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(NLP)

(Donaldson,1996; Komeili et al.,2005;
Rynolds et al., 2000)

(Yuan et al., 2003 ; Hanc & Pumphrey ,1984
Hoffman ,1997; Martin & Miller ,1983 ; Shalheret et
al.,1983; Hegney & Ebrahimipak and Pazira, 2009)

.(Ebrahimipak, 2010; Carlson et al 2003)

(Jolyni and Alavishari, 2006; Hassanpana and
Hossen Zade, 2003; Meshken et al.,2003; Sobhani et al.,
.2003)

(Komeili et
al.,2005; Debak et al., 1996; Fischer,1979).

(Rahimian and Banaian,
1998)

(Richards
et al., 2001; Rajaram et al.,1995)

(Machado et al.,1993)

(Hassanpana and Hossen Zade, 2003; Meshkini et al.,
2003; Sobhani et al., 2003; Wright & Stark, 1990; Shock
et al., 2000; Lynch et al.,1995, Eldredge,1996;

Karafyllidis et al.,1996)

(Eldredge et al.,1996; Robins &

(2002) Florencio et al.

.Dommingo, 1996)

.(Hang et al., 1986; Miller & Martin, 1987;Ebrahimipak & Pazira2009)

(2004)Wang and Zhoa

(Karafyllidis

.et al., 1996; Robins & Domingo, 1996)

(1990) Ludlow and Muchow

(1997) Mainuddin et al. .

(Bakhshode, 2001)

LINDO

Raju and .

.(Charaz et al.,1992; Matanga et al., 1977)

(1999)Kumar

(2001) Benli et al. .

Reca .

(2001) et al.

(1998) Kumar et al..

.(Carvallo et al., 1997; Benli and Kodal, 2003)

.(Carvallo et al, 1997)

(2007) Sharefan

(Manocchi and Mecarelli,

.1994; Benli et al., 2001 ; Doorenbos and Kassam, 1979)

:(1997) Carvallo et al. :

Nimah

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$$\max u = \sum_{i=1}^n \sum_{j=1}^m (P_j A_{ij} y_{ij} - c_{ij} A_{ij})$$

(2007)

:A :P :U

:i :C :y

n m J

(2004) Ishtiag and Muhamad .

:(Elamami et al., 2001) ISAREG, :

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(Dynamic Programming)

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(Jolyni and

:

Alavishari, 2006; Hassanpana and Hossen Zade, 2003;

Meshken et al.,2003; Sobhani et al., 2003)

()

(Karafyllidis et al., 1996; Robins & Domingo, 1996)

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			E ₄
			E ₀
	/		E ₁
/		/	E ₂
/			E ₃
			E ₄

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()

(Komeili et

al.,2005; Debak et al., 1996; Fischer, 1979Richards etal.,2001; Rajaram et al., 1995; Machado et al.,1993)

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$I(w) = \sum_{i=1}^3 a_i w_i^2 + \sum_{i=1}^3 b_i w_i + \sum_{i=1}^3 c_i$			$C(w) = \sum_{i=1}^3 a_i w_i^2 + \sum_{i=1}^3 b_i w_i + \sum_{i=1}^3 c_i$			$y(w) = \sum_{i=1}^3 a_i w_i^2 + \sum_{i=1}^3 b_i w_i + \sum_{i=1}^3 c_i$		
c	b	a	c	b	a	c	b	a
		/			/		/	/
		/			/		/	/
		/		/	/		/	/

$Maxu_2 = [(-1/926(w)^2 + 31447(w) - 89572445) - (-/0398(w)^2 + 898(w) + 9700671)]$

(Non Linear

: (NIP) Programming)

$Maxu_3 = [(-/740(w)^2 + 12884(w) - 20412290) - (-/096(w)^2 + 1641/9(w) + 7218780)]$

(NLP)

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$MaxU = \sum_{i=1}^n I(w_i) - C(w_i) \longleftrightarrow MaxU = [P_c \sum_{i=1}^n y(w_i) - \alpha(w_i)]$

y w C :U
p I

$max u_1 = [(-2/42(w)^2 + 27818/1(w) - 70083724) - (/0263(w)^2 - 191/08(w) + 3325488/3)]$

$max u_2 = [(-2/85(w)^2 + 30776/2(w) - 74503986) - (-/0220(w)^2 + 295/5 + 2103566)]$

$max u_3 = [(-2/11(w)^2 + 21669(w) - 47772089) - (-/0164(w)^2 + 226(w) + 2308245/8)]$

Florencio et al.

(1999)Raju and Kumar (2002)

$max u_4 = [(-1/5(w)^2 + 15574/8(w) - 32551672) - (-/01161(w)^2 + 177/8(w) + 2427926/4)]$

$max u_5 = [(-0/895(w)^2 + 8802/5(w) - 13633852) - (-0/00693(w)^2 + 125/34(w) + 2574389/3)]$

$Maxu_1 = [(-2/76(w)^2 + 47427/9(w) - 160365160) - [-/205(w)^2 + 3359/41(w) + 573924/1]$

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$$\begin{aligned}
 MaxN = & [((-1/5(w)^2 + 15574/8(w) - 32551672) \\
 & + (-2/764(w)^2 + 47427/9(w) - 16036516)) - \\
 & ((-0263(w)^2 - 191/08(w) + 3325488/3) + \\
 & (-/205(w)^2 + 3359.4(w) + 573934.1)]
 \end{aligned}
 \quad ()$$

()

$$\begin{aligned}
 MaxN = & [((- / 895 (w)^2 + 8802 / 5(w) - 13633852) + \\
 & (-1 / 926 (w)^2 + 31447 (w) - 89572445) - \\
 & ((- / 01161 (w)^2 + 177 / 8(w) + \\
 & 2427926 / 4) + (- / 0398 (w)^2 + 898 (w) + 9700671))
 \end{aligned}
 \quad ()$$

()

$$\begin{aligned}
 MaxN = & [((-2 / 42 (w)^2 + 27818 / 1(w) - 70083724) \\
 & + (- / 740 (w)^2 + 12884 (w) - 20412290)) - \\
 & ((/ 0263 (w)^2 - 191 / 08 (w) + 3325488 / 3) + \\
 & (- / 096 (w)^2 + 1641 / 9(w) - 7218780)]
 \end{aligned}
 \quad ()$$

(2004) Ishtiag and Muhamad (2007) Nimah

REFERENCES

- Benli, B., and S. Kodal. (2003). A non-linear model for farm optimization with adequate and limited water supplies Application to the South-east Anatolian Project (GAP) Region. *Agric. Water Manage.* 62, 187–203
- Benli, B., Selli, F., and Kodal, S., (2001). Crop pattern optimization with adequate and limited dwater supply at small-scale farms in GAP-Tahilalan irrigation district. In: *Proceeding of the Second GAP, Agricultural Congress, Urfa, 24–26 October 2001* (in Turkish).
- Bakhshode, M and Akbari, A. (2001). *Principles of economics agricultural products*. Kerman University, p 363 (in Farsi).
- Bondok, M.A., (1996). “The role boron regulating growth yield and hormonal balance in sugar beet”, *Annals of Agricultural Science (cario)*. 41, (1), 15-33.
- Carvalho, H.O., Holzapfel, E.A., Lopez, M.A., and Marino, M.A. (1998). “Irrigation cropping optimization”; *Journal of irrigation and Drainage Engineering*; 124(2), March/April.
- Carlson, L., and Boudier, J.(2003) “sugar beet Agronomy 101, water quality” .Montana.edu /docs/Irrigation /sugar beet, 101.shtml –1k.
- Carter, J.N., Jensen, M.E., and Traveller, D.J. (1980). “Effect of mid- to –Late season water stress on sugar beet growth and yield”. *Journal of Agronomy*..72 (3), 806-815,
- Chavez, M., Marino, J., and Holzapfel, E., A., (1992). “planning simulation model of irrigation district”; *J. Irri. And Drain. Eng. ASCE*, 118(1), pp 74-78,
- Debake, P., puech, J., and casale, M. L. (1996). “Yield build – up in winter wheat under soil water deficit.1: Lysimeter studies”. *Agronomic*, 16,3-23,
- Donaldson, E. (1996). “Crop traits for water stress tolerance”, *American journal of alternative Agriculture*, 11 (2-3), 84-94,
- Doorenbos, J., and Kassam, A.H., (1979). Yield response to water. *FAO Irrigation and Drainage Paper 33*, Rome.
- Ebrahimipak, N.A. (2010). Determination of Potential Evapotranspiration wheat and potato with Lysimeter. Final Report, *Soil and Water Research Institute*, p: 75(in Farsi).
- Ebrahimipak, N.A., and Pazira, E. (2009). The Effect of Deficit Irrigation in Growth Stages on the Quantity and Quality of Potatoes and Water Use Efficiency. *Journal of Agricultural Engineering Research*, 9(4), 17-30.(in Farsi)
- Elamami, H., Zairi, A., Perciva, L.S., Machado, T., Slatn, A., and Rodrigues, P., “Deficit irrigation of cereals and horticultural crops Economic analysis” *Agricultural Engineering international the CIGR Journal of: Scientific Research and Development*. Manuscript LW 00 7b, 3, 2002.
- Eldredge, E. P., Holmes, Z. A., Mosley, A. R., Shock C.C., and Stieber T .D.1996. Effects of transitory water stress on Potato tuber stem end reducing sugar and fry color .*American Potato Journal*, 73-517-530
- Fischer, R.A. (1985) “Number of Kernels in wheat crops and the influence of solar radiation and temperature”, *Journal of Agricultural Science*, 108,447-461.
- Florencio–Cruz, V.R., Valdivin, A and Scott, Y.C.A. (2002). Water productivity in the ALTO Riolerma, Irrigation district, *Agrocien*, 36, 4
- Hassanpana, D. and Hoseen zade, A. (2002). Evaluation of different varieties in different irrigation regimes and cut irrigation in the growth tuber stages in the Ardabil area. *The 7th Iranian Crop Sciences Congress*. Aug. 24-26. Karaj. Iran. (In Farsi)
- Ishtiaq, H. and Muhamad, A.R. (2004). Determination of optimum cropping pattern in the Faisalabad Division (Pakistan) *Internatianaal Journal of Agriculture and Biology*.
- Jolyni, M. and Alavishari, J. (2006). Study of the effects of irrigation method, planting, date and variety on true potato seed production. *Agric. Sci.* 16(2), 129-136. (In Farsi)
- Karafyllidis, D.I., Stavropoulos, N., and Georgakis, D. (1996). The effects of water stress on the yielding capacity of potato crop and subsequent performance of seed tubers, *Potato Research*, 39, 153-163.
- Komeili, H.R., Rashed. M.H., Ghodsi, M., and A. Zare Fizabadi, A.Z. (2005). Evaluation of drought

- tolerance of new wheat genotypes under water stress conditions. *Iranian Journal of Agricultural Engineering Research*, 16(2), 181-189(in Farsi)
- Kumar, C.N., Indrasenan, N., and Elango, K., (1998). Non-linear programming model for extensive irrigation, *J. Irrig. Drain. Eng.*
- Ludlow, M.M., and Muchow, R.C. (1990). A Critical evaluation of traits for improving crop yields in water – limited, environments. A.D.W.
- Matanga, G.A., and Marino, M.A., (1977). "Application of optimization and simulation techniques to irrigation management," paper No, 5003, Pept of water sci. and Engrg.univ. Of California, Davis, Ca.
- Machado, E.C., Lagoa, A.M.A., and Ticelli, m., "Source-sink relationships in wheat subjected to water stress during three productive stage". *Revista Brasileira de fisiologia vegetal*,5(2), 145-150,1993.
- Mainuddin, M., Das Gupta, A., and Raj Onta, P., (1997). Optimal crop planning model for an existing groundwater irrigation project in Thailand. *Agric. Water Manage.* 33, 43-62.
- Manocchi, F., and Mecarelli, P., (1994). Optimization analysis of deficit irrigation systems. *J. Irrig. Drain. Eng. ASCE* 120 (3), 484-503.
- Meshkini, A., Noormohamadi, Gh. and Kashi, A. (2002). Study of effects on irrigation time and splits nitrogen on yield and yield component two potato varieties. *The 7th Iranian Crop Sciences Congress*. Aug. 24-26. Karaj. Iran. (In Farsi)
- Nagaraju, K. C., Inderasenan, N., and Elang, K., (1998). "Nonlinear programming model for extensive irrigation", *J. Irri. And dran. Engineering*; 124(2), March/April.
- Nimah, N.M. (2007). Water Productivity: A new concept for Improving Irrigation water uses efficiency. ASABE Annual International Meeting.
- Raju, K.S., Kumar, D.N. (1999). Multicriterion decision making in irrigation planning. *Agric. Syst.* 62, 117-129.
- Rajaram, S., and Braun, H.J. and VanGinkel, M. (1995). "Cimmyts approach to breed for drought tolerance". *Euphytica*, 92 (1-2), pp.147-153,
- Rahimian. H and Bnaian. (2001). Physiological basas of plant breeding. Jahade-daneshgahi Ferdowsi University.
- Reca, J., Roldan, J., Alcaide, M., Lopez, R., and Camacho, E. (2001). Optimization model for water allocation in deficit irrigation systems. I. Description of the model. *Agric. Water Manage.* 48, 103-116.
- Richard, G., and Allen, M.(1986) "Sprinkler irrigation project design with production function".*J.Irri. and Drain. Eng.*; .112
- Robins, J. S. and Domingo O. E. (1996). Potato yield and tuber shape as affected several soil Moisture deficits and plant spacing. *Agronomy Journal*, 48,488-492.
- Sharefan, H. (2007). *Optimize the pattern and density of planting in the uncertain situation of the irrigation water qualities*. Ph.D. Thesis Tarbiat modars university
- Sobhani, A., Rahimian, M., Noormohamadi, Gh. and Majidi, A. (2000). The effects water stress and fertilization potassium on yield and yield component potato. *J. Agric. Sci. Res.* 3, 23-24. (In Farsi)
- Shock, C. C., and Feibert, E. B. G. (2002). Deficit irrigation of potato "F.A.O, Irrigation and Drainage Paper 22"deficit Irrigation practices" RomeItaly.
- Wang, Z., and Zhoa, Z. 2004. Optimizing of water allocation in canal systems of Chengai irrigation area, *Nature and Science*, 2: 1, in www.science pub.net.
- Winter, S.R. (1980). "Suitability of Sugar beet for limited Irrigation in a semi-arid climate", *Agro.J.* 72, 118 -123.
- Yuan Hong, Y., Zhary, L., and Shaoqiang, Z., (1994). "A study on the optimal allocation model of limited irrigation water": ICID BULLETIN 1994, 43(2).

