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# The Integrated Farming System of Crop and Livestock: A Review of Rice and Cattle Integration Farming

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**Abstract**

The objectives of the study were to describe the concept of the integrated farming system, the importance of integrated farming system development, and the integrated farming system of crop and livestock. The results showed Integrated farming system is a farming system that combines two or more fields of agriculture, which is based on the recycling biological concept, and linked of input-output between the mutually commodities which approach of low external input utilization, which is done on the land, through the utilization of crop waste, animal manure, fish waste for the purpose of increasing the production and productivity so as to increase farmer income and can create condition that are environmentally friendly farming. The development of the integrated farming system is very important, because the integrated farming system has many usages and advantages and benefits in line with the objectives of the regional development that to improve the social welfare. It can be a solution for the various problems that arise in the regional development. Rice and Cattle Integration System is a rice farming system that is integrated with cattle where there is a reciprocal relationship. Rice plants provide straw and bran for cattle as feed and cattle produce feces that is useful for rice plants as organic fertilizer, so that it can increase the production and productivity of rice and cattle and can increase farmers' income. Implementation of rice and cattle integration system could increase the use family labor, reduced the use of inorganic fertilizers, reduced production costs, and can increase rice farming income and cattle business income.

***Keywords:*** Integrated; Farming; Rice; Cattle; Income.

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## 1. Introduction

Food security is one of the strategic issues in the context of developing countries. To support the food security program in the future, then each region is required to optimize the utilization of the land resources in order to further sustainability of production is maintained [1]. Food security that aims at an active and healthy life of people should be designed as multi-sector incorporation and multidisciplinary thoughts, which then relates to sustainable agriculture development [2].

Development is a process of change from a less than good condition toward a better condition which lasted consciously, planned and sustainable in order to increase the welfare of the community life of a nation. Development must be interpreted as a multidimensional process involving major changes to both the structure of the economy, social change, reduce or eliminate poverty, reduce inequality and unemployment in the context of economic growth [3]. To build the agricultural sector there are five basic requirements that must be met, namely: 1) The market for agricultural products, 2) technology that is constantly changing is more advanced, 3) Means of production and agricultural tools provided locally, 4) Intensive production for farmers and 5) The availability of transportation to distribute agricultural products

The new paradigm of agricultural development is to improve the quality and professionalism of human resources peasants as active agents of integrated agricultural development. The development of agriculture aims to optimize the use of natural resources and advanced technology that is inexpensive, simple, and effective, supplemented with the structuring and institutional development of agriculture in the rural. The Core concept of sustainable is a belief that social, economic and environmental objectives should be complementary and interdependent in the development process. It is being more realized that food security achievement should be started from multidisciplinary approach [4] and sought intensively in both the number of terms and diversification of fields of study [5].

Sustainable development has three principal dimensions: economic growth, social equity, and protection of the environment. In relation to this thought, food security in agriculture development context requires the involving of the theories, concepts, and practices of sustainable agriculture development from upstream (inputs) to downstream (processing and marketing) as a whole system [1]. Sustainable development in relation to a diversified economy should take into account the main requirements that include: 1) meeting basic human needs, including employment; food; health; clothes; and residence; 2) maintaining equality both within and between generations; 3) improving technology and social organization to expand the environmental capability to sustain human needs [6]. Sustainable development aims to create certainty of economic development, environmental protection, and social welfare, which requires a linkage between the three pillars namely: social, economic and environmental. Sustainable development through economic and environmental components has only one beneficiary in which human factors receive income, good quality environmental factors, and a united and just generation [7].

Sustainable agriculture is agriculture that does not break, do not change, harmonious and balanced with environmental or agricultural obey and submits to the rules of nature. Sustainable development included

sustainable agricultural development so that sustainable agricultural development is development activities that integrated economic, social and environmental aspects. In practice, sustainable development requires economic, environmental and social integration, across sectors, regions, and generations. Therefore, sustainable development requires the elimination of fragmentation; That is, environmental, social, and economic issues must be integrated throughout the decision-making process in order to lead to truly sustainable development [8]. Sustainable agriculture is a form of agriculture aimed at improving the productivity of small farmers while utilizing sustainably available resources and addressing the effects of drought and other climate vulnerabilities, through environmental and climate change perspectives, and socio-economic perspectives [9]. Sustainable agriculture can protect and increase natural resources (land, water, etc.), while ensuring food security; promoting global governance systems, especially trade regimes and policies, relating to food security; and protect and improve rural livelihoods, equity and social welfare [10].

Sustainable agricultural development can be done with four models of the system, namely 1) organic farming system, 2) integrated farming system, 3) low-external-input farming system, and 4) integrated pest management [11]. The Integrated farming system was introduced based on study and research results which then gradually appear cropping pattern, farming patterns until the term of the farm system. The Integrated farming system of crop and livestock is one of the many technologies currently being developed in the sustainability of production system and increase farmer income.

The Integrated farming system (IFS) aims to optimize the use of agricultural waste by extending the biological cycle. Each cycle chain produces a new product that has high economic value, so it can optimize the empowerment and use of marginal land in all areas. Thus it is very important integrated farming systems in as a solution to increase agricultural production. IFS is a promising enterprise for the marginal and small farmers, particularly who has fewer farm holdings. From this study, the IFS provide progressive economic growth, employment opportunities, family nutritional requirements, optimal utilization of resources of the farming enterprises etc. Further many researchers found many types of integrated farming system models existing in the country but it has not properly documented to reach the mass farmers. Hence measures to be taken to document such kinds of farming system models and to disseminate to the needy farmers. Although the integrated farming system has certain constraints the scientific community and research station has to initiate steps to alleviate such problems of the farmers to improve their standard of living and income [12]. IFS of crop and livestock is one of the many technologies currently being developed in the framework of sustainability of production system and increase farmer income.

The Integrated farming system of maize and cattle is system integration without waste so that plant waste into fodder input, otherwise livestock waste used to fertilize crops. The advantage of this model of integrated farming is the positive interaction between two or more commodities are combined.

## 2. Methods

This study was using the library studies method. The activities in the research had summarized the definitions, concepts and research results from various references that are relevant to the research purpose. The references

that used consists journals, books, proceedings, and others [13].

## 3. Results And Discussion

### *3.1. The Concept Integrated Farming System (IFS)*

IFS cope with the changes farm level, in a manner that balances food production, profitability, safety, animal welfare, social responsibility and environmental care. The Integrated farming system has been used for integrated resource management which may not include either livestock or fish components. Its focus is the integration of livestock and fish, often within a larger farming or livelihood system [14]. IFS is a farming system that combines a variety of crop and livestock, and the application of various techniques to create suitable conditions to protect the environment, maintain land productivity and increase farmer income. This farming system occurs between the input-output relationship of commodities, linkages between production activities with pre-production and post-production, as well as between agriculture and manufacturing activities and services. IFS is part of the agro-eco technology system consisting of various interrelated components include non-farm business components, biophysical nature, and socio-economic, political and cultural. The Integrated farming system is a systematic approach to the use of low external input between crops with livestock [15].

IFS is a system consisting of a combination of plants and animals, where waste from one component can be used for other components. The advantages of integrated agriculture and mixed farming are more in terms of economic benefits than monocultures. Food demand is increasing day by day as food production is declining; the ongoing conversion of land to residential land and also drastic reduction of working farmers [16]. IFS is able to provide diverse benefits to smallholder systems, both social, economic and environmental benefits. This can support small farmers in farming, reduce their vulnerability, ensure food security, employment, increase biodiversity, carbon stocks in agriculture and improve agricultural energy efficiency. The Public extension should see IFS as a flexible socio-ecological intervention, not a technology with the desired socioeconomic and ecological outcomes [17]. IFS is one of the agricultural systems that can be used as one of the solutions for climate change mitigation. Agricultural systems are setting the stabilized farming, unique and feasible are managed based on the practice match with physical environmental, biological and socioeconomic according to objectives, preferences and household resources. The farming can be as cultivation or livestock raising. The feasible farming is productive and efficient that have productivity, or production per unit of high land [18].

IFS is one of the diversified activities of commodities that can be done to offset the demand for agricultural products (mainly food crop) are constantly increasing through the utilization of a synergistic relationship between commodity endeavored, without damaging the environment and high labor absorption. Implementation of the integrated farming system is the right choice to increase farmers' income and at once to utilize optimally agricultural resources. Integrated farming is defined as biologically Integrated farming system which integrates natural resources and regulation mechanisms into farming activities to achieve maximum replacement of off-farm inputs, secures sustainable production high quality food and other products through ecologically preferred technologies, sustain farm income, eliminates or reduces sources of present environment pollutions generated by agriculture and sustains the multiple function of agriculture [19].

Based on some of the above concepts, it can be concluded that the integrated farming system is a farming system that combines two or more fields of agriculture, which is based on the recycling biological concept, and linked of input-output between the mutually commodities which approach of low-external-input utilization, which is done on the land, through the utilization of crop waste, animal manure, fish waste for the purpose of increasing the production and productivity so as to increase farmer income and can create condition that are environmentally friendly farming. Then it should consider several aspects, namely: Sustainability that environmental friendly (environmentally tolerable), is socially accepted by society (socially acceptable), are economically viable (economically feasible) and politically acceptable (politically desirable).

### *3.2. The Importance of Integrated Farming System Development*

Advantages of IFS are productivity, profitability, sustainability, balanced food, environmental safety, recycling of waste, saving energy, adoption of new technology, money around the year, availability of fodder, fuel, and timber, employment round the year, agroindustries, increases input efficiency, standard of living and avoid degradation of forest [19]. IFS is very important to be develop because could become a solution to the problems in the regional development. This includes a) physical environment damage; b) biotic environmental damage such as the decline of biological resources, illegal logging, damage to coastal ecosystems, rivers, and lakes; c) damage to natural resources; d) natural disasters; e) lack of development of local potential [20].

The multifunctional of IFS is a concept that focuses on the policy of transitioning food and fiber production to multifunctional agricultural production comprehensively. This requires reconsideration of the role of small family farms, especially to improve food security, facilities, and landscaping, and protect the environment. Sustainable agriculture in developing countries emphasizes food security, sustainability of small farmers' livelihoods, and convenience for consumers and protection for the environment in developed countries. There are six benefits of multifunctional IFS, namely: one economy (income), two social (food and gender security) and three environments (carbon storage, biodiversity, and energy efficiency) [17].

The importance of IFS development is supported by some research results in the worlds. In Vietnam, IFS development could improve yield four times as compared to non-integrated systems [21]. In Japanese, IFS could reduce the purchase cost of fodder and fertilizer costs so that can increase farmer income. And Then more intensive and profitable, because it can increase the yield and product quality in the Highlands [22]. In Northeast Thailand, to stop land degradation and regain productivity, farmers have organized themselves into groups to come up with the IFS. This type of farming modifies the commercial farming system (CFS), which relies on rice-based monocropping, by adopting production of vegetables, trees, livestock, and fish. The objectives of the IFS are multiple: to enhance food production for the household, to maintain the natural resource base that contributes to food security and the well-being of the rural people, to contribute to income generation, and to be accepted by local communities [23].

In Nepal, IFS development showed the profitability analysis of revealed that among three villages, Bistagaun had the largest gross income and net income even though they operated the smallest area of farms. This was followed by Kale and Khan Chowk farmers. But the net revenue appeared to be the largest among Kale farmers,

followed by Bistagaun and Khan Chowk respectively. The profitability analysis and role of three components in total farm income showed that in Kaule, cropping contributed the largest share to both net income and revenue, and in Bistagaun too it made the largest contribution to net income. However, in Khan Chowk, largest net revenue was obtained from forestry, followed by livestock. Crops failed to give a positive net revenue and instead forestry was providing the largest net revenue, due to timber production on their private forest. Therefore, trees and tree products were the most profitable components for Khan Chowk farmers, whereas crops and crop products for Kale farmers, and crops and livestock for Bistagaun farmers in this integrated farming system. Hence, the third hypothesis that crop components had the largest role in total farm income was true only for Kale and Bistgaun farmers whereas it was not applicable in Khan Chowk village, thus contradicting the third hypothesis. As crops had [24].

In Thailand IFS applied could take advantage of livestock waste as a source of plant nutrients and organic fertilizer to improve crop yields and reduced production costs [25]. In North America could increase the diversification of agricultural production more competitively and more environmentally suitable. Integrated farming system in the United States can improve soil quality and efficiency of land use, reduce dependence on external inputs, control pests and increase the population of insect pollinators, promote the conservation of biodiversity are scarce, increased the output, diversified food, the benefits of food security and strengthen the agriculture economy [26]. Then, in India showed it increase the income of farmers, the production cost is reduced or no cost of materials, provide additional job and minimize the risk of production. This system can save resources and high level of production, sustainability and preserve the environment [27]. So in Ethiopia, Zimbabwe, Mali and Sub-Sahara Africa, IFS can reduce poverty, improve livelihoods of smallholder crop-livestock and boost national economic growth. While in Nigeria IFS as the integrated system of agricultural crops, livestock, fisheries, processing [28, 29].

In Africa, IFS development was capable of producing half of the world's cereal and a third of beef and milk, making it the livelihood for a billion people. The market orientation and strength and growing demand for food continue to increase to a strong incentive for the ongoing intensification of crop and livestock operations in mixed farming systems of small farmers in Africa. Better exploitation of the mutually reinforcing nature of crops and livestock systems can contribute to a sustainable, ecologically and economically sustainable growth path. In mixed systems, livestock intensification is often dormant for food crops, but livestock can contribute positively to improving the productivity of agricultural systems. Similarly, the intensification of food crop production can provide dividends for livestock and improve natural resource management, especially through increased availability of biomass Intensification and increased efficiency of livestock production means fewer greenhouse gases per unit of milk and more milk per water unit [30]. This system can improve soil fertility and productivity, reduce environmental hazards, the potential for food security, nutritional benefit, job creation and provide additional income [31], the system is also profitable and productive [32].

IFS could increase the content of organic matter in the soil, which can increase biomass production and enable higher levels of feedstock for livestock in grazing. Therefore implementation of IS is seen as a promising strategy in the intensification of sustainable agriculture in Brazil [33]. IFS could increase farmer income, improve soil fertility, water, and air quality and be creating environmental compatibility. It could ensure the

sustainability of land productivity and provide results and optimum added value. It can improve the efficiency of farming, or maximize profits by minimizing security risks. It is often recommended as one of the most promising solutions for declining soil fertility and declining productivity in system intensification in Nigeria [34]. So, in Bulgaria can be interpreted as a model that can be used to optimize agricultural production by utilizing information about the use of chemicals more effectively, energy saving, soil fertility conservation and product quality improvement. If IFS is an alternative production model for sustainable agriculture development as an economic sector. Thus, IFS also makes it possible to be used as an innovation in sustainable agriculture [35]. While an IFS in Brazil and Bangladesh can provide higher production, it can increase profits and suitable for the environment [36, 37].

IFS could increase productivity, profitability, nutritional safety for farmers and can sustain the productivity of land through recycling organic sources of nutrients from the companies involved. In this system, animals grazing on agricultural waste and animal power are used for agricultural operations and waste that is used as manure and fuel. The most significant advantages of using low or no cost items at the agricultural level for recycling are reduced production costs and ultimately able to significantly improve farmers income [38]. IFS could increase profits and create sustainable production through the biological recycling system of natural resources effectively to meet needs of family farmers. The integrated farming system can improve the economic conditions of small and marginal farmers who can improve education, health and social and improve overall livelihood security [39].

IFS of crops with allied enterprises, implemented both in On-station and on-farm situations. Research studies have demonstrated the technical feasibility and economic viability of integrated farming systems. Besides facilitating cash income, the IFS generates additional employment for family labor and minimizes the risk associated with conventional cropping system. It also sustains soil productivity through the recycling of organic nutrient sources from the enterprises involved. The advantage of using low-cost or no-cost material at farm level for recycling is reduced production costs, with improved farm income [40].

The integrated crops, livestock, and forestry system in the region can improve the eco-efficiency of agricultural production in Brazil. The research area is at Goias State in the Cerrado region, a vast savanna covering nearly a quarter of Brazil's land area. About half of the area is suitable for agriculture in Cerrado under grassland cultivated but is far from being degraded due to grazing. The learning systems in this report include different settings to test productivity, profitability, and sustainability of eucalyptus, plants, and grasslands. The findings show that integrated crops, livestock, and forestry systems are economically and technically feasible in Cerrados. In addition to producing foods of high biological value (meat and milk), cultivated pastures provide other important environmental benefits, including long-term soil cover, carbon fixation, increased soil organic matter content; and reductions in greenhouse gas emissions [41].

The integration of perennial crops, livestock and various tree species has implications for sustainable farming practices, enhancing product diversification, improving human nutrition, reducing system risk and instability, justice for labor and increased use of renewable resources. The ecological benefits of a successful agroforestry system include improving soil health, reducing micro limit extremities and increasing biodiversity. This land

management system aims to reduce risks and increase total productivity while providing a specialization of socio-economic services to individual farmers and their communities [42]. The integrated crop-livestock system can have a subtle effect on soil quality over time, especially in semi-arid areas where the soil response to control occurs slowly [43]. The reintegration of crop and livestock farming systems has the potential to address some of the ecological and socio-agricultural objectives: producing high yields, reducing pollution and dependence of external fertilizers and biocides, reducing climate vulnerability, making farmers more diverse, and reducing risks to market fluctuations [44].

### *3.3. Integrated Farming System of Rice and Cattle*

Integrated farming system of rice and cattle is SIPT is an improvement system of paddy productivity that combined with livestock business (cattle). Selection of rice and cattle in farming is based on reciprocity relationships, where rice provides straw and bran for cattle feed. Conversely, cattle produces feces as organic fertilizer which in rice plants can improve soil structure, encourages absorption better humidity, reduce power absorbency, and prevent crusting of the surface soil [45]. The Farm Management of on a bigger scale can save input usage and increase rice production by 17.7% and profits of 15.6%. The longer applying of the Crop Livestock System (CLS) pattern of rice and beef cattle further increases production and profits. The role of farmer institutions in farming CLS patterns is very important especially to accelerate technology transfer, efficiency of farming management, facilitate access to various resources, and establish cooperation, partnerships and marketing. The financial and economic feasibility of CLS farming pattern is higher than the non CLS pattern. The economic feasibility of CLS farming pattern is much higher than the financial feasibility obtained by farmers. The CLS pattern helped improve land fertility, water and air quality and creates harmony between the socio-cultural environment of the local community [46]. The technology introduction of the integration of cattle and rice can increase farmers' income. It increased are IDR 34,488,800 that higher than traditional technology (singgle farming) of IDR 22,903,200. Based on the R/C ratio analysis, the value of R/C ratio is 6, this value is higher than the traditional pattern with value of R/C ratio is 4. This condition indicated that farming patterns of integration of cattle and rice are feasible for farmers to cultivate [47].

The IFS of rice and cattle could increase farmers' income, had a positive impact on regional development. This could be seen from the increase in rice production and the increase in the use of labor in the family [48]. Rice productivity increased from 4.86 to 5.36 tonnes/ha, increased of 10.29% compared to those yielded by other farmers, and reduced the use of inorganic fertilizers 53.33%. The use of inorganic fertilizer decreased, like as: the use of Urea fertilizer decreased to 100 kg/ha (N 57.14%), SP-36 fertilizer decreased to 50 kg / ha (50%) and the use of KCl decreased to 50 kg / ha (50%). The average of daily weight gain was 790 gr/cattle/day, while the farmer pattern was 320 gr/head/day and an additional organic fertilizer was 10,02%. The C/N ratio of composted feces was 19.03%. The average organic fertilizer yielded was 4 kg/cattle daily and the rice straw yielded was 7.26 tons/ha/season. The income of farmers with the integrated farming system was Rp. 9,086,867 for 1 ha land and 2 cattle or Rp. 4,543,433 for 1 ha land and 1 cattle with R/C ratio of 1.56. They could provide benefits because the use of manure, increase productivity and income, and reduced production costs [49].

The advantage of single farming for beef cattle fattening are IDR 611,250/head/year. The rice cultivation

provided a profit of IDR 12,745,000/ha/year. While, the benefits obtained from integrated farming consist of: The benefits of beef cattle fatteningare IDR 3,477,380/head/year. The benefits of rice cultivation are IDR 90,517,250/ha/year. The cost efficiency achieved for integrated farming is 1.49 while the cost efficiency of a single business is only 1.16. This condition showed the integrated farming of beef cattle and rice is more profitable and more efficient than single farming [50]. The IFS of rice and cattle concept provides alternative approach to alleviate the economic conditions of subsistence farmers. It also integrates natural processes of nutrient recycling that took place between rice plants and cattles. The empirical study showed the doubling effect of net income of the farmer. It also provides an idea of decreasing synthetic fertilizers as soil amendments using organic manures to further increase the yield. Moreover, the IFS served as food security measure acting as an alternative source of income against the disastrous effect of bad weather conditions during rainy seasons [51].

The average scale of cultivation for rice commodities is 0.62 ha, sweet corn 0.68 ha and cattle livestock 5.15 ha. Farming carried out results in more than one R/C value which means it is feasible to cultivate. The contribution of rice income is 24.52%, sweet corn 50.83% and cattle 24.65%. The contribution of income from rice farming, sweet corn and beef cattle to the Decent Living Needs is 50.94% [52]. System integration of rice plant, maize-beef cattle at the level effort scale < 0.50 ha, and scale ownership of beef cattle earn IDR 11,826,026, giving an average income of farmers amounted IDR 21,003,173 for large scale > 1 ha, and IDR 23,197,101 on a scale of 0.50 to 1 ha, and IDR 11,826,026 on a broad scale land <0.5 ha. System integration of rice plant, maize-beef cattle a major contribution to the revenue-livestock farming system is the contribution of maize on a scale rice farming land area <0.5 ha 66.40%, 74.04 ha and 0.50 to 1 scale and scale > 1 ha of 78.00% and for of beef cattle on a broad scale land <0.5 ha 33, 60%, scale 1 ha land area 0,5-25.96%, and the scale of land area> 1 ha 22% [53].

The return of organic matter to the soil increases CO2 fixation in the soil in the form of soil organic matter. Increasing soil organic C positive impact on soil fertility, seed production, and biomass plants. Carbon content of the soil increases of 2.04%, equivalent to CO2 moored 40.80 tonnes/ha, being 3.32%, equivalent to 66.40 tonnes/ha in year 6 BCF applications, an increase of carbon in the soil for 3.65 tons/ha/year, equivalent to tethering 12.28 tonnes/ ha/year of CO2. Seed production of maize increased from 2.1 ton/ha to 5.9 ton/ha in year 5 BCF application. Total biomass increased from 6 ton/ha to 16.8 ton/ha. The recycling system BCF technologies that use waste from the farming system into farm production inputs to produce products that store carbon is carbon mitigation technologies tethering by slowing the conversion of carbon into the atmosphere of CO2 gas. Installing a biodigester in BCF technology that utilizes manure waste to produce biogas and modifications in cattle feed rations is mitigation technologies that can reduce CH4 emissions from cattle farming activities [18].

The supplementation of 60-80% grass feed with concentrate reducing methane gas concentration in livestock by 28.7%, from 617 ppm to 440 ppm, while methane emissions from livestock manure decreased by 31%, from 1367 ml/head/day to 943 ml/head/day. Biodigester installations that produce biogas serve to accommodate methane gas emissions from livestock manure and use them for bioenergy. Composting reduces the formation of methane gas from livestock manure through a regular transition process that aerates and forms aerobic conditions in livestock piles. Recycling produces a variety of organic products that store carbon for a longer

period of time and slow the calculation of organic C into CO2. This study shows that a variety of integrated crop farming activities can be an alternative solution to climate change mitigation [27].

The wage increases had a positive impact on manure, bran, straw on the allocation of cattle and labor in the family of rice farming, total income and expenditure of integrated cattle-paddy farming. The increase in rice paddy price has a positive impact on cow production, manure production, bran amount, straw amount, internal labor, rice farming income and cattle business income. The increase in cattle prices had a positive impact on rice production, straw, the labor allocation of internal and external of rice farming and total household income. The increase in cattle prices negatively impacted cattle production, production of manure, the amount of bran demand, the amount of straw used and the labor allocation of cow cattle business [54].

## 4. Conclusion

Integrated farming system is a farming system that combines two or more fields of agriculture, which is based on the recycling biological concept, and linked of input-output between the mutually commodities which approach of low-external-input utilization, which is done on the land, through the utilization of crop waste, animal manure, fish waste for the purpose of increasing the production and productivity so as to increase farmer income and can create condition that are environmentally friendly farming. Then, it should consider several aspects, namely: Sustainability that environmental friendly, is socially accepted by society, are economically viable and politically acceptable.

Development of integrated farming systems is a very important thing to do because the integrated farming system has many benefits and advantages in order to increase the income and welfare of farmers. Integrated farming systems could also be a solution to overcome the problems that arise in the regional development. This includes a) physical environment damage; b) biotic environmental damage; c) damage to natural resources; d) natural disasters; e) lack of development of local potential.

Rice and Cattle Integration System is a rice farming system that is integrated with cattle where there is a reciprocal relationship.

Rice plants provide straw and bran for cattle as feed and cattle produce feces that is useful for rice plants as organic fertilizer, so that it can increase the production and productivity of rice and cattle and can increase farmers' income.

Implementation of rice and cattle integration system could increase the use family labor, reduced the use of inorganic fertilizers, reduced production costs, and can increase rice farming income and cattle business income. Then, also could improve land fertility, water and air quality and creates harmony between the socio-cultural environment of the local community, and be solution to climate change mitigation.

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