

# INVEST WITH THE INTEGRATED HYBRID RICE MILLING DISTRICT



The integrated hybrid rice milling district business model aligns dryland row-rice farming and alternate wet and dry rice farming that reduce methane emissions and water usage, hybrid rice technology, organized rice production, training, research and development, power generation, international trade and development assistance, and development finance along with improving the rice value chain for purposes of contributing to food self-sufficiency and power affordability in Asia and Africa

# EXPLORING ENVIRONMENTALLY SOUND INVESTMENT OPPORTUNITIES IN RICE FARMING

Rice farming contributes to around 10 percent of global methane emissions. The wetland land preparation, the burning of rice straw and rice husk, and the inefficient application of nitrogen fertilizer that releases nitrous oxide, a greenhouse gas, are the rice farming activities that contribute to global warming.

Furthermore, rice consumes about 3 to 5 million liters of water per hectare per growing season. Water is becoming a scarce resource that must be used more efficiently because the practice of continuous wetland rice farming will become unsustainable.



Wetland land preparation in rice farming

2015/01/14

While the contribution of wetland rice agriculture to global warming has long been recognized by the international scientific community, and solutions have been proposed, it appears that there are less efforts that focus on applying technologies that address the methane and nitrous oxide emissions on large scale business models.

If there are efforts though, the scale remains on the experimental and pilot stages. The solution to boost climate change capital resources mobilization is to engage in scaled-up business models for rice first, hence the rice milling district must be globally invested with support.



Dryland Row Rice Farming

# BUILDING THE GLOBAL NETWORK OF HYBRID RICE MILLING DISTRICTS



Our objective is to build an international network of rice milling districts for food production, rural electricity generation, and farm employment and income opportunities creation resulting in prosperous rural communities.

Each rice milling district consolidates about 20,000 hectares under a unified contract production arrangement between the farm consolidator on the one hand, and the farmers and other landowners on the other hand. Every rice milling district will employ the dryland row-rice farming primarily to reduce water consumption, for more efficient mechanization, and to improve the health of the soil. The Alternate Wet and Dry rice farming will be practiced in some areas that are not possible for whole year round dryland farming.

The main product is branded aromatic hybrid rice, which is popularly known commercially and internationally known as the Jasmine type of rice from Thailand.

Aside from this main rice product using hybrid rice technology, the milling district also generates electricity through combined pump irrigation and water turbine generator system and rice hull gasification as a waste-to-energy infrastructure that converts the rice hull, the principal waste in rice processing, into electricity.

|                                    |  |                         |                       |                      |             |                     |           |
|------------------------------------|--|-------------------------|-----------------------|----------------------|-------------|---------------------|-----------|
| Mass Moisture Requirement          | ≤20% (wet basis)                               |                         |                       |                      |             |                     |           |
| Mass Size Requirement              | ≤8-15mm  |                         |                       |                      |             |                     |           |
| Mass Consumption(Kg/hr)            | 200-360  | 400-720                 | 500-900               | 600-1080             | 800-1440    | 1000-1800           | 1200-2160 |
| Production(Nm <sup>3</sup> /h)     | 500-600  | 1000-1200               | 1250-1500             | 1500-1800            | 2000-2400   | 2500-3000           | 3000-3600 |
| Discharge Type                     | Dry Ash Type                                   |                         |                       |                      |             |                     |           |
| Discharge Type of Gas Purification | POWERMAX Semi Dry Type Gas Purification System |                         |                       |                      |             |                     |           |
| Discharge Type of Gas Purification | 1200-1300Kcal/Nm <sup>3</sup>                  |                         |                       |                      |             |                     |           |
| Composition                        | CO-12~18%                                      | CO <sub>2</sub> -10~16% | CH <sub>4</sub> -4~8% | H <sub>2</sub> -3~7% | CnHm-1~1.4% | O <sub>2</sub> -0.5 |           |
| Level of Genset                    | 100GFLS  | 400GFLS                 | 500GFLS               | 300GFLS              | 400GFLS     | 1000GFLS            | 400GFLS   |
| Level of Genset                    | 2  | 1                       | 1                     | 2                    | 2           | 1                   | 3         |



1.5MW CFBG POWER PLANT



0.5MW CFBG POWER PLANT-2



0.5MW CFBG POWER PLANT



0.5MW CFBG POWER PLANT

## REDUCING AND OFFSETTING CARBON FOOTPRINT (20,000 Hectares Hybrid Rice Milling District)

| Operation  | Carbon Footprint  | Offset (kg CO <sub>2</sub> )   | Value (USD)                          |
|--|---|--|--------------------------------------|
| <b>Rice farming</b> <ul style="list-style-type: none"> <li>▪ Cultivation</li> <li>▪ Harvest and postharvest</li> </ul> <p style="text-align: center;"><b>Total</b></p> | 6720 kg CO <sub>2</sub> e/ha.<br>4869 kg CO <sub>2</sub> e/ha.<br><hr style="width: 20%; margin: 5px auto;"/> 11,589 kg CO <sub>2</sub> e/ha. | 5794 CO <sub>2</sub> e/ha at 50% of carbon footprint due to dryland rice farming                               | 811,160<br>@ 7 USD per mt            |
| <b>Rice husk gasification</b>  | Carbon 0.795 kg CO <sub>2</sub> -eg/MJ, @1 mg equals 0.000277778 MW-hr, @ 8,760 hrs, 95% utilization<br><br>1.653 Kg/MJ water footprint       | Based on 433 CO <sub>2</sub> e to generate electricity, less the combined CO <sub>2</sub> and water footprint, | For further research and computation |
| <b>Water turbine generator</b>   | 24 g/MW-hr, equivalent to 1 ton for 5 MW at   | Based on 433 kg per mw-hr to generate electricity less the CO <sub>2</sub> e to generate electricity           | For further research and computation |

# THE INTEGRATED HYBRID RICE MILLING DISTRICT OPERATING AND FUNDING STRUCTURE

**Objective**

**Operational Structure**

**Ownership and Management Model**

**Operational Strategies**

Rice Production Center

Rice Processing Center

Rice Marketing

Hybrid Rice Seed Production

Farm Machinery Pool

Training Center

Integrated Fertilizer Plant

Supplemental Pump Irrigation and Power and Rice Hull Gasification

Fund Generation and Management

**Budget**

**Financial Sustainability**

**Economic, Social, and Environmental Benefit**

**Trade, Investment, and Development Assistance Opportunities**

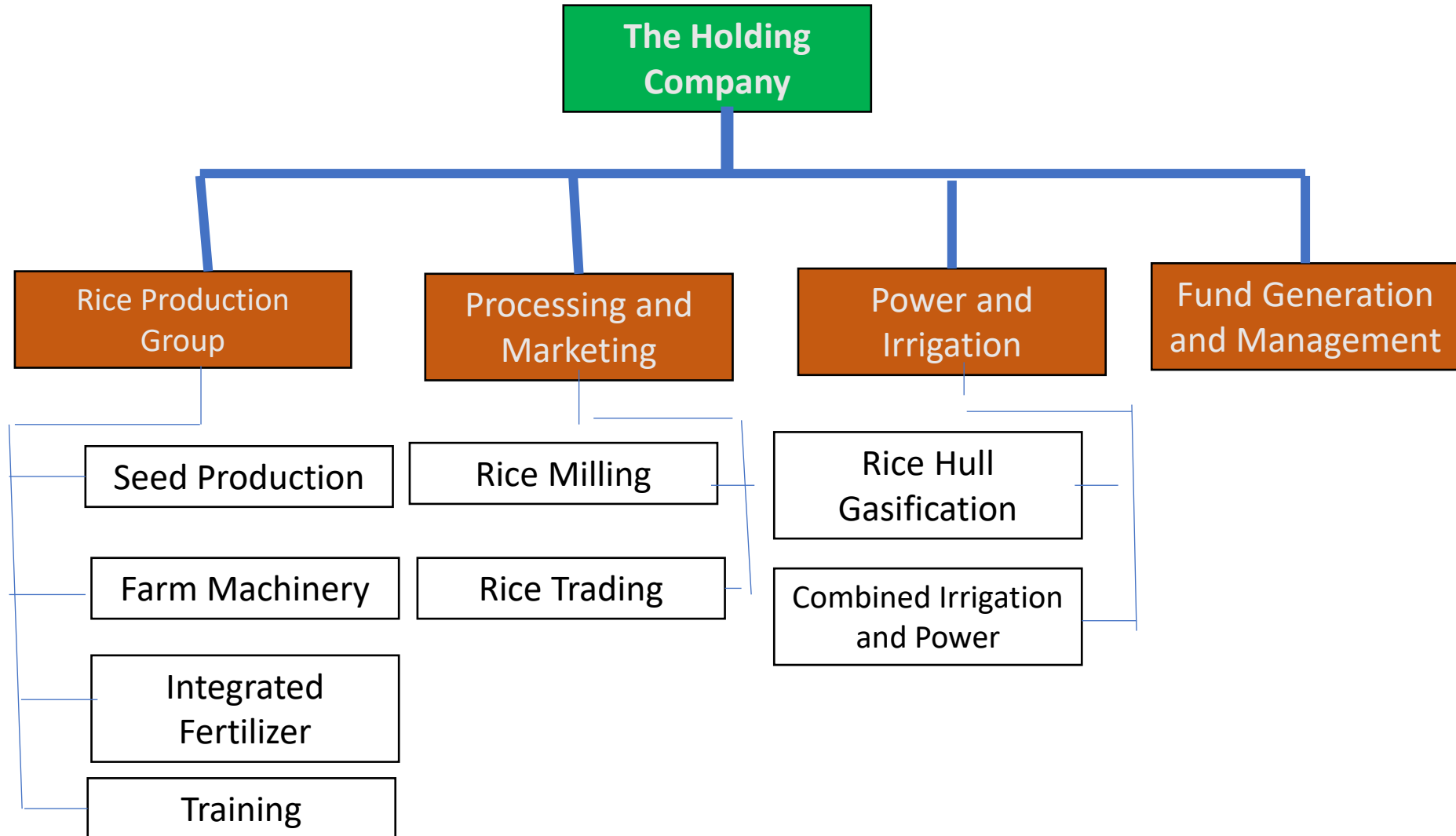
**Created**

**Funding Option**

**Conclusion**

[http://www.knowledgebank.irri.org/ricebreedingcourse/Hybrid\\_Rice\\_Breeding\\_&\\_Seed\\_Production.htm](http://www.knowledgebank.irri.org/ricebreedingcourse/Hybrid_Rice_Breeding_&_Seed_Production.htm)

# Integration of Functional Components



# OWNERSHIP AND MANAGEMENT MODEL

**Multiparty  
Ownership**

A consortium model composed of existing and new enterprises that are autonomous or semi-autonomous from the holding company

The operational enterprises for rice milling and trading, farm machinery pool, hybrid rice seed production, organic fertilizer plant, and power and irrigation, are semi-autonomous subsidiaries with the holding company as majority or minority owners

Research and development

Credit Assistance

Fertilizer and farm machinery subsidy

Power Purchase Agreement to supply power to the national grid or the local electric company

**Shared Accountability  
in Leveraging  
Government  
Programs,  
International  
Partnership, and Local  
Resources**



# NARRATIVE SUMMARY

This rice milling district model is for the integrated production, processing, and marketing of hybrid rice with an aggregate service area of 15,000 to 20,000 hectares, preferably irrigated, employing contract growing with farmer cooperators and agribusiness groups.

The basic farming units are clusters of 200-500 hectares formed through land consolidation of small farms or large farms, which enroll farmers and other business entities for the production of branded hybrid rice.

At the heart of the integrated operations are the rice processing facilities with dryers, color sorters, and storage.

The production group within the milling district provides support to farmers through close technical supervision, application of row rice farming and alternate wet and dry farming, supply of quality seeds, fertilizer, farm chemicals, farm mechanization at affordable terms and carry out its own training and extension program.

The integrated rice production and marketing business consists of four business groups. The main group engages in organized production activities. It has autonomous or semi-autonomous subsidiaries for training and supervised farming, farm machinery pool, fertilizer blending and foliar fertilizer plant, and seed production.



**The second group engages in rice processing. This group operates a rice processing facility with dryer, 20 ton per hour rice mill with color sorter, and storage facilities.**

**The third group engages in supplemental irrigation and power generation. It operates water pump for combined irrigation and power generation using a water turbine generator with a 1-mw capacity and irrigating an area of 500 hectares of rice farms. For transforming the wastes in rice processing into clean energy, it operates a 5 mw rice hull gasification plant.**

**The fourth group is the fund generation and management group. It ensures that the various business units within the rice milling district have the access to capital.**

**This rice milling district for hybrid rice entails an estimated cost of 100.72 million USD based on rough projection and estimation. This business model is a financially sustainable enterprise with wide ranging economic, social, and environmental benefits. The estimated Return on Investment (ROI) is 39 percent.**

**The autonomous and semi-autonomous components of the rice milling districts are all financially profitable individually and collectively. On the other hand, funding options include Official Development Assistance, international private sector investment, and public-private partnership.**

**The business model creates opportunities for investment and partnership, which include grains trading, engineering and procurement services, power generation, research and product development collaboration, and international development assistance.**



# PROJECT COST

| Component                      | Cost Assumption  | Total Cost |
|--------------------------------|--|------------|
| Rice Production                |  |            |
| a) Contract Production         | Land consolidation and recruitment of cooperating farmers, agribusiness groups and other partners, 20,000 hectares, 100 USD per hectare  | 2,000,000  |
| b) Hybrid Rice Seed Production | Establishment cost (3.0 tons per hectare F1 hybrid seeds, 20 kg per hectare seeding rate, 160 hectares seed farm, 50,000 USD per hectare seed farm development cost including land rental, building, farm equipment, and laboratory equipment) | 8,000,000  |
|                                | Operating cost (2,000 USD per hectare, twice than the commercial rice production cost , which will include cost of parental materials)   | 320,000    |

| Component   | Cost Assumption   | Cost (USD) |
|---|---|------------|
| c) Training Center                                      | Training facilities (500 square meter, 2,000 USD per square meter, including equipment, computers, furniture and fixtures)) | 1,000,000  |
|   | Operating cost (20,00 hectares, 20 USD/ha/year)   | 400,000    |
| d) Farm Mechanization                                   | Tractor, combine thresher, others, 50,000 USD per 50 hectares   | 20,000,000 |
|   | Operating cost (40,000 hectares, 20 USD per hectare)  | 800,000    |
| e) Integrated Bulk Blending And Foliar Fertilizer Plant | Bulk blending plant, 200 tons per day   | 500,000    |
|   | Automatic foliar fertilizer production system   | 300,000    |
|   | Operating cost,   | 200,000    |
| <b>Rice Marketing</b>                                   |   |            |
| a) Rice Marketing                                       | Revolving procurement and marketing cost, 8 tons per hectare, 20,000 hectares harvested area. 250 USD per ton               | 40,000,00  |

| Component                                | Cost Assumption  | Total Cost         |
|--|--|--------------------|
| Power and Irrigation                     |  |                    |
| a) Combined water turbine and irrigation | 1 MW with pump to serve 400-500 supplemental irrigation, 2 million USD, 10 units | 20,000,000         |
| b) Rice hull gasification                | 5 MW plant, 1.5 million USD per MW   | 7,500,000          |
| <b>Total</b>                             |  | <b>100,720,000</b> |

# FINANCIAL SUSTAINABILITY

| Profit Centers         | Unit       | Assumptions   | Amount  | Price Per Unit (USD) | Profit Margin (%) | Gross Margin (USD) |
|------------------------|------------|---|---------|----------------------|-------------------|--------------------|
| <b>Rice Production</b> |            |   |         |                      |                   |                    |
| a) Branded rice        | Metric Ton | 40,000 hectares harvested area, 8 tons per hectare yield, 65 percent milling recovery       | 208,000 | 500                  | 20                | 20,800,000         |
| b) Rice bran           | Metric Ton | 10 percent recovery as rice milling by-product  | 32,000  | 100                  | 100               | 3,200,000          |
| c) F1 Hybrid seed      | Metric Ton | 3 tons/ha, 160 hectares at 2 cropping, 20 percent allowance, F1 hybrid rice seed production | 960     | 7,000                | 70                | 4,704,000          |
|                        |            |   |         |                      |                   |                    |

| Profit Centers             | Unit       | Assumptions   | Amount  | Price Per Unit (USD) | Profit Margin (%) | Gross Margin (USD) |
|----------------------------|------------|---|---------|----------------------|-------------------|--------------------|
| d) Farm machinery services | Hectare    | For 40,000 hectares per year provided with mechanized land preparation, harvesting, and other mechanized operations | 40,000  | 100                  | 80                | 3,200,000          |
| <b>Sub-total</b>           |            |   |         |                      |                   | <b>31,904,000</b>  |
|                            |            |   |         |                      |                   |                    |
| <b>Supply of inputs</b>    |            |   |         |                      |                   |                    |
| Commercial fertilizer      | Metric Ton | 8 bags of 50 kg per hectare per planting season, 40,000 hectares  | 16,000  | 750                  | 15                | 1,800,000          |
| Foliar                     | Liter      | 4 liters/hectare, 40,000 hectares   | 160,000 | 2                    | 70                | 224,000            |
| <b>Sub-total</b>           |            |   |         |                      |                   | <b>31,904,000</b>  |





# ECONOMIC, SOCIAL, AND ENVIRONMENTAL BENEFIT

| Economic  | Social  | Environmental                       |
|---|---|-------------------------------------|
| Rice farming employment opportunities   | Land consolidation for local economic empowerment | Waste management                    |
| Direct employment in the rice milling facilities, fertilizer plants, and gasification plant |   | Clean energy                        |
| Local electricity generation  | Participatory research and development            | Efficient soil and water management |
| Application of hybrid rice technology and soil and fertilizer management practices          |   |                                     |
| Availability of locally produced quality rice comparable to the Jazmine type from Thailand  |   |                                     |

# TRADE, INVESTMENT , AND DEVELOPMENT ASSISTANCE OPPORTUNITIES CREATED

| <b>Financing</b>                          | <b>Production</b>   | <b>International Trade</b>  | <b>Development Cooperation</b>   | <b>Infrastructure Support</b>                           |
|---|---|---|--|---|
| <b>Loan of about 100 Million USD</b>      | <b>Branded quality rice in Africa with export potential</b> | <b>Fertilizer trade due to increased application as new areas are open up for rice production</b> | <b>Research and product development opportunity created by the rice milling district model for hybrid rice</b> | <b>Irrigation Infrastructure</b>                        |
| <b>Farm Credit</b>                        | <b>Hybrid Rice Seed Business in Africa</b>                  | <b>Opportunity to supply farm machinery and implement</b>   | <b>Opportunity towards improving training and extension models</b>   | <b>Road infrastructure</b>                              |
| <b>Farm Trust for 20,000 Hectares</b>     | <b>Farm Consolidation Model</b>                             | <b>Opportunity to supply rice milling, drying and storage</b>                                     |  | <b>Power Supply Contract</b>                            |
| <b>Investment Fund</b>                    | <b>Farm mechanization</b>                                   |   |  | <b>Possibility of off grid electricity availability</b> |
| <b>Bank Guarantee for 100 Million USD</b> | <b>Carbon credit</b>  | <b>Carbon credit</b>  | <b>Carbon credit</b>   |   |

# CONCLUSION

- **The rice milling district is the core business infrastructure for improving the rice value chain in the rice growing areas of the world, particularly in Africa and Asia.**
- **The integrated production and processing approach that employs the dryland row-rice farming and hybrid rice technologies is strengthened by multiparty collaboration in the rice value chain. The participation of smallholder farmers, large landowners, agribusiness companies, research and development institutions, suppliers of machinery and equipment, electricity companies, private investors, international development organizations, and government agencies forms a strong bond for sustainability**
- **The business model is essentially a scaled-up business enterprise patterned after the experimental scale “seed-to-seed” research and development approach that has never been elevated to the higher level of integration**
- **The autonomous and semi-autonomous components of the rice milling districts are all financially profitable. The collective bond contributes to ensuring this financial soundness of the milling district.**
- **The estimated cost to build an integrated rice milling district is 100.72 million USD and the ROI is 39 percent.**
- **As one whole unit, the rice milling district creates opportunities for sustainable international trade and investment, research and development partnership, public-private partnership, and international development cooperation. However, at the center of this ecosystem of opportunities are the smallholder farmers that contribute to food security on the local and national levels.**



# Global Green Technologies Corporation

<https://globalgreentechcorp.com>

## PRINCIPAL AND PARTNERS

### Eduardo Bacolod, Founder and Principal Partner

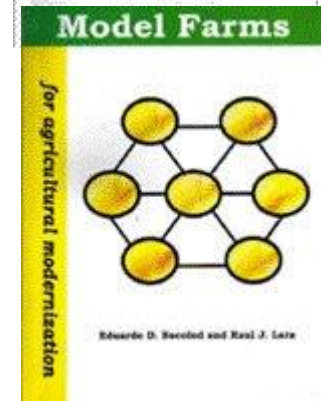
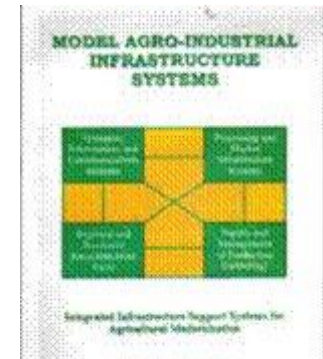
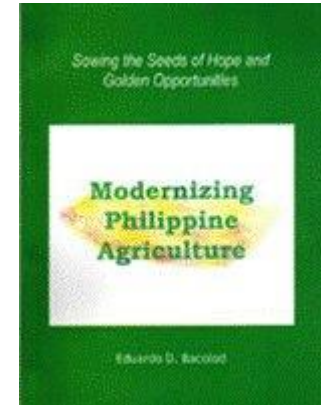
He is an immigrant from the Philippines residing in New York City. He is a development planner by training and present professional practice. His current interests and engagements are focused on fund generation for international development and humanitarian projects. He has consolidated his works in the last 30 years into the book entitled Business Models for Collective Governance. The publication is the first of an international book writing series that crafts business models for national development planning in the developing countries of the world.

He received an assignment from the Food and Agriculture Organization of the UN and the Ministry of Agriculture of Fiji to prepare the national agriculture development policy of Fiji.

His educational qualifications include Bachelor of Science in Agricultural Economics from the University of the Philippines Los Baños and Master of Science in Social Development Planning and Management from the Centre for Development Studies of the University of Wales Swansea in the United Kingdom as a British Chevening Scholar. He attended a training course in Project Management and Programme Administration in the Netherlands.

### Simplicio Endaya, Principal Partner

He has a Bachelor of Arts degree in Economics from the University of the Philippines Diliman. He is senior-level marketing, purchasing, and management professional with over 20 years of experience developing solutions, building relationships and promoting client interests among diverse audiences in domestic and international markets, particularly the US, the Philippines, and Southeast Asia. Specialty areas include economic and market research, contract negotiation, government relations and business development for government, NGO, and private sector firms. He served the Office of the President of the Philippines as Assistant Secretary for Flagship Projects



### **Jocelyn U. Bacolod, Finance and Administration Manager**

She has a Bachelor of Science in Commerce degree from Eastern Laguna Colleges in the Philippines. She is a Licensed Certified Public Accountant in the country. She started her career in a World Bank-funded project in the Department of Agriculture of the Philippines, the Agricultural Support Services Project. While in the project, she attended a Financial Management Course at the National University of Singapore. She transferred to the Philippine Rice Research Institute (PhilRice) and served as Chief Budget Officer and Chief Accountant. In the US, she has gained experience in auditing and tax preparation and accounting while working for Christopher Keller, CPA, franchisee, Liberty Tax Service, Haverstraw, New York.

### **Yegor Cillik, U.S. Partner**

He has been involved in strategic business planning for the last 30 years during which time he obtains a keen understanding of the various cultures that influence the demographic characteristics where the various project concepts he is involved with are undertaken. His method of project initiation encompasses thorough research of all accessible information to help his team to create the most feasibly assessed conceptual plan while maintaining his creativity within the development team.

### **Nephtali De Jesus, Science and Animal Industry Development Adviser**

He has gained extensive experience in the swine industry with Ciba Geigy and as a private consultant for large farms in the Philippines. His aggregate experience in farm management in North Carolina for Smithfield and in Kansas for Choice Genetics provides very vital managerial expertise and technical know-how for the modernization of the swine and livestock industries in the Philippines and other developing countries. He is going to provide his insight into the introduction of new animal husbandry and veterinary practices. He will pioneer the on-line training for animal husbandry, swine breeding, meat packing, and research using the Collective Enterprise digital media platform. He is a graduate of the University of the Philippines Los Banos with a Bachelor of Science in Agriculture degree, major in Animal Science.

### **Raul Lara, Hybrid Rice Expert**

He retired from government service as the head of Technology Commercialization and Entrepreneurship Division of the Philippine Rice Research Institute (PhilRice) in the Philippines. He is a field agronomist with more than 35 years of experience in agricultural research, technology transfer, and agribusiness. He belongs to the first group of Filipinos trained at the International Rice Research Institute (IRRI) on hybrid rice. He has a Master of Science degree in Agronomy from the University of the Philippines Los Banos on IRRI Scholarship. He holds a Bachelor of Science in Agriculture degree from the Cagayan State University. Work experiences are both in the government and private sectors in the Philippines. These institutions include the Bureau of Plant Industry, IRRI, and Cargill Seeds. He is the Principal author and co-author of research publications, conference papers, and training manuals



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