanuracos, *et al*., 2007; Theunissen, *et al*., 2013).

Consequently, the need for the study, the result of which this paper presents. The mapping exercise for Ofada rice production areas is in order to elucidate useful information such as the geographic locations of major areas of production of paddy; the flow of the commodity from paddy production, soaking, parboiling and milling to packaging and marketing. The paper also presents the estimated quantity (in metric tons) that flow through these various channels linking the major markets that sell Ofada rice to traders, re-packagers and consumers and linked back to the major sources of products be it field paddy, par-boiled paddy or milled rice. Distances of rice production areas from input sources, parboiling points, threshing points, milling points and marketing or repackaging points are presented to enable correct targeting of future interventions.

Materials and Methods

Study area

The mapping exercise covered Ofada rice production communities in the five (5) rice production clusters in Ogun state, namely, Obafemi Owode, Abeokuta North, Ogun Water side, Ifo, Ewekoro and Ijebu-North Local government areas. Also included are the rice production clusters of Igbemo, Ijero, Aramoko, Efon Alaye Afawo, Are, Erio all in Ekiti State and Erin-Ijesha and Erin-Oke in Osun State.

the map in Fig. 1 shows the geographical spread of the 'Ofada' rice producing areas in SW Nigeria while Table 1 shows the geographical coordinates of the rice production and processing clusters in the three states of south west Nigeria. Fig. 1 is the map of SW Nigeria showing the rice production clusters. The geographic coordinates of the rice producing clusters have been presented along with the specific variety of rice produced or processed.

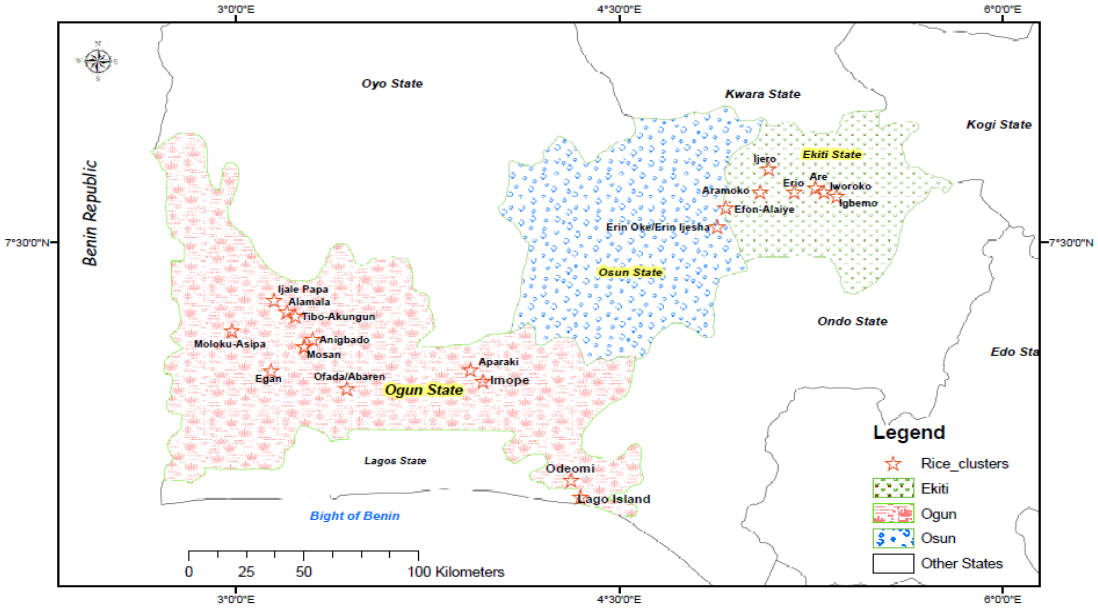

Fig. 1: Ofada rice production areas in Southwest Nigeria

Table 1: Location of clusters of rice farms and varieties cultivated

LGAs	Clusters	Latitude	Longitude	Rice varieties
Efon-Alaiye	Efon-Alaiye	7.65000000	4.91666700	Igbemo, Ofada, ITA 150
Ijero	Ijero Ekiti	7.81666700	5.08333300	Igbemo, Ofada, ITA 150
Irepodun/Ifelodun	Afao			Igbemo, ,ITA 150
	Are Ekiti	7.71666700	5.30000000	Igbemo, ITA 150
	Igbemo Ekiti	7.70000000	5.35000000	Igbemo, ITA 150
	Iworoko	7.73333300	5.26666700	Igbemo, ITA 150
Ekiti West	Erio Ekiti	7.71666700	5.18333300	Igbemo, , ITA 150
	Aramoko Ekiti	7.71666700	5.05000000	
	Erin Oke/Erin-Ijesha	7.56666700	4.88333300	ITA150,Canada,Ofada,Igbemo
Abeokuta North	Alamala barracks	7.18333300	3.23333300	ITA150, Mokwa
	Ijale Papa	7.20000000	3.20000000	ITA150, Mokwa
	Anigbado	6.67500000	3.27083300	ITA150, Mokwa
	Tibo-Akungun	7.25000000	3.15000000	ITA150, Mokwa
Ewekoro	Mosan	6.98333300	3.18333300	
	Egan	6.86666700	4.05000000	
Ijebu-North	Imope	6.90000000	3.96666700	
Obafemi-Owode	Ofada-Abaren	6.86666700	3.43333300	Ofada, ITA 150
	Moloku-Asipa	7.05000000	3.26666700	
Ogun waterside	Ode-omi			
	Lago Island			

Ofada rice value chain cuts across 10 local government areas in the three states as shown in the map in the figure.

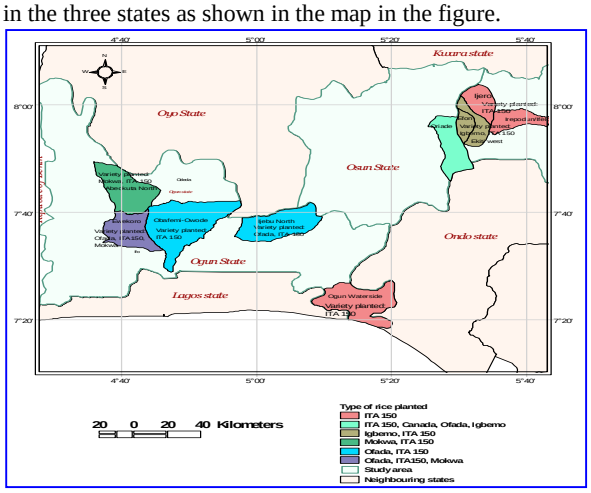

Fig. 2: Rice varieties and the local government of production

Definition of Ofada rice

The first task was to define and come to a unanimous decision on the features of Ofada rice since there were several other varieties of rice which are commonly taken for the original variety of Ofada rice. For instance, some local rice called Igbemo rice, Kogi rice, etc fit the Ofada rice description. It was unanimously agreed upon that any variety of rice called local rice with the following characteristics - bold, short and red coated kernel when milled should be accepted as Ofada rice. Ofada rice variety got its name from a community called Ofada in Ogun State where it was believed to have been cultivated by a foreign soldier who was said to have brought its seed from the Philippines during the Second World War. The rise to eminence of Ofada rice as a popular type of rice is associated with what has been described as its characteristic bold, short, mouth-filling, palate caressing, red coated karnel in its unpolished form. The term Ofada rice therefore refers generically to mean any locally produced rice that fits the description profiled above irrespective of where the rice is produced in the three states where this study was carried out.

Fig. 3: Typical variety of pure Ofada rice (left: in paddy form and right dehusked)

Sampling method

A combination of purposive and multi-stage random sampling procedures was used in selecting the sample for this study. States as well as the Local government areas were selected purposively based on the recommendation of the State Agricultural Development Project extension agents for rice cultivation. Villages and farmers in the local government areas were selected based on the proportional volume of rice production activities. In some communities and villages, complete enumeration of rice farmers, parboilers, and millers were carried out depending on the number of such people in each community or village.

Mapping techniques

The mapping exercise was preceded by selection and training of field supervisors or enumerators on the use of Global Positioning Systems (GPS) and how to conduct focus group discussion. Field supervisors were then deployed to the three states to recruit and train field workers on the use of GPS in the acquisition of spatial data for the mapping exercise and on how to conduct focus group discussions. The focus group discussions involved groups of rice farmers, parbiolers, and millers in each village and it centred on types and varieties of rice cultivated, farm size, length of period of rice cultivation, paddy yield, quantities of paddy sold as paddy, quantity milled, etc.

The following spatial variables were used for the mapping exercise:

1. Distance to and from production and value addition facilities using GPS and GIS
2. Empirical farm size using Satellite images and GPS coordinates of farm perimeter
3. Shape files of Nigerian administrative maps Ofada rice paddy production sites using GPS coordinates
4. Ofada rice milling and per boiling sites using GPS coordinates
5. Quantity of Ofada rice through value chain interviews and fieldwork data
6. Directory of commercial paddy/milled rice using fieldwork data

Creating the GIS maps

Enumerators were trained to obtain coordinates of locations needed for mapping using Global Positioning System hand-held receivers. The coordinates were incorporated into geo-referenced digital base-map of the study areas. Location of farms, markets, roads, and value addition infrastructure were incorporated into the maps. These data, including the geographic location of farmers' residence and farms form the farmers' GIS directory. Other data considered useful for spatial analysis were also collected. The full attributes of the area were captured through observation, Focus Group Discussion FGD, key informant interviews, discussion with rice growers association in each State and secondary sources.

Results and Discussion

A total of 254 farmers, 204 parboilers, 36 rice mills, were contacted in 55 villages and 11 local government areas in the three states where Ofada rice is produced in south western Nigeria. These data are presented in Table 1.

Table 2: Production data from Ofada rice producing clusters

State	LGA	No of farmers	No of parboilers	No of rice mills	Total farm area (Ha)	Qty/ Cluster (Kg)	Qty per LGA (Kg)	Qty / States (Kg)
Osun	Oriade	26	26	12	64	70100	70100	70100
Ogun	Abeokuta North	28	17	0	55.53	47700	47700	265225
	Ewekoro	15	15	5	17.2	40000	40000	
	Ijebu	15	12	1	46.9	25350	25350	
	Ogun waterside	15	16	4	27.3	11425	11425	
	Obafemi-Owode	42	40	4	325.9	140750	140750	
Ekiti	Ijero-Ekiti	15	15	1	8.2	11800	11800	53000
	Ekiti West	34	11	3	16.6	22400	22400	
	Irepodun/Ifelodun	53	41	3	109.1	17100	17100	
	Efon–Alaaye	11	11	3	13	1700	1700	
	Total	254	204	36	683.73	388325	388325	388325

The local government with the largest rice production is Obafemi Owode with 140,750 Kg per annum. Incidentally, Ofada community is in this local government area. However, with respect to processing equipment and other facilities required to promote the rice value chain, with more number of farmers has less number of mill compared to other LGAs like Oriade in Osun State. This is a point for consideration with regards to targeting of (facility) interventions.

The relative quantities of rice products along the value chain in the production areas can be visualised at a glance in map-chart form as presented in the map in Fig. 3.

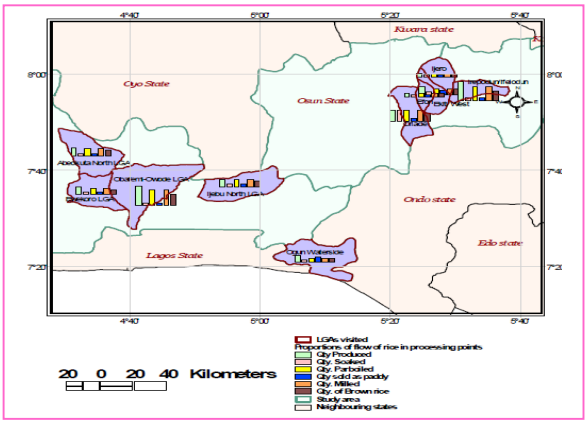

Fig. 4: Proportion of flow of rice along the value chain in the production areas

The map shows Obafemi Owode as the leader in Ofada rice production and processing. The issue of farm size was also empirically explored by capturing farm perimeter where possible on satellite images and taking GPS perimeter coordinates of a random sample of at least ten farms in each local government area. This was done to obtain the actual size of the farm using GIS area measurement menu in ArcView 3.2a. The average farm size across the three States was 3.95 Ha from what farmers reported, while the average farm size from empirical measurement was 0.72 Ha.

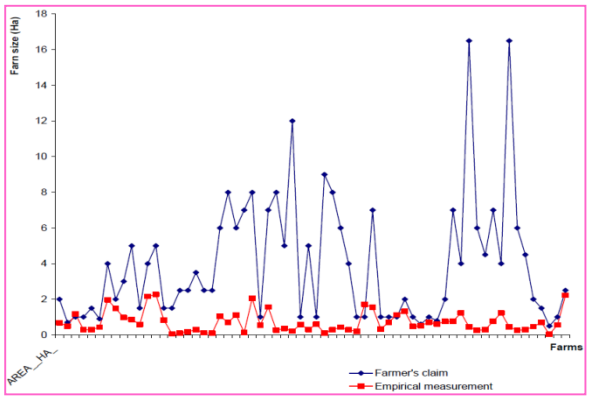

Fig. 5: Chart showing difference between between farmer's report of farm size and empirical measurement with GPS

It can be observed that there is very low correlation between what the farmer reported and the results obtained from empirical measurement. In addition, only a small proportion (4%) of the farmers used mechanized land preparation. Also, Ofada rice production system has very low external input; less than 20 percent of the farmers used fertilizers or improved seeds. All the farmers threshed their rice manually, while most farmers (68%) sourced their seeds from their previous harvests.

It is important to emphasize that many other varieties of rice other than the real Ofada were cultivated in the rice production areas of south western Nigeria. Even in Ogun State where Ofada rice is very popular and is the dominant variety in some local government areas, some local varieties of rice such as Mokwa, Igbemo with similar characteristics to that of Ofada were cultivated. Table 3 shows the quantity of rice flow from production to packaging.

Irepodun/Ifelodun LGA of Ekiti State where Igbemo rice producing cluster is found and Obafemi-Owode LGA where Ofada rice producing cluster is found accounts for more than 46% of the entire whole grain rice in south west Nigeria. Quantity of whole grain rice recovered in Kilogrammes from Obafemi Owode LGA of Ogun State is 71402.50 Kg while that of Irepodun/Ifelodun LGA in Ekiti State is 56995.25 Kg.

The schema below sums up the path of rice along various points in the rice value chain in the three states studied.

6,959 kg of seeds translated to 570,510 kg of paddy rice which is divided between storage, repackagers and processing. About 510,800 kg goes into processing; 428,112 kg is directly parboiled while the remaining 82,688 kg are turned into aromatic Ofada rice by soaking in water for days. All 510,800 kg goes into milling to produce 277,234 kg sold in bags or repackaged in 1 kg packs in the markets.

Table 3: Proportion of rice flow through the rice value chain (from farm to packaging)

State	Local Government Area	Quantity produced (Kg)	Quantity soaked (Kg)	Quantity parboiled (Kg)	Quantity sold as paddy (Kg)	Quantity milled (Kg)	Quantity of whole grain rice recovered (Kg)
Ekiti	Ijero	11800	0	7670	0	7670	4985.5
Ekiti	Ekiti West	45900	0	29835	15700	29835	19392.75
Ekiti	Efon-Alaaye	17000	0	17000	0	15550	11070.5
Ekiti	Irepodun/Ifelodun	134900	0	87685	0	87685	56995.25
Osun	Oriade	70100	64100	64100	0	64100	41665
Ogun	Abeokuta North	41250	0	36260	0	36260	23569
Ogun	Obafemi-Owode	135850	0	109850	0	109850	71402.5
Ogun	Ijebu North	42000	0	42000	0	42000	27300
Ogun	Ewekoro	40000	0	24708	0	24708	16060.53
Ogun	Ogun Waterside	31710	0	9004	21113	9004	5852.6
							277330.3

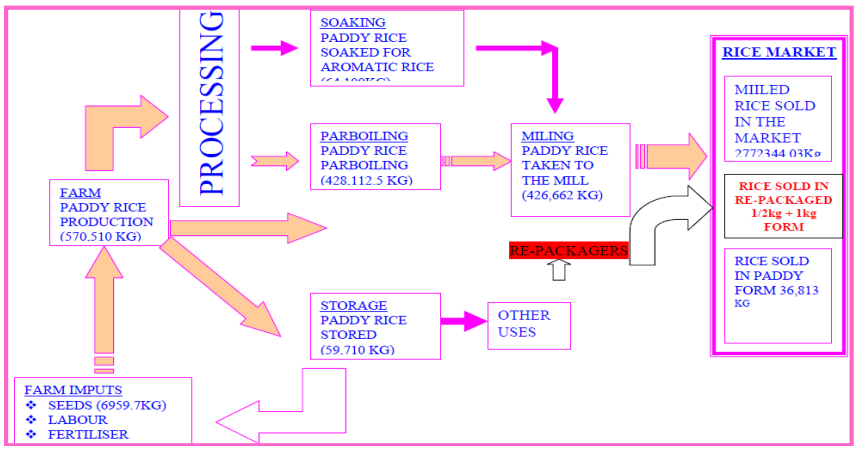

Fig. 6: Movement of rice from along its value chain (paddy production to market) in Southwest Nigeria

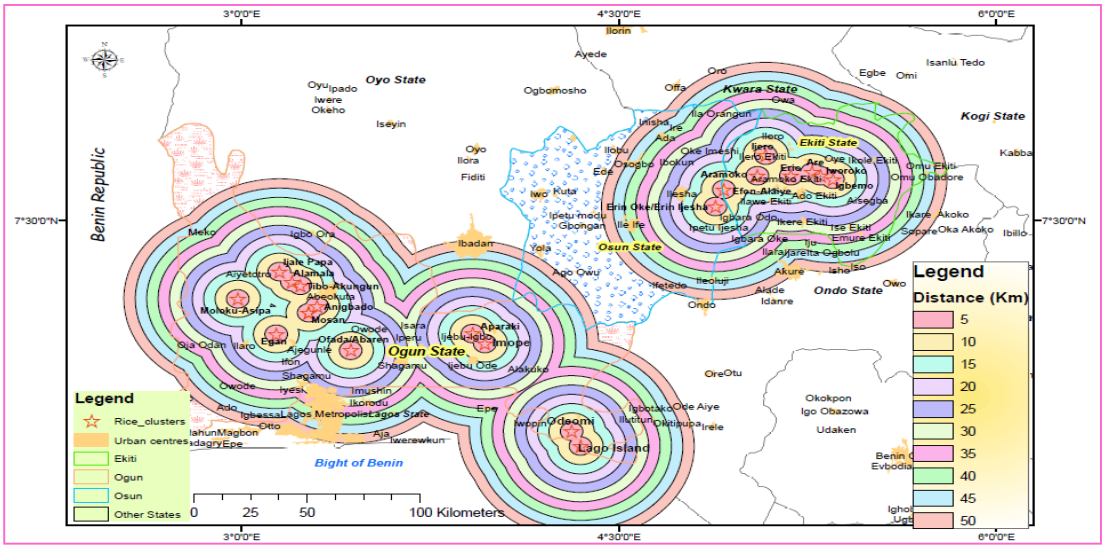

Fig. 7: Distance of production to processing point

Distance analysis at the local level

The distance analyses show that facilities for rice threshing, parboiling, milling, were readily available at local levels and within a short distance (between 2 and 4 kilometres) of the farmers' farm or residence. Although urban markets may appear to be very far away from these rice production locations according to the distance analysis data, farmers did not seem to have problems selling their paddy or milled rice as buyers come directly to these locations to buy. The same data show that points of production inputs such as seeds, agrochemicals and fertilizer were far away from farmers' field and residence (between 5 and 30 kilometres) and may not be readily available to the majority of rice farmers. This point to the need for direct intervention by agencies concerned to improve access of farmers to all production inputs.

The distance analyses data consistently show that facilities for rice threshing, parboiling, milling, were readily available at local levels and within a short distance (between 2 and 4 kilometres) of the farmers' farm or residence. Although urban markets may appear to be very far away from rice production locations according to the distance analysis data, farmers did not seem to have problems selling their paddy or milled rice as buyers come directly to these locations to buy. The data further show that locations of Ofada rice production inputs such as seeds, agrochemicals and fertilizer were far away from farmers' field and residence (between 5 and 30 kilometres) and may not be readily available to the majority of rice farmers. This situation points to the need for direct interventions to improve access of farmers to all rice production inputs.

The total arable crop land in the rice production areas of Ekiti state is 100,524.411Ha. This represents about 84 percent of the total land area. Less than 10 percent of this is currently under rice cultivation in the State. In Osun state, Oriade local government area identified as the rice production area has 47,710Ha (79%) arable land. In Ogun state apart from 67% (337,180Ha) of land available as arable land with possibility for upland rice cultivation, about 625,62Ha or (12.5%) of the land area was categorised as wetland. This area could be explored for lowland rice cultivation within the five local government areas studied.

It was established that the soils around Aramoko, Ijero Ekiti up to Ifaki were highly suitable for upland rice cultivation while the soils around Ado-Ekiti, Iyin Ekiti, Igede Ekiti and Igbemo are marginally suitable for rice cultivation. In Osun state soils close to Ilesha, particularly Erin Oke was classified as highly suitable, but over 79% of the arable land are categorised as marginal. Ogun state presents a unique feature especially around Obafemi Owode local government where almost 50% of the arable soil is considered as highly suitable for the cultivation of upland rice. This is a bit surprising given the long years of rice cultivation in the area one would expect the soil to be generally deficient in critical rice soil nutrients.

Ijebu North Local government area presents a slightly different picture. One half of the area is categorised as

marginally suitable while the other half is classified as moderately suitable. Soils of Ijebu water-side are mostly deficient in nitrogen and phosphorus

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Conclusions

The mapping exercise established that major Ofada rice production areas in southwest Nigeria are in Ogun, Osun and Ekiti States. It identified 254 Ofada rice farmers majority of whom are males, 204 parboilers mostly females, 36 rice mills in 55 villages and 11 local government areas in the three states. Ogun State is the largest producer of Ofada rice with Obafemi Owode local government area of Ogun State leading others in terms of annual production (135,850 KG). Irepodun/Ifelodun Local government area of Ekiti was next highest producer (134,90KG). Incidentally, these two local government areas respectively hosts (Ofada and Igbemo Ekiti villages); the two communities of south-west Nigeria with long tradition of rice production.

The distance analysis maps reveal the importance of spatial targeting and prioritization of interventions. It is hoped that this result will be utilized in developing, prioritizing and targeting interventions to positively impact the Ofada rice value chain in south western Nigeria.

A more detailed mapping of the production system with empirical of farm management data would reveal more comprehensively the problems associated with each stage of the Ofada rice production system. Further to this is the application of intergrated spatial information technologies for multicreteria land suitability evaluation and site-specific application of inputs at the production stage of the rice value chain. Other stages of the value chain can be also benefit from mapping of information crucial to precise decision taking. For instance, all needs assessment conducted on the processors, packagers, marketers and consumers could be developed into a spatial database in a GIS environment. The database then becomes a spatial decision support system (SDSS) to guide government and Non-governmental organisations in precise targeting of interventions at all stages of the rice value chain.

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