Improved Outlook Cropping Index Rice Field In Indonesia (Case : Central Sulawesi Province)

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ABSTRACT

Rice is the staple food of Indonesia's main supply comes from the island of Java. During its development, the supply of Java progressively reduced, so as to meet the needs of the national rice production required the addition of outside Java. The addition of rice production in the short term can be done through an increase in the IP and through increased availability of water. One province outside Java which has a chance of it was Central Sulawesi province. This is due to: (i) this province there Gumbasa Irrigation Area, (ii) the use of the water is not effective, efficient and relatively more waste into the sea, (iii), the potential has not been optimized utilization of land and (iv) the productivity gap. Other requirements are considered to increase rice IP is: (a) sufficiently broad expanse of land, (b) the land in one unit of irrigation networks, (c) coordination with PU irrigation, (d) the mechanization of agriculture, and (e) plant cultivation technology and the use of short-lived seeds.

Keywords : Production , Intensitias cropping and Rice

PRELIMINARY

Rice is the staple food of Indonesian society whose needs increase every year in line with the population increase. Meeting the needs of most of its supply of rice originating from the island of Java. During the years 1985-2005 about 55-62 per cent of the national production is produced in Java and about 95 percent of rice production is produced from paddy fields, and the rest is produced from dry land or paddy fields (Irawan, 2005). But in 2013 the contribution of rice production in Java decreased to approximately 52.16 per cent and 94.97 per cent of rice production is produced from paddy fields (BPS.2014). Despite the decline of rice supply is still highly dependent on rice production in Java.

According to Irawan, *et al*. (2013) the growth rate of rice production in Java tends to fall of 1.60% in the era of 1985-1995 became 0.59% in the 1995-2005 era. The decline in rice production could continue to grow because: (1) the irrigation network on the island of Java, many of which are not maintained, (2) the occurrence of wetland conversion to the use of non-farm, (3) new paddy fields difficult to realize due to limited land resources, (4) increase productivity of paddy difficult to realize due to the phenomenon of soil fatigue which causes rice yield response to the use of smaller input, and (5) their long-term national policies that are not conducive to the sustainability of paddy fields in Java. This is reflected in the Master Plan for the Acceleration of Growth and Expansion of Indonesian Economic Development (MP3EI) where Java is mapped as a center of industry and national services and the policy, wetland conversion to the use of non-farm on the island of Java is expected to increase in line with the demands of land for industrial development and offices.

With the decline in rice production in Java and the increasing number of people every year, the future supply of rice from Java increasingly difficult to sustain to sustain the needs of the national rice in realizing food security (Sudaryanto *et al.,* 2006). According Adiningsih *et al*. (2004), it was time for the Outer become the backbone of rice to meet food needs in Indonesia. But we realize that a lot of obstacles that must be faced include a low level of soil fertility, irrigation systems are still very simple, road infrastructure and cultivation technology adoption is relatively low.

The increase in rice production in the region in general can be reached through two efforts, the expansion and intensification (Puslitbangtan, 1991). Extensification is to increase rice production through the expansion of planting areas, while intensifying efforts to increase rice production through increased production per unit area or through increased productivity. Extensification can be reached through an increase in the intensity of crop or cropping index (IP) rice, the rice crop development on lands but untapped potential for rice and paddy fields.

Increasing the intensity of the rice harvest can be done through the construction/ rehabilitation of irrigation system and changes in cropping patterns to take advantage of short-lived rice varieties. Exploiting the potential of rice lands for example, can be done by utilizing the estates developed by intercropping pattern of rice, marsh land use / tides or the dry land that agroecological suitable for rice crop development.

To compensate for increasing rice production growth slow in Java, it is necessary to accelerate the increase in rice production in the Outer Islands. Technically, one of its efforts is the increase in the intensity of the rice plant. This paper would like to see opportunities to increase rice production in Central Sulawesi province by increasing *cropping index* (IP). The IP can be reached by increasing the utilization of irrigation water and other supporting institutional strengthening.

RESEARCH METHODS

The experiment was conducted in 2013 in two counties, an example of the district rice production centers in Central Sulawesi province. To understand the problem of increasing IP rice in paddy fields then in each district instance selected two districts examples that meet five criteria: (1) a sub potential of rice, (2) gaps IP rice is relatively high, (3) gap in rice productivity is relatively high, (4) the potential for extended wetland is relatively high, and (5) of wetland area is relatively high. In each district further examples have 2 villages example to further explore these issues at the field level.

Respondents were recruited for this study is divided into three categories, namely: (i) Sources / expert rice plants as a source of information about the problem of increasing IP rice at the central level, especially senior researcher at Puslibangtan, BB Rice, BBSDL and BPTP Sulawesi. At the district level, in particular the Head of BPP, Coordinator PPL, officers UPTD /

KCD, and irrigation officers PU. (Ii) A total of 3-5 respondents from village officials and administrators Gapoktan / Farmer. (Iii) supporting institutional actors rice agribusiness include owners of tractors, harvesting machinery owners, rice miller, P3A groups, breeder / trader of rice seeds, planting labor groups and labor groups harvest.

In addition to primary data obtained through interviews using structured questions (questionnaires), this study also collect secondary data from BPS, Bakorsurtanal, BBSDLP, BPSDA and other relevant agencies. Data already collected were analyzed qualitatively and quantitatively.

RESULTS AND DISCUSSION

Increasing the role of IP Against Rice Production Increase

Agriculture, especially rice development strategy pursued by the business: intensification, extension, diversification and rehabilitation. Intensification and extension of an effort to increase rice production. Intensification is closely related to the optimization of land that aims to increase the productivity per unit area (IP) with sufficient water main determining factor. In addition to water, other rice cultivation technology adoption is equally important: the use of improved seed, tillage good, balanced fertilizer use and control of plant pests (OPT).

Increased planting area through increased IP is determined by the adequacy of water in space and time that is appropriate phases of plant growth and development of rice. Appropriate physiological properties of rice crops in dire need of water ranging from planting preparation, seedbed, and until maturation according to IRRI's research (1999) to produce 1 kg of rice it takes a total of 5000 liters of water. Problems of water to try to farm more complex because climate change is causing extreme difficulty in determining the pattern and timing of planting for rice crops the right, while the water demand for rice is very high. Efforts to reduce the need for water in rice plants have been frequent and long implemented, such as the water supply is interrupted (intermittent) and map macak-macak are usually in addition to stumble on the social habits of farmers who are always pooled mapped fields, and also dealing with problem weeds (Julianto. 2014).

IP Rice Improvement Program

Historical facts indicate that efforts to increase the production and productivity of rice in Indonesia have long. Even in the Dutch colonial era these efforts have been done (Cahyono, 2001). One is through the optimization of land that is interpreted as an attempt to increase the utilization of agricultural land while not cultivated and agricultural land that has cropping intensity (IP) is low in order to clear land for farming more productive through improved physical and chemical soil (soil fertility) and repair and support agricultural infrastructure (agricultural infrastructure).

Objective implementation of land optimization are: (1) use the land temporarily cultivated into productive agricultural land, (2) increasing the cropping intensity (IP) to expand the planted area, (3) support the National Rice Production Enhancement (P2BN), (4) preserve agricultural land resources, and (5) expanding job opportunities and business opportunities in rural areas (PSP Director General, Ministry of Agriculture 2013).

For food crops sub-sector, optimization of land required to plant rice and implemented in addition to the lands while not cultivated, is also on lands that have the cropping intensity (IP) ≤ 100. Generally the causes of agricultural land while not sought nor have cropping intensity (IP) is low is because it has a low fertility rate and damage / unavailability of agricultural infrastructure. Therefore, the optimization activities of land to be improved soil fertility through organic fertilizer (compost, zeolite, manure) and inorganic fertilizers (urea, KCL, ZA, SP-36 and NPK), liming in accordance with the needs and other efforts in accordance with factor of limited land / local conditions. Meanwhile, to overcome the damage / unavailability of infrastructure addressed in the program of revitalization of agriculture, especially the revitalization of infrastructure and facilities with priority builders on farm roads, streets production, farm level irrigation networks, irrigation networks and the village tertiary irrigation networks and quarter.

Their gap and gap planting area IP rice in a region suggest there is an increase in acreage and increased IP rice in the region. However, these opportunities are not necessarily able to be used when the availability of water in the region is limited. This is due to the limitations of irrigation water is often a limiting factor for farmers to increase acreage and improve IP rice paddy. At the farm level this is reflected in the tendency of farmers to grow rice if adequate supply of irrigation water, and otherwise on the condition of limited irrigation water supply farmers tend to cultivate crops where water demand is relatively smaller than the rice plant.

Opportunities Through Increased Rice Production Enhancement IP

Agronomically productivity of paddy produced by farmers is the resultant of the effects of three factors: (De Datta, et. Al. 1987; Dey and Hossain, 1995): (i) environmental factors agroecology at the location of production activities such as climatic conditions, temperature, humidity, rainfall, soil solum depth, soil fertility; (Ii) the potential productivity of rice varieties used; and (iii) the quality of farming.

Environmental factors agroecological very rarely change and difficult to manipulate, while the other two factors and can be manipulated and an opportunity to improve the IP. The potential productivity can be improved rice varieties through genetic engineering to produce rice varieties that have the potential for higher productivity and short-lived. Short-lived rice varieties (early maturing) between 10 to 80 days compared to rice IR 64 include: Inpari 1, Inpari 7, Bagendit and Dodokan (Tempo. 2010). Quality of farming in growing crops can be improved by providing training and coaching a group of peasants.

Increased IP rice is a promising option to increase production without requiring additional irrigation facilities and the opening of new land. (Suyamto. 2009). Some of the requirements in the improvement of IP rice supporters include: (1) the use of very early maturing rice varieties that have a lifespan of 90-104 days, (2) control of pests / diseases integrated (IPM) to do more operations, (3) specific integrated nutrient management location, and (4) management of efficient planting and harvesting. (BB Rice. 2009)

The implementation of the increase in IP 400 has been implemented in some places, such as West Java and Jambi. Results of research Supriyadi and Nurbaeti (2011) increase in IP Rice 400 in West Java find: (1) 2 varieties of early duration is Dodokan and Silugonggo as well as two promising lines namely OM 2395 (Inpari 12) and OM 1490 (Inpari 13) that can be used to supporting the implementation of IP pattern 400, (2) system seedbed kidnapped by planting young seedlings can shorten the time of planting for 2 weeks compared with nursery systems farmer manner, (3) direct seeding system can speed up the planting time 7-10 days compared with transplanting system and (4) the need for institutional support in accelerating time to implement IP rice planting 400 dilapangaan including institutional support and Alsintan farmers and farming services

While in Jambi successful implementation of the IP 400 must meet four requirements, namely: (1) an expanse of grown simultaneously with an area of at least 25 ha, (2) tertiary close to the secondary channel, (3) irrigation water available for 11 months, and (4) not endemic pest. The varieties used in IP is Silugonggo increase in MT I with results of 4.5 tons / ha GKP, Dodokan on MT II with results of 4.8 ton / ha GKP and Ciherang on MT III with results of 5.6 tons / ha GKP (Endrizal and Bobihoe. J. 2011)

SUPPORT FOR IMPROVED WATER AVAILABILITY IP RICE FIELD

Water has a very important role in agriculture, according to Rosegrant and Hazell (2000) other than land conversion more serious threat in the future food supply is dwindling water supply. The volatility of water supply that cause droughts and floods will continue to threaten to farming (Molden, 2002; Katumi et al., 2002; Bouman, 2003). In the area that received irrigation water supply from the reservoir though, the threat of water shortages began to appear. In the dry season of 2003 for example, there was a drought in an area of 29,000 ha, or about 28 percent of irrigated area Karawang despite Jakarta's water supply remains filled (Surono, 2003).

There are some problems in the governance of water, so the water is not distributed fairly and evenly. The problem, among others (Rachman, 1999): (i) the amount of water increases the area without the control group; (Ii) the relative location of the mapped fields farthest from the channel is not taken into account in the distribution of water, and the suggestion that technology is in the downstream (tail end); (Iii) illegal wiretapping by the pump continues without doubt; (Iv) the doors of many non-functioning water, and (v) the productivity of rice varies between the upstream and downstream.

Water availability and Opportunities for Improved IP Nationally

Increased rice production agronomically can be reached through increased acreage and increased productivity of rice paddy. Increased rice planting area in the short term can be pursued through increased cropping index (IP) and the productivity of rice, while in the long term can be pursued through the expansion of wetland that enables increased production capacity of rice. Technically the success of both of these efforts is largely determined by the availability of water resources can be used for rice farming. This is because the IP rice low in a region generally occurs due to the limited supply of irrigation water so that efforts to increase rice IP will require the support of adequate irrigation water supply. Similarly, the expansion of rice fields derived from dry land would require an additional supply of water to irrigate rice fields built.

Water balance data of 2003 showed that the need for water during the dry season in Java and Bali amounted to 38.4 billion cubic meters of water available while only about 25.3 billion cubic feet (Table 1). In other words in the dry season in Java and Bali experienced a water deficit of about 52% of the total water available. This indicates that the increase in IP rice that can generally be done in the dry season may not be realized in Java and Bali due to the limited supply of irrigation water. The water deficit is expected to be higher in 2020, where the number of population and economic activity increased significantly.

Table 1. Availability and Needs Water in Some Island 2003 (million m3)

Availability and Needs Water	Jawa dan Bali	Sumatera	Nusa Tenggara	Kalimantan	Sulawesi	Papua
Rainy Season (MH)						
Availability Needs	101 160,8	384,774,4	37 490,4	389 689,3	129 400,2	381 763,9
Water	27 432,9	8 319,0	1 440,0	2 040,8	6 433,3	57,2
Balance	73 727,9	376 455,4	36 050,4	389 689,3	122 966,9	381 706,7
Dry Season (MK)						
Availability	25 290,2	96,193,6	4 215,6	167 009,7	14 377,8	163 613,1
Needs Water	38 406,1	11 646,7	4 320,0	2 857,2	9 006,7	80,0
Balance	-13 115,9	84 546,9	-104,4	164 152,5	5 371,1	163 533,1
Amount						
Availability	126 451,0	480 968,0	42 156,0	556 699,0	143 778,0	545 377,0
Needs Water	65 839,1	19 965,7	5 760,0	4 898,0	15 440,0	137,2
Balance	60 611,9	461 002,3	36 396,0	551 801,0	128 338,0	545 239,8

Source: Directorate of Irrigation Pengairandan, Bappenas, 2006; Directorate General of Water Resources, Ministry of Public Works, 2003 in Samekto and Winata, 2010

Unlike the situation in Java and Bali, the condition of water balance in the other islands still have a surplus except in Nusa Tenggara deficit of water in the dry season. On the island of Sulawesi, Sumatra, Kalimantan and Papua water supply still exceeds the need, in other words a surplus. Surplus water generally occurs during the rainy season and the dry season. On the island of Sulawesi, the water surplus of about 95 percent in the rainy season and 37 percent in the dry season. This shows that in terms of water availability there is an increased chance of extensive seasonal crops in the rainy season and the dry season on the island of Sulawesi is still possible.

Availability of Water in Central Sulawesi

In the province of Central Sulawesi availability of irrigation water for farming seasonal crops is still quite large, in which the potential rice area (which can be irrigated rice area) is generally smaller than the functional rice area (Table 2). The province's total area of irrigated land that has been printed on the entire Regional Irrigation (DI) has been built only about 72 percent of the total irrigated land with the potential to be built (174 455 ha).

Table 2. Number of Regional Irrigation (DI) and Area of Wetland According Regency in Central Sulawesi, 2012

Person in charge	Number of DI (pieces)	Potential rice area (ha)	Functional rice area	
			(ha)	%
Central government	6	34046	23159	68.0
Provincial Government	30	47649	29035	60.9
District Government	439	92760	73246	79.0
1. Palu City	11	1238	1000	80.8
2. Sigi District	28	8308	6566	79.0
3. Donggala District	37	9867	9867	100.0
4. Parigi Moutong District	30	14375	9847	68.5
5. Poso District	130	24156	20987	86.9
6. Tojo Una Una District	8	2931	2377	81.1
7. Banggai District	37	10694	6056	56.6
8. Banggai Kepulauan District	8	983	915	93.1
9. Toli Toli District	39	8818	5690	64.5
10 Buol District	35	6080	3722	61.2
11.Marowali District	75	2946	6220	211.1
Total	475	174455	125440	71.9

Source: Office of Public Works Central Sulawesi.

The above facts revealed that irrigation water is available on the network and dams which have been built by the government have not been used optimally. In other words, the irrigation water that has been pursued by the government through the construction of dams and irrigation networks can not be fully utilized to support the development of rice plants and the crops are generally cultivated farmers in paddy fields. In more detail it can be seen in the pattern of river water users in the DI Gumbasa in Central Sulawesi are shown in Table 3. In DI Gumbasa river water discharge an average of about 330 m3 / sec but which has been channeled through a network of irrigation to paddy fields farmers only about 134 m3 / sec. In other words, of the total flow of water available in the DI Gumbasa about 196 m3 / sec, or about 59% had been thrown into the sea.

Table 3. Debit Water Used for Wetland and Abandoned At Sea to DI Gumbasa in Central Sulawesi province, in 2012.

Month	Week	Irrigation water		River runoff discharged into the sea	
		River discharge (m3 / sec)	Discharge chute (m3 / sec)	(M3 / sec)	(%)
April	I and II	32.052	12.704	19.348	60.4
	III and IV	37.129	15.335	21.794	58.7
May	I and II	41.261	15.858	25.403	61.6
	III and IV	32.688	13.961	18.727	57.3
June	I and II	39.212	14.361	24.851	63.4
	III and IV	28.625	12.38	16.245	56.8
July	I and II	33.502	14.548	18.954	56.6
	III and IV	37.075	12.612	24.463	66.0
August	I and II	25.005	12.456	12.549	50.2
	III and IV	23.630	10.338	13.292	56.3
September	I and II	0	0	0	0.0
	III and IV	0	0	0	0.0
Jumlah		330.179	134.553	195.626	59.2

Source: Water allocation ON Gumbasa 2012. Observers IN Gumbasa.

Water Balance in Central Sulawesi

Economic growth and increasing population is a factor that affects the demand for water in the future. According Pasandaran (2005) there are three tendencies are expected to be occurred related to demand sufficient water: first, the demand for water from outside the agricultural sector will increase faster than the demand for water in agriculture, second, shifting the demand for agricultural commodities will lead to a shift in demand for water in the agricultural sector itself, and the third, a shift in the demand for land will also affect the demand for water.

Table 4 shows the balance of water use in Central Sulawesi Province according to the type of district. It appears that the available water resources largely allocated to the agricultural sector, especially rice plants. Water use is generally still smaller than water available, in other words, Central Sulawesi still have a surplus of water resources, which is about 87 percent of the available water.

Having regard to the terms of the availability of water, the efforts to increase rice IP and expansion of paddy fields is still possible in Central Sulawesi province. This is mainly on non districts surplus rice production center where the water is still very large at around 93 percent, which means only about 7 percent of the water resources are utilized. Surplus rice production center in the district of the water is still quite large at around 61 percent.

Table 4. Balance Water Usage By Type District in Central Sulawesi province, in 2011.

Type districts	Availability (1000 m3)	Utilization (1000 m3)					Balance	
		Rice	Non Rice	Industry	Household	Total	(1000 m3)	%
Central Sulawesi	**183756**	**18658**	**4664**	**4**	**824**	**2415 0**	**159606**	**86.9**
Central Rice	147970	45971	11493	5	903	58371	89598	60.6
Non Central Rice	195550	9657	2414	4	799	12873	182677	93.4
LK-NOSE	199202	8953	2238	4	788	11983	187219	94.0
LK-SE	185389	39134	9784	5	929	49852	135537	73.1
SW-NOSE	134924	21337	5334	4	978	27652	107272	79.5
SW-SE	86738	57158	14290	6	859	72312	14426	16.6

Source : Irawan.B, , et.al (2013)

Info : LK-NOSE : dominant dry land and not a rice production center ;
LK-SE : dominant dry land and paddy centers ;
SW-NOSE: The dominant wetland and not the center of the rice ;
SW-SE : The dominant wetland and rice production center

Lack of water use by farmers due to lack of supporting factors (Irawan. B, et al. 2013), such as: (i) alsintan, such as the availability of a tractor that enables future land processing becomes faster, availability of harvesting machines which allow past or the harvest season is becoming shorter , the availability and the drying floor alsin rice mills that allow post-harvest handling of paddy faster. (Ii) cultivation technology, for example the use of short-lived rice varieties / early maturing, planting by way of direct seeded rice (direct seeding), and nurseries were conducted with kidnapped. (Iii) Institutional support, such as: institutional irrigation, farm laborers institutional, institutional short-lived breeding rice varieties and (iv) the interests of farmers.

Associated with the utilization of water resources, Water Resource Management Agency Ministry of Public Works in order to establish that the sustainability of the water supply for a variety of needs, the utilization of water resources in every region of the maximum of 50 percent of the total water available. Regional water utilization has exceeded 50 percent of the total water available is considered to have reached a critical condition and use more water will be severely restricted. Under these conditions, an increase in the allocation of water to boost paddy rice IP and / or expansion of rice fields in an area difficult to do if the surplus water in the region has not reached 50 percent of the available water resources. Improved water allocation to support efforts to increase rice IP and printing wetland will only be possible if the surplus water in the region is greater than 50 percent, which means still available water resources can be allocated to support both attempts.

To identify districts that still may be improving and expanding IP rice paddy fields in Table 5, which shows the number of districts that have a surplus of more than 60 percent water.

Limitation of 60 percent surplus water is used to avoid the potential inaccuracies of the data used in the calculation of water balance. In districts that have relatively large surplus water of the printing wetland and / or an increase in IP rice may still be made because they provided water that can be allocated to support both attempts. Districts that have water surplus above 60 per cent is largely a non districts rice production center (72 districts in the province of Central Sulawesi).

Table 5. Have Surplus Water District of> 60% By Type District in Central Sulawesi province, in 2011.

Type districts	Districts	Percent (%)	Availability (1000 m^3)	Needs (1000 m^3)	Balance (1000 m^3)	Balance %
Central Sulawesi	**81**	**69.2**	**243037.9**	**15383.3**	**227654.7**	**93.7**
Sentra Rice	9	31.0	313170.9	44923.0	268247.9	85.7
Non Sentra Rice	72	81.8	234271.3	11690.8	222580.5	95.0
LK-NOSE	68	81.9	238571.6	10785.7	227785.8	95.5
LK-SE	9	50.0	313170.9	44923.0	268247.9	85.7
SW-NOSE	4	80.0	161167.0	27077.0	134090.0	83.2
SW-SE	0	0	-	-	-	-

Source : Irawan.B, , et.al (2013)

Info : LK-NOSE : dominant dry land and not a rice production center ;
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This shows that in terms of efforts to increase the availability of water and expansion of IP rice paddy fields is allowed on non districts rice production center. In the central districts of rice this possibility is relatively small because the available water resources that have been utilized for many rice crops. In addition to the availability of water, other supporting factors needed to improve rice IP are: (i) the availability of agricultural machinery, (ii) the availability of technology, (iii) the availability of institutional support, and (iv) the interests of farmers who want to plant rice three times.

POTENTIAL INCREASE IN RICE FIELD AND RICE IP DETERMINANTS

Determinants of IP Rice Improvement

One effort that can be taken to boost rice production is through increased cropping index (IP) rice. Empirically IP paddy fields are indicated by the wide ratio of paddy rice crops than widely available and expressed in a percentage value. The ratio value can be calculated according to the growing season and at particular cropping season (MH or MK) maximum ratio value of 100, which means the growing season of the entire wetland provided planted with rice. Assuming period of paddy planting season about 4 months, the maximum value of IP paddy rice per year is $ 300, which means wetland provided entirely planted with rice 3 times per year, namely the growing season MH, MK1 and MK2.

In some areas in West Java, Central Java, Yogyakarta, East Java, Bali, and Lombok some farmers cultivate rice five times in 2 years (IP 250) and in specific locations even three times per year (IP 300) because water is available throughout the season , Rice intensification program has been mainly directed at land irrigated with water supply is guaranteed. Although not recommended, the fields with rice IP 200 IP rice can be increased to 300 when rain or irrigation water is sufficient (Hasanuddin, 2003).

According Supriyatna (2012) an increase in the IP can be implemented if they fulfill several requirements including: (a) the technical aspects include the use of rice varieties are very early maturing (VUSG), engineering seedbed "kidnapping", the use of alsintan, introduction of tools decomposers and monitoring of plant pests (OPT) ; (B) the economic aspects include production cost efficiency, production efficiency and higher income from existing, optimizing group harvesting and planting groups and attempts stability of grain prices; and (c) the institutional aspect includes optimizing farmers' groups, support micro-finance institutions, provision and transfer of technology required, and (d) policy support both central and local government.

The same thing dikemukaan by Irawan, et al (2013) in which there are three (3) determinants of the increase in IP paddy fields, namely (1) the technical factors, (2) institutional factors, and (3) socio-economic factors. Rating the influence of each determinant factor to the increase in paddy rice IP based on the perception of respondents experts. Among the three crucial factors determining the IP paddy rice, 88.24 percent of respondents experts mentioned that technical factors are most influential on the increase in paddy rice IP (Table 6).

Table 6. Determinants of IP Rice Improvement

No	variables Determinants	Perceptions of Respondents (%)
1.	Technical	88,24
	The availability of irrigation water	88,24
	Age rice	52,94
	How cropping	52,94
2.	Institutional	55.88
	Institutional arrangements water distribution and planting schedules	55,88
	Compactness farmers in planting in unison	50,00
	Culture pengelolan / land use in the dry season (MK1 and MK2)	75,53
3.	social Economy	55.88
	The relative advantages of rice farming	64,71
	Availability of power plant	44,12
	Availability of harvest	31,25
	Availability tractor	31,25
	Availability alsintan harvest and post-harvest	58,82

Sumber : Irawan.B, et.al (2013)

Technical factors are becoming an important part in enhancing the IP rice rankings are: (a) The availability of irrigation water, due to the addition of rice cultivation to three times a year performed in the dry season second (MK II), meaning with enough water rice growing in the dry season can held; (B) Age of rice to shorten the phase of vegetative and generative plant rice; and (c) planting method that takes relatively quickly and in the farming way of planting by direct seeding system (seeded) faster than a system with transplanting (tapin).

Institutional factors, institutional factors become urgent because of the increased IP paddy rice in particular to IP Rice 300 requires a tight schedule over the distribution of water among the group of water, a treatment, nursery activities, planting activities, the length of the vegetative phase and generative rice plants, and harvesting , Institutionally, the most important is the institutional arrangement of water distribution and planting schedules, followed compactness farmers in planting simultaneously, and cultural management / land use in the dry season.

Socio-economic factors into final deciding factor affecting the increase in paddy rice IP, it is declared by 55.88 percent of respondents experts. The results of this empirical finding is logical. Justification is as follows: although technically particularly the availability of irrigation water and in terms of institutional particular coordination between institutions in order to determine planting schedules and simultaneously setting water distribution allows for upgrading the IP rice in particular IP Rice 300, but when the terms of socioeconomic not allow to do because of the relative advantages of rice farming is low, the opportunity cost of off-farm employment is relatively higher and in the villages concerned it difficult to find workers for the activities of tillage, planting and harvesting, then the increase in IP rice in particular IP rice 300 will be difficult to realized.

In this study determined 5 (five) variables that are part of the socio-economic factors, namely (1) the relative advantages of rice farming, (2) the availability of planting, (3) the availability of energy harvesting, (4) the availability of tractors, and (5) availability alsintan harvest and post-harvest. Ranked the influence of each of these variables to the realization of the increase in IP IP in particular paddy rice paddy 300 based on the respondent's perception of experts can be sorted from highest to lowest are as follows: (1) the relative advantages of rice farming (64.71%), (2) power plant availability (44.12%), (3) the availability of energy harvesting (31.25%), (4) the availability of tractors, and (5) the availability alsintan harvest and post-harvest (58.82%). So it seems here that 64.71 percent of respondents experts say that the relative advantages of rice farming is a socio-economic variables that most influence on the realization of the increase in IP IP in particular paddy rice paddy 300.

IP Increasing Opportunities and Increasing Production of Rice in Central Sulawesi

One of the factors that determine the success of efforts to increase IP rice in a region of the gap that exists between the potential of IP paddy rice can be achieved compared to existing IP. The greater the gap IP rice in a region the more likely the success of efforts to increase rice IP in the region. Conversely, if the gap is relatively small rice IP then IP rice in the region is difficult to be improved further as the full potential of rice available IP has been used.

Opportunities to increase rice production through increased IP rice in Central Sulawesi province at 159.4 thousand tons GKP (Table 7). Most of the opportunities to increase rice production through improved rice IP derived from non-center districts paddy (GKP 123.8 thousand tons or 50.7 percent of total rice production improvement opportunities). Approximately 99.8 thousand tons of opportunities to increase rice production comes from the type LK-NOSE districts (districts predominantly dry land instead of rice production center) and the rest comes from other types of districts. It shows that the type of these districts should be a priority in the implementation of improvement programs IP paddy rice. In type districts are actually quite available water resources so as to allow an increase in IP rice but also quite a wetland that is not used for rice farming.

Table 7. Production Increase Opportunities Through Increased IP Rice Paddy by Type District in Central Sulawesi province.

Type districts	District	Production of paddy 2011 (1000 ton)	Districts have an increased chance IP rice				Opportunities to increase rice production	
			District	(%)	production potential (1000 ton)	actual production (1000 ton)	(1000 ton)	(%) *
Central Sulawesi	**117**	**874.9**	**66**	**56.4**	**438.2**	**278.7**	**159.4**	**18.2**
Central Rice	29	630.6	9	31.0	175.5	139.9	35.6	5.7
Non Central Rice	88	244.3	57	64.8	262.7	138.9	123.8	50.7
LK-NOSE	83	224.5	53	63.9	220.4	120.5	99.8	44.5
LK-SE	18	325.9	9	50.0	175.5	139.9	35.6	10.9
SW-NOSE	5	19.8	4	80.0	42.3	18.3	24.0	121.1
SW-SE	11	304.7	0	0.0	0.0	0.0	0.0	0.0

Source : Irawan.B, et.al (2013)

Info : LK-NOSE : dominant dry land and not a rice production center ;
LK-SE : dominant dry land and paddy centers ;
SW-NOSE: The dominant wetland and not the center of the rice ;
SW-SE : The dominant wetland and rice production center

*) As a percentage of rice production in 2011.

STRATEGIES FOR INCREASING IP RICE RICE FIELD IN CENTRAL SULAWESI

Infrastructure Development

Improved quality of road infrastructure and electricity will improve access to employment and boost agricultural revenues (Gibson And Olivia. 2008). According to Hartono et.al (2010) increase in infrastructure development will boost economic growth, the government's revenue, income and reducing poverty. Especially in the field of agricultural infrastructure is the main choice is the improvement of land transport infrastructure facilities, and telecommunications. Hartoyo research results (2013) rehabilitation of roads could increase rice production and income of farmers in rural areas. Besides the rehabilitation of roads also have a positive effect on household income than rice and non-agricultural activities. If the path length can be increased by 10%, it will increase demand for urea fertilizer of 4.92% and 5.30% for the TSP. Increased fertilizer demand has resulted in increasing the production of rice, corn, peanuts and cassava at 2.23%, 8.90%, 9.82%, 9.34% and 2.99%, respectively (Hartayo 1994.

It should be mentioned that the illustration of the development needs of infrastructure, institutional and policy support will be carried out in the village Pandere, district Gumbasa, which is one of the villages irrigated DI Gumbasa. Pandere village has an area of 241 hectares of paddy fields with irrigation kind in the form of technical irrigation. The cropping pattern in the village are rice-paddy-rice fallow or have IP 200. It was mentioned earlier that the water balance analysis based wetland DI Pandere Gumbasa included in the village it's possible to grow rice three (3) times a year. In other words, in paddy fields in DI Gumbasa it is possible to improve the IP IP paddy rice from paddy IP 200 to 300.

Increased IP rice can be done through (1) the provision of tillage hand tractor in order to be fast. Currently with 200 IP paddy soil treatment duration was 30 days, whereas for rice IP 300 tillage recommended duration of only 20 days. Number of hand tractors in the village Pandere at present with rice IP 200 is 15 units. Though based on a formula calculating the amount of hand tractors (JTT), with rice IP 200 the number of hand tractors operating in the village of Pandere during land preparation is ideally a 28 unit. Meanwhile, the rice IP 300 the number of hand tractors operating in the village of Pandere during land preparation should be 42 units. So, if the IP paddy in the village of Pandere will be increased from 200 to IP IP rice paddy 300 then takes an additional 27 units of hand tractors.

2. Changing the cropping systems by using labor which is not much. Indications of growing labor shortages in the village Pandere marked by habit sharecroppers handed advances to labor groups in order to obtain the certainty of obtaining planting teak plantations and planting labor groups that usually only work two (2) weeks after the advance payment is submitted. It should be mentioned that the length of time (period) planting in the village Pandere with 200 IP rice or with rice IP 300 is the same, that is 14 days (2 weeks). Based on the formula calculates the number of labor groups cropping (JKBT), with IP or IP paddy rice to 200 300 the number of labor groups cropping is needed in the village at the time of planting activity Pandere ideally around 18 groups of workers planting. In this connection is not obtained information about the number of labor groups that operate in the village planting Pandere at this time.

3. Procurement reapers (combined harvester). At this time with 200 duration IP rice harvest activities is 20 days, while for the 300 IP rice harvest activities recommended duration of only 10 days. Therefore the only way to shorten the length of time the harvest is to utilize the reapers. Based on the formula of calculating the number of reapers (JMP), with rice IP 300 the

number of harvesters in the village Pandere required at the time of harvest activity should as much as 10 units.

4. Making the drying floor. To attract farmers grind the grain to his mill, mill owners usually give loans other than agricultural production facilities, also provides the use of facilities such as drying floors and storage of dried paddy (DUP) for free. The provision of facilities such as free use of the drying floor causing farmers have to queue in order to be able to use these facilities since the limited capacity of the drying floor. This in turn has led to harvesting is done in stages in accordance with the order in the queue and consequently further length of time (period) become old crop until around 1 (one) month.

Institutional Development

Institutional water management is not just an organization for technical activities per se, but rather it is a social institution, even in rural Indonesia contains the rules that have been agreed more loaded than the physical means (Ambler, 1990). According Pasandaran and Taryoto (1993) setting irrigation oriented towards generalization policy regardless of local norms often face obstacles. Therefore in a pluralistic society system as it exists in Indonesia, consideration uniqueness of each community or region should be considered.

Some empirical research results show the performance of irrigation management at the farm level is very diverse, but the allocation of irrigation water at this level is still far from optimal (Fagi and Manwan, 1997: Pasandaran and Herman, 1995; Pusposutardjo, 1995). Practices Award irrigation water for farming is still likely to extravagant, while the loss of water in irrigation canals is still hard pressed. Therefore, the institutional development of irrigation water are rooted in the local culture (local endowment) within the framework of supporting the implementation of regional autonomy becomes important.

According Saptana et.al. (2001), two factors are a constraint in the institutional development of irrigation in the framework of regional autonomy, the first technical factors such as: (i) the availability of irrigation water distribution patterns of precipitation between the time that the patterns are not steady, (ii) the occurrence of deterrence either in the main building and supporting, (iii) the occurrence of damage to both the main building and supporting and (iv) the number of channels or worm-quarter loss and does not work. The second factor is economic issues such as: (i) farmers are generally rational in selecting commodities and cropping patterns are most profitable, while the system of irrigation networks designed for rice, (ii) to accelerate time tillage faced with the constraints of the limited number of tractors and power work, (iii) the undeveloped capital markets in rural areas, (iv) rising input prices and wages tungkat, and (v) the decline in agricultural commodity prices.

Several institutional factors which are expected to hinder the realization of IP Rice 300, such as the difficulty for farmers to agree a timetable for planting, trouble synchronizing between water distribution arrangements by the Department of Irrigation Works with farmers planting schedules, and the difficulty farmers to plant simultaneously. This can be overcome by deliberation that resulted in an agreement in the form of arrangement of cropping patterns, deal time the scattering of seeds and planting schedules, variety-rice varieties to be planted in each planting season. Institutions that participated in this discussion include: the institutional committee Tk irrigation I and Level II, Tata Water Management Committee (PTPA) and local water user farmers (P3A). The existence of P3A very strategic (Kuswanto, 1977) because: (a) the owner of the rights to water and irrigation by farmers who are members of P3A is collective, (b) P3A can serve as an instrument for creating and maintaining economic equality among farmers and (c) technically would require a culture change effort that is very heavy.

Steps institutional capacity required are: (1) coordination between farmer groups / Gapoktan, Agriculture Office / District and the Department of Irrigation Works District / Sub-District in order to determine planting schedules and simultaneously setting water distribution, (2) coordination between farmers' groups in one Gapoktan and between gapoktan with HIPPA or P3A in order to realize the growing simultaneously in accordance with the planting schedule that has been agreed upon, (3) develop or grow businesses leasing services of hand tractors in the village managed by farmer groups or private so that farmers tenants easily satisfies their need for services tillage, (4) develop or grow the labor groups planted in the village managed by farmer groups or private so sharecropper easily satisfy his need for energy services cropping, and (5) grow and develop businesses in the form of procurement / deployment of agricultural machinery as well as plant workers from outside the administration area village / district / district managed by farmer groups and or private in order to meet the shortage of tillage, planting and energy harvesting power in the village.

Policy Development Support

Policy advocates an increase in the IP the rice must have at least three (3) characteristics, namely: (1) ease farming costs to be borne by farmers, (2) provide assurance of the risks of crop failure due to pest attack, and (3) facilitate the farmer / group farmer's own agricultural machines. Form of supporting policies which are offset the cost of farming is the provision of rice seeds free or subsidized provision of rice seeds like the government program of Integrated Crop Management Field School (FFS-ICM). Form of supporting policies which are guarantees of the risk of crop failures due to pest attack may be a provision for compensation in the amount adjusted by the percentage of harvest failure wide. Meanwhile, the shape of supporting policies that are easier for farmers / farmer groups have farm machinery can the form of credit with interest subsidized loans for individual farmers and farm machinery or the provision of assistance to farmers 'groups on the condition later rolled out to other farmers' groups. Giving credit with interest subsidized loans for individual farmers is deemed important because the price of agricultural machinery is relatively expensive. For example, the price of reapers (combined harvester) per unit of approximately USD 300 million. Whereas in the area of rice production centers outside Java, where the agricultural labor force is relatively rare, the use of agricultural machinery to perform an activity in rice farming is a necessity. As another example, the price of the dryer (dryer) per unit of approximately USD 600 million with a drying capacity of 20 tons per day GKP.

CONCLUSIONS AND RECOMMENDATIONS

Increased IP rice is a short-term efforts to increase the production of which requires the availability of adequate water, surplus water has a minimum of 50% (Necessary condition). During this time the water in the province of Central Sulawesi did not experience problems, even have a tendency of more thrown into the sea than to be used for rice cultivation. Excess water has the potential to improve the IP in the area of Central Sulawesi. Efforts to improve the IP needs to be supported by their efforts to accelerate the nursery activities, shorten the length of time tillage, shorten the length of time of planting, to shorten the phase of vegetative and generative plant rice and shorten the length of time the harvest is sufficient conditions (sufficient condition).

Some suggestions are taken into consideration to improve the IP rice: (a) expanse of land targeted for increased IP rice should be large enough to minimize the risk of crop failure due to nuisance pest, (b) land spread target is an integral irrigation network to facilitate the setting rotation of the water, (c) coordination with agencies PU irrigation, intensified to ensure the supply of irrigation water according to the needs of rice plants, (d) the necessary support of the tractor to shorten the processing time of land, (e) the necessary support for the mechanization of the harvest and post-harvest to shorten the time of harvest and post-harvest , (f) the necessary support rice cultivation technology that allows the rice cultivation period becomes shorter as the way to plant varieties seeded and use of short-lived, and (g) the need to develop institutional workers to shorten the time of planting / growing season.

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