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Capacity Building for Efficient Utilization of Biomass for Bioenergy & Food Security in the GMS [TA7833-REG]

TECHNICAL REPORT:

Business Models for the Scaling-Up of Climate-Friendly Agricultural Value Chains in Cambodia, Lao PDR & Viet Nam

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KEY DATA

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ACRONYMS

ADB	Asian Development Bank
APP	Authority of Plant Protection (Vietnam)
AROS	Asian Regional Organic Standards
CBO	Community-based Organisation
CEDAC	Centre d'Etude et de Développement Agricole Cambodgien / Cambodian Center for Study and Development in Agriculture
CF	Climate-Friendly
CLV	Cambodia, Lao PDR, Viet Nam
COR	CEDAC's Organic Rice
CSF	Critical Success Factor
DARD	Department of Agriculture and Rural Development (Vietnam)
DPP	Department of Plant Protection
EMRIP	Enhanced Milled Rice Production
FBA	Farm Business Adviser
FDP	Fertilizer Deep Placement
GHG	Greenhouse Gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (German Development Cooperation)
HYV	High Yield Variety
IFOAM	International Federation of Organic Agriculture Movements
MARD	Ministry of Agriculture and Rural Development (Vietnam)
MFI	Micro Finance Institution
NGO	Non-Governmental Organisation
NPK	Nitrogen, Phosphorus, Potassium
PPP	Public Private Partnership
SRI	System for Rice Intensification
TA	Technical Assistance
USD	United States Dollars
VND	Vietnam Dong
WU	Women's Union

EXECUTIVE SUMMARY

The following report presents business models currently used in value chain programs with linkages to agriculture and biomass by CODESPA in Viet Nam, CEDAC and IDE in Cambodia and SNV in Laos. The models are described separately with their objectives, embedded services and their costs, key success factors, challenges and risks, exit strategy, up-scaling (or scaling-up) opportunities and priorities. The up-scaling of these models in CLV and their incorporation with the TA7833 pilot program for the use of biomass in climate friendly value chains[1] is discussed.

The four business models are briefly summarised below:

i. CODESPA Fertilizer Deep Placement (FDP) model: The CODESPA enterprise model adopts a value chain/supply chain approach based on building micro-enterprises to produce FDP pellets and promote their use by rice farmers in Vietnam. The model embeds the cost of FDP extension services into the product costs. Local partners such as the commune leaders and Women's Unions are used to promote the FDP products through demonstration visits and awareness raising. The model has achieved rapid uptake of FDP and is building local demand for FDP products from rice growers that achieve significant financial benefits from lower costs and higher gross margins while significant reductions in nitrogenous fertiliser is achieved with commensurate reduction in GHG emission and ground water pollution.

ii. SNV Enhanced Milled Rice Production (EMRIP) model: SNV worked with old mostly inefficient rice mills in Laos PDR to improve their processing and milling efficiency. As a requirement to gain access to improved milling capacity mills were required to build backward linkages for the provision of services, technology and finance to growers. As a consequence rice yields increased, rice quality improved and millers achieved higher throughput in addition to improved milling efficiency. Consequently producers increased output that increased mill throughput and profits and built linkages within the value chain and higher gross margins for producers, millers and suppliers. A more recent addition to the model is the need for rice agronomists to work with producers which replicates the strategy of the IDE–FBA model in Cambodia.

iii. IDE Farm Business Advisor (FBA) model: IDE in Cambodia identifies and then trains individual producers and / or entrepreneurs to be local Farm Business Advisors (FBA). The FBAs support a network of producers providing services and a supply chain of inputs to the producers in their network on a commercial relationship basis. Currently the FBA supply seeds, fertiliser pellets, tools, and equipment. The model is evolving as relationships with suppliers are built. These changes include the FBA buying machinery for the mechanisation of rice production and offering this machinery as a contracting service to producers resulting in a rapid mechanisation of rice production to address labour constraints. More recent innovation to the model includes aggregating outputs (paddy, vegetables) from farmers in their network that are then marketed in greater volume resulting in higher returns that are shared between the FBA and the producer. The model embeds the extension and marketing cost into the input costs including the operation and overhead costs of IDE. FBA viability remains marginal but has improved with (i) rapid growth in slow release deep placement fertiliser pellets, (ii) their involvement with machinery contracting and

[1] A value chain can be defined as a set of actors (public, private and community based organizations (CBOs) and business service providers) and the sequence of value-adding activities involved in bringing a product from production to the final consumer.

(iii) albeit on a limited more recent basis the marketing of outputs.

iv. CEDAC rural development program has four separate business models: a) SRI-Organic Producer Groups. CEDAC in Cambodia works with SRI rice farmers (100,000) to prepare them for conversion to organic status which can take up to three years. CEDAC embeds their extension service cost into product cost and paddy price; **b) Conversion to full certified organic rice:** Through their internal control system, CEDAC certifies farming systems that achieve organic rice standards as organic rice producers. To date 300 producers are certified organic. A target is to certify 10,000 by 2015; **c) Mill Cooperatives:** CEDAC set up mill cooperatives to work with district mills to produce certified brown rice which will be milled at central mills - 3 are planned.; **d) Social enterprise (SAHAKREAS) for market outlets:** To complete the value chains, CEDAC sell their brown rice and milled rice through a social enterprise (SAHAKREAS) which has local shops, wholesale and export markets. The CEDAC costs and margins are embedded the marketing/training cost into rice price premium.

Key lessons learned from these value chain business models are:

- **Incentivizing productivity and innovation:** Any models that can incentivize and reward producer productivity and innovation whilst minimizing the risks and optimizing returns to labour and land are sustainable.

- **SRI and organic agriculture** are powerful tools to help farmers increase their production as well as raise their standard of living. But their benefits are limited to field operations. Farming communities that lack technical knowledge with low productivity farming systems are characterised by poor communication and weak relationships within the village. With low productivity they lack the means to develop income generating activities. The introduction of innovative agricultural methods into the community can be the first step in strengthening mutual cooperation and spurring new businesses for securing food and energy access.

- **Access to safer food and better health:** SRI is not only profitable but can also lead to healthier life for the farmers who use less chemicals, lower costs and report lower health costs.

- **Embedding business, operation and overhead cost into product and service cost:** The models all demonstrate the ability to recover costs while sustaining the programs. An additional benefit is that these models enable scarce public funds to be reallocated to priority uses. This reduces the demand for public extension workers who are able to concentrate their limited resource on fewer often more disadvantaged producers.

- **Building long term relationship through trust, integrity and transparency:** Giving away knowledge will generate trust and can generate reciprocity return. These basics are often ignored or assumed. In CLV countries many instances persist where trust and sharing of information remains difficult to achieve stifling the emergence of, and benefits from developing value chains.

- **Identify early adopters and local champions:** Identifying and selecting the right entrepreneur with the energy and business acumen to start an enterprise and then expand their business is challenging. The models all highlight that the right champions make their

business succeed.

- **Taking the first small step and building confidence:** Experience and confidence in the transition to a market economy e.g. SRI, has increased solidarity within the community. CEDAC trainers introduced the methods to the community but support from neighbouring villagers was vital to continuing the success of the program.

- **Farmers take pride and gain confidence in what they do and will invest time and energy if they can see the benefit**

- **Partnering with Community-based Organisations (CBOs) to create demand to reduce demand and supply risks:** CBOs who are close to and understand the needs of the end users should be used to raise awareness and promote the products for market transformation. To be sustainable incentives must be given for their efforts.

- **Selecting the right entry point:** Selecting the right entry point is critical in ensuring that the specific business services are delivered at the right place in the right time to the right people at the competitive price.

- **Access to competitive start up credit/loan:** Having acquired the necessary knowledge and skills, it is important that these skills are put to good use to start up the business by accessing credit/loans with favourable interest rates and repayment terms.

- **Quality assurance and after sales services:** To develop sustainable business and credible supply chains, it is crucial that there is integrity and credibility in building up the brand of the products and services. Developing standards and labels is a way to do that.

- **Social marketing through word of mouth, field trials and demonstration visits:** On-farm trials are a good way to demonstrate the efficacy and benefits of the products and organising farm visits are effective ways to promote the products.

- **Identifying and mitigation business and market risks:** An ability to identify and find solutions to overcome the business and marketing risks are critical in the success of the business.

- **Clear exit strategy:** To ensure that the business model is sustainable beyond the pilot, a clear exit strategy may be needed to transfer the business services to the private sector.

- **Use government and public support for market intelligence and info:** In some cases, public support in marketing and extension services may be needed to compliment the private sector extension.

- **Reduce input cost through bulk purchase and efficient use:** Bulk order may help to reduce raw material cost and result in lower product cost.

- **Developing local service providers:** While farmers are the key actors in promoting sustainable agriculture methods, there are a number people who play important roles in supporting and facilitating the value chains. These include trainers, local authorities, market vendors and, for certified organic rice farmers, the internal inspectors. Programs need to

fully encompass these roles to achieve a sustainable program

Based on the findings from above, the following discuss the potential for these models to be scaled up and how these models could be of use to pilot climate friendly value chains.

A. CODESPA's Enterprise model

The CODESPA FDP model is currently being scaled up from district to provincial levels. Specifically the enterprise model could be used to up-scale the conversion of underutilized and aggregated biomass into compost made from crop residues, bioslurry, biochar, fortified with NPK and Tricoderma. The enterprise could collect the biomass/bioslurry from the participating farms.

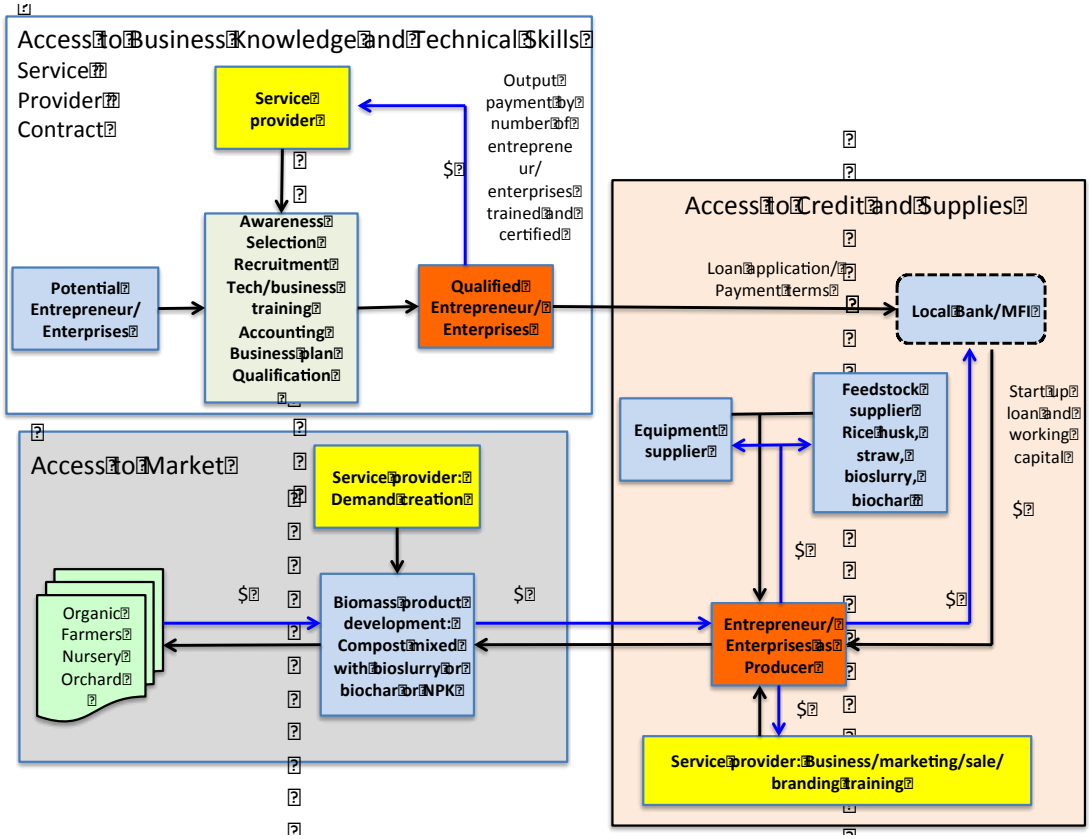
Enterprise vs. public project: The enterprise model creates new values and incentive for the private sector to participate in development of climate friendly value chains. This is a significant advantage compared to public funded projects which often are not sustainable beyond the pilot phase as they rely on subsidies which can distort the market and market prices.

The enterprise model (Figure 1) provides three important areas of access:

i. Access to Business knowledge and technical skills: The enterprise model could be used to produce compost for sale to organic vegetable and rice producers. The TA could help the government use service providers through an output-based contract to train new entrepreneurs or enterprises to produce compost made from organic waste, bioslurry and biochar. A retainer payment could be based on the number of new entrepreneurs trained and certified to produce compost. A bonus could be linked to the success of the business after 1 year based on sales volume.

ii. Access to credit and supplies: Once the enterprises have been trained and certified, they receive capacity building for business plan preparation that enables accessing credit from local bank/MFI. These loans are used as working capital to source for new equipment and machines (sprayer, pump, tanker, tools, liner) and raw material supplies (feedstock for compost). Other services such as marketing and branding skills could be procured from experts.

Figure 1: Enterprise model for climate friendly value chains



iii. Access to market: Once production has commenced, the products will be promoted and sold to producers groups. On-farm trials will be selected to demonstrate the efficacy and benefits of the products. Where needed, local women's groups could be engaged to raise awareness and promote the products with incentives based on number of orders. Once field proven, products can be certified and registered to support the emergence of long run supply chains. This will help to strengthen the national organic movement and assist in securing ongoing export markets.

B. IDE's FBA model

Being able to embed all their training, operation and overhead costs into the product and services cost has allowed the FBA model to be self-sustaining beyond the pilot. This private sector-led model could be used to develop more climate friendly (CF) and higher returning value chains in CLV. The training of the FBA could be sourced from a service provider as an output based contract similar to the modality used for the enterprise model in Figure 1. All types of compost and bio-fertiliser products could be produced by local enterprises or cooperatives and added to the FBA catalogue after some training on products. Most importantly the FBA model offers the public sector and donors the opportunity to develop and distribute technology, information and services to smallholders in a sustainable manner. Product development costs could be shared through public funding in recognition of the public goods that improved technology and products provide.

C. CEDAC certified organic rice model

CEDAC organic rice model could be used to develop climate friendly value chains and be

expanded to other provinces for meeting increasing demand for safe and organic rice and produce.

The challenge is in converting underutilized and aggregated biomass such as bioslurry and biochar into organic fertiliser to substitute inorganic fertiliser. The need for greater understanding on how to use biochar and how to formulate products to make these viable for a producer are critical knowledge gaps. Biochar from the gasifier of CEDAC mills could be collected to produce organic compost by the mill or as an enterprise business.

D. SNV EMRIP model

The EMRIP model involves improving the processing efficiency of the millers who also provide extension services, inputs on credit to their farmer clienteles. This model could be expanded to other mills in CLV who are keen to improve their milling efficiency. There are two models being promoted – one under SNV and the other under industry funding (e.g. Rabobank Foundation, Brewery investor). As similar to the enterprise modality, the training of the millers to provide extension services could be sourced from a service provider as an output based contract (Figure 1).

E. Other potential pilots that could be scaled up

i. Urban Waste Management for compost or bio-fertiliser development
COMPED in Cambodia is developing compost made from urban market wastes in Battambang - sold at USD 80 per ton with a production cost of USD 60 per ton. This provides a potentially strategic opportunity to use urban organic wastes to produce new compost and soil amendment products through the addition of bioslurry from its biodigester and biochar sourced from nearby rice mills. Other biocontrol agents such as Tricoderma could be added for the control of root rots mainly in fruit trees. Once proven the new products would offer higher returns that would justify improving the compost production technology and reduce composting times from 3-6 months to a shorter period.

ii. Specialised bio-fertiliser
Dr Kean Sophea in Cambodia is selling compost made from chicken manure, organic waste and 10% biochar supplemented with his own Tricoderma cultures. This specialised bio-fertiliser helps to control root rots in many fruit trees e.g. durian, mango, citrus.

A pilot could scale up this model by expanding the lab to produce better quality Tricoderma culture. Current production is 5,000 t per and an investment of USD 10,000 to expand the lab will produce 1,000 t per month.

iii. Small household kilns
A small gasifier kiln from Dr Chan Saruth in Cambodia could be installed at the small household mills to develop biochar from rice husk. This biochar could be sold to the compost enterprise or alternately linked as part of the compost enterprise.

iv. Medium and large millers
For mills where there is unused rice husk, a small gasifier could be used to dry the paddy with the rice husk ash and char used as soil amendment ingredients. Where there is ample biochar from the gasifier, new products could be developed.

Table 1: Business models and opportunities for scaling-up of climate friendly value chains in CLV

	CODESPA's FDP Micro-enterprise model	CEDAC Rural Development business models				SNV's EMRIP model	IDE's Farm Business Advisor model	Impact and outcomes
Objectives	• Develop micro-enterprises to produce FDP pellets for sale to farmers	• Prepare SRI rice farmers for conversion to organic status	• Certify SRI farming system as organic	• Develop District and Central Mills as Cooperatives	• Promote market outlets via social enterprise (SAHAKREAS)	• Develop millers to provide extension services to farmer clientele	• Train social entrepreneur as local Farm Business Advisor (FBA)	• Proven viable business model to create/capture value for producers to consumers • Generate new capital and business for local economy • Create financial, environmental and social capital and resilience • Expand to other opportunities and sector
Embedded Business Services and Cost	• Embed extension services cost into product costs • Smart use of local producers and Women's Union (WU) to optimize returns and minimize supply/production risks	• Embed extension cost into product cost and paddy price	• Embed extension/certification cost into product cost and paddy price	• Embed extension /certification cost into paddy price	• Embed marketing cost into rice price premium	• Embed savings from mill efficiency into extension services • Improved paddy and rice quality	• Embed extension and marketing cost into product costs • Embed overhead cost in margins from procurement/production and FBA sales	• Embedding operation and overhead costs into products and services ensure sustainability and replicability across sectors

Entry point for intervention	• WU sell FDP pellets to farmers produced by producers	• CEDAC extension staff and SRI producer group	• CEDAC extension staff and SRI producer group	• CEDAC extension staff and Miller Cooperatives	• SAHAKREAS to provide marketing/ sales training and market outlets	• Millers to provide extension services and farmers sell paddy to millers	• Local FBAs act as intermediaries between farmers and market	• Select entry points to meet local felt needs to give highest benefits whilst optimizing returns and minimizing supply/demand, business, marketing risks • Building long term, fair, trustworthy and equitable relationships ensure long term success for all
Role of NGO	• CODESPA staff to provide technical, business and marketing training to producers/WU/commune leaders/farmers • Organise on farm trials for demonstration visits • Source for quality inputs through bulk purchase	• CEDAC staff help to prepare SRI farmers for full conversion to IFOAM organic status	• CEDAC with GIZ support to provide technical, business and marketing training to SRI farmers • Train farmers using IFOAM organic standard	• Prepare and develop district paddy threshers and central millers to organic status	• SAHAKREAS to provide marketing/ sales training and market outlets • Educate consumers	• SNV to provide technical and business training for millers and farmers	• IDE to provide technical and business training for FBA to sell and buy from farmers	• Ability to foster a strong public private partnership to give the highest public and private goods • Identify and select loyal early adopters and local champions with business acumen and social responsibility • Act as facilitator to assist in user friendly training/product development/input quality control/bulk purchase/credit-loan access • Required a clear exit strategy

Roles of Farmers	• Form into collaborator group as part of a consortium • Early adopters provide on farm trails to serve as demonstration plot to raise awareness and generate buy in	• Form into SRI producers group for conversion to organic status (3 years) • Early adopter serves as on-farm demonstration plots	• Received technical/business training from CEDAC for organic certification for local and export market	• Farmers sell certified paddy to district mills at 25% premium	• Received marketing/ sales/certification training from SAHAKREAS	• Sell improved paddy to millers in exchange for extension services and inputs on credit	• Received technical/business training from agronomist and FBA • Develop on-farm demonstration plots • Buy inputs and sell outputs to FBA	• Farmers gaining confidence to switch from subsistence to market economy • Improving financial capital enable farmers to invest in farm mechanisation and innovate
Roles of Millers	• Farmers only sell to small household millers • Potential to help small household millers to improve milling efficiency • Potential to develop into larger cooperative mill	• District threshers buy paddy from SRI farmers to produce brown rice	• Millers buy certified paddy or brown rice from SRI farmers	• District mills to produce organic brown rice for milling in central mill	• SAHAKREAS provides marketing/ sales training to farmers and educate consumers	• Access to modern equipment and credit line • Miller to provide extension services and inputs for farmer on credit	• FBA will collect/buy or introduce farmers to millers	• Millers gaining confidence to invest in modern efficient technology • Improved profit from improved rice quality and capacity allows millers to build loyalty through trust, extension services and inputs on credit

Roles of CBO group	• WU work with local leaders to create demand for FDP pellets through site visits and awareness raising	• SRI farmers formed into local producers group	• SRI farmers formed into certified organic farmers	• Millers formed into cooperatives with farmers as shareholders	• Producers group promote and use SAHAKREAS as market outlets • SAHAKREAS provide consumer education	• Local farmers groups helping the millers to promote the model to recruit farmers	• Farmer groups support FBA to organise training/awareness raising	• How to generate strong buy in and support from CBO? • How to incentivise their promotional efforts?
Impact and outcomes	• 51 SMEs producing FDP pellets for sale to 110,000 households by WU • Fertilizer input reduced by 30% and yield increased by 23% • Improved income by 15% (VND 800,000 per crop person) and food security	• 100,000 trained as SRI farmers out of the 200,000 farmers in Cambodia	• 300 SRI farmers certified as organic for export status • Yield increased by 60% and income by 50-60% (USD 360/farmer/yr extra income) • 1,400 SRI farmers to be certified by end of 2013 • Target for 10,000 by 2015	• Develop 3 central mills as cooperatives with gasifier to provide electricity	• Operate local shops, wholesale and export market	• 21 mills improved milling recovery by 9% and throughput by 194% • Crop yield increased by 30-50% and income by 60% • 2 mills fitted with pyrolyser to dry paddy - ash sold for crop growth	• Farmer access to high quality inputs (HYV seeds, fertiliser, tools) and market • Enable double croppings in wet season (crop insurance) • 140 FBAs trained and certified and targeting 400 FBAs for the IFAD rice program • 30% of FBAs income come from sale of fertiliser pellets	• Farmers improve land and labour productivity through yield increase, input cost reduction, improved quality • Transition from entrepreneurship to business venture • Reduce environmental emissions and pollution

Key success factors	• Social marketing and quality assurance • Participatory product development • Improved land and labour productivity through improved yield and reduce input	• Access to extension services and high quality inputs	• Access to training, extension services and internal certification and marketing	• Access to sound mill management practices	• Access to good training and certification system	• Access to modern equipment and credit line • Miller to provide extension services and inputs for farmer on credit	• Access to good training and high quality inputs and support from field agronomist	• Access to business and technical training with access to credit/loans and supplies and market
Challenges and risks	• High staff turnover • Create loyalty and build trust and long term relationship with farmers • Can't afford FDP or loan defaults due to crop failures	• High staff turnover • Create loyalty and build trust and long term relationship with farmers	• High staff turnover • Create loyalty and build trust and long term relationship with farmers	• Competitive advantage to buy paddy • Competition from foreign millers • Create loyalty and build trust and long term relationship with farmers	• Unable to comply with IFOAM standard • Contamination of product	• Disloyal members and side selling • Loan defaults caused by crop failures • Access to competitive credit/loans	• High staff turnover • Create loyalty and build trust and long term relationship with farmers	• Create incentives to avoid high staff turnovers • How to win over non-participants? • How to insure against crop failures - micro insurance scheme? • How to reduce training/delivery/transaction/overhead cost? • Assist actors to access to competitive credit/loan

Exit strategy	• Train Women's Union/producers as Farm Business Advisor • Encourage fertiliser company as partner	• CEDAC will have to embed their operation and overhead costs into the input cost and paddy and rice cost	• CEDAC will have to embed their certification cost into the inputs cost and paddy and rice cost	• Millers will have to embed their cost paddy and rice cost	• CEDAC will have to recover their marketing cost from paddy and rice cost	• Rabobank provides loan to millers (14% interest rate) • Seed producers trained as Village Technicians • Beer Lao buy broken rice from millers	• There is no exit strategy as IDE will continue to recover their overhead cost from margins from fertiliser pellets production and FBA sales	• Transferability and scalability of the business to the private sector • Continual role of public finance to support market transformation and promotional efforts
Investment Cost	• USD 15 to 55 per new recruit of farmer						• USD 2,000 to train one FBA	• Leverage private sector resources to reduce public subsidy
Up-scaling potential	• Transition from micro-enterprise into larger business venture to wider coverage and scale • Expand from district to provincial level	• Certify 1,400 farmers by 2013 and 10,000 farmers by 2015 • Develop three mills as cooperatives	• Speed up conversion to organic status	• Set up mill cooperatives	• Speed up conversion to organic status to meet demand	• Expand to other provinces	• IDE is seeking to train and certify 400 FBAs for the IFAD rice program • Any proven products could be added to their catalogue after training	
***Improved Cook Stoves (ICS)**	• ICS could be promoted by WU members along with FDP pellets			• Rice husk from millers could be densified into briquette for ICS stoves.	• CEDAC outlets could sell ICS	• Rice husk from millers could be densified into briquettes for ICS stoves.	• Proven and certified ICS could be added to the FBA catalogue	• Improved health and reduce demand for non-renewable fuel wood and reduce black carbon emissions

***Biogas/bioslurry**	• The enterprise model could be used to establish a Youth enterprise or cooperatives to collect, produce and sale compost made from bioslurry/straw/biochar	• Compost made from bioslurry/biochar could be added as organic fertiliser	• Compost made from bioslurry/biochar could be added as organic fertiliser			• Proven bioslurry/biochar/Triconderma compost could be promoted by the millers to their farmers	• Proven bioslurry/biochar/Triconderma compost products could be added to the FBA catalogue	• Reduce input cost to improve farm income and reduc+P14e point source pollution and nutrient leaching
***Biochar**	• Biochar from rice husks/straw could be added to compost products above	• Biochar from rice husk/straw could be added to the compost products	• Biochar from rice husk/straw could be added to the compost products			• Biochar from millers with gasifier could be developed into soil amendment products for sale to farmers, nursery, fruit growers.	• Proven biochar/bioslurry and Tricoderma products could be added to the FBA catalogue	• Improve soil fertility and soil health

Up-scaling priorities	• Improve farmer income through input efficiency and reduction • Reduce labour cost through mechanization	• Access to competitive and certified compost and biofertiliser • Develop composting business as Youth Enterprise, Cooperative • Reduce labour cost through mechanization	• Access to competitive and certified compost and biofertiliser • Develop composting business as Youth Enterprise, Cooperative • Reduce labour cost through mechanization	• Ensure millers are certified	• Reduce certification and conversion cost	• Access to HYV seeds • Reduce input cost • Reduce labour cost through mechanization	• Develop suitable compost or bio-fertiliser to meet the needs of the farmers to improve profitability	• Develop viable business model
Financial modality	• Output based approach - payments by the number of pellet producers trained and developed and volume of FDP sold per year	• Output based approach - payments by the number of SRI farmers trained	• Output based approach - payments by the number of SRI farmers certified and volume of paddy or rice sold per year	• Output based approach - payments by the number of mills certified and volume of certified brown rice or rice sold per year	• Output based approach - payments by the volume of certified paddy or rice sold per year	• Output based approach - payments by the number of millers or village technicians trained and developed and volume of paddy or rice sold per year	• Output based approach - payments by the number of FBA trained and certified and volume of trade done per year	• Cost benefit analysis of input vs output based approach • Transaction and delivery cost • Compliance to ADB and national protocols • Mitigation of risks

1. BUSINESS MODEL: CODESPA'S FERTILIZER DEEP PLACEMENT

The NGO CODESPA operates only within Viet Nam where it applies a business enterprise approach to value chains that address poverty reduction and rural development needs.

1.1. BUSINESS MODEL

1.1.1. The value chain

The value chain is a supply chain for fertilizer inputs to producers that are adopting System of Rice Intensification (SRI) production principles. To date, the business model has been introduced and up-scaled within Tuyen Quang Province. CODESPA is currently planning a multi-province up-scaling program to start in 2014 for 5 provinces in the northern mountains region. For TA7833 the business model as currently applied has direct relevance to the climate friendly rice value chain model linked to SRI rice that the Government is prioritizing.

1.1.2. What part of the value chain is targeted

The program introduces improved technology and husbandry practice on the use of inorganic (nitrogenous and potassic fertilizers) for SRI rice production. Traditional fertilization practices involve the use of broadcast fertilizer techniques where loose granular fertilizers were broadcast by hand. The conventional rice production system involves up to 3 fertilizer applications with a basal dressing at sowing, and two broadcast dressings during successive plant growth. The program introduces SRI precision seeding techniques and deep placement fertilizer through awareness and demonstration techniques in addition to the business model targeting the sourcing, production and supply of nitrogen/potash slow release pellets to rice growers (Figure 2).

For CODESPA's FDP program, the value chain involves the production of fertilizer deep placement (FDP) pellets for sale to farmers by local entrepreneurs. The composition of pellets is inorganic fertilizer (Urea and Potash) pelletized under pressure to slow the speed of nutrient release. The nutrient concentrations have been formulated with the assistance of national science expertise.
The conventional fertilizer broadcasting has, over-time, seen increasing use of fertilizer as farmers seek to offset declining margins through yield increases. Further many farmers report experience of fertilizer tampering where bulk fertilizer suffers loss of integrity leading to farmers offsetting lower quality with higher application rates. Most growers currently lack the skills to match crop nutrient demand with fertilizer practice.

A consequence of increased fertilizer rates is that yields and quality are often depressed effectively reducing further the declining margin to growers. The excess fertilizer is exported (lost) from the farming system through transmission in surface water and through leaching into ground water systems. Such non-point pollution of waterways from increased nitrogen and phosphate levels is creating significant environment and associated health related risks.

CODESPA also works with DARD staff and women's unions to build awareness and provide training to build awareness and skills on the use of FDP. The primary focus is on building local enterprises/individuals for the production and distribution/sale of FDP pellets. These entrepreneurs once identified are supported to (i) build a business plan to access credit from which a pellet machine is purchased and (ii) access working capital for the initial purchase of raw materials. The entrepreneur's linkage to the farmers and women's unions and DARD programs for building

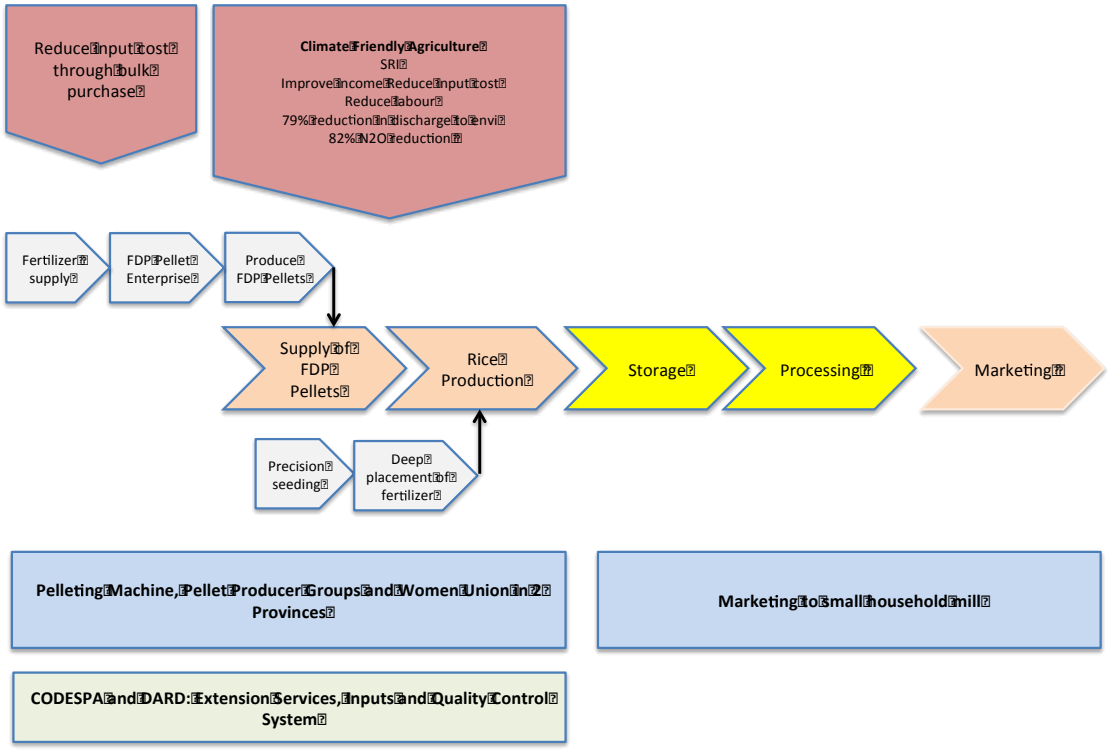
awareness programs provides an initial step in product sales. All products pricing is commercially based on a willingness to pay market price without subsidy. Further promotion and marketing capacity building services is supplied to the FDP producer to generate volume of turnover.

1.1.3. How is the value chain benefitting from the opportunity

Instead of broadcasting fertilizers that can cause huge losses and waste, FDP allows less fertilizer to be used, with deep placement of pellets supplying fertilizer to the root zone across the full growth cycle. This low input and precision farming system will reduce local pollution whilst reducing GHG emissions and reduces the carbon emissions from the farming system. The cost savings and improved efficiency is translated into higher yields and higher margins improving business resilience.

Within Tuyen Quang Province, the FDP SRI farmers have reduced fertilizer discharge to the ecosystem by 79% (an estimated 1,000 tonnes equivalent per crop), reduceed the nitrous oxide emissions from fertilizer by 82%, while increasing their yield on average by 23 percent (range from 12% to close to 30%).

Figure 2: FDP Value chains



1.1.4. Who Champions the Model

The model is championed at two levels. CODESPA field teams champion the improvement of rice production through DARD and the use of demonstration plots for precision seeding and FDP. Through building knowledge and awareness in DARD they have been able to move into farmer field schools linked to the demonstration areas as part of the Provincial DARD program. Extension of the program from demonstration plot to wider adoption is taken through a wider range of

promotion activities involving DARD and various community groups that use field days theatre to support the community awareness programs.

Once established the FDP producer champions the use of their product as would be expected of any commercial business. The promotion and marketing of products is perhaps the biggest differentiating factor between FDP producers with some taking passive approaches and others a far more wider reaching program involving distributors and resellers.

As local entrepreneurs start producing and marketing pellets they increasingly take responsibility for marketing and promoting FDP. At the commune level farmer and women's unions have worked to promote the benefits of FDP alongside DARD extension services while CODESPA creates the initial linkage between supplier and these programs.

Private sector stakeholders:

- **Producers of pelleting machines:** Machines are sourced from outside Tuyen Quang Province that are fabricated in Viet Nam.

  Producers of FDP pellets: Early adopters are identified and selected by the commune group. Selected individuals receive technical support to produce fertilizer pellets according to the CODESPA standard. These producers have access to start-up credit and access to business services for securing funding to purchase the machines. Increasingly the focus has shifted from entrepreneurial characteristics to business characteristics and the scale-target shifted from local to larger scale that can support more sustainable businesses.

  Pellet producers source fertilizer commercially through existing retail channels (urea and Potash) and then use the pelleting machine to produce compressed slow (slower) release pellets. Producers are trained in promotion and marketing activities – some have simply passed product through middlemen whilst other actively promote their products and FDP techniques using drama, field demonstrations and joining with DARD extension staff.

  Farmers as end users: Pioneer farmers who are keen to reduce their input cost and try out the FDP system will be grouped as collaborator group. These farms will serve as on-farm trials and used as demonstration plots to test the pros and cons of the technology. The challenge is how to win over non-participants in the commune. Experience in Tuyen Quang suggests that this occurs at highly variable rates, but the program has been able to upscale largely without ongoing input from the CODESPA team to the point where over 100,000 farmers in the Province have adopted and continue to use the FDP program. The ability to garner support from district and commune leaders is a critical factor in the up-scaling as both hold significant influence. Within Tuyen Quang the program has built strong grassroots support and demand with the FDP producers cooperating and seeking to expand their client base.
- **Financial institutions:** Credits and loans will be provided to promising social entrepreneurs and FDP producers. CODESPA staffs have worked closely with potential pellet machine buyers to support credit applications.

Public sector stakeholders:

- **Provincial and district planners**: These government officials help to develop local plans and budget for the promotion of the FDP system and there has been ongoing policy dialogue at the provincial level with limited impact. However, there is a significant level of FDP awareness and advocacy at the Provincial People Council and District People Council level.

- **District extension services**: In collaboration with CODESPA staff, to provide training and extension services to all value chain actors.

CBO stakeholders:

- Women's and Farmer's Unions are used to create demand for FDP to reduce demand risk and gain price advantage through bulk order

1.1.5. Market demand

i) Customers

FDP in Tuyen Quang province has demonstrated significant levels of demand in the farming community[2]. High levels of adoption have been achieved in a relatively short period of time. Transferability for up-scaling (extending) the technology is still significant in Tuyen Quang but also in neighbouring provinces with a similar rural economy.

Potentially all rice growers could apply the technology. However, reports from differing sources note that lowland irrigated rice producers face too much competition for their labour to manually place deep fertilizer pellets. Even within the SRI produced rice crops some doubt exists on the likely uptake of the technology, although we are unaware of actual attempts to implement the technology in these environments. The CODESPA team have found total labour requirement from the farmer to be similar between FDP and contemporary practice.

1.1.6. Strategic – marketing support, segmentation and market access

- No price subsidies are offered on the fertilizer product. Efforts are made to invest in supporting marketing for the purchase of products rather than subsidizing the supply side.
- Women's Union members are used to create awareness to increase demand to reduce FDP supply risks and contribute to policy dialogue through advocacy.
- It is critical to identify market segmentation so that targets are aimed for the right segment of the market (willingness to pay and readiness) and end users.

1.1.7. Operational Parameters

- The scale ranges from pellet machines producing from 7t/day up to over 20t/day
- Time to delivery from time of order - 14 days
- Shelf life of 1 month - this is for the CODESPA formulated product, similar product in Cambodia is far more stable.
- FDP comes in different packaging sizes (1, 5 and 10 kg bag), labelled, sealed and packed in plastic.
- Sales strategy and distribution network: In Yen Bai province the Women Union network was used to create demand and place orders and sell the FDP to farmers. In Tuyen Quang - a mix of unions and DARD Extension staff proved more effective. Existing rural household demand was matched with early supply of FDP, initially for application on terraces. Communication difficulties and resultant lack of coordination between the remote mountain villages and the pellet producers resulted in failure. A modified strategy building greater focus on the promotion of FDP by pellet producers, private intermediaries and distributors that recorded orders was far more successful. The impact was to increase certainty for the

[2] Similar demand growth is reported in Cambodia for the FBA / IDE slow release pellets

pellet producers with resultant increase in returns. The families receive FDP in their villages – using credit, cash, orders etc. but as they use less fertilizer the cost of fertilizer is significantly lower.

1.1.8. Quality assurance

- **Pellet production**: Each batch of FDP pellets are checked by local DARD and CODESPA staff to ensure compliance with agreed standards. Self and collective verification through peer pressure are fully encouraged.
- **Pellet use:** Agricultural extension agents and cultivation technicians work through SRI demonstrations and farmer field schools to build knowledge and skill levels. Key elements are to ensure all seedlings receive nutrients, that pellet placement in the root zone is followed, and timing of pellet application is optimal. This way the data for monitoring and evaluation of the sustainability of the market can also be collected.
- **User reaction and comment from monitoring:** The reaction of users has been positive with independent monitoring reporting a grower group saying "much more grain, more colourful, with less days of work and much less water pollution...without a doubt, the next harvest we will use FDP again."

1.1.9. Benefits

Private values:

- 110,000 households currently using FDP
- 51 small and medium enterprises produce and sell compacted fertilizers
- FDP has been applied in up to 40% of the cultivated land in the targeted areas
- Up to 500,000 people have achieved food security. Gains in food security – many households in Tuyen Quang remain at or slightly above the threshold of consumption poverty especially ethnic minorities. The increase in production provides a significant contribution to hunger reduction.
- Investment for producing 24 tonnes of pellets over a 3 years window totalled VNĐ 3.5 billion ($160,000).
- To date the impact includes 5 full time jobs (excluding the owner/investor), and margins for pellet producers of VNĐ 4,000 per kg (USD 0.2 per kg)
- Benefit cost ratio of 8:1 are reported but no systematic assessment has been completed
- Reduced fertilizer use - estimates indicate a 30% reduction
- Reduced seed costs – equivalent to SRI precision seeding
- Higher yields increased food security – on average 23% increase in yield for the adopters[3]
- Higher gross margins/profit levels from increased marketable surpluses – Tuyen Quang profit per household increased by VNĐ 800,000 per crop, an increase of 15% per person in addition to the gains in food security

Public values:

- Reduced fertilizer use leading to lower environmental pollution – reports estimate reductions of nonpoint pollution of 79%, equivalent to 1,000 tonnes of fertiliser per crop
- Lower greenhouse gas (mostly from reduced volitisation of nitrates) – by 82%
- Increased rural enterprise employment, livelihoods and wellbeing
- Impact highlights on FDP market development

[3] Note this appears to be a before and after assessment and does not include potential yield gains achieved under a without scenario.

1.2. POSSIBLE APPLICATION OF THE BUSINESS MODEL

It is proposed that the enterprise model could be integrated within the SRI / climate friendly rice program.

Linking the CODESPA approach to the national biogas program and use of bioslurry nutrients offers a potential opportunity. This would aim to maximize the financial return for farmers on their investment in a biodigester - by making optimal use of the bioslurry.

Moreover, by promoting the multiple benefits of bioslurry, the bioslurry programme serves as an important source of revenue and marketing instrument that can trigger uptake of biodigester technology among new clients.

Biodigester owners use bio-slurry:

- as organic fertilizer to enhance agricultural productivity.
- for animal feed production.
- as botanical pesticide.

Investment in the bioslurry programme would (i) offer biodigester owners greater income-generating opportunities; (ii) promote wide-spread awareness and use of organic fertilizer among smallholder farmers in CLV who would benefit from higher crop yields; and (iii) lead to greater uptake of biodigesters as a sustainable energy source.

1.2.1. Product or product mix

i) Group marketing and sales of liquid bioslurry

An enterprise could be formed that collects surplus liquid bioslurry from biodigester owners (e.g. using tractor with tanker sprayer) and markets the slurry (in its raw form) as organic fertilizer to other farmers. This is already happening informally with some biodigester owners who sell surplus bioslurry to their neighbours.

ii) Marketing and sales of bioslurry fertilizer products (fertilizer pellets/powder; compost; pesticide)

A variation of the above business model – and a step up the value chain - an enterprise could be formed that turns liquid bioslurry and biosludge into fertilizer pellets or powder after filtration. This would allow for easier transportation, packaging, distribution, and marketing – and as a more refined/standardised product would command a higher sales price. One pilot business of this sort supported by JICA exists in Cambodia. Machines for pellet production from CODESPA or IDE could be used.

Similarly, an enterprise could turn bioslurry into compost / buy compost from biodigester owners who use a compost hut. While this is less suited for packaging, marketing, and distribution to individual smallholder farmers, large-quantity supply contracts could be made with larger organic farms. Similarly, bioslurry could be packaged and marketed as an organic foliar feed or pesticide.

iii) Linking biodigester owners to organic growing groups

Applying bioslurry to their rice fields, farmers not only increase their crop yields (which allows for selling of surplus food crops – a step up from subsistence farming to cash crops), but can also

market their produce as ‘organic produce’ or even ‘climate-friendly rice’ and command a premium price for their produce. An enterprise could be linked to CEDAC’s organic rice model or IDE’s FBA model to monitor organic farming standards; certifies bioslurry farmers as ‘organic farmers’; buys crops; and markets crops under an organic/climate-friendly label to international markets.

iv) Marketing and sales of bioslurry-enhanced animal feed

An enterprise could be formed that buys surplus liquid bioslurry from farmers and uses it to produce and market animal feed for fish, ducks, pigs and chicken.

1.2.2. Accessing raw materials

The CODESPA network and approach would be retained for the purchase of fertilizer raw materials and also for the purchase /production of pellet machines.

1.2.3. Ownership model

The only possible deviation from the existing CODESPA model is to assess if the production of pellets could be moved to a larger (or even an existing) enterprise either with distribution or production capability. The opportunity to improve products for deep placement and to widely distribute and disseminate their benefits would benefit from the change. In areas where such enterprises are not available the current CODESPA small enterprise model is successful but may need greater scale to survive into the future.

1.2.4. Risks

Key issues relate to the labour or perceived labour requirement for FDP and its impact on:

- **Business risk:** lack of demand for FDP; high default on credit/loan caused by crop failures (drought, flooding, pest/diseases);
- **Marketing risks:**
  - proliferation of sub-standard products
  - inventory turnover needs to be fast if product wastage is to be minimized
  - Women’s Union unable to perform as promoter
- **Financing risks:**
  - new entrepreneurs often lack access to credits/loans – CODESPA now require significant equity for the machine purchase as a criteria for selecting entrepreneurs
  - farmer’s affordability for the purchase of pellets
  - farmer access to trade finance and the linkages to middlemen as input providers
  - high interest rates and
  - narrow product range creates risk

1.2.5. Readiness for commercial up-scaling

- **Technical Feasibility:** Proven technology that has applicability. Further development of pellet formulation suitable for improving productivity; development of second and third generation products. The use of the Cambodian pellet that is applied during the final cultivation to reduce labour inputs needs to be tested and demonstrated.
- **Regulatory Feasibility:** Standardization of products and product formulation with quality control systems limits the regulatory risk.

- **Market Feasibility:** price is not a constraint. Needs to be clearly demonstrated on irrigated rice in Red River Delta areas.
- **Financial Viability:** sustained profitability of the pellet machine and FDP producers; sustained land and labour productivity of the farmers; rewards for the WU members; local banks and MFIs ready to lend to various value chain actors.

1.3. CRITICAL SUCCESS FACTORS

1.3.1. Lessons

By January 2011, the project had reached nearly 40,000 farm households (25% of these being poor households), exceeding by ten times the target of 3,850, and a total of 133 small enterprises in Yen Bai had been created or strengthened, and were already participating in the supply chain. FDP has had a significant impact on rural poverty and food security, boosting farm income by USD 60-90 (VND 1.1M – 1.6M) in Yen Bai per year.

In terms of wealth creation and return on investment, the project has demonstrated very favourable gains in net income for farmers and service providers in the value chain, with a benefit-cost ratio of 7.77 and leveraging of 3.45. FDP contributed considerably to improving crop yields; farmers using FDP achieved the significant increase in their rice yield of 22.5%. Also FDP technology has had a positive effect on women, enabling them to increase farm income while also economizing labour time that can then be used productively for other income earning activities. Furthermore, FDP utilization has improved soil and water quality owing to the significant reduction in the use of fertilizers, pesticides, and herbicides, and the reduced levels of the runoff of urea and other chemicals into the water supply.

With regards to market sustainability there are grounds for optimism. Considering demand for FDP continues to grow in both project areas, there is evidence of a commercially viable FDP supply chain.

Best practices drawn from the project lie in the following areas:

- a pro-poor market-based approach;
- a commercial enterprise model of machine suppliers, FDP producers, distributor;
- rural social marketing strategy;
- a strong public private partnership;
- supply chain development with quality assurance;
- opportunity for establishing the provision of embedded business development services (BDS);
- strong monitoring and evaluation plan;
- sustainability with a clear exit point; and
- a strategy for scaling up.

Market functions, particularly in weak markets, take longer to establish. Experience from the FDP project to date suggests that despite encouraging signs of progress significant differences were achieved in two provinces. In Yen Bai FDP is not self-sustaining and some market functions, such as advertising and market promotion, may require continued support. The experience in Tuyen Quang Province is however different and far more favourable – something attributed to far greater effort in selecting entrepreneurs, and the building awareness and extension programs.

The farmers or members of women's unions act as farm business agents with a comparative advantage in relation to private sector entities, particularly in remote areas. The WU could provide a dual role being both the market facilitator and service provider. Over time the distribution and retail functions could be transferred back to private sector agents.

1.3.2. Potential for up-scaling

Up-scaling opportunity exists with all traditional rice production models. The irrigated rice labour constraint to SRI may be far less than expected due to the shorter maturity varieties grown to enable 2 to 3 crops. In Cambodia FDP pellets are incorporated at the final cultivation stage with considerable success. Such an approach would reduce overall labour as well as fertiliser use. The existing model could be applied in areas where labour is not such a tight constraint in areas away from the delta growing regions.

Why is it not up-scaling already? –

- FDP is still considered as an extensive low input technology suitable only for remote upland tribes that may not be appropriate for the lowland farmers. The lack of appropriate tools for placing the FDP and high labour requirement are viewed as a deterrent.
- A policy that promoted district and provincial gross output targets incentivized the use of increased inputs to maximize yields often at the expense of farmer margin and increasing debt burden
- Lack of facilitators will be a barrier.
- Investment cost in Tuyen Quang is between USD 15 to 55 per new recruit based on less than 40% adoption. If adoption uptake growth continues this falls rapidly as the investment cost is fixed and adoption continues to expand.

2. BUSINESS MODEL: HANOI SRI (3 DECREASES AND 3 INCREASES – '3D3I' MODEL)

With the support of the Authority of Plant Protection (APP), the National IPM Programme and the Department of Agriculture and Rural Development of Hanoi, the Sub Department of Plant Protection (DPP) of Hanoi have been conducting researches and applications of System of Rice Intensification (SRI) in Hanoi. On October 15th 2007, the Ministry of Agriculture and Rural Development (MARD) published the Decision No.3062/QĐ-BNN-KHCN to recognize "Application of integrated intensive cultivation system in rice production in several Northern provinces" as an innovative technique.

From 2006 till now, in executing the Instruction No.24/2006/CT-BNN, dated July 04th 2006 by MARD, DPP in Hanoi has been implementing the "3 decreases & 3 increases" programme in rice production where SRI is recognised as part of the technical solution.

2.1. OBJECTIVES OF THE 3D3I PROGRAMME

The objectives are to improve farm gross margin via:

- 3 decreases to reduce cost of production through:
  - Reduction in the amount of seeds used (decreased by 72.7% from 55 kg/ha to 15 kg/ha).
  - Reduction in the amount of chemical used (nitrate fertilizers use decreased by 30% from 190 kg/ha to 135 kg/ha) and pesticides.
  - Reduction in the amount of water used.
- 3 increases to improve farm gross margin through:
  - Increase rice yield by 10% to 12% (approximately extra 560-680 kg/ha of SRI paddy when compared to the traditional practices).
  - Increasing farm income by 36% to 43% (household income increase by 5.6-8.2 million VND/ha in comparison with the traditional practices).
  - Increase in land and labour productivity

SRI is a set of effective, eco-friendly rice farming practices proven to increase crop productivity, while at the same time reducing inputs such as seed, water, fertilizer and pesticides. Though effective, SRI represents a radical break from traditional farming practices in most rice-growing regions, and requires effective education and awareness building among farmers before it can be implemented successfully. When adopted, though, SRI can bring dramatic improvements to the livelihoods of rural communities.

Over the past year, three program partners, Oxfam Quebec, the Plant Protection Department (DPP), and the Centre for Sustainable Rural Development, have, with funding from Oxfam America, worked to develop a collaborative initiative that aims to support small-scale rice farmers through SRI implementation. The initial implementation of the SRI program in Vietnam took place in 12 communes, distributed among six provinces: Ha Tay, Yen Bai, Phu Tho, Thai Nguyen, Nghe An and Ha Tinh. This initiative is part of Oxfam America's broader Livelihood and Income Security program in the Mekong Sub-region (including Cambodia, Laos, and Vietnam).

2.2. VALUE CHAIN OPPORTUNITIES

SRI farmers are organized into production or Farmer Field School groups to apply SRI best practices. Cost savings are achieved via: reduced seed cost, reduced fertiliser inputs and greater yield. But high labour inputs in weeding and water management can be a deterrent.

- Farmers who use SRI transplant seedlings earlier in un-flooded soils and space them individually in square patterns farther apart to reduce competition for light, water, and nutrients. Soils are kept moist rather than continuously flooded. These allow the rice plants to grow stronger resilient root system with more tillers to resist lodging and strong winds.
- 70-75% reduction in seeds used because fewer seedlings (1 or 2 seedlings instead of 5-6 seedlings per hill) are used. Some farmers are still puzzled as to how fewer seedlings with less artificial fertilizer and water could yield more harvest and income. For example, one farmer has compared 1 traditional variety and 2 high yield varieties under SRI and found that HYV Quu has 324 rice grains per tillers; traditional variety Khang Dan has only 282 rice per tiller with smaller rice size and HYV AS9 produces 312 rice per tiller. She concluded that HYV Quu is the best for her rice field and she will use this variety for next crop seasons.
- 20-50% reduction in water use as the water is taken out of the fields 3 – 4 times during the growing cycle to allow better aeration and root development. This aerobic condition will reduce methane emissions and GHG emissions from reduced use of inorganic fertilizer.
- Reduction of fertilizer and pesticides because plants are healthier and less receptive to diseases.
- 13 – 29% increase in yields. Vietnamese farmers reported incremental profits of between 1.8 to 3.5 million VND ($95-$184) per hectare per crop when using SRI. The combination of cost savings and increased yield has increased the average farmer income.
- Grain quality is reportedly increased and plants are less vulnerable to lodging due to wind.
- Farmers are less exposed to hazardous chemicals.
- Some farmers have testified that less time was spent on weeding and transplanting (10-15 days instead of 1 month). This saving has allowed more time to do other work such as raising livestock or growing vegetables. Many women in the community have benefited from the extra time to be sellers at the market. Many men have been able to supplement their income with additional work in construction.
- By improving nutrient use efficiency, farmers reduce the use of water, fertilizers, herbicide and pesticide, resulting in reduced emissions of methane, one of the most prevalent and dangerous greenhouse gases.
- Farmers also reported positive change in community relations as a result of using these techniques. SRI farmers—most of them are women—learn together and help each other in the fields. This practice has created a culture of mutual support in rural communities.
- Oxfam has been supporting organizations promoting SRI in Vietnam since 2006, working closely with officials of the Plant Protection Department. Because farmers who try SRI see results almost immediately, the number of SRI farmers increased five-fold from 2009 to 1.3 million in 2012.
- The project not only promotes SRI adoption, but also conducts other activities like producing organic composting to improve organic matter in the soil.
- SRI training: Plant Protection Department of Hanoi in partnership with Oxfam and Centre for Sustainable Development, has achieved the following outcomes:
    - Organizing training workshops: 6 classes for commune plant protection technicians and officials (Ba Vì district: 2 classes for 60 members, ỨngHòa district: 2 classes for 60

members, Thanh Oai district: 1 class for 30 members, PhúXuyên district: 1 class for 30 members).
  - Organizing training for farmers: 334 classes with 10,020 farmers participated.
- Scaling up of SRI models: 120 models were implemented with 43 models operated at the 2-4 hectares scale; 10 models at 10 hectares scale; 67 models at 50 hectares scale, involving 16,050 farmers.
- The 3d3i Programme has been increasing every harvest. In spring harvest 2013, SRI planting has reached 51,350 ha with 1.3 million farmers, where 10,050 ha used the full 5 SRI principles, whilst 41,300 ha only practice 2, 3 to 4 principles.
- For the harvest in 2010, DPP has applied SRI on a local yellow sticky rice variety and achieved good results. Average productivity reached to 4.7 ton/ha, an increase of 1.2 ton/ha compared to the traditional practices of cultivation based on the use of improved rice seeds and quality.

2.3. SCOPE OF THE MODEL

Oxfam and DPP facilitators provide advisory services and training to SRI farmers and purchase inputs (fertilizers, seeds, tools) at dedicated outlets.

2.4. ENTRY POINT

For entry to new areas, in collaboration with Oxfam, DARD and DPP facilitators enter the village, review potential agronomic improvements and identify interested farmers. Facilitators discuss trials with farmers and run trials on farmers' fields as demonstration of the SRI technology. Facilitators meet regularly to exchange information, ideas and share experiences. Farm visits are organised to promote the SRI technology and find innovative means to apply the full 5 SRI principles.

2.5. KEY SUCCESS FACTORS

Best practices drawn from the project are: i) SRI farmers experience benefits of increased gross margin derived from higher productivity and cost savings; ii) using SRI facilitators as entry point to build long term trust, loyalty and relationship with farmers; iii) a market-based approach; iii) supply chain development; iv) embedded business development services (BDS); v) self-sustaining private sector model where margins were derived from product and sales of services.

2.6. CHALLENGES FACED

- How to scale up SRI nationally and to cover larger group and area (50 ha plots) to optimize economy of scale for the aggregation of strong and resilient plants to avoid pockets of weak plants which are pre-disposed to infestation.
- How to optimize land and labor productivity? The balance between time, labour availability and practicing the full 5 principles – e.g. a farmer has 7 sao of rice land, but SRI is adopted fully on 3 sao, and 4 other sao is adopted SRI partly with herbicide/weedicide spray due to lack of labor. He and his wife did weeding by hand and weeder. Weeding on each sao took him one working day. Weeding should be done exactly on 15th day after rice transplanting. Weeding is also be done on 30th day. Due to shortage time, he could do weeding on only 3 sao. He said that weedicide spray has negative impact on rice growing. Flood irrigation makes it more difficult to apply the full 5 principles.

- Some farmers prefer to apply direct seeding to save time. Some consider that direct seedling makes rice stronger than transplanting, but propose to have direct seeding with good spacing. This makes rice healthier and easy to do the weeding.
- How to increase organic matter of the soil to sustain the fertility and yield and replace inorganic with organic fertilizer?
- What biomass sources are suitable and available and aggregated as alternative organic fertilizer? How could biochar be used to improve soil conditions?
- What roles can mechanisation play in weeding and transplanting?
- How to manage the irrigation water delivery timing and amounts as a group?
- How to certify the SRI as climate friendly rice nationally and regionally?
- How to recruit new SRI farmers and local farmers to train others? These local experts could form a core of SRI champions and proponents and form Farmer Field Schools that start demonstration plots and promot the techniques.

2.7. INVESTMENT MODALITY

Service Providers could be paid on the numbers of SRI trained and certified as organic producers. Further payments could also be based on volume of paddy produced or sold.

2.8. OPPORTUNITIES FOR UP-SCALING

The SRI model could be expanded to other districts and provinces. Aggregation of SRI farmers over larger areas (30 to 50 ha plots) would optimize economy of scale. Biomass such as bioslurry/biochar/biofertiliser/compost/Tricoderma compost could be added as organic fertiliser.

2.9. SRI PRINCIPLES, PRACTICES AND EXPERIENCES IN CAMBODIA

Lessons can also be drawn from experience in Cambodia.

SRI offers an alternative approach to rice production, emphasizing sustainable practices with more efficient use of resources that farmers already have access to. The 'intensification' is not for purchased inputs but for knowledge and skills that improve the management of rice seeds, plants, soil, water and nutrients.

The benefits of SRI for farmers in Cambodia - data from several evaluation studies are presented as follows:

- Data from 120 farmers who by 2003 had used SRI methods for three years showed that with SRI methods, rice yields were on average 2.75 t/ha – double what they produced with conventional methods, 1.34 t/ha. Since their costs of production were lower, their net income from rice increased from around 58 $US per ha to 172 $US per ha, a tripling of income.
- An evaluation study conducted by GTZ in 2004 showed an average increase in yield of 660 kg/ha, or 41% (from 1,629 kg/ha to 2289 kg/ha), while gross profits per hectare went from $US 120/ha with conventional methods to $US 209/ha with SRI methods, an increase of $US 89 or 74%. This consisted of a $US 23/ha saving in variable costs such as seeds and mineral fertilizer, and an increase of $US 66 in the income coming from higher yield. These farmers included many first-year SRI users who had not yet mastered the methods so results were not as good as for farmers who had multi-year experience.

- In early 2007, the CEDAC team interviewed 2,304 farm households that had been cooperating with CEDAC for more than 3 years. Results show that 70% of them were practicing SRI methods. Among the SRI users, 25% were able to successfully apply SRI ideas in most or all of their plots. On average, their total household rice production had increased by around 110 percent. The amount of fertilizers that they used had been reduced by more than 50%, and the amount of seeds was reduced by 70-80%. Also, 13% of farmers interviewed have stopped using pesticides, and 7% have stopped using chemical fertilizers on rice and other crops.

3. BUSINESS MODEL: CEDAC'S ORGANIC RICE (COR) VALUE CHAIN MODELS

For more than 15 years, Centre d'Etude et de Développement Agricole Cambodgien / Cambodian Center for Study and Development in Agriculture (CEDAC) has been working to build the capacity and knowledge of rural farmers in ecologically-sound agriculture. Founded in August 1997, CEDAC is recognized for its farmer-led extension services, agricultural innovation trainings, support for farmer organizations and publications.

As of 2013, CEDAC employs over 200 people, including 49 women, 170 technical staff members and 35 administration/support staff members. The organization currently provides direct assistance to about 150,000 families from 6,179 villages, 953 communes and 131 districts in 22 provinces of Cambodia.

Since its inception, CEDAC has implemented more than 165 community development projects with funding support from over 40 institutional, international and private donors. Key development indicators include:

- Improved health conditions (improved food, nutrition and sanitation)
- Development of collective action and mutual cooperation among farmers and stakeholder
- Improved income and saving capital
- Improved management of natural resources and environment
- Improved participation in local governance
- Convert SRI farmers into certified organic rice producers for local and export market.

3.1. BACKGROUND

3.1.1. Proposed business opportunity

The model is a rice production model, with certification, processing and export linkages.

From July 9-10, 2013, CEDAC with funding support from GIZ organized the Organic Rice Producer Confederation Assembly of Cambodia at its head office in Phnom Penh. 50 organic rice farmers from Takeo, Kampong Speu, Kampong Chnang, Prey Veng and Kampot provinces attended the assembly. The main objectives of the assembly were to prepare the 2013-2014 organic rice production plan and strengthen the quality of rice production to meet export market standards.

During the assembly, some key presentations were delivered on topics including: organic rice production plan, the preparation of an Internal Control System, the monitoring and certification process, and the potential of organic rice market.

According to the plan, for this year 2013-2014, the organic rice farmer producer groups commit to producing 5,000 tons of organic rice to supply to the local market and another 1,500 tons of certified organic rice to supply to the export market.

To date, about 300 farmer households in three provinces (Takeo, Kampong Speu and Kampong Chnange) have been certified by the international certification bodies BCS Öko-Garantie GmbH and Trade Sustainability Alliance (FairTSA). The future target number of farmers participating is 10,000 by 2015 with 600 certified to export in 2014, and 1,400 in 2015.

3.1.2. What part of the value chain is targeted

The business seeks to develop, train and certify SRI farmers as organic rice farmer (using the IFOAM Standard). Producers are organized into SRI Producers Groups. CEDAC provides both the extension services and the administration of the certification system to the farmers. The farmers sell their certified paddy to SAHAKREAS, CEDAC's social business enterprise, with the paddy price set on a per district basis where the prevailing district price is agreed and a set premium offered to the certified farmers. The producer price is not derived from market realization or the market premium but is a premium over and above local rice market prices.

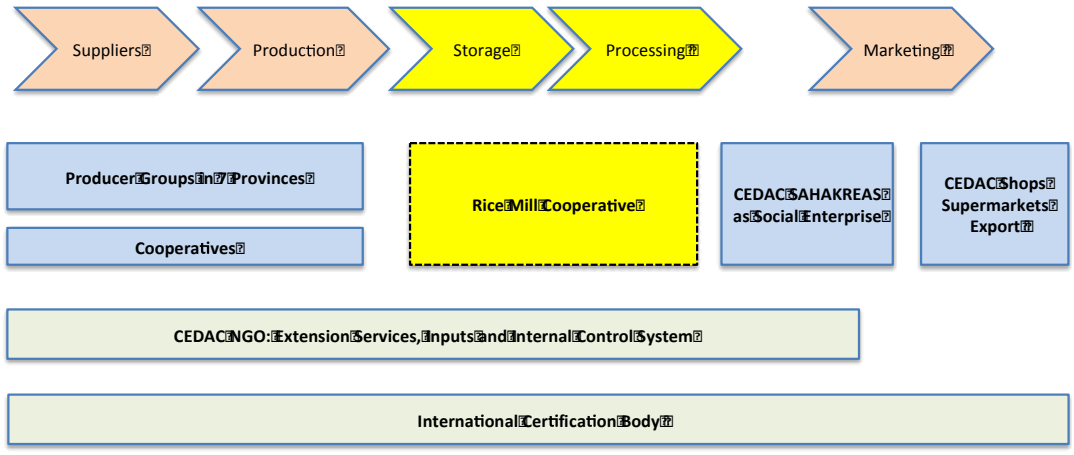
The paddy is currently milled in a single site that is also certified, however it is envisaged that district level mills will supply brown rice to a central mill for final milling into a final product. The ownership of these district mills is not clearly established although the intent is for them to be owned by rice producers possibly through a cooperative model. CEDAC SAHAKREAS will market the certified rice through their local retail shops, supermarkets or international export market.
As part of the market linkage CEDAC embed the provision of high quality inputs on credit, and provide technical, business, and certification services.

3.1.3. How is the value chain benefitting from the opportunity

The organic rice value chain seeks both upstream and backward linkages to increase the value of rice to the farmer while also providing a margin for CEDAC services. In essence farmers are supported in growing high quality crops with higher margins with a coordinated market linkage to niche overseas markets.

Historically farm production was promoted on the basis of increased inputs supporting increased crop yields as extension messages. Many of these provided no increase in farmer margins.

Figure 3: CEDAC organic rice value chains



3.1.4. Who Champions the Model

CEDAC champions the model with institutional support from a GIZ advisor. At the commune level Producers Groups work with CEDAC to promote the benefits of this model while district extension services promoted it as part of the public extension program.

Private sector stakeholders:

- **Producers Group:** There are several types of producers at different stage of development: i) new recruits into the SRI program; ii) producers which are not yet certified; iii) producers who are certified as organic for local market; iv) producers certified for export
- **Rice Millers:** CEDAC works closely with millers to improve processing and milling efficiency and is currently developing a milling capability to support its growers.
- **CEDAC and SAHAKREAS:** CEDAC staff provides technical and business training and certification support for the farmers and millers as well as to source for inputs through bulk purchase. SAHAKREAS offers retail shops, wholesale/distribution and export networks and consumer education.
- **GIZ Staff:** GIZ provide technical assistance in rice marketing and certification for CEDAC staff and the wider rice program.

Public sector stakeholders:

- **District extension services**: In collaboration with CEDAC COR staff, district extension staffs also provide training and extension services to SRI farmers on agricultural best practices.

3.2. CURRENT STATUS OF THE OPPORTUNITY IN THE VALUE CHAIN

3.2.1. Value addition

i) Private values:

- Improved land and labour productivity through high quality affordable seeds and reduced fertilizer use (50-70% reduction). Farmers earn at least 200-400 riel ($0.05-0.10 USD) more per kilo of paddy; reduced input expenses to about 250,000 riel annually, down from 500,000 riel ($62.50-125 USD) before adopting SRI; yields have also risen, to around 1.9 tons from 1.4 (2.5-1.9 tons per hectare) compared to conventional techniques.
- Higher yields increased food security and farmers crop yields increased by 60% (1.5 to 2.5-3 t/ha) and income from rice increased (due to yields and higher premium) by at least 50-60% (USD 360 extra income per household per year).
- Higher gross margins/profit levels from increased marketable surplus.
- Best practices in organic rice husbandry and efficient milling processes.
- Improved health from less chemical use.
- Building strong social capital – producers group working together to improve their community.

ii) Public values:

- Lower CO_2 emissions through lower inputs and improve milling efficiency
- Increased rural enterprise employment, livelihoods and wellbeing

3.2.2. Market demand

CEDAC COR is gaining demand in the farming community. 300 SRI farmers have been certified and CEDAC is expanding to 600 farms and a target of 1,400 farms by 2015 and then 10,000 farms by 2020. Certification is based on farm production system and not farmers.

The potential for up-scaling (extending) the COR model to neighbouring provinces with a similar rural economy is significant for meeting the increasing market demand for certified organic rice.

3.2.3. Strategic – marketing support, segmentation and market access

- No price subsidies are offered for the seeds or fertilizer product.
- Marketing is based on creating a trustworthy organic brand to capture higher premium.
- **Robust and transparent internal control system:** 1 inspector works with between 80 to 100 farmers in the province to ensure they are correctly implementing organic farming principles before the external inspectors survey the crops so that it can be exported as certified organic rice. Inspector meets with potential organic farmers to clarify organic principals that CEDAC trainers have previously introduced to the community. When they agree, they sign a contract pursuant to what they discussed. After signing, inspections take place from July to September and from September to November (before harvest time)
  .
  During these inspections, the inspector asks farmers to sketch a map of their home and rice field, and which they go directly to the field to measure the plot and make sure their estimates of the distance, size and layout are correct.

  During inspection of the crops, the inspector checks which variety of rice they are planting and if they follow SRI principals, such as reduced seedlings, green manure, etc. and addresses any concerns they have. For example, farmers sometimes have trouble producing enough compost; the inspector encourages them to make a compost cage to follow the proper standards. During these inspections and more general monitoring visits, the inspector goes with their handbook to mark each farmer's progress and their use of any chemicals nearby any compost or the field.

  Before harvest, inspectors attend trainings with the community on post-harvest management techniques, including separate storage for each crop and labelling for transportation (fully organic, first conversion, 2nd). After harvest, the inspector first collects the all-organic (at least 3 years of conversion) to be certified for export, followed by first and 2nd year conversions for local sale. The inspector provides technical support and oversees transportation and storage in the CEDAC warehouse in Phnom Penh.

3.2.4. Precedence and Experience to date

i) What has been tested and trailed already in the context of the proposed business – by country if relevant

CEDAC has certified 300 farmers and expanding to 1,400 by 2015 out of a total of 10,000 participating farmers.

ii) What scale of technology and what is the effect of scale on the business model

CEDAC aspires to develop three new central mills in Oct 2013 with capacity ranging from 10 to 30 t/hr for mill.

iii) Ongoing programs

The organic value chain component seeks to build up to 10,000 farmers that are certified and supplying district and centralized rice mills all of which are certified and audited by third party inspectors.

3.2.5. What is the proposed business model

i) Product or product mix

The model is based on a market demand/linked model that supports organics, with CEDAC playing a significant role in the market linkage and the compliance to market requirements.

The program has the following business products:

- Certified rice producers
- Certified rice for export
- Certified district rice mills with producer involvement in ownership
- Certified central rice mills
- Certification compliant inputs for organic rice production

ii) Operational model

- **Technology:**
  - Organic production systems
  - Improved rice milling technology
- **Scale of production – relevance to up-scaling:** potential to expand from farmer to farmer group, and then district (linked to mills) and to provincial levels. Potential to aggregate farmers into larger plots (50 ha) to optimize economy of scale.
- **Sales strategy and distribution network:** farm producer groups networked in forward linkage models to district rice millers. SAHAKREAS provide retail, wholesale and export market.
- **Quality assurance:** IFOAM certification through internal control system provided by CEDAC.

iii) Financial Performance

At the start of the program, the operation and overhead costs can be high and subsequent cost will depend on the size of the group and success of the recruitment and training. Another issue is the skills and commitment of the farmers and how much of the internal control and documentation the farmers could do on their own. When there is a huge market demand with respective price and social premiums the farmers are more likely to follow and comply with the rules.

The cost for the international certification depends also a lot on the size of the group. The special case in Cambodia is that there is no certification body in the country so the inspector has to be recruited from Thailand or the Philippines incurring additional costs for traveling, hotels and expenses.

CEDAC has managed to reduce the certification cost per farmer in the last years. CEDAC have got 1,400 farmers under the internal control system where 300 have received international certification for export. This will be up-scaled to 2,000 farmers for the internal control system and around 600 for international certification for the 2013 harvest. Mr. Makarady from CEDAC and his assistant are supervising the Internal Control System and there are 7 Internal Inspectors (young

graduates) in the field. Beside the control and supervision, the farmers receive trainings on organic agriculture techniques and organize assemblies for their organizational development.

The cost per farmer for the internal control system, the trainings and the assemblies is about 15 USD. Beside the certification this package supports the farmers to reduce their input costs, improve their farm management and to organize as a cooperative on the rice market.

After the internal control system is running and it's proved that the farmers didn't use any chemicals for at least 3 years, the international inspection and certification for export can happen. The cost last year was around 40 USD per farmer and this year this will reduce to 25 USD. The more farmers are included and the more the farmers understand the process to run the documentation more efficiently the less costly it is.

iv) Risks

- **Technical risks:** Risk of failing to comply with the standards or delays in the certifying process; ensuring producers adhere to standards and that they have the skill and options to address difficult production periods and crop failures caused by drought/flooding/pest/diseases/poor soil fertility; finding sufficient time for farmers to attain training on business management, green manure, compost making.
- **Business risks:**
  - Demand for organic rice and loss of premium
  - Ability of the mills to compete for supply and generate loyalty
  - Ownership of mills and raw materials and transparent structure/governance/oversight of the mill board
  - Competition from foreign owned and modern mills
  - Lack of labour
- **Marketing risks:** default on contract and side selling enticed by collectors and brokers; selling of sub-standard rice;
- **Financing risks:** lack of access to credits/loans for value chain actors; loan default high risk and low return.

3.2.6. Readiness for commercial up-scaling

- **Technical Feasibility:** sustain high land and labour productivity through improved high yielding variety seeds and soil fertility.
- **Regulatory Feasibility:** creation of enabling environment; compliance to environmental standard; changes in standards i.e. Asian Regional Organic Standards (AROS)
- **Market Feasibility:** unknown - current supply is inadequate to meet demand
- **Financial Viability:** sustained land and labour productivity of the farmers (e.g. at least 200-400 riel ($0.05-0.10 USD) more per kilo of paddy; reduced input expenses to about 250,000 riel annually, down from 500,000 riel ($62.50-125 USD) before adopting SRI; yields have also risen, to around 1.9 tons from 1.4 (2.5-1.9 tons per hectare) compared to conventional techniques); rewards for the Producer and Mill members; local banks and MFIs ready to lend to various value chain actors; sustained profitability of the millers
- **Health benefits:** Farmers who adopt SRI, cease to use chemical inputs. Prior to this, farmers used chemical inputs, which had negative effects on his family's health, especially stomach pain and throat irritation. During that time, farmers spent an average of 200,000 to 300,000 riel ($50-75 USD) per year on health expenditures, which has since decreased to 40,000 riel ($10 USD).

3.2.7. Critical Success factors

It is important to identify that the impacts gained are sustainable and how the key success factors could be replicated outside of a project environment.

Sustained income and benefits for farmer: The extra income can be used to support children's education or to invest in new business e.g. tractor for ploughing services (additional 2 million riel annually ($500 USD)).

Use of role model farmer: Successful farmers become role models and are voted to become board members for the regional Organic Rice Producer Group. In this role, they facilitate meetings, disseminate key ideas, support paddy collection and negotiate prices.

Access to social marketing and training: The "4.5%" program is especially popular, where 4.5% of the profits from sales of their fair-trade certified rice abroad is returned to the farmers in the form of a social development fund. (a) contract with SAHAKREAS provided a more reliable market for farmers; (b) inputs were made available by CEDAC and (c) technical advice was coordinated and provided through CEDAC extension staff in an effective manner to farmers.

Achieving improved production practices: The contributing factors for higher yields were: high yielding seed varieties; improved best practices and reduction in fertilizer and chemical application using SRI principles.

A mechanism that could scale-up this would be to contract CEDAC and its producer group. These provide the opportunity for core members experienced in the mechanism to introduce new farmers and to wider conversion to organics.

- Lessons learned:
  - **Production issues:** there is a need to ensure that yield increases are sustained through improved soil fertility; the need to source for sustainable biofertiliser and reduce labour cost; larger areas planted to a monocrop with a single variety run the risk of disease or pest; supply of increasing fresh HYV seed will need to be addressed.
  - **Financial exposure:** Crop failure (drought or flooding) could lead to high credit default and under-capacity of the mill.
  - **Strengthen the Producer Group and Mill Cooperatives:** Farmers and millers networks need to be strengthened to generate greater ownership and solidarity to improve performance and to participate in policy dialogue and advocacy at provincial level and negotiate for fair and competitive input and rice prices with SAHAKREAS.
- Best practices drawn from the project lie in the following areas: (i) SRI farmers improving and sustaining their income; (ii) sustained conversion of SRI farmers into certified organic producers. (iii) a strong CEDAC/GIZ as facilitator-centered model in supporting producers and miller groups; (iv) a strong public private partnership; (v) supply chain and market development; (vi) business development services (BDS); (vii) sustainability and clear exit strategy; and (viii) a strategy for scaling up.

3.2.8. Lessons learned

- **Addressing production issues:** To improve and sustain soil fertility through efficient and competitive utilization of biomass for the production of compost and biofertiliser within the

SRI system; reduce labour cost through mechanization; access to high quality hybrid seeds.

  - **strengthening producers groups:** to create greater ownership and loyalty within the group and to train and recruit new members
  - **strengthening rice mill cooperatives:** Mills need to be strengthened in regards to their (a) access to funds to ensure they can purchase larger volumes; (b) access to markets both domestic and export; and (c) review of miller groups to achieve solidarity and ensure support for farmers production is a standard practice for members

- **Up-scaling priorities:** Access to sustainable supply of competitive compost and biofertiliser; low labour competitiveness, potential for improved extension and business services; development of appropriate mechanization to reduce drudgery and labour input; continual exposure of millers to modern mill technology and management
- **Why is it not up-scaling already? –** The model is being scaled up to other provinces but the challenge is in maintaining organic standards and compliance beyond the three years especially in drought years when farmers often revert to using urea to boost yield to make up losses.

4. BUSINESS MODEL: SNV'S ENHANCED MILLED RICE PRODUCTION (EMRIP) MODEL

The SNV's EMRIP project operates within Laos PDR and seeks to develop business models that address poverty reduction and rural development needs.

4.1. BACKGROUND

There are two models being promoted – one under SNV and the other under industry funding (e.g. Rabobank Foundation, Brewery investor). The following section presents the basis for the SNV's EMRIP business model to be up-scaled.

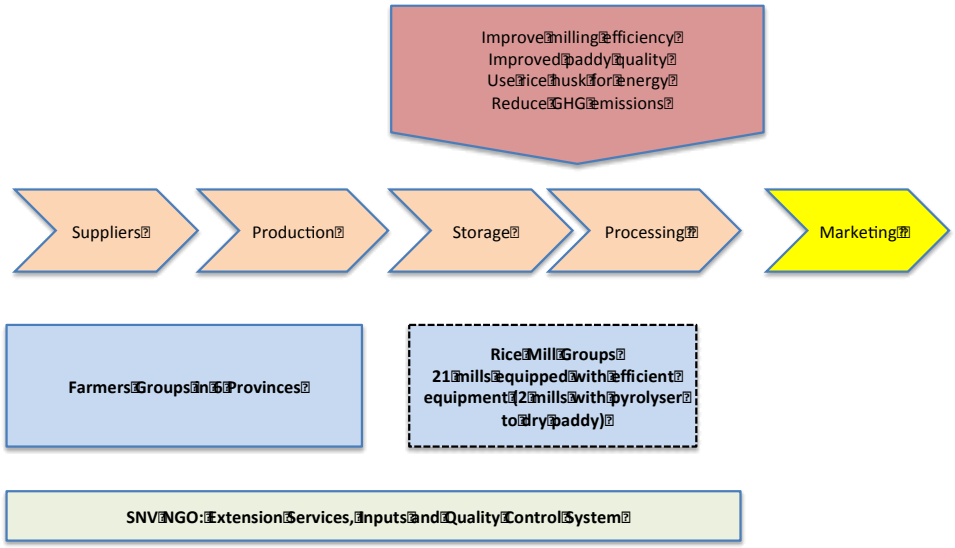
i) What is the value chain

The value chain targeted by SNV EMRIP was the rice value chain through to the mill door after milling. The program involved improving the processing efficiency of the millers who also provided extension services, and inputs on credit to their farmer clienteles. The business model had been implemented in 6 provinces - Vientiane Capital, Bolikhamxay, Khammouane, Savannakhet, Saravan and Champasak.

ii) What part of the value chain is targeted

Specifically the business seeks to strengthen the mutual relationships between the millers and farmers whereby farmers will sell paddy to millers in exchange for inputs (seeds, fertilizer, tools, credits) and extension services. A key theme was to build relationships between millers and producers for both of their mutual benefit. By improving the rice milling and processing technology for mills that are not operating efficiently, savings provide millers extra profits, whilst producer support coordinated by millers increased output and therefore throughput for the mills. The ability to work with producers provided opportunity to improve rice quality through lowering moisture content of grain supplied to the mills, and the installation of drying pads at mills. Poor and inefficient milling practices lead to poor rice quality and wastage due to high percentage of broken rice.

Figure 4: SNV EMRIP value chain model



The poor pre- and post-harvest practices coupled with poor milling process has over time led to poor quality rice. A consequence is that there is excess waste at the mill and famers do not have access to quality inputs and extension services often leading to poor yields or increasing yields while decreasing net marginal returns.

iii) How is the value chain benefitting from the opportunity

The largest benefit derives from increased integration between value chain participants up to the mill door. The millers and farmers were better able to plan and make informed decisions. This is evident at farm level: farmers gaining greater confidence in marketing their crop and thus more commitment to it as a commercial crop, and by millers, who co-invested in equipment and have become proactive to seek new markets (rather than wait for spot traders). Through its support for policy dialogue, EMRIP has seen specific outcomes with streamlining of trade procedures; reduction of import taxes on agricultural inputs; and retraction of trade bans. This process has opened the door to inclusion of millers in constructive dialogue with provincial authorities that should continue to inform decisions at this level.

The results are of significance for the development of national strategies for rice production. The 'high inputs' technical interventions that contributed to the increased crop yields have long been provided to farmers as extension messages, but with little change in practices and often associated with debt burdens. The EMRIP project embeds such services related to agronomy, technology and financial management within the value chain relationships and as such achieved substantial yield increases both at the farm and at macro levels.

iv) Who Champions the Model

The model was championed by SNV EMRIP staff. As millers improve their efficiency and benefited from the consistent supply of improve paddy quality, mutual relationships are further strengthened whereby farmers gain confidence in adopting best practices and improving their paddy whilst millers improve their delivery services and expand their capacity. At the commune level farmers groups have worked with EMRIP staff to promote the benefits of this model. The long run sustainability will require the miller to take a far greater coordination role in which case the miller and his suppliers will be sustained however building a wider uptake with new mills is not possible.

Private sector stakeholders:

- **Rice Millers Group:** Enterprising millers who were keen to improve their performance were recruited as early adopters. Millers who were socially responsible and keen to support their farmer members with inputs and best rice farming practices. SNV EMRIP staff worked closely with millers to source and supply high yielding seeds, fertilizer, tools as well as support for credit applications.
- **Farmer Group:** Existing or new farmers were identified and selected for the pilot. These champions were supported technically to produce high quality paddy to generate higher gross margin. These farmers have access to competitive inputs on credit.
- **Seed producers:** Seed producers were encouraged to produce high yielding variety. Those with business skills were encouraged to provide extension services to the farmers.

Public sector stakeholders:

- **District extension services**: EMRIP staff also work closely with district extension staffs.

4.2. CURRENT STATUS OF THE OPPORTUNITY IN THE VALUE CHAIN

4.2.1. Potential for value addition

Private values:

- Access to best practices in rice husbandry and efficient milling processes
- Improve land and labour productivity through high quality affordable seeds and reduced fertilizer use
- Reduced seed and fertilizer costs through bulk purchase
- Higher yields increased food security
- Higher gross margins/profit levels from increased marketable surplus
- Farmers crop yields increased by 30-50% and income from rice increased (due to yields and higher prices) by at least 60%
- Greater food security
- Potential entry point for adding new technology and opportunities for rice farmers

Public values:

- Lower CO2 emissions through lower inputs and improved milling efficiency
- Increased rural enterprise employment, livelihoods and wellbeing

4.2.2. Market demand

EMRIP has operated in only six provinces where it has demonstrated significant levels of demand in the farming community. But the level of adoption and the sustainability of initiatives after rice millers upgrade their technology remains unknown.

There is anecdotal evidence of both sustained and growing value in the relationships and of failure or breakdown in relationships.

There is potential to up-scale (extending) the technology to neighbouring provinces with a similar rural economy. Potentially the model can be applied to all mills. Millers have seen loyal farmers increase as inputs and extension services were offered.

4.2.3. Strategic – marketing support, segmentation and market access

No price subsidies are offered on the seeds or fertilizer product. Efforts were made to invest in supporting marketing for the purchase of products rather than subsidizing the supply side.

4.2.4. Precedence and Experience to date

i) What scale of technology and what is the effect of scale on the business model

Average milling capacity per mill increased from measured baseline of 472 kg per hour to 1,100kg per hour, or from 3.8T to 8.7 T per day (+130%).

ii) Knowledge of benefits and outputs

Impact highlights on EMRIP market development:

- Upgraded milling equipment was installed in 21 mills
- Milled rice recovery increased from the measured baseline of 57.7% to 63.0% (+9%)
- Farmers crop yields increased by 30-50%

- Incomes from rice increased (due to yields and higher prices) by at least 60%
- Throughput through mills increased from 12,400T to over 36,523 T (+194%)
- 2 mills were equipped with pyrolyser to dry the paddy and the ashes were sold to farmers and apply to their crop. Pyrolyser were bought from Kolao Farm, Korea for USD 38,000.

iii) Ongoing programs

The 21 mills established producer networks in over 300 villages with 21,361 households. There are no ongoing programs.

4.2.5. Lessons for TA7833

i) Product or product mix

Rice husks from the mill could be developed into compost. Bio-fertiliser or compost or fertilizer pellets could be promoted by the millers to farmers.

ii) Accessing raw materials

Ash from pyrolyser could be sold as soil conditioner.

iii) Operational model

- **Technology:** the promotion of pre- and post-harvest best practices to improve land and labour productivity and paddy quality. Improvement in drying, screening and moisture testing equipment.
- **Scale of production – relevance to up-scaling:** potential to expand from district to provincial levels.
- **Sales strategy and distribution network:** Millers sell inputs to farmers when they visit the mills.
- **Quality assurance:** The use of drying pad at the mill has improved paddy quality.

iv) Ownership model

- **Beneficiaries:** affordability of the farmers to purchase inputs; debt burden
- **Business risks:** lack of demand for inputs; high default on credit/loan; lack of trust between millers and farmers; 4 mills have stopped with 17 mills still carrying on; risk averse farmers;
- **Marketing risks:** loss of market share; default on contract and side selling enticed by collectors and brokers; selling of sub-standard rice;
- **Financing risks:** lack of access to credits/loans for value chain actors; high interest rate; high income tax; high risk and low return.

v) What is the readiness for commercial up-scaling

- **Technical Feasibility:** development of best practices that are suitable for improving land and labour productivity
- **Regulatory Feasibility:** compliance to environmental standard
- **Market Feasibility:** millers continue to fetch competitive prices through improved paddy quality
- **Financial Viability:** sustained profitability of the millers; sustained land and labour productivity of the farmers; local banks and MFIs ready to lend to various value chain actors

vi) Critical Success Factors (CSFs)

An evaluation report seeks to identify whether the impacts gained were sustainable and could be replicated outside of a project environment. These included:

Achieving improved production practices: The main factors delivering increased crop yields were; fresh High Yielding Variety seed; improved practices and modest increases in fertilizer application. There were three elements that contributed to this: (a) contracts with millers provided a more reliable market for farmers; (b) inputs were made available by miller supply and (c) technical advice was coordinated and provided through millers in an effective manner to farmers.

Mills committed to farmer support: Mills recognized that supporting producer productivity generates improved paddy supply for their mills. Thus they made no attempt to profit from input supply, and the prices for the purchase of rice has to be competitive. They were committed to ensuring that technical advice did assist the farmers, and most mills have already begun to employ their own staff to provide technical support in a targeted manner.

A mechanism that could scale-out this PPP model for rice production is the establishment of miller groups. These provide the opportunity for core members experienced in the mechanism to introduce support to farmers as 'standard practice' to new mills joining a group. This is the case with the current 5 groups (85 member mills) in Khammouane. However groups formed in the other provinces visited (Bolikhamxai and Saravan) were not built on the EMRIP mills as a core, but by designation by DoIC, along with the roles and responsibilities imposed on the group. As a result there is indication of resentment amongst these designated mills, which could prove to be counterproductive.

More recent provinces have included a rice technician to work with farmers as many millers felt this were outside of their expertise and also had inadequate time for farmer support programs. The rice technicians are effectively an embedded service provider – similar to the farmer business advisor used by IDE but with the same financial sustainability.

- **Lessons learned:** The model is still in its early development (just 3 cropping seasons over 2 years) but mills have enthusiastically expanded their producer network. However there are various issues that are likely to emerge as this is applied widely that will need to be addressed for it to be applied sustainably and more widely:
  - **Production issues:** significantly increased yields will reduce soil fertility; larger area planted to a single variety will result in large losses if susceptible to disease or pest; supply of increasing fresh HYV seed will need to be addressed.
  - **Mills themselves are becoming more exposed to financial loss as they fund input supply to farmers and credit defaults:** Mills have invested 200-500 Million Kip and mills would be exposed if 20-30% of farmers suffered crop failure and could not repay the credit. This level of loss is quite possible. While farmers bore some of the risks, such failure would discredit the model.
  - **Empower farmers:** Farmers will need to be able to form associations to participate in policy dialogue and advocacy at provincial level and negotiate prices with mills.
- **What are the CSFs:** Best practices drawn from the project lie in the following areas: i) using the millers as entry point; ii) a market-based approach; iii) a strong public private partnership; iv) supply chain development with seed producers becoming village rice technician; v) business development services (BDS).
- **What is the CSF status vis a vis the business opportunity for up-scaling:** These following issues provide some of the challenges ahead for the model piloted by EMRIP to make a widespread contribution to rice production in Lao PDR. Future action should consider the following areas of activity:

- **Data collection for stronger model development:** The data collected during the evaluation is limited. This should be confined through more rigorous collection by a multi-sector team: (a) crop yields (DoA); (b) extension and farmers groups (NAFES); (c) mill operation (MoIC)
- **Addressing production issues:** To sustain the support from farmers, they must be able to increase their income and reduce inputs cost.
- **Strengthening farmers groups:** These need to be strengthened at village and association level. Formation of farmer associations will remain a challenging exercise, but their potential to access lower input cost through lower import taxes may encourage their formation.
- **Strengthening mill operation:** Mills need to be strengthened in regards to their (a) access to credit/loans to ensure they can purchase larger volumes; (b) access to markets both domestic and export; and (c) review of miller groups to achieve solidarity and ensure support for farmers production is a standard practice for members

- **Based on CSF what is potential for up-scaling:** Using the millers as an entry point for intervention offer potential for scaling up from district to provincial level. The priority is to have millers building trust, loyalty and long term relationship with farmers.
- **Why is it not up-scaling already?** Rabobank Foundation is offering loans to potential millers in two provinces at an interest rate of 14%. Beer Lao also seeks to buy broken rice from millers. The government has tried to offer subsidized loan to millers that may be unsustainable. The mill technology upgrading is a critical incentive for mill owners while SNV provided this in Phase 1 the current funding is more limited and requires commercial sub lending.

5. BUSINESS MODEL: IDE'S FARM BUSINESS ADVISOR (FBA) MODEL

The IDE's FBA model operates within Cambodia and seeks to develop and train Farm Business Advisor to provide horizontal link between market and the farmers. The FBA is embedded in the supply chain for farm inputs and increasingly in a wider range of services and product marketing opportunities.

Value chain opportunities: IDE embeds the cost of advisory services to farmers into the product cost. This incentivises the FBA to serve as business agent to act as an intermediary between market and farmers.

FBA training: IDE identifies farmers with business acumen and trained them as FBA for two years. It costs about USD 2,000 to train one FBA. FBA received training on crop agronomy, business and marketing/sales strategy.

Scope of FBA: FBA provides advisory services to farmers and sell inputs (fertilizers, seeds, tools) to farmers with a margin. FBA also buy products from farmers and sell to market. FBA are innovative by buying drumseeders at USD 50/60 and rent out their services to farmers at USD 5/ha.

Entry Point: for entry to new areas, IDE's Commercial Agronomist enters the village, reviews potential agronomic improvements and identify interested farmers. The agronomist discusses trials with farmers and runs trials on farmers' fields as demonstration of the technology. Each agronomist looks after 10 FBAs. FBAs meet regularly to exchange information, ideas and share experiences. Farm visits are organised to promote the technology and generate interest in the use of the inputs. Inputs are sold as cash. IDE links farmers to MFIs for credit access.

Key success factors: Best practices drawn from the project are: i) using the competent and enterprising FBA as entry point to build long term trust, loyalty and relationship with farmers; ii) a market-based approach; iii) supply chain development; iv) embedded business development services (BDS); v) self-sustaining private sector model where IDE's margins were derived at product and FBA level.

Challenges faced: To remain sustainable, FBA must be incentivised to help farmers improve their land and labour productivity and make a decent living in serving as the link person between community and the market. Their business knowledge and technical skills will need to be upgraded and spur local innovation. They may have to compete with local extension staff who may promote different technology. FBA who does not performed will be terminated. Cost of registering products.

Investment modality: IDE's FBA models could be used to develop and promote climate friendly value chains. IDE could serve as service provider to train new agronomists and FBA and get paid on the number of FBA trained and certified. Further payments could also be based on number of active farmers recruited by each FBA and on the annual volume of sales transacted.

Opportunities for upscaling: The FBA model could be used to promote biofertiliser/compost/Tricoderma compost. For example, the FBA could sell FDP impregnated with biochar or sell compost made from bioslurry/biochar to SRI farmers or organic farmers. Dupont already use FBA to promote their products and provides FBA training on their products.

IDE income: IDE recover their cost from the selling of inputs with a margin (e.g. FDP pellets, seeds, tools).

Figure 5: IDE's FBA value chain model