

# THE PERFORMANCE OF THE UPSUS PROGRAM IMPLEMENTATION ON RICE PRODUCTION AND FARMERS' INCOME

## *Kinerja Implementasi Program UPSUS pada Produksi dan Pendapatan Petani Padi*

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### ABSTRAK

Padi merupakan komoditas pangan utama penduduk dan memiliki peran penting dalam perekonomian Indonesia. Pada tahun 2015 dilaksanakan Program UPSUS oleh Kementerian Pertanian di 16 provinsi dan diperluas di 33 dari 34 provinsi di Indonesia pada 2016. Program UPSUS telah dilaksanakan selama 5 tahun, namun demikian penelitian-penelitian mengenai kinerja pelaksanaan Program UPSUS dari aspek peningkatan produksi dan pendapatan petani padi penerima program tidak banyak dilakukan. Jurnal ini bertujuan untuk menganalisis kinerja Program UPSUS terhadap pencapaian target peningkatan produksi dan pendapatan usaha tani. Program UPSUS telah berhasil mempertahankan luas tanam padi dan mendorong peningkatan luas areal panen padi, tetapi tidak berhasil dalam mendorong pertumbuhan produktivitas dan peningkatan pendapatan petani padi. Dalam implementasi Program UPSUS yang akan datang perlu diupayakan (1) mengembangkan perencanaan yang sistematis dan rinci berdasarkan evaluasi yang spesifik, komprehensif, dan terinci guna meningkatkan efektivitas pelaksanaan Program UPSUS, (2) penguatan sistem penyuluhan pertanian dan peningkatan bantuan teknis untuk meningkatkan produktivitas dan kualitas padi dan beras yang dihasilkan, (3) melakukan perbaikan dan penguatan penyelenggaraan organisasi pelaksanaan Program UPSUS mulai dari pusat hingga lokasi kegiatan, (4) menempatkan implementasi strategi pada fokus yang lebih besar untuk peningkatan produktivitas, baik melalui peningkatan penerapan paket teknologi budi daya pada usaha tani padi, maupun penurunan tingkat kehilangan hasil pada saat panen dan penanganan pascapanen, serta saat distribusi dan pemasaran, dan (5) mendorong peningkatan pendapatan petani dari usaha tani padi dan aktivitas penanganan panen dan pascapanen mereka.

**Kata kunci:** *pendapatan petani, Program UPSUS, produktivitas dan produksi, usaha tani padi*

### ABSTRACT

Rice is the main food staple commodity for the population and has an important role in the Indonesian economy. In 2015, the UPSUS Program was implemented by the Ministry of Agriculture in 16 Provinces and expanded in 33 of 34 provinces in Indonesia in 2016. The UPSUS Program has been implemented for five years; however, studies on the performance of the UPSUS Program from the aspect of increasing production and income of rice farmers who received the program were not widely carried out. This paper aims to analyze the performance of the UPSUS Program towards achieving the target of increasing the production and rice farming using descriptive analysis methods and is focused in West Java Province to get an accurate picture of implementation in the field. The analysis results show that the UPSUS Program has succeeded in maintaining the planted area of rice and encouraging an increase in rice harvested area but has not succeeded in encouraging productivity growth and increasing the income of rice farmers. In the implementation of the upcoming UPSUS Program, there must (1) develop a systematic and detailed planning base on a specific, comprehensive and detailed evaluation in order to increase the effectiveness of the implementation of the UPSUS Program, (2) strengthening the agricultural extension system and enhancing technical assistance to improve rice productivity and quality, (3) conducting improvement and strengthening in the organization of implementation from central into program location, (4) putting strategy implementation on greater focus on increasing productivity, both through increasing the application of cultivation technology packages to rice farming, and reducing the level of yield loss during harvest and post-harvest handling, and distribution and marketing, and (5) encouraging increased farmers' income from their rice farming and harvest and post-harvest handling.

**Keywords:** *UPSUS Program, rice farming, productivity and production, farmer income*

## INTRODUCTION

Rice is the most important staple crop and contributes significantly to the Indonesian economy. Rice is considered a strategic commodity that include corn, soybean, chilies, shallot, sugar cane, beef, coffee, cacao, palm oil and rubber. The Government of Indonesia (GOI) intervened heavily in rice production, marketing, trade, and pricing policies under the new Law of Food 2012. Consequently, food and nutrition adequacy became the centre of the Medium-Term National Development Plan 2015–2019. Following this, the President of the Republic of Indonesia has instructed to achieve sustainable self-sufficiency in rice, corn, and soybeans in less than five years. Thus, the Ministry of Agriculture (MOA) initiated the UPSUS program or “Special Program” for increasing rice, corn and soybean production. The MOA (2017) reported that the UPSUS program implementation was started in 2015 in 16 provinces, and expanded in 2016 to 33 provinces out of 34 provinces in Indonesia.

The UPSUS Program is an integrated approach with coordination and integration among the central government institutions down to the lowest institutions at the local level. Included are the BULOG, universities, and the military services staff. It was based on the program's success story during the early years by adjusting the current situations and conditions. The program also considers the programs that have been done in the previous period, and targeted to address some problems as the causes why Indonesia cannot meet the rice consumption needs of the population. There is a need to address these problems as soon as possible, include (MOA 2015) (1) fifty-two percent of irrigation networks have been damaged, (2) utilization of superior seeds at the farm level was only about 47% of the total acreage, (3) farmers do not use fertilizer correctly according to application time and they sometimes use it over the recommended dosage with unbalanced components, (4) lack of knowledge and education of farmers was one reason why farmers give less attention to the importance of proper crop management and input usage, (5) technology innovation and dissemination were weak because of a lack of extension staff and farmer assistance, (6) the high cost of labour was due to scarcity, (7) high losses before harvest time were due to a lack of pest control management and climate change adaptation

problems, (8) high losses at harvest and post-harvest handling problems were due to lack of mechanization and technology, and (9) lack of coordination and integration among stakeholders and weak capability of farmers were due to inadequate capital and access to transportation, distribution and marketing facilities.

Due to those problems, the UPSUS Program on rice has been designed include 10 components (MOA 2015) (1) development of irrigation networks to develop new big and small DAM and new irrigation networks in some specific areas, rehabilitation of primary and secondary irrigation networks in all existing areas, introduce the deep well and pump irrigation system in some specific areas, (2) land optimization, cover locations which have paddy field with cropping index (CI)  $\leq 1$  with paddy field rehabilitation in the specific areas, tertiary irrigation network rehabilitation in all areas, and introduce deep well and pump irrigation system for the specific areas, (3) Development of System of Rice Intensification (SRI) for the specific and favorable areas, (4) implementation of Integrated Crop Management (ICM) for all locations program using Farmers Field School (FFS) and demo farms assisted and tested by University and Indonesian Agency for Agricultural Research and Development (IAARD), (5) provision of superior seed and assistance for all production center areas, (6) provision of subsidized chemical fertilizer and assistance for all production center areas, (7) provision of agricultural equipment and machinery and assistance for all production center areas, (8) Pest control and the impacts of climate change for all production center areas, (9) agricultural insurance for specific and pilot project areas, and (10) guidance and extension for all areas and link to the other programs to address farmers' problems on capital and access to transportation, distribution, and marketing.

Five components of the UPSUS program support the increase in planting areas and productivity by providing production facilities and infrastructure and providing farm support. Providing production facilities and infrastructures has three components (1) providing seed assistance, (2) providing fertilizers assistance, and (3) providing agricultural machinery assistance; while providing farm supports has two components (1) the development of agricultural insurance, and (2) guidance and assistance. In terms of program outcome, the UPSUS program has increasing planting areas

and productivity through technology application as the primary target focus in its implementation. Provision of production facilities and infrastructures and farm support is a supporter of achieving the target of the increase in planting areas and productivity. These two aspects (increase in planting areas and productivity are also set as performance indicators to measure the level of success in their implementation). The UPSUS program is expected to increase rice production by increasing the harvested area and productivity (Setiyanto and Pabuayon 2020).

The performance indicators or outcomes of the UPSUS program implementation were stipulated in the Minister of Agriculture Regulation No. 03/2015. There were no performance indicators set, hence, the 2015 performance indicators were used for the next four years (ICASEPS 2019; Setiyanto and Pabuayon 2020; Setiyanto 2020). Based on this regulation, the performance indicators of the UPSUS program implementation on rice were an increase in rice planting area or cropping index (CI) of at least 0.5 and an increase in rice productivity of at least 0.30 tons/ha of gabah kering panen (GKP) or harvest dry quality of paddy and equal to 0.25 tons/ha of gabah kering giling (GKG) or rice mill dry quality of paddy. GKG is a standard quality in the statistical data (Setiyanto and Pabuayon 2020; Setiyanto 2020). The UPSUS program has been implemented for five years. Researches on the performance and impact of the implementation of the UPSUS program in achieving the target of increasing the production and income of rice farmers who received the program were not widely carried out. This paper aims to analyze the achievement of performance targets for implementing the UPSUS program in rice production and increasing rice farmer income based on statistical publication and literature review. This paper aims to discuss the performance of the components of UPSUS program during the implementation of the program based on statistical data and some studies in the second section after the introduction. The third section shows the UPSUS program performance on target achievement based on statistical data and some studies. The next section shows farmers' inputs use, yield, and income to show UPSUS program implementation. The final section is concluding remarks.

## THE PERFORMANCE OF THE COMPONENTS OF UPSUS PROGRAM

In the four years of implementing the UPSUS program (2015/2016–2019), the Regulation of the Minister of Agriculture No. 03/2015 was issued in 2015, and this was the only released guideline during this period. This guideline was used as a reference in implementing the UPSUS program until 2019 (Setiyanto 2020). Meanwhile, the technical guidelines for implementing the UPSUS program activities at the central level were exceptionally complete and were issued each year, including the technical guidelines for small dam development, rehabilitation of tertiary irrigation networks, seed assistance, fertilizer assistance, machinery assistance, guidance and extension in carrying out operational activities (ICASEPS 2017; ICASEPS 2019; Setiyanto 2020). However, the technical guidelines for implementing the UPSUS program obtained from the local level, provincial and district/city government agencies were not complete (Setiyanto 2020). A general description of the implementation of the UPSUS program in Indonesia during 2016–2018 showed that the Government of Indonesia (GOI) provided significant support for rice in the UPSUS program. Based on the Directorate General of Food Crops (DGFC) and Directorate General of Agriculture Infrastructure and Facilities (DGAIF) of MoA (2019) data, expenditure support for the UPSUS program on rice amounted to around IDR 24 trillion in 2016 and increasing to more than IDR 32 trillion in 2018. This amount does not yet include the fertilizer subsidy, new big dam development fund, credit interest subsidy, and transportation access and networks. Almost all the program components were implemented and carried out through farmer group development capacities. The distribution among provinces was based on the contribution of the national production center of rice production.

### Irrigation Network and Land Optimization

The implementation of irrigation network development activities is directed at rehabilitating tertiary networks damaged and connected to secondary and primary channels. Tertiary networks consist of (1) tertiary canals and buildings, (2) quarterly canals and buildings, and (3) disposal channels. During 2016–2018, the rehabilitation of the tertiary irrigation channel has covered 3,141,153.57 ha paddy field irrigated areas in 32 provinces and 1,386,176.20 ha for land optimization development programs in 31 provinces. The results of several studies indicated that the implementation of the

development of irrigation networks and land optimization components has problems (ICASEPS 2019 and 2017; Setiyanto 2020; Setiyanto and Pabuayon 2020) (1) tertiary integration channels built were not integrated with improvements in the secondary or primary irrigation networks and dams (still in a damaged condition and sedimentation accident), and other tertiary networks, (2) relatively short preparation time negatively affected construction, and cost standards set by the government. For tertiary channel repairs do not meet the needs and the rehabilitation activities carried out by consultants and contractors resulting in inadequate facilities, and (3) land optimization socialization activities and planning for implementation of Design Investigation Survey (DIS) activities were not carried out properly, and water sources and land are not available for facilities construction.

These components have no impact on increasing CI due to West Java, having an average CI more than 2 times a year (Setiyanto 2020). The same result was coming from the study by Eviriani (2018), that rehabilitation of tertiary irrigation networks impacts on changes in fixed cropping patterns 2 times a year, namely MT-I (rainy season) and MT-II (Gadu season) but in terms of land cultivation. Although it has no impact on increasing cropping index (CI), several studies have shown that rehabilitating irrigation networks has an impact on increasing production, income and adoption of rice cultivation technology for farmers and farmer groups. The maximum availability of irrigation water from the newly constructed tertiary channel is one of the factors in increasing the production and income of lowland rice farming (Ismaya et al. 2016), has a significant effect on increasing farmers' income (Suwarni 2015), increase rice production and productivity (Triasni 2019). After the rehabilitation of the rural irrigation infrastructure, the water supply was becoming more available, and farmers were motivated to adopt the rice farming technology and rice cultivation management (Zakaria 2014).

### **System of Rice Intensification (SRI) and Integrated Crops Management (ICM)**

SRI development has been implemented in 24 provinces and amounted to 365,280.00 ha during 2016–2018. SRI is a way of cultivating rice on irrigated and non-irrigated paddy fields whose water availability is guaranteed to be intensive and efficient in managing land, plants, and water through empowering farmers or farmer groups and local wisdom (DLEM 2014). Rice planting in the SRI pattern is an environmentally friendly way of cultivating rice, starting from the tillage process

by providing organic material (compost), conducting quality seed test, seedling through dry nursery, intermittent water management (water scrambling), single planting, young seedlings, shallow and horizontal roots and spacing of 25x25 cm<sup>2</sup> or 27x27cm<sup>2</sup> or 30x30 cm<sup>2</sup> (IAARD 2015). This component of the UPSUS program concerns the organic rice development program developed in Paddy Organic Farming Village and the specific or special rice development program (DGFC 2016a, 2017a, 2018a, 2019a). The Paddy Organic Farming Village is where paddy or more organic farming has been developed (DGFC 2016b). Implementation of the organic farming system based on the Minister of Agriculture Regulation No. 64 of 2013 and the Indonesian National Standard 6729: 2016 (DGFC 2016a).

Based on DELM (2014), rice field soils should be kept moist rather than continuously saturated in the SRI technology, minimizing anaerobic conditions, as this improves root growth and supports the growth and diversity of anaerobic soil organisms. Rice plants should be planted singly and spaced optimally to permit more roots and canopy growth and keep all leaves photosynthetically active. Rice seedlings should be transplanted when young, less than 15 days old, with just two leaves, quickly, shallow and carefully, to avoid roots trauma and minimize transplant shock. The SRI pattern emphasizes the efficient use of water and seeds and improving soil fertility by providing organic (compost or biological fertilizer) intake (IAARD 2015). Development of specific rice is an effort to cultivate rice by utilizing particular varieties, including Japonica rice, Basmati, Thai Hom-Mali, Black Glutinous Rice, Steamed Rice, Taiken, Tarabas, etc., to meet the needs in the specific rice market segments through domestic production (DGFC 2016a; 2016b; 2017; 2018; 2019). "Hazton Farming System" technology is a way to grow rice using old seeds (25–30 days) after seedling with the number of solid seeds (20–30 stems) per planting hole (IAARD 2015a; DGFC 2016d). This technology leads to organic farming, where chemical fertilizers should be reduced as much as possible, like straw for organic materials with the help of decomposers. The utilization of biological fertilizers, organic fertilizers, and biological agents characterizes the development of rice with this technology. The other components are more or less the same as the ICM recommended by the IAARD (DGFC 2016d). West Java Province got allocation amounted to 50,819.00 ha in 2016–2018 or 13.91% of the total national allocation. SRI development program reported failed because the location did not match the criteria needed in

developing SRI (intermittent irrigation) and not according to farmers' preferences (not compatible with the mechanization program, skilled workers are not available) in some districts of West Java (Setiyanto 2020). Based on WJAIAT (2017; 2016) reports, teoretically the "Hazton Farming System" is better, but the implementation results has shown worse results than SRI technology.

During 2016–2018, Integrated Crop Management (ICM) technology package has been implemented in 31 provinces and covered rice planted areas amounted to 3,676,504.36 ha. ICM is an innovative approach to increase farm productivity and efficiency by improving the system or approach to assemble synergistic technology packages between the technology components carried out participative by farmers and site-specific (DGFC 2015). ICM is an innovation to solve various problems in increasing rice productivity. It applies rice intensification technology on site-specific, depending on the problem to be addressed (demand-driven technology). The ICM technology component is determined jointly by farmers through a need assessment. The component of basic ICM technology or compulsory is a technology that is recommended to be applied in all locations (WJAIAT 2017; 2016). Before the UPSUS program being implemented, the ICM technology package was implemented in the form of The Farmer Field School (FFS) program since 2007 by IAARD and AIAT in all provinces as a responsible provincial institution, transferred into national program authorized by DGFC in 2009 in some provinces and decided as a massive program in the UPSUS program. The success of the ICM FFS implementation towards increasing rice productivity and farmer income in several regions in Indonesia is shown by several research results (Arya and Mahaputra 2020; Simanjuntak et al. 2016; Supriadi et al. 2015; Suharyanto et al. 2015; Kinanthi et al. 2014; Sadikin 2013; Kamandalu et al. 2013; Nurasa and Supriadi 2012; Kamandalu et al. 2012). In 2016, the implementation of the ICM program used the "Jajar Legowo (Jarwo) Farming System" (DGFC 2015; 2016; 2016c).

In 2017, this program was transformed into other programs and was named, "Jarwo Super Farming System", and "Salibu Farming System", among others (IAARD 2015a; DGFC 2017a; 2018a; 2019a; DGAIF 2019; 2018). The total cumulative coverage of the program in 2017–2018 was 212,305 ha. "Jarwo Planting System" is a pattern of rice planting alternating between two or more (usually two or four) crop rows and

one blank row. The term "legowo" was taken from the Javanese language "lego" which means broad and "dowo" which means long. "Legowo" was also interpreted as a way of planting rice that has several rows and interspersed with one empty row (IAARD 2013; DGFC 2016c). In this case, the population of rice clumps in the empty row is placed and inserted in the row next to it, so that the "Jarwo" method did not reduce the number of plant population, but the method of planting by creating all rows of plants is in the "edge row" (IAARD 2013; DGFC 2015; WJAIAT 2017; 2016). "Jarwo Super Technology" is an integrated cultivation technology of irrigation wetland based on a 2:1 (one blank row in every two rows) planting system (IAARD 2016; WJAIAT 2017). The important parts of this technology are using (1) new high yielding varieties (HYV's), (2) bio-decomposers has been given together during soil processing/land tillage, (3) organic and biological fertilizers are applied through seed treatment and balanced fertilization, (4) plant-based pesticides and inorganic pesticides (based on thresholds) in the pest control, and (5) agricultural equipment, tools, and machinery, especially "Jarwo Transplanters" for planting and combine harvester for harvesting.

This shows that the planting technology is carried out to adjust with the help of tools and machines provided in the UPSUS program implementation (IAARD 2016; DGFC 2017a; 2018a; 2019a). "Salibu Farming System" or "Salibu Technology" is rice cultivation technology by utilizing rootstock after harvest as a producer of shoots or tillers, which will be maintained. The shoots function as a substitute for seedlings in the transplanting cropping system. Using this technology, farmers will not need seed for a nursery and they apply minimum tillage to reduce the cost of land tillage (IAARD 2015; WJAIAT 2017; 2016). Unfortunately, without realizing it, Jarwo Super Technology was originally thought better than ICM, but it was no better when it was implemented massively. The average productivity and net farm income level of ICM 8.80 ton/ha Rp 14.65 million/ha (WJAIT 2016) and higher than the results of Jarwo Super Technology with the productivity and net farm income level 8.60 ton/ha and Rp 12.20 million/ha (WJAIT 2017). Due to cultural factors constraints and showing results that are not better, Jarwo Super Technology was not adopted by many farmers in Subang, Karawang and Indramayu (Setiyanto 2020).

The extension workers and farmers should fully understand the new technology system. The transformation of a technology program package from ICM to another has caused several

problems in implementing the UPSUS Program. The ICM technology, whose development has been pioneered since 2007 and has been tested in the long-run has been replaced by new, untested technology packages such as the Jarwo technology, Jarwo Super technology, Salibu Technology, and Hazton Technology. The Jarwo Super technology is no better than the ICM technology and has inferior results before and after the UPSUS Program implementation. Setiyanto (2020) reported four problems (1) there was no more guidance and assistance for the farmers after the demo farm program implementation, (2) as the new technology package, the Jarwo Planting System requires skilled workers who are not available on-site; this technology did not match with the farmers' preferences, (3) the "Jarwo transplanter" machine is too big and heavy, and the wheels have collapsed due to thick soil and deep mud, and (4) during the implementation of the UPSUS Program, there were problems on the extension workers and farmers' knowledge about the application of the components of the UPSUS Program, especially regarding the new technical terms of agricultural innovation. Nugroho et al. (2017) reported that farmers' knowledge about the program assistance component is still not maximized and many extension workers and farmers do not understand the terms of some new technology and innovation components. The experienced farmers who adopt the ICM technology and modify it according to their conditions and preferences produce more output and income than the technology package used in implementing the UPSUS program since 2017 (Setiyanto 2020). In contrast to the ICM applied previously, the change confused agricultural extension workers and was not adopted by the farmers. When it was first introduced, the farmers were willing to accept it because there was a grant in farm inputs; however, it was not implemented and adopted during the following year.

### **The Provision of Rice Seed and Fertilizer**

At the national level, these components are allocated in all (34) provinces. During 2016–2018, the GOI distributed 58,052.70 tons of subsidized rice seeds and 20,457,614.06 tons of subsidized fertilizer. Before the UPSUS program being implemented, the provision of subsidized seeds and fertilizers have been a regular program. In the UPSUS program, the GOI increased the rice seed provision volume and coordinated and controlled for subsidized fertilizer. Studies in several locations in Indonesia show that the subsidized fertilizer and seed

assistance policy has a positive impact on production (Ramadhani et al. 2019; Prayoga and Sutoyo 2017; Yurahman 2014) and at the national level, the fertilizer subsidy policy increases the consumer surplus (Naully 2019). However, there were problem in the provision of rice seed and fertilizer include (1) the seed provided did not match with the farmers' preference (the varieties are not the same as those proposed by farmer s, have poor quality and mixed with other varieties, and deliveries were late) and different prices among the varieties caused farmers to be less sure about their quality, and (2) fertilizer distributors were often not timely in distributing fertilizers and warehouse capacity is lacking, farmers were less enthusiastic in using organic fertilizer and socialization is not enough (Setiyanto 2020; ICASEPS 2019; ICASEPS 2017).

Prasetyo and Saksono (2019) concluded that (1) The effect of seed subsidies on Farmer Terms of Trade (FTT) in general / national negative, the relatively small and varied realization of the distribution of seed subsidies between years cannot explain the significance of the effect on FTT. This indicates a problem in distribution related to timeliness, quality, quantity, and price. The impact on FTT is less visible, (2) at the national level, fertilizer subsidies also have a negative effect on FTT. This implies that even though the realization of subsidies (in tonnes) is relatively large each year of observation, the subsidy price is thought not to be thoroughly enjoyed by farmers because it is not reflected in the NTP indicator which is conceptually a price index ratio, and (3) There are still some weaknesses in implementation.

The policy of seed subsidies and fertilizer subsidies, among others the suboptimal realization indicates that policy planning is not yet mature, at the level of implementation it is not yet fully as expected (not fulfilling the principles of timely, quality and quantity), as well as sub-optimal supervision and farmer institutions. Results of a study by the CEC (2017) showed that (1) the design of the subsidy program has not supported the implementation of effective and efficient policies, (2) the implementation of policies has not been able to make subsidy programs implemented effectively and efficiently, and (3) supervision over the implementation of the subsidy program has not been running optimally. Supervision of the subsidy program has not yet involved the active role of all stakeholders. Policymakers and implementers have not entirely made efforts to ensure that the implementation of subsidy programs achieves results according to the stated objectives.

### **Agricultural Equipment and Machinery Provision**

During 2016–2018, the GOI distributed 280,092.00 units of agricultural equipment and machinery for all provinces. In West Java, these components have been implemented in 27 districts, and it amounted to 26,693.00 units in 2016–2018. Based on DGAIF 2018 data, this component distributed only small numbers for some paddy field areas, but extensive and massive in all districts and provinces of the UPSUS program (DGIF 2019). A study showed that this component impacts increasing farmer production and income (Prayoga and Sutoyo 2017). However, commonly the study showed some problems. The common problems of this component are agricultural equipment and machinery that provided do not fit into local agro-ecosystem and other local characteristics i.e local community socio-cultural, availability of warehouse, workshop and spare parts, skilled operator, and existing providers (Setiyanto 2020; ICASEPS 2019; ICASEPS 2017).

Agriculture machine tool aid preferred in rice plants, especially in cultivating, planting and harvesting activities; the types of given tools were not the same for each group; Agriculture machine tools size did not adjust the condition of farmers' land (Darwis et al. 2020). A Study by Hantoro et al. (2020) concluded that (1) there are no significant differences in rice production and productivity after utilising of agricultural equipment and machinery in the lowland and highland area, (2) a significant difference in the use of assisted agricultural equipment and machinery was the increase in the rice planting index, which only occurred in upland areas, and (3) in general, the use of assisted agricultural equipment and machinery has a positively impacts rice production, productivity, and the rice planting index.

### **Pest Control and Climate Change Impact, as well as Agriculture Insurance**

Pest control and climate change impact implement in the form of FFS climate change, and this component has been implemented at 34 provinces covers 2,924,553.00 ha during 2016–2018. The agricultural insurance program covers 2,304,160.11 ha at 16 provinces in Indonesia during 2016–2018. The component of pest and disease control and the impact of climate change is inadequate and ineffective, due to less attention from a government institution. There is limited the number of agricultural extension workers available and the training provided, new rice varieties that are more resistant to certain

pests and diseases are introduced into the seed assistance program, but the increase in the crop index from once to twice and from twice to thrice a year in 2016 resulted in a rapid increase in pests and diseases in 2017 (Setiyanto 2020). Mitigation costs incurred by the farmers and the government budget to cope with impacts have increased.

The agricultural subsidy policy is implemented to boost national food productivity. It is hoped that the subsidy policy will also reduce planting costs and protect farmers' planting businesses. In reality, the efficiency and effectiveness of implementing the programs contained in the subsidy policy still create various problems (CEC 2017). The rice farming insurance (*Asuransi Usaha Tani Padi / AUTP*) program impacts social change and good economic health in the community. This can be seen from a good change in the aspect of social attitudes and an increase in financial terms, namely an increase in income or income, the level of asset ownership and also the level of consumption expenditure (Irfan 2019). However, agricultural insurance has very little socialization and promotion, guidance and extension, and a one-time pilot project is considered not enough (Setiyanto 2020). The results of the study by Saleh et al. (2019) also show that the one problem on agricultural insurance component implementation is the socialization problem. The achievements of the rice insurance (AUTP) and Community Business Credit (*Kredit Usaha Rakyat / KUR*) programs have not been optimal and beneficiaries are still constrained in accessing the programs (CEC 2017).

The program's implementation has been successful but socialization is still lacking and complex application resolution (Saleh et al. 2019). The insurance company officers did not actively carry out an information campaign. They directly explained to the farmers, and the insurance claims process takes too long (three months) affecting the next season's rice planting (Setiyanto 2020). They only came to the District Agriculture Office together with the central and provincial governments team but left to agricultural extension workers to inform the farmers. The operationalization in the field was not well prepared and without enough socialization and understanding of the agriculture insurance as a critical component of the UPSUS program.

### **Guidance and Extension Services**

These components allocated for all provinces in Indonesia amounted to 57,514 persons per

year during 2016–2018 (DGAIF 2019; 2018; 2017). In this component of the program, in addition to involving agricultural extension agents who are already in their respective jobs, there was participation from elements of the Army, namely, the Bintara Pembina Desa (BABINSA). This cooperation is contained in the memorandum of understanding (MOU) between the Minister of Agriculture and the Kepala Staf Angkatan Darat (KASAD) or Indonesian Army Force (IAF) chief of staff No. 01 / MOU / RC.120 / M / 2015 concerning Realizing Food Sovereignty. Operating from the MOU, the MOA issued the Minister of Agriculture Regulation No. 14/2015 concerning Guidelines for Integrated Guidance and Assistance, Extension Workers, Students, and BABINSA within the framework of the UPSUS program (MoA 2015a). Based on the MOU, the IAF followed up by moving the entire regional military command starting from the Military Resort Command (MRC), the Military District Command (MDC) and the Military Sub District Command (MSDC) and all other territorial apparatuses to be directly involved in the success of the government program. The guideline states that to achieve sustainable self-sufficiency in rice, corn and soybean, the agricultural extension officers, students, and BABINSA are the main actors to implement technology. The extension agents, students, and BABINSA were driving factors for farmers. They can play an active role as communicators, facilitators, advisors, motivators, educators, organizers, and dynamists to carry out activities to increase rice, corn and soybean production. The involvement of students and universities in this program was only in 2016 (ICASEPS 2017; Setiyanto 2020).

The implementation of the UPSUS Program has succeeded to improve rice production. Yet there were problems at the level of both farmers and extensions workers, an issue on time of preparation, starting of implementation, and the supervisors' motivation. Supervision is needed at the start of the planting season, and the supervisors' salary needs to be increased for improving their motivation (Sari and Sjah 2017). During the implementation of the UPSUS Program, there were problems with the extension workers and farmers' knowledge about the application of the components of the UPSUS Program, especially regarding the new technical terms of agricultural innovation. Many extension workers and farmers do not understand some new technology and innovation components, although providing subsidized seed, a balanced fertilizer and rehabilitation tertiary irrigation have been running well (Nugroho et al. 2017). Agricultural extension workers have successfully carried out their role as facilitators, educators and

technical experts and farmer participation in the UPSUS Program is high, but there is no relationship between the role of agricultural extension agents and farmer participation in the UPSUS Program (Firmansyah et al. 2016). There were technical, economic, and institutional problems in program implementation, program support and promotion, it has given less attention to the empowerment of farmers (Saptana et al. 2016). This means that agricultural extension agents have no role in increasing farmer participation in the UPSUS program. Research in Banten Province by Pullaila et al. (2018) showed that the larger the farm size, the more training provided by the government extension office, and the more extended farming experience, the lesser the negative perception on the use of transplant and combine harvesters. Educational background (formal human capital formation), the number of family members (within-household labor endowment), and yield per hectare do not significantly affect farmers' negative perceptions. The government agricultural extension service plays a significant role in lessening farmers' negative perceptions of transplanters and combine harvesters and thereby facilitates agricultural mechanization to cope with the rapid rise in agricultural labor wages.

Based on the Regulation of the Minister of Agriculture No. 14/2015 (MoA 2015a), the difference in the tasks of agricultural extension workers, BABINSA and students are noticeable. The tasks do not overlap but are complementary. Likewise, the tiered working relations between agencies are clear. The important and necessary factor is that the two parties coordinate with each other to facilitate the implementation of the task. The presence of BABINSA in the food program serves as a motivator and encouragement for farmers and farmer groups and as a trigger for extension workers and agricultural officers in the field. The BABINSA is not to take on instructors duties but to ensure the synergy of steps and movements of their respective functions and roles to improve the dynamics of agricultural development in the rural areas (ICASEPS 2017). The weakness of this approach is that the Ministry of Home Affairs (MOHA) did not participate in the cooperation agreement (ICASEPS 2017; Setiyanto 2020). As a result, the Governors and Regents/Mayors are not entirely responsible for the success of this program in their areas. Meanwhile, due to regional autonomy, the agricultural extension workers and agricultural service officials are no longer under the central government's authority. The agricultural extension workers and staff of the agriculture office in the regions participating in the



program get additional workload, but as in the central, the Governor and Regents/Mayor did not provide additional salary (Setiyanto 2020). Increasing salaries and improving and strengthening the organization's implementation of the UPSUS program needs to arrange.

The organization of the implementation of the UPSUS program needs to be arranged specifically to avoid having multiple positions and eliminate the presence of people who do not have the skills, capacity and ability to be in it (Setiyanto 2020). The organizational structure must be filled with competent human resources in their fields and focused on the commodities developed. The organizational structure must be directed to accommodate the coordination, synchronization and integration of planning, implementation, evaluation and monitoring from various central and regional agencies namely the Ministry of Home Affairs, the Ministry of Public Works, the Ministry of Development Planning, the Ministry of Industry and Trade, and the Governor and Regent / city. The improved organizational structure must be able to carry out tasks consistent with the plans that have been prepared and the targets set to be achieved. Should strengthen the system extensions by providing more extension workers with adequate knowledge and skills according to areas where they are most needed. Both central and local governments should constantly offer technical assistance to encourage farmers to improve their farm productivity. Such support should be provided (1) in terms of improved farmers' knowledge through trainings, extension services, greater access to tenable credit programs, and an efficient marketing system, and (2) in terms of innovations and new invention, specific location technologies are more appropriate and more efficient through various means such as demo farms, field laboratories, superior seeds, and more suitable agricultural equipment and machinery.

### THE UPSUS PROGRAM PERFORMANCE ON TARGET ACHIEVEMENT

The UPSUS Program is expected to increase rice production by increasing both the harvested area and productivity. All strategies are meant to increase the planting activities, harvested areas and productivity by providing favourable conditions for paddy growing and input use efficiency. As stipulated in the Minister of Agriculture Regulation No. 03/2015, there were two performance indicators of the UPSUS program implementation on rice. First is an

increase in rice planting area or cropping index (CI) of at least 0.5 times per year. The second is an increase in rice productivity of at least 0.30 tons/ha of Gabah Kering Panen (GKP) or harvest dry quality of paddy (equal to 0.25 tons/ha of Gabah Kering Giling (GKG) or rice mill dry quality of paddy). Concerning to the facts that the 10 components of the UPSUS Program can be grouped into four aspects, namely: (1) The increasing planting area has two components, namely, (i) irrigation network development and (ii) land optimization; (2) aspect of increasing productivity through the application of technology with three components, namely, (i) development of the system of rice intensification (SRI), (ii) massive implementation of the integrated crop management (ICM), and (iii) control of plant pests and diseases and the effects of climate change; (3) aspect of providing production facilities and infrastructure with three components, namely, (i) providing seed assistance, (ii) providing fertilizer assistance, and (iii) providing agricultural machinery assistance; and (4) the aspect of providing farm support with two components, namely, (i) development of agricultural insurance and (ii) guidance and assistance, then the production increase is to be achieved through an increase in planting area (the first aspect) to reach the target of rice harvested area, and increased productivity through the application of technology (the second aspect). These two aspects set the performance indicators to measure the level of success in program implementation. Supporting aspects are providing production facilities and infrastructure (third aspect) and farm support (fourth aspect).

### Rice Cropping Intensity and Productivity Target Achievement

The results of the analysis using the increase in rice cropping intensity (CI) by 0.5 as a measure of performance indicator show that in 2016–2018, the rice CI in the study area in West Java (Setiyanto, 2020), some Province (ICASEPS 2019) and at the national level (Setiyanto and Pabuayon 2020) never reached the target Copping intensity at the national level reached 56% of the target, while West Java achieved only 16% of the target Indramayu only reached 4% of the target in the study area, whereas Karawang and Subang performed better by attaining about 16% and 32% of the target, respectively (Setiyanto 2020 and Setiyanto and Pabuayon 2020). The result shows that the UPSUS program did not succeed in achieving the target of CI increase. Considering the changes from 2015 to 2018, rice CI showed only a slight increase. This shows that the level of CI, which is already above

2 in the study area and West Java, has reached the maximum level. At the national level, where the average rice planting intensity is less than 2, there is still an increase.

The performance indicator of productivity improvement, where the target is to increase productivity by 0.25 tons/ha of GKG, did not achieve the target (Setiyanto 2020; ICASEPS 2019; Setiyanto and Pabuayon 2020). The productivity of paddy in 2016, 2017 and 2018 was stagnant and showed a tendency to decline. When compared to that of 2015, the productivity in 2018 showed a far more significant decline. Aside from not achieving the target increase, productivity has been stagnant and showed a tendency to level off or a continuous decline in the study sites in West Java and at the national level. At the same time, the UPSUS program was being implemented.

#### **Trend of Harvest Area Development, Productivity and Production: Component Allocation and Other Influential Factors during the UPSUS Program Implementation**

Based on national statistical data (CADIS 2020; 2019; 2018; CBS, 2021; 2020; 2019; 2018; 2018a; 2016; 2015; Prasetyo et al. 2020; Prasetyo et al. 2020a) in the period of 2014–2018, rice harvested area increased by average 3.79% per year, productivity decreased by average -0.22% per year and production increased 3.56% per year. Compared to 2010–2014, the harvested area increased by 0.99% per year, productivity increased by 0.59% per year and production increased by average of 1.55% per year. This is mean that although rice harvested area and production growth during the UPSUS program implementation higher than the 2010–2014 period, UPSUS program implementation was failed to increase productivity. In the case of West Java, Setiyanto (2020) noted that (1) in 2010–2014, average paddy production in West Java declined by about 0.11% per year, with an annual growth rate in the harvested area of -0.65% per year and productivity of 0.54% per year. The harvested area of paddy declined and productivity tended to be stagnant, (2) during UPSUS program implementation (2014–2018), average paddy production in West Java increased by about 1.90% per year, with an annual growth rate in the harvested area of 1.93% per year and productivity of 0.07% per year. Harvested area of paddy increased and its productivity started to level off, (3) the data show that the productivity growth rate was slower than the harvested area. The increase in rice production, therefore, was determined by the rise in area than productivity.

This phenomenon indicates that rice technology adoption at the farm level has been developing well enough and has experienced saturation and requires innovations to increase rice productivity, (4) In the last decade, the area of rice harvested in West Java reached its lowest level in 2015 and increased again in 2016, and continued until 2018. This means that during the UPSUS program's implementation, the average growth in the harvested area of rice in West Java increased again after experiencing declining growth in the period five years before. However, the average rice productivity growth during the UPSUS program was lower than the average growth of the previous five years. This shows that the UPSUS program has encouraged an increase in rice harvested area but did not increase rice productivity in West Java. Even though it offers a lower negative growth value, decreasing productivity during the implementation of the UPSUS program that occurred in West Java shows the same thing as happened in the national situation.

As a consequence, the contribution of West Java to national paddy harvested area and production to the national production has declined by about 1.67% per year and 1.68% per year in 2010–2014, respectively, and this condition continued in the next period. During 2014–2018, West Java's contribution to the national harvested area and rice production was about 13.55% and 15.51% per year, respectively. However, such contributions declined by an average of 1.85 % and 2.07% per year, respectively (Setiyanto 2020; CADIS; 2020; 2019; 2018; 2017; DGFC 2019; WJOAFC 2019). The data show that during the implementation of the UPSUS program, the contribution of West Java to the national harvested area and production declined. Such increase was contributed by the other provinces rather than by West Java. The development of the harvested area, productivity and rice production in West Java are very likely to have a close relationship with changes that occur during the implementation of the UPSUS program.

ICASEPS (2019; 2017) showed that since the middle of 2016, there had been a change in the program's focus. It has become more focused on increasing the rice planting area. Stopped the participation of tertiary institutions (university) and students in providing technical assistance to increase productivity at the end of 2016. The SRI development component and the ICM massive movement were ended in 2016 and replaced by other technology packages that were relatively new and these were introduced in early 2017. Likewise, the focus was to increase the rice

cropping index from once to twice and twice to three times a year. This meant increasing the risk of pests and diseases of rice plants. Statistical data (CADIS 2018; 2017; 2016) show that national rice planting which was attacked by pests and diseases, increased by 15.77% in 2016, and 16.50% in 2017 compared to 2015. In West Java Province, the rice planting area was attacked by pests and diseases increased by 15.92% in 2016 and 31.33% in 2017 compared to 2015.

ICASEPS (2017) which conducted a national study, identified five main problems in increasing rice production, namely (1) damaged irrigation of around 3 million ha, could potentially result in rice production loss of around 4.5 million tons, (2) the farmer's delivery of fertilizers often experiences a delay of about 1–2 weeks and potentially causes loss of rice production of around 3.0 million tons, (3) the number of agricultural extension workers is decreasing, leading to a loss of rice production of 3.0 million tons, (4) the use of seeds whose quality is not good and certified causes loss of rice productivity potential of 1.0 ton/ha, meaning that potentially from 6.0 million hectares of paddy fields can lose potential rice production of about 6.0 million tons, and (5) limited supply and use of machinery can cause pre-harvest and harvest losses of around 3.5 million tons. The study noted that despite successfully implementing the repair of damaged irrigation networks and procurement of agricultural equipment and machinery, other aspects were problematic.

The results of studies on the magnitude of the level of loss of rice production due to pests and diseases of rice planting areas were not available yet Based on the statistical data (CADIS 2019; 2018; 2017; 2016; DGFC 2018; 2017; 2016), it is estimated that pest and rice disease attacks have the potential impact of a decline in West Java rice production of around 176 thousand tons in 2016 and nearly 211 thousand tons of paddy rice in 2017 compared to the previous year. At the national level, it is estimated that there has been a potential loss of rice production of around 1.31 million tons in 2016 and nearly 1.4 million tons in 2017. Setiyanto (2020) noted that it could be estimated that if the problem of increasing pest and disease attacks did not occur, harvested area, productivity and production of rice at the national level would be more significant. Likewise, the growth rate of the harvested area, productivity and production of the rice can be expected to increase even more remarkable. The information described above can be considered the cause of the low rice harvest and productivity growth rate in West Java after implementing the UPSUS program.

Research by Ahmadi and Rusmawan (2017) shows that the UPSUS program impacts on increasing planting area and harvest area significantly but has no significant effect on increasing rice production. Ismaya et al. (2017) found that the decline in production yields in one area of Majalengka District resulted from an attack by blast plant diseases. The UPSUS program impacts on increasing the planted area and harvested area and rice production on the island of Belitung, both in East Belitung Regency and Belitung Regency. The most significant impact was an increase in harvested area by 14.63% in East Belitung Regency and 59.47% in Belitung Regency. However, the increase in the harvested area has not been accompanied by a significant increase in production. The use of blast bacterial resistant varieties, rotating varieties and planting more than one variety in a stretch, balanced fertilization according to recommendations and followed by integrated control of plant disturbing organisms (OPT) is a solution to increase rice production. The research results provide the same information by Maulana et al. (2018) showing that the implementation of the UPSUS program for corn and soybean rice in Aceh Besar District did not result in an increase in rice production, in fact there was a decrease in rice production to 230,985 tons in 2015 and 199,248 tons in 2016 compared to before the implementation of UPSUS 264,190 tons in 2014 and 243,734 tons in 2013. This research shows that rice production in Aceh Besar District before the UPSUS program experienced a decrease of 8.39% in 2014 and 12.57% in 2015 compared to the previous year, and in 2016 during the UPSUS program, rice production experienced an even more significant decline, namely 13.74% compared to before the program.

During 2010–2018, after experiencing the lowest level in 2015, the paddy harvested area increased in 2016, and Subang district reached the highest level in 2017–2018. In the last five years (2014–2018) or during the implementation of the UPSUS program, the harvested area, productivity, and production of rice showed an increase by an average of 3.42%, 1.76%, and 1.11% per year, respectively (DGFC 2019; WJOAFC 2019; Setiyanto 2020). Subang district is the centre of the national seed industry and has a better advantage in improving irrigation networks. In 2016–2018, the total area of rehabilitated tertiary irrigation networks in Subang reached 53.30 thousand ha, greater than Karawang and Indramayu districts, each reaching 25.00 thousand ha and 50.00 thousand ha, respectively (Setiyanto 2020). In the equipment and agricultural machinery component, before implemented the UPSUS

program, Subang was the center of the seed industry and had better conditions than Karawang and Indramayu. The implementation of the UPSUS program further enhanced this condition.

Setiyanto (2020) calculated that in 2016–2018, Subang received an allocation of 691 tractors, 286 units of water pumps, 63 units of rice transplanters, 37 units of rice harvester, 73 units of small-scale organic fertilizer processing and 428 units of other equipment and machinery including drying machines, power threshers, sprayers and rice milling units. In the same period, the total subsidized fertilizer assistance reached 143.41 thousand tons of Urea, 40.53 thousand tons of SP36, 1.12 thousand tons of ZA, and 96.25 thousand tons of NPK, 13.84 thousand tons of organic fertilizer. Total subsidized seed aid reached 399.75 tons. Improving irrigation networks during the UPSUS program has positively impacted the Subang region's planting area, harvested area and rice productivity. As a district that produces quality and certified rice seeds, the delay in procuring rice seeds has relatively no effect on this district. The rice seed independent village program carried out before implementing the UPSUS program had a positive impact on seed procurement activities during the UPSUS program. During 2006–2018, the harvested area, productivity, and rice production in the Subang district increased by an average of 1.52%, 0.98% and 1.65% per year, respectively. During this period, the contribution of paddy production of Subang district to West Java Province and national rice showed output declined by an average of 0.63% and 1.63% per year, respectively.

Based on West Java provincial statistical (DGFC 2019; WJOAFC 2019), the harvested paddy area in Karawang district 2006–2018 shows a declining trend. In 2006–2010, its paddy harvested area increased by an average of 1.32% per year. However, it was only 0.23% per year in 2010–2014 and decreased to 0.05% in 2014–2018. In the period 2006–2018, the paddy harvested area increased by an average of 0.50% per year. Its productivity of paddy increased by an average of 2.24% per year in 2006–2010, 0.03% per year in 2010–2014, 0.19% per year in 2014–2018, and 0.82% per year in 2006–2018. During the implementation of the UPSUS program, Karawang was one of the districts that resisted adding targets to increase the area of rice planting provided by the central and provincial governments (Setiyanto 2020). This resistance was based on the consideration that Karawang has more than two rice planting

indexes, avoids the risk of pests and plant diseases, and has increasingly limited paddy fields due to the high rate of land conversion.

Setiyanto (2020) calculated that in implementing the 2016–2018 UPSUS program, Karawang obtained a tertiary irrigation network rehabilitation allocation for an area of 25.00 thousand ha. Its subsidized seed allocation reached 189.50 tons, with subsidized fertilizer aid allocation reaching 127.47 thousand tons of Urea, 36.07 thousand tons of SP36, 999.78 tons of ZA, 85.55 thousand tons of NPK, and 12.30 thousand tons of organic fertilizer. Allocation of agricultural machinery and equipment assistance in Karawang was 182 units of tractors, 269 units of water pumps, 91 units of rice trans-planters, 20 units of a harvester, 4 units of rice milling units, and 474 units of other equipment, including dryers, power threshers, sprayers and small-scale organic fertilizer processing units. In contrast to the Subang district, which shows unstable growth rates, paddy production growth in Karawang district has consistently increased by an average of 0.70% per year in 2006–2010, 1.56% per year in 2010–2014, and 3.95% in 2014–2018. During 2006–2018, rice production in the Karawang district increased by an average of 2.07% per year. In the same period, its contribution of paddy production to West Java Provinces and national production showed an average decline of 0.29% per year and 1.44% per year.

Paddy harvested area in Indramayu increased by 5.68% per year in 2006–2010, 1.74% per year in 2010–2014, 0.06% per year in 2014–2018, 2.49% per year in 2006–2018. In the same period, its paddy productivity increased by an average of 1.84% per year, 1.73% per year, 1.44% per year and 1.67% per year, respectively. In contrast to Karawang, which tends to reject efforts to increase rice planting area, the low increase of rice harvested area in Indramayu district in 2014–2018 was due to floods and drought in 2017. Indramayu Regency has more non-irrigated rice fields, and has a topographic area of rice fields very close to the coastal area. High rainfall in early 2017 and low rainfall towards the end of 2017 caused the area of rice plants affected by floods and drought to increase by 9.78% in 2017 compared to 2016. This caused the rice harvest area in the Indramayu district to decrease from 235.94 thousand ha in 2016 to 230.49 ha in 2017 (Setiyanto 2020).

Paddy production in the Indramayu district increased by 7.68% per year in 2006–2010, 0.14% per year in 2010–2014, 3.97% per year in 2014–2018, and 3.93% per year in 2006–2018 (DGFC 2019; WJOAFC 2019). In contrast to

Subang and Karawang districts, which showed a decrease in contributions, the contribution of Indramayu district to West Java and national rice production showed an increase by an average of 1.24% per year and 0.30% per year, respectively, in 2006–2018. However, its increased contribution to the national level happened in 2006–2010. From 2010 to 2014 and 2014 to 2018, contribution in paddy production declined by an average of 1.41% per year and 0.08% per year, respectively. In 2016–2018, rehabilitation of tertiary irrigation networks in Indramayu reached an area of 50.00 thousand ha, and subsidized seed assistance was 455.52 tons. In that period, subsidized fertilizer assistance reached 202.56 thousand tons of Urea, 57.25 thousand tons of SP36, 1.59 thousand tons of ZA, 135.95 thousand tons NPK, and 19.55 thousand tons of organic fertilizer. Agricultural equipment and machinery assistance were 788 units of tractors, 308 units of water pumps, 91 units of rice transplanters, 54 units of harvesters, 77 units of small-scale organic fertilizer processing and 658 units of equipment and other agricultural machinery including rice milling units, drying machines, power threshers, and sprayers (Setiyanto 2020). Indramayu received a greater allocation of aid compared to Subang and Karawang. Indramayu has more extensive rice fields. However, agricultural mechanization in Indramayu is relatively behind when compared to Subang and Karawang. Therefore, Indramayu received a greater allocation of aid compared to Subang and Karawang. Data on harvested area, productivity and rice production in the Subang, Karawang, Indramayu and other districts mentioned above show different responses and results during the implementation of the UPSUS program. This gives importance to the consideration of site characteristics in the planning and implementation of the UPSUS program.

### **Lessons for Future UPSUS Program Planning and Implementation**

Since more focused on increasing rice planting area, UPSUS Program has encouraged an increase in rice harvested area but did not encourage growth in rice productivity. The increase in planting intensity from 2 times to 3 times caused pest and disease attacks in many areas. Even though the cultivated area successfully increased, the harvested area and productivity eventually declined. As a consequence, increased production cannot be achieved. In other words, the areas that have had a planting intensity of 2 times a year are maintained and the areas that have less than 2

times a year should be increased. In implementing the upcoming UPSUS Program, there should be a greater focus on increasing productivity through improvement in rice farming technology application and reducing yield loss during harvest and post-harvest handling. Increasing agricultural mechanization and regional characterization are essential considerations.

Planning and implementation of the subsequent UPSUS program implementation should be covers seven site or regional characteristics, i.e (Setiyanto 2020) (1) areas of potential for increased crop intensities of high, medium, low and which have no potential for improvement, (2) areas with high, medium, low productivity potential and no potential for increased productivity, (3) areas that have high, medium and low yield losses, (4) areas which only need additional agricultural equipment and machinery only for pre-harvest and types, (5) areas that only need additional post-harvest agricultural equipment and machinery and types; areas that need both, (6) areas that received assistance for which agricultural equipment and machinery were not suitable and were not used in the past years but could be modified, the same areas of agricultural equipment and machinery were not suitable and could not be modified so they had to be moved, (7) the area where the agriculture is damaged does not make repairs because there are no plots and spare parts, (8) areas that require additional infrastructure and supporting facilities in the form of input kiosks, spare parts, workshops, warehousing, drying floors, agricultural extension workers and capacity building for farmers, agricultural extension operators, operators of agricultural equipment and machinery and farmer groups, farmer associations and providers of agricultural equipment and machinery, (9) summarizes the characteristics of the first to fifth regions to find areas that focus only on increasing planted area, focus only on increasing productivity, focus on reducing yield loss, focus on improving yield quality and areas in combination; and (10) further dividing the region with a focus on orientation to meet the needs of the domestic market and areas that focus on meeting the development of rice exports in the future. Then a detailed design of the UPSUS program implementation planning is produced with a focus and target of activities in accordance with regional characteristics, should implement preferences of farmers, and technological technology package at the district level as a basis for the preparation of provincial and national level plans. Related to the areas where agricultural equipment and machinery assistance could not utilize because it does not fit

the characteristics of the location and cannot be modified, it must be withdrawn and moved to another suitable location. This transfer can occur between districts and even across provinces. Therefore coordination, synchronization and integration of planning across districts, regions and national levels were necessary. Agricultural equipment and machinery replacement is required in accordance with the location characteristics and farmers' preferences in the area where the equipment and machinery are moved.

### THE PERFORMANCE ON FARMERS' INPUTS USE, YIELD, AND INCOME

In the UPSUS Program approach, the government provides a complete technological package (irrigation, equipment and machinery, seeds, fertilizers, pesticides and agricultural management, improved techniques) and guidance to farmers through extension agents and program implementation assistants. Farmers can learn how to use new production technologies and how much inputs should be used in order to achieve optimal results. They can adopt better farm management techniques improve their technical skills, and allocate inputs properly bringing about higher yields and more efficient cost structures. This is mean that the UPSUS Program is expected to increase rice production by increasing both the harvested area and productivity. All strategies are meant to increase the planting activities, harvested areas and productivity by providing the favorable conditions for paddy growing and input use efficiency. These are expected to improve cost efficiency and farmers' income.

#### Farmers' Inputs Use

In the case Subang, Karawang and Indramayu districts, except tractor and machine, the seed, chemical fertilizer, organic fertilizer, labor and pesticide after the UPSUS program was lower than before (Setiyanto 2020). Tractor and machine use was higher by 2.53 machine days after the UPSUS program than before the program. The use of the seed, chemical fertilizer, organic fertilizer, labor and pesticide was lower by about 1.11 kg/ha, 40.56 kg/ha, 143.53 kg/ha, 0.53 man-day/ha, and 1.97 kg/ha, respectively, than before the UPSUS program. Irrigation cost after the UPSUS program was lower by about IDR 0.23 million per ha than before the program. Seed prices show a decrease from IDR 10,304.74 per kg before the UPSUS program to

IDR 8,809.58 per kg after the program. Nevertheless, actual use only averaged 22.52 kg per ha, which is lower than the recommendation of 25 kg per ha. A study by Saridewi (2018) in Garut District showed that in 2016 the use of seeds before the program was 36.48 kg/ha, more significant than the subsidized seeds of 25 kg/ha. Setiyanto (2020) stated that many farmers reported that delivery of the seed is often late, the varieties are not the same as those proposed by farmers, and are also not pure but mixed with other varieties.

In Subang, Karawang and Indramayu districts, the farmer chemical fertilizer is much higher than the recommendation but much lower for organic fertilizer (Setiyanto 2020). The farmers used an average of 636.10 kg per ha of chemical fertilizers before the UPSUS program but it was lower at 595.55 after the program, although still above the recommendation of 400 kg per ha. At Garut district, Saridewi (2018) found that in 2016, the use of urea and NPK fertilizers before the program was more significant than after the program. Before the program, the urea fertilizer used by farmers was 148 kg/ha, while the NPK fertilizer was 337 kg/ha. Setiyanto (2020) noted that the UPSUS program implementation effected in increasing price input and labor wages in Subang, Karawang and Indramayu districts. The average price of chemical fertilizers at the farm level is IDR 4,322.72 per kg before the UPSUS program and lower at IDR 4,014.42 after the program. The use of organic fertilizer decreased from an average of 503.46 kg per ha before the UPSUS program to only 359.93 kg per ha, which is below the recommendation of 1 ton per ha. This could be due to an increase of price from IDR 957.85 per kg before the UPSUS program to IDR 1,129.65 per kg.

In the case of Subang, Karawang and Indramayu districts, the use of pesticides was decreased. Setiyanto (2020) found that pesticide use decreased from 5.27 kg per to 3.57 kg per ha after the program. Meanwhile, the average pesticide price increased from around IDR 0.31 million per kg before the UPSUS program to IDR 0.34 million per kg after the program. The decrease in used pesticides was due to the reduced use of herbicides. The sufficient volume of water brought about by the irrigation networks' inundated paddy fields suppressed the growth of weeds, thereby reducing the use of pre-planting post-planting herbicides. Farmer also takes action to prevent the risk of pests and diseases from villages or other areas. As a result of differences in planting and harvest time, pests and diseases can migrate or be carried away by

the wind and attack their rice crop. The use of insecticides and other pesticides increased by 0.68 and 0.26 kg per ha, respectively, after the UPSUS program. However, the increase is not as much as decrease in the use of herbicides, so the total use of pesticides continued to decrease.

Agricultural equipment and machinery increased from 4.06 machine days per ha before the UPSUS program to 6.59 machine days per ha after the program. Increasing the number of agricultural equipment and machinery working days did not reduce the labor used (Setiyanto 2020). The average number of workers used before the UPSUS program was 98.08 man-day/ha and 97.56 man-day/ha. Labor wage increased from IDR 94.66 thousand/man-day before the UPSUS program to IDR 113.52 thousand/man-day after the program. Meanwhile, the average tractor rental price increased from IDR 0.38 million/machine day before the UPSUS program to IDR 0.42 million/machine day after the program due to the operator's salary increase. The addition of working days of agricultural machinery and equipment did not decrease the amount of labor used. This is consistent with the perception of the farmer respondents that the components of agricultural machinery and machine tools are adequate but not effective (Setiyanto 2020). The increase in working days for machines and agricultural equipment occurred due to the increased use of threshing machines by 62 farmers in Subang, Karawang and Indramayu districts. The use of rice thresher machines still requires the use of labor. The increase in the number of working days for agricultural equipment and machinery only occurred in Indramayu. The rice transplanter and combine did not use harvester machines and the soil processing tractors at the Karawang and Subang research sites were also not used.

There are activities in rice farming, tillage, planting, harvesting and post-harvest handling that require much labor. The number of workers did not decrease much after the UPSUS program because the Jarwo transplanter and combine harvester machines were not used (Setiyanto 2020). In addition, big tractor (four-wheel tractor) aid is not widely used. The aid components of agricultural machinery and equipment became ineffective. The Jarwo technology and Jarwo Super technology as technology package to replace the ICM components were also not adopted by the farmer. Saridewi (2018) found that most significant component of farming costs is labor costs, namely IDR 7.09 million per ha before the program and IDR 7.2 million/ha after the program. Higher costs after the program

because farm management must follow recommendations, both in planting and maintenance methods.

Based on WJAIAT (2017; 2016), at Subang, Karawang and Indramayu, the application of ICM has recommended the use of chemical fertilizer 400 kg per ha, organic fertilizer 1 ton per ha and seeds at 25 kg per ha, with an estimated use of pesticides at 3.27 kg per ha, labor of 105 man-day per ha, and agricultural equipment and machinery 6.00 machine day per ha. Setiyanto (2020) stated that only 11.11% of 144 farmer respondents adopted the complete ICM technology package in accordance with the recommendations. In addition, there were only 59.72%, 68.05% and 67.36% of the farmer respondents, respectively, who adopted the components in accordance with the recommendations for the use of seeds, fertilizers, agricultural machinery and equipment. Furthermore, according to Setiyanto (2020), since the guidance and extension component was perceived as ineffective, input use was generally lower after the UPSUS program.

### Rice Yield

Paddy output after the UPSUS program was 8,967.57 kg/ha compared to 9,123.93 kg/ha before the program. This means that paddy productivity was 156.37 kg/ha or 1.71% less than before the program (Setiyanto 2020). This result is consistent with previous findings that at the national level, West Java Province, Subang, Karawang and Indramayu districts productivity was stagnant or even decreased in the last five years. Likewise, in the 2015–2018 period, rice productivity in national, West Java and Subang, Karawang and Indramayu districts declined. It never reached the target set in the implementation of the UPSUS program.

Different results are shown by several studies in other districts and years. The results of research by Prayoga dan Sutoyo (2018) at Malang District East Java Province in 2017 showed productivity before the UPSUS program was 5.80 tonnes/ha, while productivity during the program was 6.21 tonnes/ha. Examining these results means an increase in productivity before and after receiving assistance, namely 0.41 tonnes/ha or a rise of 7%. At Badung District of Bali Province in 2017, the UPSUS program on rice increased the productivity of paddy, from 6.19 tons/ha to 8.15 tons/ha or increased by 24.05% (Mataliana et al 2018). At Garut District in 2016, farm productivity before the program was 4.96 tonnes/ha and increased to 5.28 tonnes/ha or by 6.45% (Saridewi 2018). The UPSUS

program did not affect farmers' input allocation, although farm productivity increased in the Tabanan Regency of Bali Province (Wijaya et al. 2016). The value of marginal products of seed and fertilizer inputs compared to seed and fertilizer prices is greater than 1, and less than 1 for pesticides. The use of seeds and fertilizers still needs to be added, while must reduced pesticides to achieve an efficiency higher level. The implementation of the UPSUS program has increased rice productivity by 0.93 tons/ha, which is higher than the target of increasing productivity by 0.30 tons/ha. This shows that the UPSUS program affects on increasing rice productivity which varies according to the specific characteristics of the location, agroecosystem, socio-economy and conditions of the technology package application before the program is implemented. Mapping characteristics, differentiating technology packages and adjusting targets should take this into account and should consider comprehensive evaluation

An evaluation must be carried out to produce characterization of each district and sub-district based on the adoption and effectiveness of the implementation of the UPSUS program in each component. The evaluation includes the level achieved at this time; the problems faced, alternative solutions, the needs of each element, the procurement of the following plan of activities must pass up targets, strategies for achieving targets and stages of implementation and the volume of activities that must be passed up to the next five years. The evaluation results must produce detailed plans for developing, rehabilitating, repairing and synchronizing the development of irrigation networks and optimizing land integrated with primary, secondary, drainage and integration with other areas, as well as additional irrigation sources districts and sub-districts characteristics produced from this (Setiyanto 2020) (1) the characterization developing and developed area and the program needed to development, (2) target planting, harvesting, productivity and production, technology package recommendations, volume of seed requirements, fertilizer and agricultural machinery and equipment according to location characteristics and farmers' preferences, and (3) infrastructure needs and supporting facilities such as input kiosks, spare parts, workshops, warehousing, drying floors, agricultural extension workers and capacity building for farmers, agricultural extension workers, operators of agricultural equipment and machinery, farmer groups, farmer groups and providers agricultural equipment and machinery.

### Farmer's Income

Even though the implementation of the UPSUS program is not effective in increasing productivity, there was a reduction in the total cost of rice farming after the program. However, since the average price of paddy decreased from IDR 4,634.55 per kg to IDR 4,484.19 per kg, the total revenue after the UPSUS program was lower by about IDR 2.71 million per ha as compared to before the program (Setiyanto 2020). This is due to lower productivity and lower paddy prices after the UPSUS program. As a consequence of a more significant decline in total revenue than a decrease in total costs, net income decreased by IDR 2.15 million per ha after the UPSUS program. A study by Saridewi (2018) at Garut District of West Java Province in 2016 showed that total costs after the program were also lower than before the program, namely IDR 13.3 million per ha after the program and 13.9 million rupiah/ha before the program. In Malang District of East Java Province, in 2017 showed that rice farming income before the UPSUS program was IDR 9.92 million per ha, while rice farming income after the program was IDR 12.79 million per ha. There is an increase in rice farming income before and after the program, namely IDR 2.87 million or an increase of 28.96% (Prayoga and Sutoyo 2018). Other studies have shown that the UPSUS program has a positive impact on farmer productivity and income. Research by Saputra et al. (2018) at Sigi Regency Central Sulawesi Province in 2017 showed that rice productivity was higher after the UPSUS program was implemented and positively impacted the farmer by improving their welfare through increasing wetland rice productivity. At Tabanan district of Bali Province showed that labor, land area, production costs, and cultivation techniques directly influence production and affect farmers' income through production (Irvan and Yuliarini 2019). A study by Nainggolan and Malik (2017) at Batang Asam District of Jambi Province indicated that the use of UPSUS program technology was in the low to moderate category and requires high additional costs but is able to provide additional production, revenue, net income and R/C ratio significantly for UPSUS rice-farming compared to non-UPSUS rice farming. Overall, several studies mentioned above show that the UPSUS program has different effects on input use, yield and farm income. Mapping characteristics, differentiating technology packages and adjusting targets should be considered the impact of the UPSUS program on rice farmer income. A specific, comprehensive and detailed evaluation is imperative.



## CONCLUDING REMARKS

The UPSUS program is expected to increase rice production by increasing both the harvested area and productivity. The performance indicators of the UPSUS program implementation on rice were an increase in rice planting area or cropping index (CI) of at least 0.5 and an increase in rice productivity of at least 0.30 tons/ha of *gabah kering panen* (GKP) or harvest dry quality of paddy and equal to 0.25 tons/ha of *gabah kering giling* (GKG) or rice mill dry quality of paddy. The UPSUS program failed in achieving the target of CI and productivity increase. Even so, the national harvested area for rice shows an increase, so that even if productivity decreases, rice production still shows a slight increase. It will reach much higher if the UPSUS program achieves the target of increasing cropping intensity and productivity.

An increase in the harvested area in 2016–2018 compared to 2015 did not occur in all provinces and districts. Even though rice production showed a slight increase in 2016–2018, rice productivity has never matched the level achieved in 2015. This indicates that rice technology adoption at the farm level has been developing well enough and has experienced saturation and requires innovations to increase rice productivity. The productivity of paddy in 2016, 2017 and 2018 was showed continuous to decline. Aside from not achieving the target increase, productivity has been levelling off or a continuous decline in many districts in West Java and others provinces, and at the national level. At the same time, the UPSUS program was being implemented.

The UPSUS program has different effects on input use, yield and farm income. Different results are shown by several studies in different districts and years. This shows that the UPSUS program affects increasing or decreasing rice productivity, production and farm income which varies according to the location, agro-ecosystem, socio-economy and conditions of the technology package before the program is implemented. Mapping characteristics, differentiating technology packages and adjusting targets should take this into account.

The following are some policy recommendations to help further and improve the following implementation strategies of UPSUS program implementation to increase rice production and farmers income in Indonesia (1) develop a systematic and detailed planning base on a specific, comprehensive and detailed evaluation to increase the effectiveness of the

implementation of the UPSUS program, (2) strengthening of the agricultural extension system and enhancing technical assistance to improve rice productivity and quality, (3) conducting improvement and strengthening in the organization of implementation, (4) putting strategy implementation on greater focus on increasing productivity, both through increasing the application of cultivation technology packages to rice farming and reducing yield loss during harvest and post-harvest handling and distribution and marketing, and (5) encouraging increased farmers' income from their rice farming and harvest and post-harvest handling.

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