

■ POLITICAL ECONOMY PROGRAM

Advancing the Local Production and Commercialization of Single Cylinder Engines

for Agricultural and Fisheries Sector Mechanization

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Rationale

In his first State of the Nation Address (SONA) in 2022, President Ferdinand R. Marcos, Jr. declared agricultural mechanization and modernization as a priority of his administration to raise the country's food production and food security. More recently, the administration,

in reiterating its commitment to agricultural mechanization, also stressed the importance of local agricultural machinery production towards meeting these goals to lessen reliance on imports (Unite 2023).

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The administration's pronouncements on agricultural mechanization are notable developments since they reinforce past government policies such as the Agricultural and Fisheries Modernization Act of 1997 (AFMA, Republic Act No. 8435), Agricultural and Fisheries Mechanization Law of 2013 (R.A. 10601), and Rice Tariffication Law of 2019 (R.A. 11203) that established the Rice Competitiveness Enhancement Fund (RCEF), partly to be used for the procurement and distribution of agricultural machineries.

As a contribution to the current push for agricultural mechanization, this policy brief discusses efforts and recommendations to promote domestic production and commercialization of the single cylinder engines (SCEs) for small farm machines. Such development efforts would benefit not only small farmers but also the country's agricultural manufacturers, creating a ripple effect on the domestic economy by creating jobs and raising productivity of the rural sector.

Government Mechanization Programs and Policies

Continuing government mechanization programs over the years have allowed and encouraged more farmers to utilize agricultural mechanization technologies (AMTs). Reasons for mechanization include farm products' low competitiveness because of high farm production cost, increasing cost of farm labor due to labor migration to more lucrative industry or sectors, ageing farm workers, climate change, and irrigation needs, among other factors (Rodulfo et al. 2021). To address these constraints, the Philippine government has pursued various agricultural mechanization initiatives that intensify the distribution and utilization of agricultural machinery.

Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA) study in 2019 indicated that the Department of Agriculture (DA) banner programs, such as the national rice program, national corn program, and high value crops development program, allocated significant budgets for agricultural equipment and facilities support services from 2014 to 2016. These programs and the RCEF procured farm machinery, such as four-wheel tractors,

combine harvesters, hand tractors, pneumatic planters, transplanters, and grain dryers. They distributed these to farming communities, local government units (LGUs) as well as cooperatives and other farmer's groups.

Noteworthy, the majority of the procured and distributed machines consists of imported machinery. Even the locally fabricated machines, such as hand tractors, shellers, corn mills, threshers, grain cleaners, and other small machinery, are powered mainly by imported single cylinder engines (Larona et al. 2022a). Since there are currently no locally manufactured engines for these machines, there seems to be no other recourse but to procure imported ones.

Bureau of Customs data shows that, from 2015 to 2021, the Philippines imported around Php 38.27 billion (or an average of about Php 5.47 billion/year) worth of agricultural tractors, combine harvesters, transplanters, and grain dryers (cited in Larona et. al. 2022a and 2022b). Moreover, Business Statistics Monitor data indicated that the estimated average annual distribution of imported engines from 2011 to 2015 was around 122,681 units/year. Meanwhile, the estimated average annual distribution of imported engines from 2006 to 2016 was 410,316 units/year, based on Department of Trade and Industry data.⁶

Yet, there are policies and programs that recognize the importance of promoting the local agricultural manufacturing sector. The Agricultural and Fisheries Mechanization (AFMech) Law and Rice Tariffication Law (RTL) with its RCEF, and other mechanization policies and programs provide the legal basis for the localization of AMTs. These laws promote the use of locally produced and appropriate agricultural and fisheries mechanization technologies.

One of AFMA's objectives is to advance the transformation of agriculture and fisheries from a resource-based to a technology-based industry. AFMA's Section 59 calls for the development, and promotion of AMTs to improve the country's agricultural mechanization. The AFMech Law shares this goal and aims to strengthen local assembly and manufacturing of engines/prime movers, and other AMTs. For its part, the RTL established the Php 10-billion RCEF, part

⁶ Data discrepancy in the annual distribution of imported engines may be attributed to many factors including the numerous applications of imported SCEs in agriculture and other industries, as per Rodulfo et. al., 2017a and 2017b.

of which was intended to be utilized to “whenever feasible, procure from accredited local manufacturers to assist in the promotion of locally manufactured farm machineries and equipment” (R.A. No. 11203).

The Philippine Agricultural Manufacturing Sector

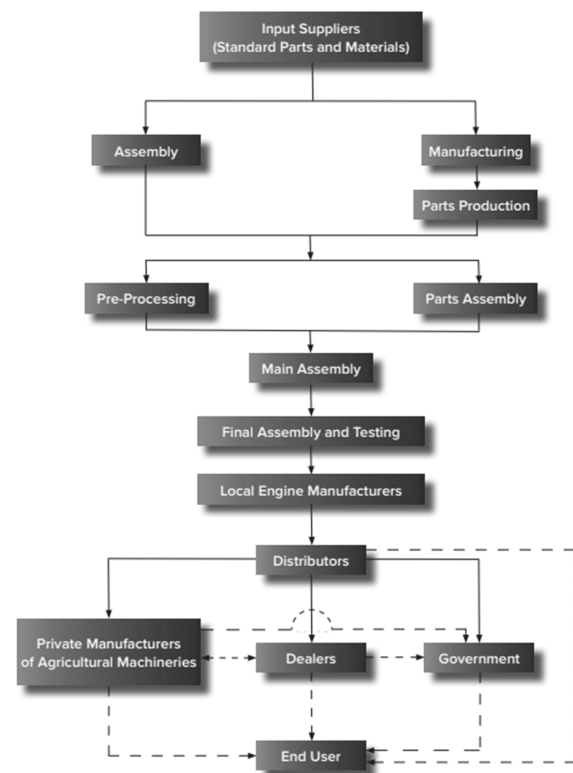
A multistakeholder roundtable discussion (RTD) on “Status of and Ways Forward for the Single Cylinder Engines,” was organized in March 2023 by the Center for Agri-Fisheries and Biosystems Mechanization (BIOMECH), the College of Engineering and Agro-Industrial Technology of the University of the Philippines Los Baños (UPLB), and the Political Economy Program (PEP) of the UP Center for Integrative and Development Studies (UP CIDS). This RTD reaffirmed previous government-industry-university agreements to push for the localization and commercialization of the SCEs.

The local agricultural manufacturing sector is a key stakeholder of the government program to promote agricultural mechanization and modernization. For one, domestic firms have long been involved in localizing SCE production and in the government mechanization distribution program. Rodulfo et al. (2017a, 2017b) indicated that as early as the 1980s, there had been attempts by the private sector to produce SCEs. In particular, the studies noted that Delta Motors succeeded in producing around 1,000 units of 12 Hp (8.95 kW) gasoline engines, but failed in its commercialization efforts. SCE localization was also pursued in the 1990s through the 2000s. These undertakings, however, were not sustained because of factors such as limited government assistance, political and financial disruption, licensing agreement problems, concern on economies of scale, and lack of enabling policy environment.

The most recent case of SCE localization was the development of a functional prototype of a 12-Hp single cylinder diesel engine through the collaboration of the Department of Science and Technology’s Metals Industry Research and Development Center (DOST-MIRDC), Philippine Center for Postharvest Development and Mechanization (PHilMech), local manufacturers like Supercast Foundry and Machinery Corporation (SFMC), and the Ramon Uy Foundry and Machinery Corporation (RUFMSC). Testing of this 12 Hp single

cylinder was conducted by the Agricultural Machinery Testing and Evaluation Center (AMTEC) (Puerto 2017). Unfortunately, the commercialization of the prototype was disrupted by the pandemic and other factors. This included the lack of funding to continue technology modifications and the absence of an assured domestic market for local SCE and local agricultural machines.

That said, the studies of Rodulfo et al. (2017a) and Larona et al. (2022a) indicated that local manufacturers have the capability to manufacture SCEs and selected agricultural machines. Rodulfo et al. (2017a, 2017b) presented a value chain model through which the production of engines could be localized. One way is to import parts of the engine for assembly in the country, with the medium-term goal of increasing local content as domestic manufacturers raise their capacity to produce the parts. Another option is to locally fabricate some parts (part specialization by local manufacturers) and obtain the other components that are commercially available (i.e., off the shelf locally or internationally through traditional and online marketing systems). The two options take a similar path as the ultimate intent is 100% localization of all parts in the long-term. See Figure 1 below.



■ **Figure 1.** Value Chain of Local Manufacturing/ Assembly of SCEs (Rodulfo et al., 2017a, 40) and (Rodulfo, et al., 2017b, 23).

Moreover, a project funded by the Department of Agriculture - Bureau of Agricultural and Fisheries Engineering (DA-BAFE) and conducted by BIOMECH in 2021–2022 indicated that local manufacturers have increased their capability to undertake various manufacturing processes, and that some of them have acquired advanced equipment (e.g., CNC machines, plasma cutters, laser cutters, and advanced welding machines) to achieve this (Larona et.al. 2022a). DA-BAFE 2022 data showed that the top agricultural

machines produced by local manufacturers were hand tractors, rice threshers, trailers, corn shellers, biomass shredders, rice mills, corn mills, mechanical dryers, hammer mills, chippers, plows, forage choppers, harrows, coffee grinders and hullers (cited in Larona et.al. 2022a). This trend in manufacturing, therefore, increases the viability of producing SCEs locally. Table 1 shows that, depending on their power rating—ranging from less than five horsepower to about 23 Hp—SCEs can be used for a variety of agricultural machines.

POWER RANGE	SINGLE CYLINDER ENGINE APPLICATION
5.00 ≤ HP < 7.00	water pumps, power sprayers, rice reapers, orchard cultivators, hand tractors, small fishing boats
7.00 ≤ HP < 10.0	water pumps, power sprayers, rice reapers, orchard cultivators, hand tractors, small fishing boats
10.0 ≤ HP < 13.0	water pumps, hand tractors, dryers, small fishing boats
13.0 ≤ HP < 16.0	threshers
16.0 ≤ HP < 23.0	threshers, generators
HP ≥ 23.0	rice mills, generators, and other agricultural application

■ **Table 1.** Applications of the SCE for Agri-fisheries Machines.

Basic Source of Data: AMMDA, as cited in (Rodulfo et al. 2017a, 22).

The UPLB-BIOMECH and DA-BAFE Local Agri-Fisheries Machinery Assembly and Manufacturing Industry Roadmap of the Philippines or LAMMP Roadmap (2022–2036) includes plans for the local production and commercialization of the single cylinder engines. The DA is implementing the roadmap through Administrative Order No. 12, s. 2022. The roadmap also planned for the availability and presence of locally fabricated machines powered by SCEs by 2031 in the domestic market.

As past efforts have shown, a comprehensive plan to grow domestic manufacturing for agricultural mechanization and modernization must involve supporting the commercialization of its products. As in other developing countries that use procurement of domestic products as a policy tool for national development, government has a role to play in ensuring the viability of locally-made SCEs. Through its procurement programs, the government would enable the industry to gain resources, experience, and market exposure to become competitive in the long term. Procurement of locally produced agricultural

machinery would also lead to huge savings of the country's dollar reserves by reducing engine and machinery importation, thus improving the country's balance of trade.

That said, the procurement of locally manufactured transplanter, combines, planters and four-wheel tractors has not yet happened. Thus, the local suppliers and dealers' participation has been limited to small machines or trading of large and imported machinery.

The budget for the purchase of locally produced agricultural machinery could come from government procurement mechanization programs. In fact, spending even only 10 percent of the estimated Php 38.27 billion importation value from 2015–2021 for farm machineries—that had been acquired abroad to procure locally made SCEs and machinery—could have gone a long way in building the domestic agri-fisheries manufacturing industry. The RCEF of RA 11203 has a budget of around Php 5 billion per year for five years to cover the procurement and distribution of

rice mechanization technologies that include locally manufactured machines.

In the March 2023 RTD, the local agricultural manufacturing sector stressed that support for locally produced SCEs and other agricultural machinery would promote inclusive and innovation-driven modernization of agriculture, particularly the manufacturing sector. Energizing the local agricultural manufacturing industry, in turn, would contribute to the creation of quality jobs in the rural population and affordable farm machinery for small farmers, thus increasing land productivity and farm incomes. In the medium term, research and development support and intensified procurement of locally produced agricultural machinery would contribute to the growth and further development of the domestic manufacturing sector.

Challenges on SCE Local Production and Commercialization

Some of the challenges on the local production of SCEs that were raised during the focused group discussions with local manufacturing stakeholders, as a result of the BIOMECH and PEP-CIDS initiative and collaboration include:

1. **Pricing and Quality:** In the early stage of the localization, it is expected that SCEs may cost higher than mainstream brands. Pricing needs to be optimized to be able to compete with the high-quality brand. Quality of the local SCEs and agricultural machines should also be at par with the high-quality and known brands.
2. **Assured Market:** Manufacturers are willing to invest on SCE local production and commercialization but are wary of not being able to compete with the cheaper and/or high-quality brands in government procurement programs.
3. **Procurement Policy:** Small to medium manufacturers argue that the restrictive procurement policy (e.g., 30-year market presence, Statement of Single Largest Completed Contract, etc.) hinders them from participating in

government bidding for agri-fisheries machinery for mechanization programs.

4. **Concrete action plan for SCE:** The 2017 policy study of Rodulfo et. al. provided policy recommendations for the local production and commercialization of SCE. These recommendations were, however, not supported by concrete action plans that could have jump-started the revival of the local SCE production.

Recommendations for the Local Production and Commercialization of SCEs

1. Continue Research and Development (R&D) support for the sustained development and manufacturing innovation of locally manufactured SCE and agricultural machineries, which are not currently manufactured locally:
 - a. Support the two-pronged thrusts for the local production and commercialization of SCE by the stakeholders: continued R&D on engine design innovations and development, and jumpstarting the local manufacture and commercialization of single cylinder engines for the agricultural and fisheries sector through university-private-government partnerships.
2. Implement the major actions for the local SCE (Rodulfo et al., 2017a), which was endorsed by the DA-Philippine Council for Agriculture and Fisheries (PCAF) and was approved by the DA Secretary on January 3, 2018. The major actions needed include:
 - a. Crafting a roadmap for a single-cylinder assembling and manufacturing (SEAM) Program in coordination with the DOST Metal Industry Research and Development Center (MIRDC) and other government and private agencies concerned;⁷
 - b. Formation of an intersectoral committee to oversee the implementation of the SEAM

⁷ This plan can also be integrated in recommendation number 1.

Program, including government agencies concerned, SUCs, Civil Societies, and the local agricultural machinery manufacturers;

- c. Institutionalization of efforts on the localization of SCE production, through the following (Rodulfo et al. 2017a):
 - Conduct of collaborative research and development on the localization of SCE production, with the collaboration of UPLB-BIOMECH, CEAT, DA-PhilMech, DA-BAFE, Department of Science and Technology-Metals Industry Research Development Center (DOST-MIRDC), local manufacturers and other stakeholders
 - Development of human resource capabilities to meet the demand for skilled labor for the local assembly and manufacture of SCEs, through the collaboration of DA-Agricultural Training Institute (ATI), Technical Education and Skills Development Authority (TESDA), MIRDC, and private manufacturing associations (e.g., Metalworking Industries Association of the Philippines, Philippine Die and Mold Association of the Philippines, Philippine Metal Casting Association, Inc., etc.);
 - d. Provision of credit by government financing institutions to local manufacturers for the upgrading and modernization of their facilities in support of local assembly and manufacture of the SCE;
 - e. Development and implementation of a localization plan for the assembly (with local content and imported content) and manufacture of the SCEs.
 - Rodulfo et al. (2017a) presented a value chain model through which the production of engines could be done through a process of localization.
 - LAMMP Roadmap (2022-2036) further identified/bolstered the need for local SCE as one of its major objectives.
3. Allocate a budget for the implementation of the Local Agri-Fisheries Machinery Assembly and Manufacturing Industry Roadmap of the Philippines (2022–2036), which shall be implemented and monitored by the DA-BAFE as part of the National Agricultural Mechanization Program (NAFMP) of the AFMech Law.

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