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**Ban on Rice Cultivation in Uganda's Wetlands: Implications for Household Income,
Food Security, Gender Equity and Social Safety Nets in the Rainfed Lowland Areas of
Amuria, Soroti and Katakwi Districts**

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List of acronyms

ASSP	Agriculture Sector Strategic Plan
CGIAR	Consultative Group on International Agricultural Research
DFID	Department for International Cooperation
DISO	District Internal Security Officer
EIA	Environmental Impact Assessment
FGD	Focus Group Discussion
IFDC	International Fertilizer Development Center
JICA	Japan International Cooperation Agency
MAAIF	Ministry of Agriculture, Animal, Industry and Fisheries
NEMA	National Environment Management Authority
NRDS	National Rice Development Strategy
RDC	Resident District Commissioner
UBOS	Uganda Bureau of Statistics
UGX	Uganda Shillings
WEAI	Women Empowerment in Agriculture Index

Key messages

- Over 80% of rice produced in Uganda is by smallholder farmers (with 2 ha on average), the majority of whom are located in the rainfed and irrigated lowland ecologies.
- The rainfed lowland ecology, which comprises mainly of seasonally flooded swamps, covers 53% of rice ecologies and contributes about 63% to total rice production in the country.
- In July 2021, the Government of Uganda announced new measures to protect the environment, including the immediate ban on rice cultivation in the rainfed lowland ecologies. The government is of the view that the affected rice farmers should be supported to engage in alternative livelihood activities such as fish farming.
- This rapid assessment was undertaken to understand the likely effects of the ban on rice growing households located in the rainfed lowland ecology, focusing on eastern Uganda, which produces about 67% of the country's rice.
- Up to 80% of the population in the study area is involved in rice cultivation. The crop is a major cash and food crop and is a source of livelihood for women and youth in both the upstream and downstream nodes of the rice value chain.
- Income from rice farming supports household food security. It enables rice growing households to meet their other food needs through the market. Therefore, the ban will likely lead to a decline in food security that is guaranteed by own-production, and a decline in household dietary diversity due to loss in income.
- The ban will marginalize women in some districts insofar as it diminishes their ability to earn and acquire productive assets such as land, and to subscribe to and actively participate in self-help groups such as community savings groups.
- Rice farmers believe that in the absence of rice cultivation, they could feasibly venture into other enterprises such maize, cassava, retail shops, brick making and boda boda services. However, they would need support in accessing capital and markets, among other things, to succeed in these enterprises.
- In the short run, households are likely to deplete their safety nets by utilizing their little savings and selling off their assets, especially livestock and land.
- The Africa Rice Center is contributing to rice cultivation and the preservation of biodiversity and ecosystem services in wetlands using a three-level approach. One approach is to set land for biodiversity and ecosystem services in wetlands through the identification of lands suitable for sustainable cropland expansion and lands suitable

for biodiversity and ecosystem services preservation. The Center has developed and validated a tool that provides such information for inland valleys of the West African region with the location and area that needs to be developed to meet rice self-sufficiency and the area that can be preserved for biodiversity and ecosystem services.

- The second approach is through assessing the stakeholders' perceptions of biodiversity and ecosystem services and accounting for these in the wetland landscape development plan. The Center is developing a toolkit for landscape-level natural resources management and agricultural development in wetlands.
- Thirdly, the Center is developing and promoting the use of nature-based agronomic solutions in wetlands including integrated rice-fish farming, and the use of legumes and organic fertilizers to reduce the reliance on chemical fertilizers and pesticides.

1. Introduction

Wetlands are defined as areas of marsh, fen, peatland, or water, whether natural or artificial, permanent, or temporary, with water that is static or flowing, fresh, brackish, or salt, including areas of marine water that do not exceed 6 meters at low tide (Aryamanya-Mugisha, 2011; Convention on Wetlands, 2022; Yoon, 2009). Wetlands can also be defined as areas which are seasonally or permanently waterlogged, and where plants and animals have become adapted to temporary or permanent flooding by saline, brackish or freshwater (Glass, 2007; Kaggwa et al., 2009). They include permanently flooded areas with papyrus or grass swamps, swamp forests or high-altitude mountain bogs, as well as seasonal flood plains and grasslands (Balasubramanian et al., 2007).

Wetlands provide globally significant social, economic, and environmental benefits. These include water storage, groundwater recharging, storm protection, flood mitigation, shoreline stabilization, erosion control, nutrient cycling, carbon sequestration, filtering pollutants (Aryamanya-Mugisha, 2011; Convention on Wetlands, 2022), stabilization of the hydrological cycle and microclimates, protection of riverbanks, nutrient and toxin retention, sewerage treatment and water purification (Kaggwa et al., 2009). In this way, wetlands serve as freshwater reservoirs that release water slowly to the major drainage basins. This slow release of water ensures continuous water availability, particularly during the dry season, to support the economy (Verhoeven & Setter, 2010). In addition, wetlands are an important stopover for large congregations of migratory water birds. National and international visitors seek out wetlands as tourist attractions and educational opportunities to learn about their unique animals and plants. Wetlands are important breeding grounds for fish and birds (Yoon, 2009). Furthermore, wetlands contribute to global food security by supporting agriculture, fishing, and livestock grazing (Convention on Wetlands, 2022). Wetlands provide families with basic needs such as water, construction material, fuel, and raw materials for crafts (Aryamanya-Mugisha, 2011; Cunha et al., 2015; Kaggwa et al., 2009).

Worldwide, population growth coupled with expansion of farmland has resulted into people encroaching on wetlands (Buri et al., 2012; Nanfumba et al., 2013; Verhoeven & Setter, 2010) to convert them into agricultural land, industrial land, human settlement or for extraction of useful materials (Machado & Maltchik, 2010; Verhoeven & Setter, 2010; Yoon, 2009). In particular, lowlands, especially river flood plains and inland valleys consisting of wide and flat

alluvial plains bordering rivers, are important landscapes for rice cultivation and are targeted by national governments to attain self-sufficiency (Akpoti et al., 2019; Cunha et al., 2015). This is because valley bottoms are relatively secure with water availability, and have higher soil fertility compared to the surrounding uplands, and hence are suitable for lowland rice production (Kaizzi et al., 2014; Kijima & Sserunkuuma, 2012)

1.1. Background

In Uganda, the importance of rice has been increasing rapidly both as a staple food in people's diet and as a source of income for nearly 80,000 smallholder households (Hong et al., 2021; Iqbal et al., 2013; Mwendo et al., 2017; Nanfumba et al., 2013; Yusuke et al., 2013). The crop's year-round availability on the market and the convenience associated with its preparation and consumption have made it a good fit in the lifestyles of urban consumers (MAAIF, 2020). Rice is an important food crop that is consumed mostly outside its major production areas in Uganda, with over 90% of production marketed to urban areas and major institutions within the country (Oonyu, 2011). Rice exhibits great potential for poverty reduction since it has a relatively long value chain that employs many players and contributes to other sub-sectors such as livestock as a source of feed (MAAIF, 2022). The Government of Uganda has therefore prioritized rice as a strategic commodity for the national economy (Hong et al., 2021).

There are three rice production ecologies in Uganda, namely, rainfed lowland that covers 53% of rice fields, irrigated lowland that covers 2% of rice fields, and rainfed upland that covers 45% of rice fields in the country (Dossou-Yovo et al., 2022; Hong et al., 2021; Kikuchi et al., 2014; Lamo et al., 2017). The rainfed lowland covers 60,000 ha, irrigated lowland covers 6,000 ha, while rainfed upland covers 50,000 ha. The potential area for lowland rice (both irrigated and rainfed) is about 570,000 ha. Uganda therefore has the potential to meet her rice self-sufficiency, which requires about 200,000 ha of upland area and 92,000 ha of lowland area (MAAIF, 2022).

Over 90% of the rice in Uganda is produced by smallholder farmers with less than 2 acres of land in Eastern, Northern, and mid-Western parts of Uganda under rainfed conditions (Hong et al., 2021; Oonyu, 2011; MAAIF, 2019; MAAIF, 2020). In addition, over 80% of these farmers grow local lowland rice varieties in wetland ecologies since these ecologies have high moisture content throughout the growing season (Makosa, 2015; Nanfumba et al., 2013). About

48% of Uganda's total rice acreage is located in eastern Uganda, which contributes 67% to total output and has the highest yield. Production of rice in upland and rainfed lowland ecosystems can be characterized as occurring in a rice-based cropping system in which rice is the major crop, followed by cultivation of other crops during low rainfall or off-season periods (MAAIF, 2019).

The Agriculture Sector Strategic Plan (ASSP) 2015/16-2019/20 set out to increase rice productivity to 4.0 tons/ha, increase rice production to 680,000 tons of paddy, and to eliminate rice imports (MAAIF, 2019). Under the first National Rice Development Strategy (NRDS I), annual rice paddy production increased from 237,000 tons in 2014 to approximately 246,530 tons in 2018. Productivity increased from 2.49 t/ha to 2.53 t/ha in the same time period. The increase in production seemed to emanate mostly from the 3.4% increase in area under rice production, and the same period was characterized by an increase in the number of medium and large-scale farms to 18 and 3, respectively (UNRDS, 2009).

In July 2021, the Government of Uganda announced new measures to protect the environment. Among them was the immediate ban on rice cultivation in the rainfed lowland ecologies usually characterized by seasonal and permanent wetlands. The government is of the view that the affected rice farmers should be supported to engage in alternative livelihood activities such as fish farming.

The major objective of this study therefore is to understand the potential impacts of the ban on household income, food security and gender equity, and to propose win-win interventions for rice farmers and the environment. The study aims to answer the following research questions:

1. What is the likely impact of the ban on incomes of rice farming households?
2. What is the likely impact of the ban on household food and nutrition security?
3. What is the likely impact of the ban on gender equity and women empowerment?
4. How will the ban affect rice farmers' safety nets?
5. What alternative enterprises or sources of livelihoods can farmers feasibly undertake?
And what would they need to succeed in the new enterprises?
6. Which innovations can be adopted to ensure sustainable intensification and diversification, while preserving the valuable biodiversity and ecosystem services provided by lowlands?

Findings from this study will be informative to the ongoing debate on the merits and demerits of the ban. The study proposes interventions that minimize the negative impacts of the ban on rice farming households, while supporting the government's objective to protect the environment. The next sub-section presents information on Uganda's wetlands and the wetlands policy and sub-section 1.3 discusses rice cultivation in wetlands. Section two presents the study approach and methods used, and section three presents and discusses the study findings. Section four concludes the study with recommendations for minimizing the negative impacts of the ban on household welfare and for sustainable use of wetlands for rice cultivation with well-preserved biodiversity and ecosystem services.

1.2. Uganda's wetlands and wetlands policy

Uganda has a total area of 241,554.96 km². Open water bodies cover 37,495.81 km², wetlands cover 7,154.81 km², while land area is 196,906.34 km² (UBOS, 2019). Uganda's wetlands range from those fringing the equatorial lakes at an altitude of 1,134 meters above sea level to those in the Afromontane regions of Mt. Elgon and the Rwenzori range, which may be found as high as at 4,000 meters above sea level. This large wetland resource is explained by a climate of high rainfall and the general topography of the country (Aryamanya-Mugisha, 2011). In 1964, the total area under wetlands was estimated at 32,000 km² but by 1999, it had decreased to 30,000 km², or about 13% of the total area of Uganda and by 2005, the area under wetlands had reduced to 26,308 km², or 11% of total land area. A significant percentage of wetlands has therefore been converted to land for agriculture, industrial and related activities (Aryamanya-Mugisha, 2011; Kaggwa et al., 2009).

According to Glass (2007), wetlands management in Uganda has greatly changed depending on the regime in power. When president Museveni came to power in 1986, he placed a ban on large scale wetland drainage until a wetlands program was developed. The Museveni administration has continued to support wetland management and conservation and Uganda is a signatory to the international Ramsar Convention on Wetlands. The national wetlands programme was launched in 1989 and its first objective was to study Uganda's wetlands to generate scientific information to help form sound policy. In 1994, the national policy for the conservation and management of wetland resources was adopted by parliament. It was the second wetlands policy in the world and the first of its kind in Africa. The policy outlines thirteen specific stipulations:

1. No further drainage of wetlands
2. Ensure environmentally sound management of wetland resources
3. Ensure sustainable use of wetlands
4. Conserve wetlands by fully protecting certain wetlands and partially protecting other wetlands for research purposes
5. Ensure full protection of wetlands that provide water and treat effluent
6. Government ownership of wetlands for the people of Uganda; no leases to individuals
7. Recovery of certain previously drained wetlands
8. Ensure that environment impact assessment precede all developments in wetlands, and ensure monitoring throughout the development process
9. Develop public awareness
10. Carry out research and a full inventory of wetlands
11. Build capacity by training staff and developing a system of EIAs
12. Promote international actions and agreements
13. Enact wetlands legislation and create institutional arrangements

In addition, section 36(1) of the National Environment Act Cap. 153 provides for the restricted use of wetlands and prohibits the following activities unless with authorization of National Environment Management Authority (NEMA) in consultation with a lead agency:

- Reclamation or drainage of wetlands
- Construction and placement of any structure on the wetland
- Drilling or tunnelling in a manner that is likely to have adverse effects on the wetland
- Depositing any substance that is likely to have adverse effects on the wetland
- Introducing any toxic plant or animal in a wetland

Furthermore, the National Environment (Wetlands, Riverbanks and Lake Shores Management) Regulations S.I No. 3/2000 have been particularly put in place to protect wetlands from encroachment and to regulate activities in the wetlands. The principles for the management of wetlands under these regulations state that every landowner, occupier, or user who is adjacent or contiguous with a wetland has a duty to prevent the degradation or destruction of the wetland, and to maintain ecological and other functions of the wetland. The traditional uses of wetlands allowed under this regulation include:

- Harvesting of papyrus, medicinal plants, trees and reeds, any cultivation where the cultivated area is not more than 25% of the total area of the wetland

- Fishing using traps, spears and baskets or other method other than weirs (low head dams)
- Collection of water for domestic use and hunting subject to the provisions of the Wildlife Act, Cap. 200.

This Regulation, in the Second Schedule provides a list of regulated activities listed below, for which a permit granted by NEMA in consultation with the lead agencies is a prerequisite.

- Brick making
- Recreation activities such as spot fishing, maintenance of green spaces
- Cultivation
- Drainage
- Commercial exploitation of wetland resources
- Sewerage filtration
- Fishing using fish gear and weirs, fish farming and other aquaculture
- Construction of transport and communication facilities such as roads, railways, telephone lines
- Burning
- Any other exploitative activity which is of a commercial or trade nature, such as harvesting of papyrus for commercial purposes

1.3. Rice cultivation in wetlands

Rice is adapted to growing in swampy conditions and is sensitive to water stress (Balasubramanian et al., 2007). In addition, valley bottoms have high soil fertility and water availability levels compared to the surrounding uplands (Convention on Wetlands, 2022). Furthermore, double cropping in a year is possible using residual soil moisture (Buri et al., 2012; Yokouchi & Saito, 2017). Most rice fields are therefore placed in former natural wetlands and approximately 15% of the world's wetland area is rice farms. On average, rice yields are 3.8 t/ha in irrigated lowland, 2.6 t/ha in rainfed lowland, and 1.7 t/ha in rainfed upland on farmers' fields, while the potential yields (the maximum theoretical yield achieved by a specific crop genotype in a well-defined biophysical environment) are 8.8 t/ha in irrigated lowland, 7.9 t/ha in rainfed lowland, and 7.3 t/ha in rainfed upland. The yield gaps (difference between the potential yield, and the farmers' yields) are large in all rice-growing environments, indicating significant opportunities for improving rice production, and achieving rice-self-sufficiency (Dossou-Yovo et al., 2020). With a small investment in water control, rice production in the

rainfed lowlands is considered to have the highest potential for productivity growth in SSA (Miguel et al., 2015).

About 10% (205,000 km²) of Uganda's total land area is occupied by wetlands (Mafabi, 2018). Uganda is mainly an agrarian society with approximately 7 million households engaged in agricultural activities. This number represents 80% of the total households in the country. Due to an increase in population and the negative impacts of climate change in rainfed upland, farmers have encroached on wetlands in search for suitable agricultural land for rice cultivation. These waterlogged areas attracted little attention, being considered useless, and associated with water-borne diseases such as bilharzia (schistosomiasis - *Schistosoma haematobium* and *S. mansoni*), river blindness (onchocerciasis - *Wolbachia pipientis*), sleeping sickness (trypanosomiasis - *Trypanosoma brucei gambiense* and *T. brucei rhodesiense*) and malaria (e.g. *Plasmodium falciparum*, *P. malariae* and *P. ovale*) (Gbakima et al., 1994; Yapi et al., 2005) except to provide a few fish, and building materials in a country where good agricultural land was plentiful. This notion has apparently changed over the last 20 years as many unutilized wetlands (normally covered with papyrus) have been converted to lowland rice fields (Balasubramanian et al., 2007; Kijima et al., 2012).

Kaggwa et al (2009) reported that destruction of the wetland ecosystems was a serious environmental problem facing the country, and that about 20% of wetlands in eastern Uganda had been converted to cultivation of largely paddy rice. In addition, Aryamanya-Mugisha (2011) reported that by the year 2000, 64% and 68% of the total seasonal wetlands in Iganga and Pallisa districts, respectively, had been converted for rice cultivation. In Butaleja district, over 80% of the rice is cultivated in the Doho wetland. The wetland is an important ecological flood plain for River Manafwa from the highlands of Bugisu, before it empties into Lake Kyoga, and eventually River Nile (Oonyu, 2011; Otieno, 2014). Shortage of land in the densely populated districts of eastern Uganda forced people to cultivate rice and other crops in wetlands. In addition, rapid urbanization, and the current decline in the production of food crops such as millet, cassava, and bananas, have caused an increase in the demand for rice. Furthermore, rice is one of the few profitable cash crops that can be grown in the lowlands of the country (Kijima et al., 2012; Oonyu, 2011). The previous governments put in place certain policies that did favor agricultural development in wetlands. For instance, in the 1960s and 1970s, there were policies to double agricultural production, which encouraged cultivation of

paddy rice in swamps, e.g., the Doho, Kibimba and Olweny rice schemes, which contributed to the drainage of wetlands (Kaggwa et al., 2009).

The clearing of wetlands for rice has resulted in the loss of biodiversity and a number of ecosystem services (Aryamanya-Mugisha, 2011). Rice requires slightly more water to produce than other grains. Long-term flooding of rice fields cuts the soil off from atmospheric oxygen and causes anaerobic fermentation of organic matter in the soil. In addition, methane production from rice cultivation contributes approximately 1.5% of anthropogenic greenhouse gases. Using scenario analyses, Duku et al. (2016) and Danvi et al. (2018) showed that unplanned cropland expansion results in declining water resources and ecosystem services, which in turn affect lowlands productivity. According to Duku et al. (2016), streamflow in watershed could irrigate between 20,000 and 30,000 ha of rice fields in the dry season in upper Oueme watershed in Benin. However, much of the water availability is dependent on the conservation of the vast forest and woodlands, which loss could reduce the irrigation potential by 15,000 to 20,000 ha. Danvi et al. (2018) investigated the effects of rice intensification on water availability in inland valleys of Central Benin and reported that bund construction would increase water availability, while nitrogen application at the recommended level would have a limited effect. The above-mentioned studies showed that water resources provided in lowlands could be affected by rice expansion and intensification. Some of the consequences of lowlands degradation include changes in climate such as unreliable rainfall patterns, excessive heat due to long periods of drought, and flooding (Kim et al., 2016; Nyamadzawo et al., 2013; Otieno, 2014). The impacts of rice cultivation on lowland resources are the results of the poor water and crop management practices used by farmers. Most farmers remove rice straw from the field or burn it in situ instead of applying rice straw as mulch or incorporating it into the field, which would improve water infiltration, and groundwater recharge (Niang et al., 2017). Also, most of farmers do not use bunding, which would help store water in the fields, and increase water availability in the lowlands. Farmers do not often apply agro-forestry techniques, while this would contribute to soil carbon sequestration in rice fields.

Avoiding trade-offs between agricultural development and preservation of biodiversity and ecosystem services in wetlands is possible, provided that the value of different ecosystem services is properly assessed and integrated in landscape planning and decision-making processes, and farmers use sustainable cultivation practices (de Groot et al., 2010). Development should focus on wetlands with not only high agricultural production potential but

also high resilience to the degradation of natural resources combined with a (relatively) low value of other ecosystem services. For development to be sustainable, potential or existing conflicts between stakeholders should be avoided or resolved, in institutional settings such as multi-stakeholder platforms, where each stakeholder can express their interests and concerns and negotiate the best compromise. Of critical importance is to ensure wetlands development is led by representatives of the local stakeholders as the stakeholders are better placed to identify suitable sites and locations in the wetlands and to select and adapt infrastructure, technologies and practices suited to the environment and relevant to their needs.

Effective nutrient and water management, suitable land preparation options and crop management practices that reconcile sustainable intensification, and diversification with well-preserved biodiversity and ecosystem services are key factors for the effective and sustainable utilization of wetlands (Buri et al., 2012; Convention on Wetlands, 2022; Cunha et al., 2015; Machado & Maltchik, 2010). For instance, the Japan International Cooperation Agency (JICA) initiated a project on lowland rice production in eastern Uganda that provides training to rice farmers on better lowland rice cultivation practices (Kijima et al., 2012). The “Capitalizing the inland valley potential for food and nutrition security for smallholder farmers in West Africa (CIPA)” project funded by the International Fund for Agricultural Development (IFAD) developed innovations to ensure agricultural intensification while preserving biodiversity and ecosystem services in lowlands in Ghana and Cote d’Ivoire. Similar projects can be implemented in Uganda to improve the livelihoods of lowland-dependent communities and preserve the environment. Under the relevant resolutions adopted by contracting parties to the Convention on Wetlands on the wise use of wetlands, resolution 10.31 on enhancing biodiversity in rice paddies as wetland systems encouraged parties to promote the identification, recognition and protection of sustainable rice paddy farming practices that support wetland conservation objectives and provide ecosystem services.

2. Methods

Mixed methods involving quantitative and qualitative primary data were used to answer the research questions. Primary data was collected in November 2022 from focus group discussions (FGDs) with rice farmers in the three districts of Amuria, Soroti and Katakwi in eastern Uganda. The FGD tool captured, among other things, data on agricultural production activities and rice productivity during the cropping seasons for the last one year. The focus

group discussions ascertained whether or not farmers had been evicted, which could have made them unable to work during the previous farming seasons. The discussions also captured other challenges that farmers faced in the previous cropping seasons. Participants described involvement in work and decision making for men and women along the rice value chain. Activities included land preparation, planting, weeding, harvesting, and post-harvest handling. The research questions were answered as follows.

What is the likely impact of the ban on incomes of rice farming households?

The study considered two categories of household incomes, namely, income from rice enterprises (value of rice production in UGX per acre) and other income sources (other crop and animal enterprises and off-farm income). The value of crop production represents the sum of a household's crop production (including the amount consumed and sold). In addition, the study determined how many rice farming households, on average were located in the rainfed lowland ecologies. The study also determined the share of income from rice farming for women and men, and the likely difference in this share due to the ban. The study analyzed the effect of the ban at two levels: at household level and at individual level but disaggregated by gender of farmers.

What is the likely impact of the ban on food and nutrition security?

Since the participants were from the same village, it was assumed that they are generally homogeneous in terms of the composition of their food baskets. Where participants consumed some of the rice produced, we quantified and further determined the value of rice consumed. The study determined the food types purchased with money from rice farming. Participants were asked to mention alternative crops they could grow and how these crops would affect their food security.

What is the likely impact of the ban on gender equity and women empowerment?

The study determined if each gender category was getting a fair share of returns from rice production. This necessitated evaluating each gender's contribution to rice production in terms of labor (time) and finances. The study also determined if each gender category equitably gained from other farm enterprises and if they were likely to equitably gain from alternative enterprises.

The study further determined how the ban would affect intra-household decision making. What differences would exist in terms of ownership of production resources, decision making, education and other opportunities? Would the shift from rice farming affect these differences? The study drew insights from the Women Empowerment in Agriculture Index (WEAI) to understand the measures of women empowerment.

How will the ban affect rice farmers' safety nets?

The study determined what the ban on rice farming in wetlands meant for farmers' safety nets. Specifically, it sought to examine how the ban would affect the farmers' assets and social capital in form of, for instance, the economic and social activities that they undertake collectively.

What alternative enterprises or sources of livelihoods can farmers feasibly undertake? What would they need to succeed in the new enterprises?

The study probed for other agricultural and non-agricultural economic activities available in a given area that provided employment besides rice farming. Data was obtained on how much income was earned from these economic activities per season or month. Activities included fishing, poultry keeping, livestock keeping, trading, non-farm agribusinesses, brick laying, local brewing, bicycle riding, boda boda riding, tailoring, hair dressing and charcoal burning. Given the resources available to these farmers, the study asked for what new enterprises farmers could feasibly get involved in. The study found out what the farmers would need to be successful in these new activities. Needs included capital, loans, training and sensitization, government investment in processing plants, formation of farmer cooperatives and the like. The study used descriptive statistics to show available economic activities and how much could be earned from each.

3. Findings

3.1. Farmers' general perceptions

In the three districts, rice cultivation was the major income generating activity in the community. In particular, up to 80% of the population in Katakwi and Amuria districts and up to 90% of the population in Soroti district was involved in rice cultivation. This is consistent with findings by Asiimwe (2018), Diakite et al. (2012), Fungo et al. (2013), Hong et al. (2021),

Makosa (2015), Nanfumba et al. (2013) and Ntudhu (2018) who reported that involvement in rice farming is increasing in Uganda because of the crop's potential to double as an income source as well as a food security crop. Major crops grown in the study area after rice were maize, ground nuts and cassava. According to UBOS (2021), the most popular seasonal crops grown in Uganda are maize, beans, and cassava, with more than 50% of agricultural households involved in their cultivation. Statistics from UBOS (2021) further confirm that the majority of households (about 7 million or 80%) in Uganda cultivate land or rear livestock. But crop production is the most widespread agricultural activity, with 99% of agricultural households engaged in it.

Since the introduction of rice in 1904, Uganda has had production under different agro-ecological conditions covering rainfed upland conditions, rainfed lowland conditions and irrigated conditions (Lamo et al., 2017). However, over 80% of rice farmers in Uganda grow local lowland rice varieties in wetland ecologies (Nanfumba et al., 2013). Farmers in this study agreed that all (100%) rice farmers in Katakwi district and the majority (about 98%) of those in Soroti district grow rice in wetlands. However, farmers in Amuria district claimed that rice is grown on low lying land and not necessarily wetlands. They explained that:

“Amuria is a flat land where when it rains, some places flood. These places are then what we take advantage of to grow rice since other crops would be destroyed by the floods anyway.”

Farmers from the three districts have heard about the government's directive on wetlands through radios and local leaders, but they have not had an opportunity to express their views. For instance, a female farmer from Katakwi district said that:

“Rice cultivation is where we get income. And since we heard of this directive, we have been looking for whom to share our issues with and now we are glad to share with you. We tried going to the DISO and suggested that the president should come and see where we should go.”

Farmers in the three districts were concerned about the directive and said that their livelihood was at stake. One of the women in Soroti also stated that:

“It brings us pain because the RDC warned us last month not to continue using the wetlands. Rice cultivation is our major income generating activity in the district. Banning rice cultivation in wetlands will stop us from sending our children to the university because no other crop can fetch us up to UGX 2 million like rice does. We even wonder if we will be able to consume rice after the ban. Will the government start importing rice? If yes, then how much will it cost. We might leave the wetlands for a while after the ban but eventually, we will cultivate in them again and they will just have to kill or arrest us.”

Farmers in Katakwi district have mixed feelings about the government’s reason for the ban on rice cultivation in wetlands. Some believe it is valid and others do not. To the former, wetlands protect the environment, and provide water and animal feed. To the latter, however,

“Some farmers do not own any upland so they will have no way of survival without rice. In addition, farmers have not been given an alternative. Government should first of all relocate farmers on upland.”

They suggested that the government should only ban rice cultivation in big wetlands but let cultivation continue in the small ones.

In Amuria district, farmers are of the view that the government’s position is a selective policy. For instance, one opined that:

“The government is focusing on the poor farmers in villages but leaving the rich who have constructed buildings in the city wetlands, especially Kampala.”

In Katakwi district, no farmer had been evicted from a wetland yet. However, they had been given until the end of the year (2022) to harvest their crops after which no cultivation would continue in the wetlands. In Amuria district, residents had heard of people whose crops had been slashed by RDCs. In Soroti district, farmers had been evicted. Farmers reported that their ox ploughs had been confiscated, and RDCs had asked farmers not to use the wetlands beyond 2nd November 2022. It was also reported that some of the people evicted have been left with very small pieces of land with just their houses.

3.2. Potential impact on household income

The ability of small-scale farmers to earn a living income (income level sufficient to ensure a decent standard of living) is critical to ensuring their viability and economic success (Gneiting & Sonenshine, 2018; Rajindra & Irmawati, 2021). Cropping activities contribute on average 40% to the income of farming households (Mugisa et al., 2017; Nadja et al., 2021). Rice is mainly grown commercially by smallholders (Makosa, 2015). This is consistent with the results from our study where rice was reported as the major cash crop in the study area, and most of the crop produced is sold for income. For instance, up to 75% of rice harvested in Katakwi district and up to 85% of rice harvested in Amuria and Soroti districts is sold for income.

The total number of acres cultivated by a household in a year¹ ranges from 5-30 acres in Katakwi district, 2-8 acres in Amuria district and 1-10 acres in Soroti district as shown in Tables 1a, 1b and 1c. Average yield per acre for milled rice is 975 kgs for Katakwi district, 880 kgs for Amuria district and 720 kgs for Soroti district. Average prices of milled rice received by farmers are UGX 3,500/kg for Katakwi, 3,000/kg for Amuria districts, and 2,800/kg for Soroti district. Gross revenue per acre from the sale of milled rice amounts to UGX 2,555,000 for Katakwi, UGX 2,244,000 for Amuria, and UGX 1,713,000 for Soroti.

Table 1a: Crop productivity and income for Katakwi district

Crop	Minimum land planted in acres for all seasons/per year	Maximum land planted in acres for all seasons/per year	Average yield per acre (kg)	Quantity consumed (proportion)	Post-harvest loss (proportion)	Quantity sold (proportion)	Average price (UGX/kg)	Who mainly controls this income?
Rice	5	30	975	15%	10%	75%	3500	Men
Maize	4	40	2600	30%	10%	60%	2000	Both
G-nuts	4	20	1200	75%	15%	10%	4500	Women
Cassava	5	20	2500	70%	10%	20%	1000	Women

Source: Primary data from FGDs

Note: Rice and ground nuts are planted once a year, maize is planted twice a year while cassava is a perennial crop. Average yield and price for rice is in terms of milled rice.

¹ For instance, if a household plants 2 acres in the first season and 2 acres in the second season, the total would be 4 acres

Table 1b: Crop productivity and income for Amuria district

Crop	Minimum land planted in acres for all seasons/per year	Maximum land planted in acres for all seasons/per year	Average yield per acre (kg)	Quantity consumed (proportion)	Post-harvest loss (proportion)	Quantity sold (proportion)	Average price (UGX/kg)	Who mainly controls this income?
Rice	2	8	880	10%	5%	85%	3000	Men
G-nuts	1	6	1500	45%	10%	45%	4000	Both
Maize	2	6	300	70%	5%	25%	4500	Both
Cassava	0.5	1	350	80%	10%	10%	1000	Both

Source: Primary data from FGDs

Note: Rice and ground nuts are planted once a year, maize is planted twice a year, while cassava is a perennial crop. Average yield and price for rice is in terms of milled rice.

Table 1c: Crop productivity and income for Soroti district

Crop	Minimum land planted in acres for all seasons/per year	Maximum land planted in acres for all seasons/per year	Average yield per acre (kg)	Quantity consumed (proportion)	Post-harvest loss (proportion)	Quantity sold (proportion)	Average price (UGX/kg)	Who mainly controls this income?
Rice	1	10	720	5%	10%	85%	2800	Both
Cassava	1	5	3000	75%	5%	20%	1500	Both
Maize	0.25	2	400	50%	5%	45%	1000	Both
Groundnuts	0.5	3	150	75%	5%	20%	4500	Both

Source: Primary data from FGDs

Note: Rice and ground nuts are planted once a year, maize is planted twice a year while cassava is a perennial crop. Average yield and price for rice is in terms of milled rice.

Studies on the contribution of rice growing to household income in various parts of Uganda include Asimwe (2018) and Ntudhu (2018). They observed rice to be an important component of household income as it acts as collateral in accessing loans. Rice bi-products including rice straw, husk and bran are important in farm activities and are a source of revenue. Post-harvest and marketing activities such as threshing, drying, cleaning, milling, storage, and distribution provide employment to millions of people, and rice consumption from own production represents a substantial amount of household saving on food expenditures.

Table 2a: Other income sources for Katakwi district

Income source	Maximum amount of income (annual, UGX)	Minimum amount of income (UGX)	Average income in the past 12 months (UGX)	Who mainly controls this income?
Animal production	10,000,000	400,000	5,200,000	Men
Casual labor in rice fields	800,000	200,000	500,000	Both
Casual labor in other crops	200,000	100,000	150,000	Both
Off farm income (trading and other business)	10,000,000	5,000,000	7,500,000	Both

Source: Primary data from FGDs

Table 2b: Other income sources for Amuria district

Income source	Maximum amount of income (annual, UGX)	Minimum amount of income (UGX)	Average income in the past 12 months (UGX)	Who mainly controls this income?
Animal production	2,000,000	200,000	1,100,000	Men
Casual labor in rice fields	1,000,000	200,000	600,000	Both
Casual labor in other crops	300,000	200,000	250,000	Both
Off farm income (trading and other business)	2,000,000	500,000	1,250,000	Both

Source: Primary data from FGDs

Table 2c: Other income sources for Soroti district

Income source	Maximum amount of income (annual)	Minimum amount of income	Average income in the past 12 months in UGX	Who mainly controls this income?
Animal production	1,500,000	100,000	800,000	Men
Casual labor in rice fields	150,000	50,000	100,000	Both
Casual labor in other crops	30,000	10,000	20,000	Both
Off farm income (trading and other business)	5,000,000	600,000	2,800,000	Both

Source: Primary data from FGDs

Tables 2a, 2b and 2c summarize the data on other sources of income from Katakwi, Amuria and Soroti districts, respectively. In all the districts, animal production and off-farm activities appear to fetch large gross income relative to income from farm labor. Therefore, animal-related enterprises and off-farm activities could be the alternative sources of income to be supported, but this ultimately depends on the level of net income that accrues from them.

3.3. Potential impact on household food and nutrition security

In the three districts, participants mentioned that rice was very important for their food security. Rice growing supports food security among households in several ways. First, rice is an important source of calories. Although most of the rice is sold, a portion is usually spared for home consumption (Hong et al., 2021). For instance, 15%, 10%, and 5%, of rice harvested in Katakwi, Amuria and Soroti districts, respectively is consumed at home. In Uganda, rice consumption has changed from a ‘Christmas treat’ one generation ago, to one of Uganda’s staple food crops. Like other new staple crops, demand is driven by a combination of population growth, urbanization, changes in dietary preferences and its convenience in terms of preparation. Rice is visible throughout the country and in all segments of society. Rice is now also served in small rural kiosks. Whereas in the past, poor-quality rice with impurities was accepted, consumers are now demanding better quality clean rice (IFDC, 2018).

However, rice is consumed mostly outside its major production areas in Uganda, with over 90% of production marketed to urban areas and major institutions within the country (Lamo et al., 2017; Oonyu, 2011). For instance, in Katakwi district, farmers reported that most of the rice produced in villages was taken to urban areas, especially Kampala. They added that the working-class group were the largest consumers of rice in their community. In Amuria district, children, schools, institutions, and restaurants were the largest consumers of rice in the community. In Soroti district, women and children were the largest consumers of rice in the community. It was very common for community members to consume rice outside their homes for instance, at restaurants, parties, and workshops.

Second, income from rice farming contributes to household food and nutrition security as it enables households to meet their other food requirements from the market (Rajindra & Irmawati, 2021). This is especially the case for farmers from Soroti and Katakwi districts. Food items purchased with money earned from rice included mukene, beans, cabbage, tomatoes, cassava, sugar, cooking oil, meat, onions, salt, posho, cabbage and tomatoes. On the contrary, farmers from Amuria district reported that income from rice is not so important for their food needs. They explained that most of money from rice is used for school fees, investing in other businesses and developments. Nonetheless, farmers in all three districts agreed that the ban on rice cultivation would negatively affect their food and nutrition security and is likely to cause

other problems such as land insecurity and a decline in the performance of businesses such as restaurants that heavily depend on it.

Across the three districts, foods consumed along with rice do not differ and these include pasted ground nuts, beans, meat, eggs, chicken, and greens. In addition, foods consumed in place of rice included cassava, atapa, sweet potato and maize. Alternative food crops that can be grown in the place of rice include maize, millet, sorghum, green gram, cassava, ground nuts, simsim, sunflower and beans. There will be changes in local demand for, and hence the prices of these foods in the short run due to the ban.

3.4. Potential impact on gender equity and women empowerment

Women's empowerment is considered a 'prerequisite' to achieving global food security. This is so because women produce over 50% of the world's food and comprise about 43% of the agricultural labor force (Doss et al., 2018). Among household members, females devote on average more time to crop production activities than males – about 46 person-days per season compared to 36 person-days per season for males (UBOS, 2021). In addition, the means by which increased agricultural productivity brings about improvement in nutritional outcomes is affected by gender roles within households. In most rural households, the responsibility for the nutrition of household members, in general, and for the nutritional outcomes of children, in particular, falls on the mother. Intra-household resource allocation therefore has a considerable role to play in the kind of care women provide for their children and for the rest of the household (Akter et al., 2017; Yimer & Tadesse, 2015). Additionally, women invest as much as 10 times more of their earnings than men do in their family's well-being, in areas such as child health, education and nutrition. Women therefore represent an untapped opportunity for raising household income (Gneiting & Sonenshine, 2018).

Narayan (2002) and Solava & Sabina (2007) define empowerment as the capacity to translate choices into desired actions and outcomes given the opportunity structure within which one operates. Empowerment in agriculture is generally defined as one's ability to make decisions on matters related to agriculture as well as one's access to the material and social resources needed to carry out those decisions (Alkire et al., 2013). The Gender and Agriculture Research Network of CGIAR recommends two indicators to track and evaluate empowerment. The first is women's control over productive resources such as land, livestock, water, forests, common

property, seeds, fertilizers, machinery, financial assets, and the income from sales of crop, livestock, or forest products. The second is women’s decision-making power over time-use and income, and their decision-making power in groups and collective organizations.

The different dimensions of inequity, such as decision-making power over production and income from rice may vary independently across and within communities. In some communities, women may enjoy considerable decision-making power over production but are disempowered with respect to asset ownership, control over income, or community leadership. For instance, in Katakwi district, decision making and participation in rice production activities was majorly left for the women.

Tables 3a, 3b and 3c show that decision making in production and marketing activities and participation in the activities is split between men and women. In Katakwi and Amuria, input acquisition decisions are made by men, but both men and women make decisions regarding the marketing of rice. In Soroti, however, both gender groups make decisions in input acquisition and rice marketing. Unlike women in Katakwi and Amuria, their counterparts in Soroti have much more freedom to own land. This probably explains their greater level of empowerment in decision-making than that of women in Katakwi and Amuria. But by and large, the fact that women are able to make decisions in rice marketing and are at liberty to own land, albeit to different degrees, implies that the ban on rice cultivation in wetlands will undoubtedly disempower them. Not only will they be denied the “rice space” in which to exercise decision making, they will lose the income they need to purchase land and other assets. Alternative crop and livestock enterprises will be beneficial to women to the extent that the enterprises are profitable to them, and the women have control over the income generated.

Table 3a: Decision making in rice production in Katakwi district

Activity description	Who normally makes decisions concerning this activity	Who spends more time participating in this activity	With the ban, what will happen to the group that mostly does this activity? What does it mean if they can’t participate in this activity?
Purchasing seed and other inputs	Man	Woman	They will be idle and frustrated
Renting of land	Man	Man	Stressed
Land preparation	Man	None	Engage in alternative crops
Planting	Woman	Woman	Engage in alternative crops
Weeding	Woman	Woman	Engage in alternative crops
Harvesting	Woman	Woman	Engage in alternative crops

Processing	Woman	Woman	Engage in alternative crops
Marketing	Both	None	Engage in alternative crops

Source: Primary data from FGDs

Table 3b: Decision making in rice production in Amuria district

Activity description	Who normally makes decisions concerning this activity	Who spends more time participating in this activity	With the ban, what will happen to the group that mostly does this activity? What does it mean if they can't participate in this activity?
Purchasing seed and other inputs	Man	Man	They will be frustrated, and families will be broken
Renting of land	Man	Man	Engage in other crops
Land preparation	Man	None	Engage in alternative crops
Planting	Both	None	Engage in alternative crops
Weeding	Both	None	Engage in alternative crops
Harvesting	Both	None	Engage in alternative crops
Processing	Woman	None	Engage in alternative crops
Marketing	Both	Man	Engage in alternative crops but the turnover will never be the same

Source: Primary data from FGDs

Table 3c: Decision making in rice production in Soroti district

Activity description	Who normally makes decisions concerning this activity	Who spends more time participating in this activity	With the ban, what will happen to the group that mostly does this activity? What does it mean if they can't participate in this activity?
Purchasing seed and other inputs	Both	Man	Poverty, gambling, idleness
Renting of land	Both	Man	Gambling
Land preparation	Both	None	Engage in alternative crops and keeping animals
Planting	Both	None	Engage in alternative crops and keeping animals
Weeding	Both	None	Engage in alternative crops and keeping animals
Harvesting	Both	None	Engage in alternative crops and keeping animals
Processing	Both	Man	Engage in alternative crops and keeping animals
Marketing	Both	Man	Engage in alternative crops and keeping animals

Source: Primary data from FGDs

There are sources of credit in the study communities. These include village saving groups (St. Marys Aseluk saving group, Dokomer Abarataker saving group and Bada Yakasi saving group in Katakwi district, Ogwolo mot saving group, Alemasi Icaan womens group, Aminit youth group in Amuria district, and Alito mixed farmers group in Soroti district), money lenders, banks, farmer associations and cooperatives. FGD participants from the three districts reported that there are times when women need credit for, say, school fees, hospital bills, investing in agriculture and investing in other businesses. In fact, women borrow more frequently than men because they are trusted more than men to pay back. Therefore, another way the ban will disempower women is by reducing their ability to access credit by eroding their incomes.

3.5. Potential impact on farmers' safety nets

In all districts, the single most important private social safety net farmers have is their physical assets, especially livestock and land. Therefore, as expected, the ban will cause a decline in the stock of household assets as farmers will have to sell them to survive. Another private social safety net is formal and informal household savings, which will likely be depleted before selling the physical assets. At community level, social safety nets include farmer associations, savings groups, and other forms of self-help groups. The vibrancy of these groups generally depends on the overall health of the rural economy and the performance of commodity value chains if the groups are commodity-based. Undoubtedly, the ban will in the short run weaken the rural economy and domestic rice value chains in particular.

3.6. Alternative livelihoods and conditions for success

In rural areas, diversification of income sources is extremely important in order to minimize vulnerability to environmental and economic shocks. In addition, it is a key pathway to raising farmer incomes. Many farmers who rely on only on-farm income find it difficult to cover their household expenses. In the developing world, non-farm income accounts for 35% to 50% of rural household income. Diversification into non-farm income sources can represent another key income growth strategy since many small-scale farmers don't earn a living income from farming activities alone. Furthermore, for farmers who rely predominantly on a single export crop, fluctuations in price and productivity can have a major impact on their incomes. This is why as a general rule, better-off households have more diversified sources of income (Gneiting & Sonenshine, 2018; Hariyanto et al., 2021).

Table 4a: Existing alternative enterprises in Katakwi district

Agricultural enterprise	Annual income (UGX)	Non-farm enterprise	Annual income (UGX)
Maize	2,000,000	Retail shop (daily living items)	1,500,000
Cassava	850,000	Selling clothes	200,000
Beans	300,000	Brewing local beer	200,000
Green gram	200,000	Brick laying	800,000
Cowpeas	300,000	Papyrus mat making	200,000
Simsim	300,000		

Source: Primary data from FGDs

Table 4b: Existing alternative enterprises in Amuria district

Agricultural enterprise	Annual income (UGX)	Non-farm enterprise	Annual income (UGX)
Sunflower	300,000	Retail shop (daily living items)	2,000,000
Animal production	800,000	Charcoal burning	500,000
Soya	400,000	Brewing local beer	300,000
Horticulture	400,000	Boda boda taxi	1,000,000
Simsim	200,000	Bicycle taxi	600,000
		Papyrus mat making	200,000

Source: Primary data from FGDs

Table 4c: Existing alternative enterprises in Soroti district

Agricultural enterprise	Annual income (UGX)	Non-farm enterprise	Annual income (UGX)
Millet	320,000	Trading in agricultural produce	120,000
Beans	300,000	Boda boda taxi	500,000
Green gram	100,000	Brewing local beer	300,000
Sorghum	60,000	Bicycle taxi	400,000
Soya	200,000	Brick laying	900,000
Sweet potato	300,000	Hair dressing	300,000
Sunflower	300,000		

Source: Primary data from FGDs

Tables 4a, 4b and 4c summarize information on guesstimates of net incomes from alternative enterprises in Katakwi, Amuria and Soroti districts, respectively, that FGD participants believe they could undertake. In Katakwi district, the alternative enterprises with relatively high incomes are maize, cassava, retail shops and brick making. In Amuria district, retail shops, boda boda taxi and animal production are important. Dairy and beef production are of particular interest to rice farmers since some of them are already engaged in these enterprises. However, they would like to add value to their products. In Soroti district, farmers, especially male youth could enter into brick making and boda boda taxi. But the guesstimated net incomes from these enterprises appear to be much lower than income from rice. In order to succeed in the

alternative enterprise, farmers would like to be trained and sensitized, to have access to input and output markets including markets for services such as credit, and they would want the government to provide water dams and support agro-processing.

4. Conclusion and recommendations

Summary and conclusion

The study uses primary data from focus group discussions with rice farmers in three rice growing communities of eastern Uganda to understand the potential impacts of the ban on household income, food and nutrition security, gender equity and women empowerment, and household (private) and community social safety nets. It also examines farmers' knowledge of potential alternative enterprises that they could undertake in place of rice cultivation.

Generally, rice farmers are aware of the government's directive not to cultivate rice in wetlands. But they do not seem to have all the information regarding the directive and its enforcement. Currently, they perceive the ban as unnecessary, unjustified, and highly unfair to them. They need to be sensitized more about it and enlightened on its rationale. Based on the findings of this study, the ban will in the short run negatively impact the welfare of rice farmers located in the rainfed lowland ecology. It will cause a decline in their incomes, weaken their food and nutrition security, disenfranchise women, and erode their social safety nets. The most promising alternative economic activities in the farmers communities as perceived by the farmers in terms of income generation include maize production, cassava production, livestock production (beef, dairy and piggery), brick making and boda boda taxi services. However, none appears to match rice farming in terms of sustainable income generation and equitable employment of women. For instance, women are likely to remain excluded from participation in boda boda services and brick making.

Recommendations for sustainable rice cultivation in wetlands

It is often hypothesized that rice field expansion could be detrimental to the biodiversity and ecosystem services provided by wetlands. However, few studies have addressed this topic, and the results are mixed with some studies reporting more abundant and diverse biodiversity in reserve lakes compared to rice fields (e.g., Machado and Maltchik, 2010), and others a decrease in species richness and abundance after the abandonment of rice cultivation in wetlands (e.g.,

Koshida and Katayama, 2018). These contrasting results can be explained by differences in management practices. For example, maintaining the irrigation channels flooded during the rice growing season increases the abundance of aquatic species compared to the non-rice growing period (Maltchick et al., 2011). Allowing a fallow period after rice cultivation, and keeping it flooded enhances the species abundance and composition compared to fields without a fallow period, and non-agricultural wetlands (Cunha et al., 2015).

The Africa Rice Center is contributing to rice cultivation and the preservation of biodiversity and ecosystem services in wetlands using a three-level approach. One way is to set land for biodiversity and ecosystem services in wetlands through the identification of lands suitable for sustainable cropland expansion and lands suitable for biodiversity and ecosystem services preservation. The Center has developed and validated a tool that provides such information for inland valleys of the West African region with the location and area that needs to be developed to meet rice self-sufficiency and the area that can be preserved for biodiversity and ecosystem services (see Akpoti et al., 2020).

The second approach is through assessing the stakeholders' perceptions of biodiversity and ecosystem services and accounting for these in the wetland landscape development plan. The Center is developing a toolkit for landscape-level natural resources management and agricultural development in wetlands in Work Package 3 of the Transforming Agri-Food Systems in West and Central Africa (TAFS WCA) Initiative as an example.

Thirdly, the Center is developing and promoting the use of nature-based agronomic solutions in wetlands including integrated rice-fish farming, and the use of legumes and organic fertilizers to reduce the reliance on chemical fertilizers and pesticides that affect water quality and microorganisms.

The implementation of the above-mentioned innovations would ensure sustainable intensification and diversification in wetlands with well-preserved biodiversity and ecosystem services, which would benefit both the wetland-dependent communities and the environment. To assess sustainability improvements resulting from changes in farm practice including profitability, labor and land productivity, food safety, resource use efficiency, climate change mitigation, labor conditions, and women empowerment, the Center uses the Sustainable Rice Platform (SRP) Standard and Performance Indicators. The Standard defines a set of key

requirements with different levels of performance, allowing for a stepwise improvement and compliance process. Based on the results of the assessment, further interventions can be designed and implemented.

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